NOAA Technical Memorandum NMFS-NE-238

US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2015

US DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Fisheries Science Center
Woods Hole, Massachusetts
May 2016

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US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2015

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May 2016

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Information Quality Act Compliance: In accordance with section 515 of Public Law 106-554, the Northeast Fisheries Science Center completed both technical and policy reviews for this report. These predissemination reviews are on file at the NEFSC Editorial Office.

Species Names: The NEFSC Editorial Office's policy on the use of species names in all technical communications is generally to follow the American Fisheries Society's lists of scientific and common names for fishes, mollusks, and decapod crustaceans and to follow the Society for Marine Mammalogy's guidance on scientific and common names for marine mammals. Exceptions to this policy occur when there are subsequent compelling revisions in the classifications of species, resulting in changes in the names of species.

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ACKNOWLEDGMENTS

The authors wish to acknowledge advice, comments and valuable contributions provided by the Northeast Fisheries Science Center Fisheries Sampling Branch; Mendy Garron, Amanda Johnson, David Gouveia, and Allison Rosner of the Northeast Regional Office; Ruth Ewing, LaGena Fantroy, Wayne Hoggard, Aleta Hohn, Blair Mase, Wayne McFee, Gina Rappucci, Elizabeth Scott-Denton and Elizabeth Stratton of the Southeast Fisheries Science Center; Jarita Davis, Fred Serchuck, and Michael Simpkins of the Northeast Fisheries Science Center; Jessica Powell of the Southeast Regional Office; Lori Schwacke of the National Ocean Service;William McLellan of University of North Carolina Wilmington; and James Gilbert, Robert Kenney, Jack Lawson, Michael Moore, Douglas Nowacek, James 'Buddy' Powell, Andy Read, Richard Seagraves, Randall Wells, and Sharon Young of the Atlantic Scientific Review Group. We also thank the Marine Mammal Commission and the Humane Society of the United States for their constructive comments and advice.

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EXECUTIVE SUMMARY

Under the 1994 amendments of the Marine Mammal Protection Act (MMPA), the National Marine Fisheries Service (NMFS) and the United States Fish and Wildlife Service (USFWS) were required to generate stock assessment reports (SARs) for all marine mammal stocks in waters within the U.S. Exclusive Economic Zone (EEZ). The first reports for the Atlantic (includes the Gulf of Mexico) were published in July 1995 (Blaylock *et al.* 1995). The MMPA requires NMFS and USFWS to review these reports annually for strategic stocks of marine mammals and at least every 3 years for stocks determined to be non-strategic. Included in this report as appendices are: 1) a summary of serious injury/mortality estimates of marine mammals in observed U.S. fisheries (Appendix I), 2) a summary of NMFS records of large whale human-caused serious injury and mortality (Appendix II), 3) detailed fisheries information (Appendix III), 4) summary tables of abundance estimates generated over recent years and the surveys from which they are derived (Appendix IV), a summary of observed fisheries bycatch (Appendix V), and a list of reports not updated in the current year (Appendix VI).

Table 1 contains a summary, by species, of the information included in the stock assessments, and also indicates those that have been revised since the 2014 publication. Most of the changes incorporate new information into sections on population size and/or mortality estimates. A total of 43 of the Atlantic and Gulf of Mexico stock assessment reports were revised for 2015. The revised SARs include 27 strategic and 16 non-strategic stocks.

This report was prepared by staff of the Northeast Fisheries Science Center (NEFSC) and Southeast Fisheries Science Center (SEFSC). NMFS staff presented the reports at the February 2014 meeting of the Atlantic Scientific Review Group (ASRG), and subsequent revisions were based on their contributions and constructive criticism. This is a working document and individual stock assessment reports will be updated as new information becomes available and as changes to marine mammal stocks and fisheries occur. The authors solicit any new information or comments which would improve future stock assessment reports.

INTRODUCTION

Section 117 of the 1994 amendments to the Marine Mammal Protection Act (MMPA) requires that an annual stock assessment report (SAR) for each stock of marine mammals that occurs in waters under USA jurisdiction, be prepared by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS), in consultation with regional Scientific Review Groups (SRGs). The SRGs are a broad representation of marine mammal and fishery scientists and members of the commercial fishing industry mandated to review the marine mammal stock assessments and provide advice to the NOAA Assistant Administrator for Fisheries. The reports are then made available on the *Federal Register* for public review and comment before final publication.

The MMPA requires that each SAR contain several items, including: (1) a description of the stock, including its geographic range; (2) a minimum population estimate, a maximum net productivity rate, and a description of current population trend, including a description of the information upon which these are based; (3) an estimate of the annual human-caused mortality and serious injury of the stock, and, for a strategic stock, other factors that may be causing a decline or impeding recovery of the stock, including effects on marine mammal habitat and prey; (4) a description of the commercial fisheries that interact with the stock, including the estimated number of vessels actively participating in the fishery and the level of incidental mortality and serious injury of the stock by each fishery on an annual basis; (5) a statement categorizing the stock as strategic or not, and why; and (6) an estimate of the potential biological removal (PBR) level for the stock, describing the information used to calculate it. The MMPA also requires that SARs be updated annually for stocks which are specified as strategic stocks, or for which significant new information is available, and once every three years for non-strategic stocks.

Following enactment of the 1994 amendments, the NMFS and USFWS held a series of workshops to develop guidelines for preparing the SARs. The first set of stock assessments for the Atlantic Coast (including the Gulf of Mexico) were published in July 1995 in the *NOAA Technical Memorandum* series (Blaylock *et al.* 1995). In April 1996, the NMFS held a workshop to review proposed additions and revisions to the guidelines for preparing SARs (Wade and Angliss 1997). Guidelines developed at the workshop were followed in preparing the 1996 through 2015 SARs. In 1997 and 2004 SARs were not produced.

In this document, major revisions and updating of the SARs were completed for stocks for which significant new information was available. These are identified by the May 2016 date-stamp at the top right corner at the beginning of each report. Stocks not updated in 2015 are listed in Appendix VI.

REFERENCES

Blaylock, R.A., J.W. Hain, L.J. Hansen, D.L. Palka and G.T. Waring 1995. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments. NOAA Tech. Memo. NMFS-SEFSC-363, 211 pp.

Wade, P.R. and R.P. Angliss 1997. Guidelines for assessing marine mammal stocks: Report of the GAMMS workshop April 3-5, 1996, Seattle, Washington. NOAA Tech. Memo. NMFS-OPR-12, 93 pp.

TABLE 1. A SUMMARY (including footnotes) OF ATLANTIC MARINE MAMMAL STOCK ASSESSMENT REPORTS FOR STOCKS OF MARINE MAMMALS UNDER NMFS AUTHORITY THAT OCCUPY WATERS UNDER USA JURISDICTION.

Total Annual S.I. (serious injury) and Mortality and Annual Fisheries S.I. and Mortality are mean annual figures for the period 2009-2013. The “SAR revised” column indicates 2015 stock assessment reports that have been revised relative to the 2014 reports (Y=yes, N=no). If abundance, mortality, PBR or status have been revised, they are indicated with the letters “a”, “m”, “p” and “status” respectively. For those species not updated in this edition, the year of last revision is indicated. Unk = unknown and undet=undetermined (PBR for species with outdated abundance estimates is considered "undetermined").

Species	Stock Area	NMFS Ctr.	Nbest	Nbest CV	Nmin	Rmax	Fr	PBR	Total Annual S.I and Mort.	Annual Fish. S.I. and Mort. (cv)	Strategic Status	SAR Revised
North Atlantic right whale	Western North Atlantic	NEC	476	0	476	0.04[a]	0.1	1	4.3[a]	3.4[a]	Y	Y (a, m, p)
Humpback whale	Gulf of Maine	NEC	823	0	823	0.065	0.1	2.7	9.0[b]	7.4[b]	Y	Y (m)
Fin whale	Western North Atlantic	NEC	1,618	0.33	1,234	0.04	0.1	2.5	3.55[c]	1.75[c]	Y	Y (m)
Sei whale	Nova Scotia	NEC	357	0.52	236	0.04	0.1	0.5	0.4[d]	0 [d]	Y	Y (m)
Minke whale	Canadian east coast	NEC	20,741	0.30	16,199	0.04	0.5	162	7.9[e]	6.5 [e]	N	Y m
Blue whale	Western North Atlantic	NEC	unk	unk	440	0.04	0.1	0.9	unk	unk	Y	N (2010)
Sperm whale	North Atlantic	NEC	2,288	0.28	1,815	0.04	0.1	3.6	0.8	0.8	Y	N (2014)
Dwarf sperm whale	Western North Atlantic	SEC	3,785[j]	0.47 [k]	2,598 [j]	0.04	0.5	26	3.4	3.4 (1.0)	N	N (2013)
Pygmy sperm whale	Western North Atlantic	SEC	3,785 [j]	0.47 [k]	2,598 [j]	0.04	0.5	26	3.4	3.4 (1.0)	N	N (2013)
Killer whale	Western North Atlantic	NEC	unk	unk	unk	0.04	0.5	unk	0	0	N	N (2014)
Pygmy killer whale	Western North Atlantic	SEC	unk	unk	unk	0.04	0.5	unk	0	0	N	N (2007)
False killer whale	Western North Atlantic	SEC	442	1.06	212	0.04	0.5	2.1	unk	unk	Y	N (2014)
Northern bottlenose whale	Western North Atlantic	NEC	unk	unk	unk	0.04	0.5	unk	0	0	N	N (2014)
Cuvier's beaked whale	Western North Atlantic	NEC	6,532	0.32	5,021	0.04	0.5	50	0.4	0.2	N	N (2013)
Blainville’s beaked whale	Western North Atlantic	NEC	7,092[i]	0.54	4,632 [i]	0.04	0.5	46	0.2	0.2	N	N (2013)
Gervais beaked whale	Western North Atlantic	NEC	7,092[i]	0.54	4,632 [i]	0.04	0.5	46	0	0	N	N (2013)
Sowerby’s beaked whale	Western North Atlantic	NEC	7,092[i]	0.54	4,632 [i]	0.04	0.5	46	0	0	N	N (2014)
True’s beaked whale	Western North Atlantic	NEC	7,092[i]	0.54	4,632 [i]	0.04	0.5	46	0	0	N	N (2013)

Species	Stock Area	NMFS Ctr.	Nbest	Nbest CV	Nmin	Rmax	Fr	PBR	Total Annual S.I and Mort.	Annual Fish. S.I. and Mort. (cv)	Strategic Status	SAR Revised
Melon-headed whale	Western North Atlantic	SEC	unk	unk	unk	0.04	0.5	unk	0	0	N	N (2007)
Risso's dolphin	Western North Atlantic	NEC	18,250	0.46	12,619	0.04	0.48	126	54	54 (0.26)	N	Y (m)
Pilot whale, long-finned	Western North Atlantic	NEC	5,636	0.63	3,464	0.04	0.5	35	31	31 (0.14)	N	Y (a, m, p)
Pilot whale, short-finned	Western North Atlantic	SEC	21,515	0.37	15,913	0.04	0.5	159	148	148 (0.20)	N	Y (m)
Atlantic white-sided dolphin	Western North Atlantic	NEC	48,819	0.61	30,403	0.04	0.5	304	102	102 (0.17)	N	Y (m)
White-beaked dolphin	Western North Atlantic	NEC	2,003	0.94	1,023	0.04	0.5	10	0	0	N	N (2007)
Short-beaked common dolphin	Western North Atlantic	NEC	173,486	0.55	112,531	0.04	0.5	1,125	363	363 (0.11)	N	Y (m)
Atlantic spotted dolphin	Western North Atlantic	SEC	44.715	0.43	31,610	0.04	0.5	316	0	0	N	N (2013)
Pantropical spotted dolphin	Western North Atlantic	SEC	3,333	0.91	1,733	0.04	0.5	17	0	0	N	N (2013)
Striped dolphin	Western North Atlantic	NEC	54,807	0.3	42,804	0.04	0.5	428	0	0	N	N (2013)
Fraser's dolphin	Western North Atlantic	SEC	unk	unk	unk	0.04	0.5	unk	0	0	N	N (2007)
Rough-toothed dolphin	Western North Atlantic	SEC	271	1.0	134	0.04	0.5	1.3	0	0	N	N (2013)
Clymene dolphin	Western North Atlantic	SEC	unk	unk	unk	0.04	0.5	undet	0	0	N	N (2013)
Spinner dolphin	Western North Atlantic	SEC	unk	unk	unk	0.04	0.5	unk	0	0	N	N (2013)
Common bottlenose dolphin	Western North Atlantic, offshore	SEC	77,532 [g]	0.40	56,053[g]	0.04	0.5	561	43.9	43.9 (0.26)	N	Y (m)
Common bottlenose dolphin	Western North Atlantic, northern migratory coastal	SEC	11,548	0.36	8,620	0.04	0.5	86	1-7.5	1-7.5	Y	Y (m)
Common bottlenose dolphin	Western North Atlantic, southern migratory coastal	SEC	9,173	0.46	6,326	0.04	0.5	63	0-12	0-12	Y	Y (m)
Common bottlenose dolphin	Western North Atlantic, S. Carolina/Georgia coastal	SEC	4,377	0.43	3,097	0.04	0.5	31	1.2-1.6	1.2-1.6	Y	Y (m)
Common bottlenose dolphin	Western North Atlantic, northern Florida coastal	SEC	1,219	0.67	730	0.04	0.5	7	0.4	0.4	Y	Y (m)
Common bottlenose dolphin	Western North Atlantic, central Florida coastal	SEC	4,895	0.71	2,851	0.04	0.5	29	0.2	0.2	Y	Y (m)

Species	Stock Area	NMFS Ctr.	Nbest	Nbest CV	Nmin	Rmax	Fr	PBR	Total Annual S.I and Mort.	Annual Fish. S.I. and Mort. (cv)	Strategic Status	SAR Revised
Common bottlenose dolphin	Northern North Carolina Estuarine System	SEC	823	0.06	782	0.04	0.5	7.8	1.0-16.7	1.0-16.7	Y	Y (m)
Common bottlenose dolphin	Southern North Carolina Estuarine System	SEC	unk	unk	unk	0.04	0.5	undet	0-0.4	0-0.4	Y	Y (a, m, p)
Common bottlenose dolphin	Northern South Carolina Estuarine System	SEC	unk	unk	unk	0.04	0.5	unk	0.2	0.2	Y	Y (m)
Common bottlenose dolphin	Charleston Estuarine System	SEC	unk	unk	unk	0.04	0.5	undet	unk	unk	Y	Y (a, p)
Common bottlenose dolphin	Northern Georgia/ Southern South Carolina Estuarine System	SEC	unk	unk	unk	0.04	0.5	unk	1.4	1.4	Y	Y (m)
Common bottlenose dolphin	Central Georgia Estuarine System	SEC	192	0.04	185	0.04	0.5	1.9	unk	unk	Y	Y
Common bottlenose dolphin	Southern Georgia Estuarine System	SEC	194	0.05	185	0.04	0.5	1.9	unk	unk	Y	Y
Common bottlenose dolphin	Jacksonville Estuarine System	SEC	unk	unk	unk	0.04	0.5	unk	1.2	1.2	Y	Y (m)
Common bottlenose dolphin	Indian River Lagoon Estuarine System	SEC	unk	unk	unk	0.04	0.5	unk	4.4	4.4	Y	Y (m)
Common bottlenose dolphin	Biscayne Bay	SEC	unk	unk	unk	0.04	0.5	unk	unk	unk	Y	N (2013)
Common bottlenose dolphin	Florida Bay	SEC	unk	unk	unk	0.04	0.5	undet	unk	unk	N	N (2013)
Harbor porpoise	Gulf of Maine/Bay of Fundy	NEC	79,833	0.32	61,415	0.046	0.5	706	564	564 (0.15)	N	Y (m)
Harbor seal	Western North Atlantic	NEC	75,834	0.15	66,884	0.12	0.5	2,006	420	408 (0.11)	N	Y (m)
Gray seal	Western North Atlantic	NEC	unk	unk	unk	0.12	1.0	unk	3,810	1,193 (0.11)	N	Y (m)
Harp seal	Western North Atlantic	NEC	unk	unk	unk	0.12	1.0	unk	306,082[g]	271 (0.19)	N	N (2013)
Hooded seal	Western North Atlantic	NEC	unk	unk	unk	0.12	0.75	unk	5,199[h]	25(0.82)	N	N (2007)
Sperm whale	Gulf of Mexico	SEC	763	0.38	560	0.04	0.1	1.1	0	0	Y	Y (m)
Bryde's whale	Gulf of Mexico	SEC	33	1.07	16	0.04	0.1	0.03	0.2	0	Y	Y (p, m)
Cuvier's beaked whale	Gulf of Mexico	SEC	74	1.04	36	0.04	0.5	0.4	0	0	N	N (2012)
Blainville's beaked whale	Gulf of Mexico	SEC	149[i]	0.91	77	0.04	0.5	0.8	0	0	N	N (2012)
Gervais' beaked whale	Gulf of Mexico	SEC	149[i]	0.91	77	0.04	0.5	0.8	0	0	N	N (2012)
Common bottlenose dolphin	Gulf of Mexico, Continental shelf	SEC	51,192	0.10	46,926	0.04	0.5	469	0.8	0.6	N	Y (m)
Common bottlenose dolphin	Gulf of Mexico, eastern coastal	SEC	12,388	0.13	11,110	0.04	0.5	111	1.6	1.6	N	Y (m)

Species	Stock Area	NMFS Ctr.	Nbest	Nbest CV	Nmin	Rmax	Fr	PBR	Total Annual S.I and Mort.	Annual Fish. S.I. and Mort. (cv)	Strategic Status	SAR Revised
Common bottlenose dolphin	Gulf of Mexico, northern coastal	SEC	7,185	0.21	6,044	0.04	0.5	60	0.4	0.4	N	Y (m, status)
Common bottlenose dolphin	Gulf of Mexico, western coastal	SEC	20,161	0.17	17,491	0.04	0.5	175	0.6	0.6	N	Y (m, status)
Common bottlenose dolphin	Gulf of Mexico, Oceanic	SEC	5,806	0.39	4,230	0.04	0.5	42	6.5	6.5 (0.65)	N	N (2014)
Common bottlenose dolphin	Gulf of Mexico, bay, sound and estuary (27 stocks)	SEC	unk for all but 6 stocks	unk	unk for all but 6 stocks	0.04	0.5	undet for all but 6 stocks	unk	unk	Y for all	Y stranding and fishery data
Common bottlenose dolphin	Barataria Bay	SEC	unk	unk	unk	0.04	0.5	undet	0.8	0.8	Y	Y (m)
Common bottlenose dolphin	Mississippi Sound, Lake Borgne, Bay Boudreau	SEC	901	0.63	551	0.04	0.5	5.6	2.2	1.6	Y	Y (m)
Common bottlenose dolphin	St. Joseph Bay	SEC	152	0.08	142	0.04	0.5	1.4	unk	unk	Y	Y (m)
Common bottlenose dolphin	Choctawhatchee Bay	SEC	179	0.04	173	0.04	0.5	1.7	0.4	0.4	Y	Y (m)
Atlantic spotted dolphin	Gulf of Mexico	SEC	unk	unk	unk	0.04	0.5	undet	42	42 (0.45)	N	Y (m)
Pantropical spotted dolphin	Gulf of Mexico	SEC	50,880	0.27	40,699	0.04	0.5	407	4.4	4.4	N	Y (m)
Striped dolphin	Gulf of Mexico	SEC	1,849	0.77	1,041	0.04	0.5	10	0	0	N	N (2012)
Spinner dolphin	Gulf of Mexico	SEC	11,441	0.83	6,221	0.04	0.5	62	0	0	N	N (2012)
Rough-toothed dolphin	Gulf of Mexico	SEC	624	0.99	311	0.04	0.5	3	0	0	N	N (2012)
Clymene dolphin	Gulf of Mexico	SEC	129	1.00	64	0.04	0.5	0.6	0	0	N	N (2012)
Fraser's dolphin	Gulf of Mexico	SEC	unk	unk	unk	0.04	0.5	undet	0	0	N	N (2012)
Killer whale	Gulf of Mexico	SEC	28	1.02	14	0.04	0.5	0.1	0	0	N	N (2012)
False killer whale	Gulf of Mexico	SEC	unk	unk	unk	0.04	0.5	undet	0	0	N	N (2012)
Pygmy killer whale	Gulf of Mexico	SEC	152	1.02	75	0.04	0.5	0.8	0	0	N	N (2012)
Dwarf sperm whale	Gulf of Mexico	SEC	186[j]	1.04	90	0.04	0.5	0.9	0	0	N	N (2012)
Pygmy sperm whale	Gulf of Mexico	SEC	186[j]	1.04	90	0.04	0.5	0.9	0.3	0.3 (1.0)	N	N (2012)
Melon-headed whale	Gulf of Mexico	SEC	2,235	0.75	1,274	0.04	0.5	13	0	0	N	N (2012)
Risso's dolphin	Gulf of Mexico	SEC	2,442	0.57	1,563	0.04	0.5	16	7.9	7.9 (0.85)	N	Y (m)
Pilot whale, short-finned[l]	Gulf of Mexico	SEC	2,415	0.66	1456	0.04	0.5	15	0.5	0.5 (1.0)	N	Y (m)
Sperm Whale	Puerto Rico and US Virgin Islands	SEC	unk	unk	unk	0.04	0.1	unk	unk	unk	Y	N (2010)
Common bottlenose dolphin	Puerto Rico and US Virgin Islands	SEC	unk	unk	unk	0.04	0.5	unk	unk	unk	Y	N (2011)
Cuvier's beaked whale	Puerto Rico and US Virgin Islands	SEC	unk	unk	unk	0.04	0.5	unk	unk	unk	Y	N (2011)

Species	Stock Area	NMFS Ctr.	Nbest	Nbest CV	Nmin	Rmax	Fr	PBR	Total Annual S.I and Mort.	Annual Fish. S.I. and Mort. (cv)	Strategic Status	SAR Revised
Pilot whale, short-finned	Puerto Rico and US Virgin Islands	SEC	unk	unk	unk	0.04	0.5	unk	unk	unk	Y	N (2011)
Spinner dolphin	Puerto Rico and US Virgin Islands	SEC	unk	unk	unk	0.04	0.5	unk	unk	unk	Y	N (2011)
Atlantic spotted dolphin	Puerto Rico and US Virgin Islands	SEC	unk	unk	unk	0.04	0.5	unk	unk	unk	Y	N (2011)

a. The R given for right whales is the default Rmax of 0.04. The total estimated human-caused mortality and serious injury to right whales is estimated at 4.3 per year. This is derived from two components: 1) non-observed fishery entanglement records at 3.4 per year, and 2) ship strike records at 0.9 per year.

b. The total estimated human-caused mortality and serious injury to the Gulf of Maine humpback whale stock is estimated as 9.0 per year. This average is derived from two components: 1) incidental fishery interaction records 7.4; 2) records of vessel collisions, 1.6.

c. The total estimated human-caused mortality and serious injury to the Western North Atlantic fin whale stock is estimated as 3.55 per year . This average is derived from two components: 1) incidental fishery interaction records 1.75; 2) records of vessel collisions, 1.8.

d. The total estimated human-caused mortality and serious injury to the Nova Scotia sei whale stock is estimated as 0.4 per year. This average is derived from two components: 1) incidental fishery interaction records 0; 2) records of vessel collisions, 0.4 .

e. The total estimated human-caused mortality and serious injury to the Canadian East Coast minke whale stock is estimated as 7.9 per year. This average is derived from three components: 1) 0.2 minke whales per year from observed U.S. fisheries; 2) 6.5 minke whales per year (unknown CV) from U.S. and Canadian fisheries using strandings and entanglement data; and 3) 1.2 per year from U.S. ship strikes

f. Estimates may include sightings of the coastal form.

g. The total estimated human caused annual mortality and serious injury to harp seals is 306,082. Estimated annual human caused mortality in US waters is 271 harp seals (CV=0.19) from the observed US fisheries. The remaining mortality is derived from five components: 1) 2007-2011 average catches of Northwest Atlantic harp seals by Canada, 125,751; 2) 2007-2011 average Greenland Catch, 79,181; 3) 1,000 average catches in the Canadian Arctic; 4) 12,330 average bycatches in the Newfoundland lumpfish fishery; and 5) 87,546 average struck and lost animals.

h This is derived from three components: 1) 5,173 from 2001-2005 (2001 = 3,960; 2002 = 7,341; 2003 = 5,446, 2004=5,270; and 2005=3,846) average catches of Northwest Atlantic population of hooded seals by Canada and Greenland; 2) 25 hooded seals (CV=0.82) from the observed U.S. fisheries; and 3) one hooded seal from average 2001-2005 stranding mortalities resulting from non-fishery human interactions.

i. This estimate includes Gervais' beaked whales and Blainville's beaked whales for the Gulf of Mexico stocks, and all species of *Mesoplodon* in the Atlantic.

j. This estimate includes both the dwarf and pygmy sperm whales.

k. This estimate includes all *Globicephala sp.*, though it is presumed that only short-finned pilot whales are present in the Gulf of Mexico.

NORTH ATLANTIC RIGHT WHALE (*Eubalaena glacialis*): Western Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The western North Atlantic right whale population ranges primarily from calving grounds in coastal waters of the southeastern United States to feeding grounds in New England waters and the Canadian Bay of Fundy, Scotian Shelf, and Gulf of St. Lawrence. Mellinger *et al.* (2011) reported acoustic detections of right whales near the nineteenth-century whaling grounds east of southern Greenland, but the number of whales and their origin is unknown. However, Knowlton *et al.* (1992) reported several long-distance movements as far north as Newfoundland, the Labrador Basin, and southeast of Greenland. In addition, resightings of photographically identified individuals have been made off Iceland, in the old Cape Farewell whaling ground east of Greenland (Hamilton *et al.* 2007), northern Norway (Jacobsen *et al.* 2004), and the Azores (Silva *et al.* 2012). The September 1999 Norwegian sighting represents one of only two published sightings in the 20th century of a right whale in Norwegian waters, and the first since 1926. Together, these long-range matches indicate an extended range for at least some individuals and perhaps the existence of important habitat areas not presently well described. A few published records from the Gulf of Mexico (Moore and Clark 1963; Schmidly *et al.* 1972; Ward-Geiger *et al.* 2011) likely represent occasional wanderings of individual animals and mom-calf pairs beyond the sole known calving and wintering ground in the waters of the southeastern United States. Whatever the case, the location of much of the population is unknown during the winter. Offshore (greater than 30 miles) surveys flown off the coast of northeastern Florida and southeastern Georgia from 1996 to 2001 had 3 sightings in 1996, 1 in 1997, 13 in 1998, 6 in 1999, 11 in 2000 and 6 in 2001 (within each year, some were repeat sightings of previously recorded individuals). An offshore survey in March 2010 observed the birth of a right whale in waters 40 miles off Jacksonville, Florida (Foley *et al.* 2011). Several of the years that offshore surveys were flown were some of the lowest count years for calves and for numbers of right whales in the Southeast recorded since comprehensive surveys began in the calving grounds. Therefore, the frequency with which right whales occur in offshore waters in the southeastern U.S. remains unclear.

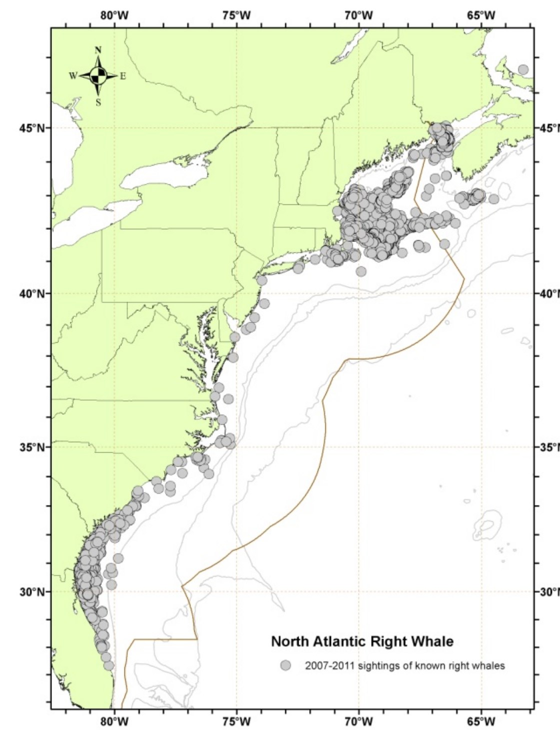

Figure 1. *Distribution of sightings of known North Atlantic right whales, 2007-2011. Isobaths are the 100-m, 1000-m and 4000-m depth contours.*

Surveys have demonstrated the existence of seven areas where western North Atlantic right whales congregate seasonally: the coastal waters of the southeastern United States; the Great South Channel; Jordan Basin (Cole *et al.* 2013); Georges Basin along the northeastern edge of Georges Bank; Cape Cod and Massachusetts Bays; the Bay of Fundy; and the and the Roseway Basin on the Scotian Shelf. Passive acoustic studies of right whales have demonstrated their near year-round presence in the Gulf of Maine (Bort *et al.* 2015). In addition, acoustic studies detected right whale presence off Georgia and North Carolina in 7 of 11 months monitored (Hodge *et al.* 2015). All of this work further demonstrates the highly mobile nature of right whales. Movements within and between habitats are extensive and the area off the mid-Atlantic states is an important migratory corridor. In 2000, one whale was photographed in Florida waters on 12 January, then again eleven days later (23 January) in Cape Cod Bay, less than a month later off Georgia (16 February), and back in Cape Cod Bay on 23 March, effectively making the round-trip migration to the Southeast and back at least twice during the winter season (Brown and Marx 2000). Results from satellite tags clearly indicate that sightings separated by perhaps two weeks should not necessarily be assumed to indicate a stationary or resident animal. Instead, telemetry data have shown rather lengthy and somewhat distant excursions, including into deep water off the continental shelf (Mate *et al.* 1997; Baumgartner and Mate 2005). Systematic surveys conducted off the coast of North Carolina during the winters of 2001 and 2002 sighted 8 calves, suggesting the calving grounds may extend as far north as Cape Fear. Four of the calves were not sighted by surveys conducted further south. One of the females photographed was new to researchers, having effectively eluded identification over the period of its maturation (McLellan *et al.* 2003). There is also at least one recent case of a calf apparently being born in the Gulf of Maine (Patrician *et al*. 2009) and another newborn recently detected in Cape Cod Bay.

New England waters are important feeding habitats for right whales, which feed in this area primarily on copepods (largely of the genera *Calanus* and *Pseudocalanus*). Research suggests that right whales must locate and exploit extremely dense patches of zooplankton to feed efficiently (Mayo and Marx 1990). These dense zooplankton patches are likely a primary characteristic of the spring, summer, and fall right whale habitats (Kenney *et al.* 1986, 1995). While feeding in the coastal waters off Massachusetts has been better studied than in other areas, right whale feeding has also been observed on the margins of Georges Bank, in the Great South Channel, in the Gulf of Maine, in the Bay of Fundy, and over the Scotian Shelf. The characteristics of acceptable prey distribution in these areas are beginning to emerge (Baumgartner *et al.* 2003; Baumgartner and Mate 2003). NMFS (National Marine Fisheries Service) and Center for Coastal Studies aerial surveys during springs of 1999-2006 found right whales along the Northern Edge of Georges Bank, in the Great South Channel, in Georges Basin, and in various locations in the Gulf of Maine including Cashes Ledge, Platts Bank, and Wilkinson Basin. Analysis of the sightings data has shown that utilization of these areas has a strong seasonal component (Pace and Merrick 2008). The consistency with which right whales occur in such locations is relatively high, but these studies also highlight the high interannual variability in right whale use of some habitats (Pendleton *et al.* 2009). Right whale calls have been detected by autonomous passive acoustic sensors deployed between 2005 and 2010 at three sites (Massachusetts Bay, Stellwagen Bank, and Jeffreys Ledge) in the southern Gulf of Maine (Morano *et al*. 2012, Mussoline *et al*. 2012). Acoustic detections demonstrate that right whales are present more than aerial survey observations indicate. Comparisons between detections from passive acoustic recorders with observations from aerial surveys in Cape Cod Bay between 2001 and 2005 demonstrated that aerial surveys found whales on approximately two-thirds of the days during which acoustic monitoring detected whales (Clark *et al*. 2010). Passive acoustic monitoring is demonstrating that the current understanding of the distribution and movements of right whales in the Gulf of Maine and surrounding waters is incomplete. In the most recent years (2012—2015), surveys have detected fewer individuals using areas such as the Great South Channel and the Bay of Fundy, which is suggestive of another large shift in habitat use patterns.

Genetic analyses based upon direct sequencing of mitochondrial DNA (mtDNA) have identified 7 mtDNA haplotypes in the western North Atlantic right whale, including hetroplasmy that led to the declaration of the 7th haplotype (Malik *et al.* 1999, McLeod and White 2010). Schaeff *et al.* (1997) compared the genetic variability of North Atlantic and southern right whales (*E. australis*), and found the former to be significantly less diverse, a finding broadly replicated by Malik *et al.* (2000). The low diversity in North Atlantic right whales might be indicative of inbreeding, but no definitive conclusion can be reached using current data. Additional work comparing modern and historic genetic population structure, using DNA extracted from museum and archaeological specimens of baleen and bone, has suggested that the eastern and western North Atlantic populations were not genetically distinct (Rosenbaum *et al.* 1997; 2000). However, the virtual extirpation of the eastern stock and its lack of recovery in the last hundred years strongly suggest population subdivision over a protracted (but not evolutionary) timescale. Genetic studies concluded that the principal loss of genetic diversity occurred prior to the 18th century (Waldick *et al.* 2002). However, revised conclusions that nearly all the remains in the North American Basque whaling archaeological sites were bowhead whales and not right whales (Rastogi *et al.* 2004; McLeod *et al.* 2008) contradict the previously held belief that Basque whaling during the 16th and 17th centuries was principally responsible for the loss of genetic diversity.

High-resolution (i.e., using 35 microsatellite loci) genetic profiling has been completed for 66% of all North Atlantic right whales identified through 2001. This work has improved our understanding of genetic variability, number of reproductively active individuals, reproductive fitness, parentage, and relatedness of individuals (Frasier *et al.* 2007).

One emerging result of the genetic studies is the importance of obtaining biopsy samples from calves on the calving grounds. Only 60% of all known calves are seen with their mothers in summering areas, when their callosity patterns are stable enough to reliably make a photo-ID match later in life. The remaining 40% are not seen on a known summering ground. Because the calf's genetic profile is the only reliable way to establish parentage, if the calf is not sampled when associated with its mother early on, then it is not possible to link it with a calving event or to its mother, and information such as age and familial relationships is lost. From 1980 to 2001, there were 64 calves born that were not sighted later with their mothers and thus unavailable to provide age-specific mortality information (Frasier *et al.* 2007). An additional interpretation of paternity analyses is that the population size may be larger than was previously thought. Fathers for only 45% of known calves have been genetically determined. However, genetic profiles were available for 69% of all photo-identified males (Frasier 2005). The conclusion was that the majority of these calves must have different fathers that cannot be accounted for by the unsampled males and the population of males must be larger (Frasier 2005). This inference of additional animals that have never been captured photographically and/or genetically suggests the existence of habitats of potentially significant use that remain unknown.

POPULATION SIZE

The western North Atlantic minimum stock size is based on a census of individual whales identified using photo-identification techniques. A review of the photo-ID recapture database as it existed on 20 October 2014 indicated that 476 individually recognized whales in the catalog were known to be alive during 2011. This number represents a minimum population size. This is a direct count and has no associated coefficient of variation.

Previous estimates using the same method with the added assumption that whales seen within the previous five years were still alive have resulted in counts of 295 animals in 1992 (Knowlton *et al.* 1994) and 299 animals in 1998 (Kraus *et al.* 2001). An International Whaling Commission (IWC) workshop on status and trends of western North Atlantic right whales gave a minimum direct-count estimate of 263 right whales alive in 1996 and noted that the true population was unlikely to be substantially greater than this (Best *et al.* 2001).

Historical Abundance

An estimate of pre-exploitation population size is not available. Basque whalers were thought to have taken right whales during the 1500s in the Strait of Belle Isle region (Aguilar 1986), however, genetic analysis has shown that nearly all of the remains found in that area are, in fact, those of bowhead whales (Rastogi *et al.* 2004; Frasier *et al.* 2007). The stock of right whales may have already been substantially reduced by the time whaling was begun by colonists in the Plymouth area in the 1600s (Reeves *et al.* 2001; Reeves *et al.* 2007). A modest but persistent whaling effort along the coast of the eastern U.S. lasted three centuries, and the records include one report of 29 whales killed in Cape Cod Bay in a single day during January 1700. Reeves *et al*. (2007) calculated that a minimum of 5500 right whales were taken in the western North Atlantic between 1634 and 1950, with nearly 80% taken in a 50-year period between 1680 and 1730. They concluded "there were at least a few thousand whales present in the mid-1600s." The authors cautioned, however, that the record of removals is incomplete, the results were preliminary, and refinements are required. Based on back calculations using the present population size and growth rate, the population may have numbered fewer than 100 individuals by 1935 when international protection for right whales came into effect (Hain 1975; Reeves *et al.* 1992; Kenney *et al.* 1995). However, little is known about the population dynamics of right whales in the intervening years.

Minimum Population Estimate

The western North Atlantic population size was estimated to be at least 476 individuals in 2011 (461 cataloged whales plus 15 not cataloged calves at the time the data were received) based on a census of individual whales identified using photo-identification techniques. This value is a minimum, and does not include animals that were alive prior to 2008 but not recorded in the individual sightings database as seen during 1 December 2008 to 25 October 2013 (note that matching of photos taken during 2013-2014 was not considered complete at the time these data were received, P. Hamilton, New England Aquarium, pers. comm.).

Current Population Trend

The population growth rate reported for the period 1986–1992 by Knowlton *et al.* (1994) was 2.5% (CV=0.12), suggesting that the stock was showing signs of slow recovery, but that number may have been influenced by discovery phenomenon as existing whales were recruited to the catalog. Work by Caswell *et al.* (1999) suggested that crude survival probability declined from about 0.99 in the early 1980s to about 0.94 in the late 1990s. The decline was statistically significant. Additional work conducted in 1999 was reviewed by the IWC workshop on status and trends in this population (Best *et al.* 2001); the workshop concluded based on several analytical approaches that survival had indeed declined in the 1990s. Although capture heterogeneity could negatively bias survival estimates, the workshop concluded that this factor could not account for the entire observed decline, which appeared to be particularly marked in adult females. Another workshop was convened by NMFS in September 2002, and it reached similar conclusions regarding the decline in the population (Clapham 2002). At the time, no one examined the early part of the recapture series for excessive retrospective recaptures which had the potential to positively bias survival as the catalog was being developed.

An increase in mortality in 2004 and 2005 was cause for serious concern (Kraus *et al.* 2005). Calculations based on demographic data through 1999 (Fujiwara and Caswell 2001) indicated that this mortality rate increase would reduce population growth by approximately 10% per year (Kraus *et al.* 2005). Of those mortalities, six were adult females, three of which were carrying near-term fetuses. Furthermore, four of these females were just starting to bear calves, losing their complete lifetime reproduction potential. Strong evidence for flat or negative growth exists in the time series of minimum number alive during 1998-2000, which coincided with very low calf production in 2004. However, the population has continued to grow since that apparent interval of decline (Figure 1).

Examination of the minimum number alive population index calculated from the individual sightings database, as it existed on 20 October 2014, for the years 1990-2011 (Figure 1) suggests a positive and slowly accelerating trend in population size. These data reveal a significant increase in the number of catalogued whales with a geometric mean growth rate for the period of 2.8%.

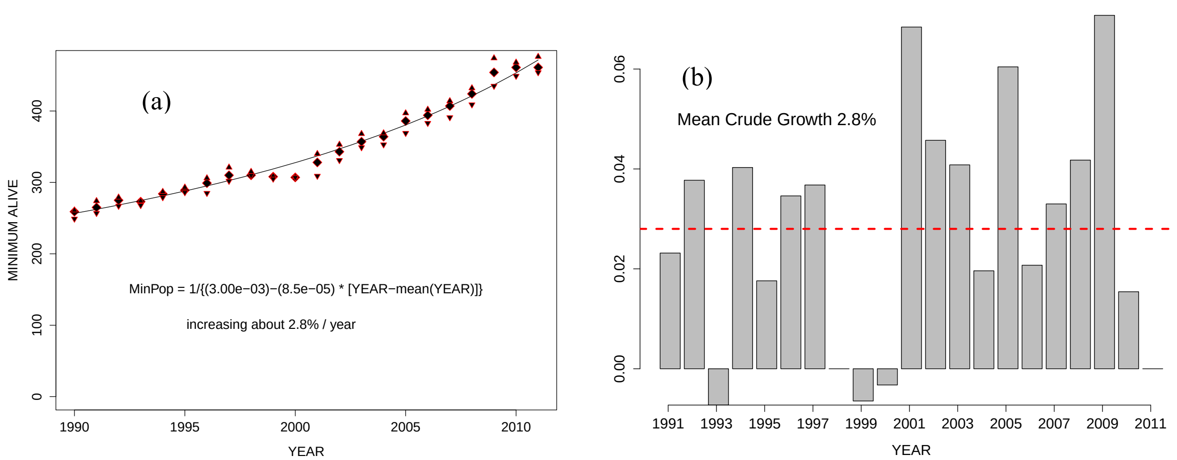

Figure 1. Minimum number alive (a) and crude annual growth rate (b) for cataloged North Atlantic right whales. Minimum number (N) of cataloged individuals known to be alive in any given year includes all whales known to be alive prior to that year and seen in that year or subsequently plus all whales newly cataloged that year. Cataloged whales may include some but not all calves produced each year. Bracketing the minimum number of cataloged whales is the number without calves (below) and that plus calves above, the latter which yields Nmin for purposes of stock assessment. Mean crude growth rate (dashed line) is the exponentiated mean of $\log_e [(N_{t+1}-N_t)/N_t]$ *for each year (t).*

The minimum number alive may increase slightly in later years as analysis of the backlog of unmatched but high-quality photographs proceeds. For example, the minimum number alive for 2002 was calculated to be 313 from a 15 June 2006 data set and revised to 325 using the 30 May 2007 data set.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

During 1980–1992, at least 145 calves were born to 65 identified females. The number of calves born annually ranged from 5 to 17, with a mean of 11.2 (SE=0.90). The reproductively active female pool was static at approximately 51 individuals during 1987–1992. Mean calving interval, based on 86 records, was 3.67 years. There was an indication that calving intervals may have been increasing over time, although the trend was not statistically significant (P=0.083) (Knowlton *et al.* 1994). Since 1993, calf production has been more variable than a simple stochastic model would predict (Table 1).

Table 1. North Atlantic right whale calf production and mortality, 1993-2013.

Year[a]	Reported calf production	Reported and assumed calf mortalities [b]
1993	8	2
1994	8	0
1995	7	0
1996	22	3
1997	20	1
1998	6	1
1999	4	0
2000	1	0
2001	31	4
2002	22	2
2003	19	0
2004	16	1
2005	28	0
2006	19	2
2007	23	2
2008	23	2
2009	39	1
2010	19	0
2011	22	0
2012	7	1
2013	20	1

[a] includes December of the previous year
[b] mortalities include assumed deaths based on observations of mothers seen with a calf and then resighted later that same year without a calf

Total reported calf production and calf mortalities from 1993 to 2013 are shown above in Table 1. The mean calf production for this 20-year period was 17. During the 2004 and 2005 calving seasons three adult females were found dead with near-term fetuses. Productivity for this stock has been highly variable over time as has been characterized by periodic changes in mean reproductive intervals of some females (Kraus *et al.* 2001). Not withstanding the high variability observed which might be expectedfrom a small population, productivity as characterized by calves observed per Nmin has no apparent trend (Figure 2).

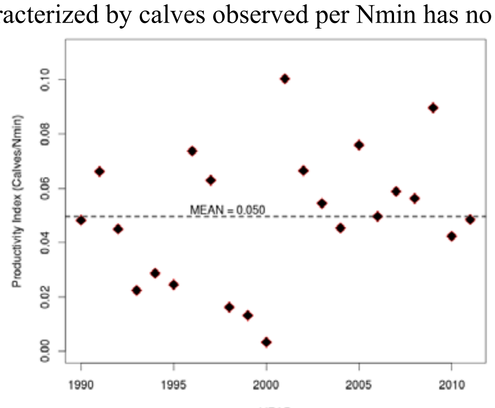

Figure 2. Productivity in the North Atlantic right whale population as characterized by calves detected/Nmin. Note that because Nmin is likely biased somewhat low, the values shown in the graph likely overstate actual per capita production.

North Atlantic right whales have thinner blubber than southern right whales off South Africa (Miller *et al.* 2011). Blubber thickness of male North Atlantic right whales (males were selected to avoid the effects of pregnancy and lactation) varied with *Calanus* abundance in the Gulf of Maine (Miller *et al.* 2011). Sightings of North Atlantic right whales correlated with satellite-derived sea-surface chlorophyll concentration (as a proxy for productivity), and calving rates correlated with chlorophyll concentration prior to gestation (Hlista *et al.* 2009). On a regional scale, observations of North Atlantic right whales correlate well with copepod concentrations (Pendleton *et al*. 2009). The available evidence suggests that at least some of the observed variability in the calving rates of North Atlantic right whales is related to variability in nutrition.

An analysis of the age structure of this population suggests that it contains a smaller proportion of juvenile whales than expected (Hamilton *et al.* 1998; Best *et al.* 2001), which may reflect lowered recruitment and/or high juvenile mortality. Calf and perinatal mortality was estimated by Browning *et al.* (2010) to be between 17 and 45 animals during the period 1989 and 2003. In addition, it is possible that the apparently low reproductive rate is due in part to an unstable age structure or to reproductive senescence in some females. However, few data are available on either factor and senescence has not been documented for any baleen whale.

The maximum net productivity rate is unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal (PBR) is the product of minimum population size, one-half the maximum net productivity rate and a recovery factor for endangered, depleted, threatened stocks, or stocks of unknown status relative to OSP (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The recovery factor for right whales is 0.10 because this species is listed as endangered under the Endangered Species Act (ESA). The minimum population size is 476. The maximum productivity rate is 0.04, the default value for cetaceans. PBR for the Western Atlantic stock of the North Atlantic right whale is 1.

ANNUAL HUMAN-CAUSED SERIOUS INJURY AND MORTALITY

For the period 2009 through 2013, the minimum rate of annual human-caused mortality and serious injury to right whales averaged 4.3 per year. This is derived from two components: 1) incidental fishery entanglement records at 3.4 per year, and 2) ship strike records at 0.9 per year. All but one of the entanglements during the 5-year time period of this report that were classified as serious injuries or mortalities were detected after the enactment of the Atlantic Large Whale Take Reduction Plan’s sinking-groundline rule which went into effect April 2009. All 5 of the reported ship strike serious injury and mortalities from U.S. waters during this 5-year time period were after the speed limit rule went into effect in December 2008, although none were known to occur in areas where the rule mandates speed restrictions (see Laist *et al*. 2014). Early analyses of the effectiveness of the ship strike rule were reported by Silber and Bettridge (2012). Recently, van der Hoop *et al.* (2015) concluded large whale vessel strike mortalities decreased inside active SMAs and increased outside inactive SMAs.

Beginning with the 2001 Stock Assessment Report, Canadian records have been incorporated into the mortality and serious injury rates of this report to reflect the effective range of this stock. It is also important to stress that serious injury determinations are made based upon the best available information; these determinations may change with the availability of new information (Henry *et al.* 2015). For the purposes of this report, discussion is primarily limited to those records considered confirmed human-caused mortalities or serious injuries. Annual rates calculated from detected mortalities should not be considered an unbiased estimate of human-caused mortality, but they represent a definitive lower bound. Detections are haphazard, incomplete, and not the result of a designed sampling scheme. As such they represent a minimum estimate of human-caused mortality which is biased low.

Background

The details of a particular mortality or serious injury record often require a degree of interpretation (Moore *et al.* 2005). The assigned cause is based on the best judgment of the available data; additional information may result in revisions. When reviewing Table 2 below, several factors should be considered: 1) a ship strike or entanglement may occur at some distance from the location where the animal is detected/reported; 2) the mortality or injury may involve multiple factors; for example, whales that have been both ship struck and entangled are not uncommon; 3) the actual vessel or gear type/source is often uncertain; and 4) in entanglements, several types of gear may be involved.

The total minimum detected annual average human-induced mortality and serious injury incurred by this stock (including fishery and non-fishery related causes) for the period 2009–2013 was 4.3 right whales per year. As with entanglements, some injury or mortality due to ship strikes is almost certainly undetected, particularly in offshore waters. Decomposed and/or unexamined animals (e.g., carcasses reported but not retrieved or necropsied) represent lost data, some of which may relate to human impacts. For these reasons, the estimate of 4.3 right whales per year must be regarded as a minimum count.

Further, the small population size and low annual reproductive rate of right whales suggest that human sources of mortality may have a greater effect relative to population growth rates than for other whales. The principal factors believed to be retarding growth and recovery of the population are ship strikes and entanglement with fishing gear. Between 1970 and 1999, a total of 45 right whale mortalities was recorded (IWC 1999; Knowlton and Kraus 2001; Glass *et al.* 2009). Of these, 13 (28.9%) were neonates that were believed to have died from perinatal complications or other natural causes. Of the remainder, 16 (35.6%) resulted from ship strikes, 3 (6.7%) were related to entanglement in fishing gear (in two cases lobster gear, and one gillnet gear), and 13 (28.9%) were of unknown cause. At a minimum, therefore, 42.2% of the observed total for the period and 50% of the 32 non-calf deaths was attributable to human impacts (calves accounted for three deaths from ship strikes). Young animals, ages 0-4 years, are apparently the most impacted portion of the population (Kraus 1990).

Finally, entanglement or minor vessel collisions may not kill an animal directly, but may weaken or otherwise affect it so that it is more likely to become vulnerable to further injury. Such was apparently the case with the two-year-old right whale killed by a ship off Amelia Island, Florida in March 1991 after having carried gillnet gear wrapped around its tail region since the previous summer (Kenney and Kraus 1993). A similar fate befell right whale #2220, found dead on Cape Cod in 1996.

Fishery-Related Serious Injury and Mortality

Reports of mortality and serious injury relative to PBR as well as total human impacts are contained in records maintained by the New England Aquarium and the NMFS Northeast and Southeast Regional Offices (Table 2). From 2009 through 2013, 18 records of mortality or serious injury (including records from both U.S. and Canadian waters, pro-rated to 17 using serious injury guidelines) involved entanglement or fishery interactions. For this time frame, the average reported mortality and serious injury to right whales due to fishery entanglement was 3.4 whales per year. Information from an entanglement event often does not include the detail necessary to assign the entanglements to a particular fishery or location.

Although disentanglement is often unsuccessful or not possible for many cases, there are several documented cases of entanglements for which the intervention of disentanglement teams averted a likely serious-injury determination. An adult female, #2029, first sighted entangled in the Great South Channel on 9 March 2007, may have avoided serious injury due to being partially disentangled on 18 September 2007 by researchers in the Bay of Fundy, Canada. On 8 December 2008, #3294 was successfully disentangled. Several cases exist in which female whales disentangled from potentially life-threatening wraps subsequently produced one or more calves. Sometimes, even with disentanglement, an animal may die of injuries sustained from fishing gear. A female yearling right whale, #3107, was first sighted with gear wrapping its caudal peduncle on 6 July 2002 near Briar Island, Nova Scotia. Although the gear was removed on 1 September by the New England Aquarium disentanglement team, and the animal seen alive on an aerial survey on 1 October, its carcass washed ashore at Nantucket on 12 October 2002 with deep entanglement injuries on the caudal peduncle. Additionally, but infrequently, a whale listed as seriously injured becomes gear-free without a disentanglement effort and is seen later in reasonable health. Such was the case for whale #1980, listed as a serious injury in 2008 but seen gear-free and apparently healthy in 2011. Three whales freed from probably fatal entanglements are known to have birthed calves at least once after their disentanglement, including 2 disentangled during the period 2008–2012.

The only bycatch of a right whale observed by the Northeast Fisheries Observer Program was in the pelagic drift gillnet fishery in 1993. No mortalities or serious injuries have been witnessed by fisheries observers in any of the other fisheries monitored by NMFS.

Whales often free themselves of gear following an entanglement event, and as such scarring may be a better indicator of fisheries interaction than entanglement records. A review of scars detected on identified individual right whales over a period of 30 years (1980–2009) documented 1032 definite, unique entanglement events on the 626 individual whales identified (Knowlton *et al.* 2012). Most individual whales (83%) were entangled at least once, and almost half of them (306 of 626) were definitely entangled more than once. About a quarter of the individuals identified in each year (26%) were entangled in that year. Juveniles and calves were entangled at higher rates than were adults. Scarring rates suggest that entanglements are occurring at about an order of magnitude greater than that detected from observations of whales with gear on them. More recently, analyses of whales carrying entangling gear also suggest that entanglement wounds have become more severe since 1990, possibly due to increased use of stronger ropes (Knowlton *et al*. 2015).

Knowlton *et al* (2012) concluded from their analysis of entanglement scar rates over time that efforts made since 1997 to reduce right whale entanglement have not worked. Working from a completely different data source (observed mortalities of eight large whale species, 1970-2009), van der Hoop *et al*. (2012) arrived at a similar conclusion. Vessel strike and entanglements were the two leading causes of death for known mortalities of right whales for which a cause of death could be determined. Across all 8 species of large whales, there was no detectable change in causes of anthropogenic mortality over time (van der Hoop *et al*. 2012). Pace *et al.* (2015) analyzed entanglement rates and serious injuries due to entanglement and found no support that mitigation measures had been effective at reducing takes due to commercial fishing.

Incidents of entanglements in waters of Atlantic Canada and the U.S. east coast were summarized by Read (1994) and Johnson *et al.* (2005). In six records of right whales that were entangled in groundfish gillnet gear in the Bay of Fundy and Gulf of Maine between 1975 and 1990, the whales were either released or escaped on their own, although several whales were observed carrying net or line fragments. A right whale mother and calf were released alive from a herring weir in the Bay of Fundy in 1976. Gillnet gear entanglements in the U.S. can also be fatal. A calf died in 2006, apparently victim of a gillnet entanglement, and other whales initially detected in gillnet gear have subsequently not been seen alive (NMFS unpub. data).

For all areas, specific details of right whale entanglement in fishing gear are often lacking. When direct or indirect mortality occurs, some carcasses come ashore and are subsequently examined, or are reported as "floaters" at sea. The number of unreported and unexamined carcasses is unknown, but may be significant in the case of floaters. More information is needed about fisheries interactions and where they occur.

Other Mortality

Ship strikes are a major cause of mortality and injury to right whales (Kraus 1990; Knowlton and Kraus 2001, van der Hoop *et al* 2012). Records from 2009 through 2013 have been summarized in Table 2. For this time frame, the average reported mortality and serious injury to right whales due to ship strikes was 0.9 whales per year.

Table 2. Confirmed human-caused mortality and serious injury records of North Atlantic Right Whales (*Eubalaena glacialis*) where the cause was assigned as either an entanglement (EN) or a vessel strike (VS): 2009–2013 [a]

Date[b]	Injury Determination	ID	Location[b]	Asigned Cause	Value against PBR[c]	Country[d]	Gear Type[e]	Description
1/14/2009	Serious Injury	3311	off Brunswick, GA	EN	1	XU	PT	Line deeply embedded in rostrum & lip. Sedated, partial disentanglement. SI due to health decline: heavy cyamids, skin discoloration.
7/18/2009	Prorated Injury	1019	off Nantucket, MA	EN	0.75	XU	NR	Full configuration unknown.
8/9/2009	Serious Injury	3930	Bay of Fundy	EN	1	XC	NP	Deep lacerations at fluke insertion potentially affecting arteries. Health decline: fluke deformation, increased cyamids & rake marks.

6/27/2010	Mortality	1124	off Cape May, NJ	EN	1	XU	NR	Evidence of constricting rostrum, mouth & pectoral wraps w/associated hemorrhage & bone damage
7/2/2010	Mortality	3901	off Great Wass Island, ME	VS	1	XU	-	2 large lacerations from dorsal to ventral surface.
8/12/2010	Mortality	1113	Digby Neck, NS	EN	1	XC	NP	Evidence of entanglement w/associated hemorrhaging around right pectoral
9/10/2010	Serious Injury	1503	Jeffreys Ledge, NH	EN	1	XU	NR	Constricting wrap on rostrum. Poor health.
12/25/2010	Mortality	3911	off Jacksonville Beach, FL	EN	1	XU	GU	Constricting wraps w/ severe health decline. Sedation & partial disentanglement. Carcass recovered w/ embedded line on flipper & in mouth.
1/20/2011	Serious Injury	3853	off South Carolina	VS	1	US	-	Sixteen deep lacerations across back, potentially penetrating body cavity.
2/13/2011	Serious Injury	3993	off Tybee, GA	EN	1	XU	NR	Right pectoral compromised, likely necrotic. Emaciated & poor skin condition.
3/16/2011	Mortality		Cape Romain, SC	EN	1	XU	GU	Multiple wraps embedded in right pectoral bones
3/27/2011	Mortality	1308	Nags Head, NC	VS	1	US	-	Fractured right skull.
3/27/2011	Serious Injury	2011 Calf of 1308	Nags Head, NC	VS	1	US	-	Dependent calf of mom that was killed by ship strike.

4/22/2011	Serious Injury	3302	off Martha's Vineyard, MA	EN	1	XU	NR	Constricting wrap on head.
9/3/2011	Serious Injury	2660	Gaspe Bay	EN	1	XC	NP	No gear present but evidence of extensive, constricting entanglement. Significant health decline:cyamids, sloughing skin. Right blow hole not functional. Dependent calf absent
9/18/2011	Prorated Injury	4090	Jeffreys Ledge, NH	EN	0.75	XU	NR	Full configuration unknown.
9/27/2011	Prorated Injury	3111	off Grand Manan Island, New Brunswick	EN	0.75	XC	NR	Constricting wrap on left flipper. Disentanglement attempted, but unsure if any cuts made. Final entanglement configuration unknown. Resight in 2012 did not confirm configuration or if still entangled, but health apparently improved.
2/15/2012	Serious Injury	3996	off Provincetown, MA	EN	1	XU	NR	Constricting gear across head and health decline.
7/19/2012	Mortality	-	Clam Bay, Nova Scotia	EN	1	XC	GU	Multiple constricting wraps on peduncle; COD - peracute underwater entrapment.
9/24/2012	Serious Injury	3610	Bay of Fundy	EN	1	XC	NP	New significant raw & healing entanglement wounds on head, dorsal & ventral peduncle, and leading fluke edges. Health decline:

								moderate cyamid load, thin
12/7/2012	Prorated Injury	-	off Wassaw Island, GA	VS	0.52	US	-	46' vessel, 12-13 kts struck whale. Animal not resighted but large expanding pool of blood at surface.
12/18/2012	Mortality	4193	off Palm Coast, FL	EN	1	US	PT	Constricting & embedded wraps w/ associated hemorrhaging at peduncle, mouthline, tongue, oral rete, rostrum & pectoral; malnourished.
07/12/2013	Prorated Injury	3123	off Virginia Beach, VA	EN	0.75	XU	NR	Constricting gear cutting into mouthline; Partially disentangled; final configuration unknown
Five-year averages		Shipstrike (US/CN/XU/XC)			0.90 (0.70/ 0.00/ 0.20/ 0.00)			
		Entanglement (US/CN/XU/XC)			3.40 (0.20/ 0.00/ 2.05/ 1.15)			
a. For more details on events please see Henry *et al.* 2015.								
b. The date sighted and location provided in the table are not necessarily when or where the serious injury or mortality occurred; rather, this information indicates when and where the whale was first reported beached, entangled, or injured.								
c. Mortality events are counted as 1 against PBR. Serious injury events have been evaluated using NMFS guidelines (NOAA 2012)								
d. CN=Canada, US=United States, XC=Unassigned 1st sight in CN, XU=Unassigned 1st sight in US								
e. H=hook, GN=gillnet, GU=gear unidentifiable, MF=monofilament, NP=none present, NR=none recovered/received, PT=pot/trap, WE=weir								

STATUS OF STOCK

The size of this stock is considered to be extremely low relative to OSP in the U.S. Atlantic EEZ, and this species is listed as endangered under the ESA. While OSP has not been calculated since population growth is accelerating and has not reached an inflection point, the very acceleration itself leads to the conclusion that the stock size is still low relative to whatever OSP would end up being. The North Atlantic right whale is considered one of the most critically endangered populations of large whales in the world (Clapham *et al.* 1999). A Recovery Plan has been published for the North Atlantic right whale and is in effect (NMFS 2005). NMFS is presently engaged in evaluating the need for critical habitat designation for the North Atlantic right whale. Under a prior listing as northern right whale, three critical habitats, Cape Cod Bay/Massachusetts Bay, Great South Channel, and the Southeastern U.S., were designated by NMFS (59 FR 28793, June 3, 1994). Two additional critical habitat areas in Canadian waters, Grand Manan Basin and Roseway Basin, were identified in Canada's final recovery strategy for the North Atlantic right whale (Brown *et al.* 2009). Status review by the National Marine Fisheries Service affirms endangered status (NMFS Northeast Regional Office 2012). The total level of human-caused mortality and serious injury is unknown, but reported human-caused mortality and serious injury was a minimum of 4.3 right whales per year from 2009 through 2013. Given that PBR has been calculated as 1, any mortality or serious injury for this stock can be considered significant. This is a strategic stock because the average annual human-related mortality and serious injury exceeds PBR, and also because the North Atlantic right whale is an endangered species.

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HUMPBACK WHALE (*Megaptera novaeangliae*): Gulf of Maine Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the western North Atlantic, humpback whales feed during spring, summer and fall over a geographic range encompassing the eastern coast of the United States (including the Gulf of Maine), the Gulf of St. Lawrence, Newfoundland/Labrador, and western Greenland (Katona and Beard 1990). Other North Atlantic feeding grounds occur off Iceland and northern Norway, including off Bear Island, Jan Mayen, and Franz Josef Land (Christensen *et al.* 1992; Palsbøll *et al.* 1997; M. Moore, WHOI, pers. comm.). These six regions represent relatively discrete subpopulations, fidelity to which is determined matrilineally (Clapham and Mayo 1987), which is supported by studies of the mitochondrial genome (Palsbøll *et al.* 1995; Palsbøll *et al.* 2001) and individual animal movements (Stevick *et al*. 2006). In early stock assessment reports, the North Atlantic humpback whale population was treated as a single stock for management purposes (Waring *et al.* 1999). Subsequently, a decision was made to reclassify the Gulf of Maine as a separate feeding stock (Waring *et al.* 2000) based upon the strong fidelity by individual whales to this region, and the attendant assumption that, were this subpopulation wiped out, repopulation by immigration from adjacent areas would not occur on any reasonable management timescale. During the 2002 Comprehensive Assessment of North Atlantic humpback whales, the International Whaling Commission acknowledged the evidence for treating the Gulf of Maine as a separate management unit (IWC 2002).

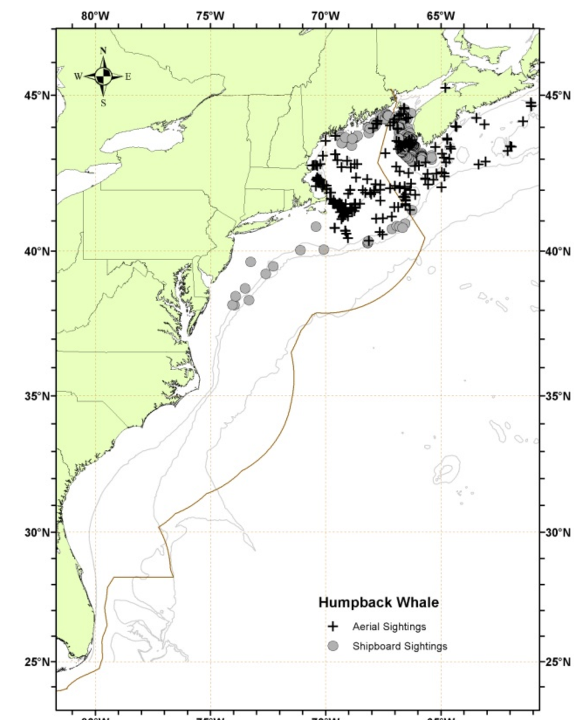

Figure 1. *Distribution of humpback whale sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1995, 1998, 1999, 2002, 2004, 2006, 2007, 2008, 2010 and 2011. Isobaths are the 100-m, 1000-m and 4000-m depth contours.*

During the summers of 1998 and 1999, the Northeast Fisheries Science Center conducted surveys for humpback whales on the Scotian Shelf to establish the occurrence and population identity of the animals found in this region, which lies between the well-studied populations of the Gulf of Maine and Newfoundland. Photographs from both surveys were compared to both the overall North Atlantic Humpback Whale Catalogue and a large regional catalogue from the Gulf of Maine (maintained by the College of the Atlantic and the Center for Coastal Studies, respectively); this work is summarized in Clapham *et al.* (2003). The match rate between the Scotian Shelf and the Gulf of Maine was 27% (14 of 52 Scotian Shelf individuals from both years). Comparable rates of exchange were obtained from the southern (28%, n=10 of 36 whales) and northern (27%, *n*=4 of 15 whales) ends of the Scotian Shelf, despite the additional distance of nearly 100 nautical miles (one whale was observed in both areas). In contrast, all of the 36 humpback whales identified by the same NMFS surveys elsewhere in the Gulf of Maine (including Georges Bank, southwestern Nova Scotia and the Bay of Fundy) had been previously observed in the Gulf of Maine region. The sighting histories of the 14 Scotian Shelf whales matched to the Gulf of Maine suggested that many of them were transient through the latter area. There were no matches between the Scotian Shelf and any other North Atlantic feeding ground, except the Gulf of Maine; however, instructive comparisons are compromised by the often low sampling effort in other regions in recent years. Overall, it appears that the northern range of many members of the Gulf of Maine stock does not extend onto the Scotian Shelf.

During winter, whales from most North Atlantic feeding areas (including the Gulf of Maine) mate and calve in the West Indies, where spatial and genetic mixing among feeding groups occurs (Katona and Beard 1990; Clapham *et al.* 1993; Palsbøll *et al.* 1997; Stevick *et al.* 1998). A few whales likely using eastern North Atlantic feeding areas migrate to the Cape Verde Islands (Reiner *et al.* 1996; Wenzel *et al.* 2009). In the West Indies, the majority of whales are found in the waters of the Dominican Republic, notably on Silver Bank and Navidad Bank, and in Samana Bay (Balcomb and Nichols 1982; Whitehead and Moore 1982; Mattila *et al.* 1989, 1994). Humpback whales are also found at much lower densities throughout the remainder of the Antillean arc, from Puerto Rico to the coast of Venezuela (Winn *et al.* 1975; Levenson and Leapley 1978; Price 1985; Mattila and Clapham 1989). Although recognition of 2 breeding areas for North Atlantic humpbacks is the prevailing model, several observations suggest that our knowledge of breeding season distribution is far from complete (see Smith and Pike 2009).

All whales from this stock may not migrate to the West Indies every winter, because significant numbers of animals may be found in mid- and high-latitude regions at this time (Clapham *et al.* 1993; Swingle *et al.* 1993) and some individuals have been resighted across a winter season (Clapham *et al.* 1993; Robbins 2007). Acoustic recordings made in Stellwagen Bank National Marine Sanctuary in 2006 and 2008 detected humpback song in almost all months, including throughout the winter (Vu *et al*. 2012). This confirms the presence of male humpback whales in the area (a mid-latitude feeding ground) through the winter in these years. In addition, photographic records from Newfoundland have shown a number of adult humpbacks remain there year-round, particularly on the island's north coast. In collaboration with colleagues in the French islands of St. Pierre and Miquelon, a new photographic catalogue and concurrent matching effort is being undertaken for this region (J. Lawson, DFO, pers. comm.).

An increased number of sightings of humpback whales in the vicinity of the Chesapeake and Delaware Bays occurred in 1992 (Swingle *et al.* 1993). Wiley *et al.* (1995) reported that 38 humpback whale strandings occurred during 1985–1992 in the U.S. mid-Atlantic and southeastern states. Humpback whale strandings increased, particularly along the Virginia and North Carolina coasts, and most stranded animals were sexually immature; in addition, the small size of many of these whales strongly suggested that they had only recently separated from their mothers. Wiley *et al.* (1995) concluded that these areas were becoming an increasingly important habitat for juvenile humpback whales and that anthropogenic factors may negatively impact whales in this area. There have also been a number of wintertime humpback sightings in coastal waters of the southeastern U.S. Whether the increased numbers of sightings represent a distributional change, or are simply due to an increase in sighting effort and/or whale abundance, is unknown.

A key question with regard to humpback whales off the southeastern and mid-Atlantic states is their population identity. This topic was investigated using fluke photographs of living and dead whales observed in the region (Barco *et al.* 2002). In this study, photographs of 40 whales (alive or dead) were of sufficient quality to be compared to catalogs from the Gulf of Maine (i.e., the closest feeding ground) and other areas in the North Atlantic. Of 21 live whales, 9 (43%) matched to the Gulf of Maine, 4 (19%) to Newfoundland, and 1 (4.8%) to the Gulf of St Lawrence. Of 19 dead humpbacks, 6 (31.6%) were known Gulf of Maine whales. Although the population composition of the mid-Atlantic is apparently dominated by Gulf of Maine whales, lack of photographic effort in Newfoundland makes it likely that the observed match rates under-represent the true presence of Canadian whales in the region. A new photographic catalog and concurrent matching effort is being undertaken for this region which may improve knowledge in this regard. Barco *et al.* (2002) suggested that the mid-Atlantic region primarily represents a supplemental winter feeding ground used by humpbacks.

In New England waters, feeding is the principal activity of humpback whales, and their distribution in this region has been largely correlated to abundance of prey species, although behavior and bathymetry are factors influencing foraging strategy (Payne *et al.* 1986, 1990). Humpback whales are frequently piscivorous when in New England waters, feeding on herring (*Clupea harengus*), sand lance (*Ammodytes* spp.), and other small fishes. In the northern Gulf of Maine, euphausiids are also frequently taken (Paquet *et al.* 1997). Commercial depletion of herring and mackerel led to an increase in sand lance in the southwestern Gulf of Maine in the mid-1970s, with a concurrent decrease in humpback whale abundance in the northern Gulf of Maine. Humpback whales were densest over the sandy shoals in the southwestern Gulf of Maine favored by the sand lance during much of the late 1970s and early 1980s, and humpback distribution appeared to have shifted to this area (Payne *et al.* 1986). An apparent reversal began in the mid-1980s, and herring and mackerel increased as sand lance again decreased (Fogarty *et al.* 1991). Humpback whale abundance in the northern Gulf of Maine increased markedly during 1992–1993, along with a major influx of herring (P. Stevick, pers. comm.). Humpback whales were few in nearshore Massachusetts waters in the 1992–1993 summer seasons. They were more abundant in the offshore waters of Cultivator Shoal and on the Northeast Peak on Georges Bank and on Jeffreys Ledge; these latter areas are traditional locations of herring occurrence. In 1996 and 1997, sand lance and therefore humpback whales were once again abundant in the Stellwagen Bank area. However, unlike previous cycles, when an increase in sand lance corresponded to a decrease in herring, herring remained relatively abundant in the northern Gulf of Maine, and humpbacks correspondingly continued to occupy this portion of the habitat, where they also fed on euphausiids (Wienrich *et al.* 1997). Diel patterns in humpback foraging behavior have been shown to correlate with diel patterns in sand lance behavior (Friedlaender *et al.* 2009).

In early 1992, a major research program known as the Years of the North Atlantic Humpback (YONAH) (Smith *et al.* 1999) was initiated. This was a large-scale, intensive study of humpback whales throughout almost their entire North Atlantic range, from the West Indies to the Arctic. During two primary years of field work, photographs for individual identification and biopsy samples for genetic analysis were collected from summer feeding areas and from the breeding grounds in the West Indies. Additional samples were collected from certain areas in other years. Results pertaining to the estimation of abundance and to genetic population structure are summarized below.

POPULATION SIZE

North Atlantic Population

The overall North Atlantic population (including the Gulf of Maine), derived from genetic tagging data collected by the YONAH project on the breeding grounds, was estimated to be 4,894 males (95% CI=3,374-7,123) and 2,804 females (95% CI=1,776-4,463) (Palsbøll *et al.* 1997). Because the sex ratio in this population is known to be even (Palsbøll *et al.* 1997), the excess of males is presumed a result of sampling bias, lower rates of migration among females, or sex-specific habitat partitioning in the West Indies; whatever the reason, the combined total is an underestimate of overall population size. Photographic mark-recapture analyses from the YONAH project provided an ocean-basin-wide estimate of 11,570 animals during 1992/1993 (CV=0.068, Stevick *et al.* 2003), and an additional genotype-based analysis yielded a similar but less precise estimate of 10,400 whales (CV=0.138, 95% CI=8,000 to 13,600) (Smith *et al.* 1999).

Gulf of Maine stock - earlier estimates

Please see Appendix IV for earlier estimates. As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable and should not be used for PBR determinations.

Gulf of Maine Stock - Recent surveys and abundance estimates

An abundance of 335 (CV=0.42) humpback whales was estimated from a line-transect survey conducted during June-August 2011 by ship and plane (Palka 2012). The aerial portion that contributed to the abundance estimate covered 5,313 km of tracklines that were over waters north of New Jersey and shallower than the 100-m depth contour through the U.S. and Canadian Gulf of Maine and up to and including the lower Bay of Fundy. The shipboard portion covered 3,107 km of tracklines that were in waters that were deeper than the 100-m depth contour out to beyond the U.S. EEZ. Both sighting platforms used a two-simultaneous-team data collection procedure, which allows estimation of abundance corrected for perception bias (Laake and Borchers, 2004). Estimation of abundance was based on the independent observer approach assuming point independence (Laake and Borchers 2004) and calculated using the mark-recapture distance sampling option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009). This estimate did not include the portion of the Scotian Shelf that is known to be part of the range used by Gulf of Maine humpback whales. These various line-transect surveys lack consistency in geographic coverage, and because of the mobility of humpback whales, pooling stratum estimates across years to produce a single estimate is not advisable. However, similar to an estimate that appeared in Clapham *et al.* (2003), J. Robbins (Center for Coastal Studies, pers. comm.) used photo-id evidence of presence (see Robbins 2009, 2010, 2011 for data description) to calculate the minimum number alive of catalogued individuals seen during the 2008 feeding season within the Gulf of Maine, or seen both before and after 2008, plus whales seen for the first time as non-calves in 2009. That procedure placed the minimum number alive in 2008 at 823 animals.

Minimum Population Estimate

For statistically-based estimates, the minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The most recent line-transect survey, which did not include the Scotian Shelf portion of the stock, produced an estimate of abundance for Gulf of Maine humpback whales of 331 animals (CV=0.48) with a resultant minimum population estimate for this stock of 228 animals. The line-transect based Nmin is unrealistic because at least 500 uniquely identifiable individual whales from the GOM stock were seen during the calendar year of that survey and the actual population would have been larger because re-sighting rates of GOM humpbacks have historically been <1 (Robbins 2007). Using the minimum count from at least 2 years prior to the year of a stock assessment report allows time to resight whales known to be alive prior to and after the focal year. Thus, the minimum population estimate is set to the 2008 mark-recapture based count of 823.

Table 1. Summary of abundance estimates for Gulf of Maine humpback whales with month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV). Note that the second row represents the results from an analysis of resights of individually identified animals.

Month/Year	**Type**	$\mathbf{N_{best}}$	**CV**
Jun-Oct 2008	Gulf of Maine and Bay of Fundy	823	0
Jun-Aug 2011	Virginia to lower Bay of Fundy	335	0.42

Current Population Trend

As detailed below, the most recent available data suggest that the Gulf of Maine humpback whale stock is characterized by a positive trend in size. This is consistent with an estimated average trend of 3.1% (SE=0.005) in the North Atlantic population overall for the period 1979-1993 (Stevick *et al.* 2003), although there are no feeding-area-specific estimates. The best available estimate of the average rate of increase for the West Indies breeding population [which includes the Gulf of Maine feeding stock] is 3.1% per year (SE= 0.005) for the period 1979-1993 (Stevick et al. 2003). An analysis of demographic parameters for the Gulf of Maine (Clapham *et al.* 2003) suggested a lower rate of increase than the 6.5% reported by Barlow and Clapham (1997), but results may have been confounded by distribution shifts.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Zerbini *et al.* (2010) reviewed various estimates of maximum productivity rates for humpback whale populations, and, based on simulation studies, they proposed that 11.8% be considered as the maximum rate at which the species could grow. Barlow and Clapham (1997), applying an interbirth interval model to photographic mark-recapture data, estimated the population growth rate of the Gulf of Maine humpback whale stock at 6.5% (CV=0.012). Maximum net productivity is unknown for this population, although a theoretical maximum for any humpback population can be calculated using known values for biological parameters (Brandão *et al.* 2000; Clapham *et al.* 2001). For the Gulf of Maine stock, data supplied by Barlow and Clapham (1997) and Clapham *et al.* (1995) give values of 0.96 for survival rate, 6 years as mean age at first parturition, 0.5 as the proportion of females, and 0.42 for annual pregnancy rate. From this, a maximum population growth rate of 0.072 is obtained according to the method described by Brandão *et al.* (2000). This suggests that the observed rate of 6.5% (Barlow and Clapham 1997) is close to the maximum for this stock.

Clapham *et al.* (2003) updated the Barlow and Clapham (1997) analysis using data from the period 1992 to 2000. The population growth estimate was either 0% (for a calf survival rate of 0.51) or 4.0% (for a calf survival rate of 0.875). Although uncertainty was not strictly characterized by Clapham *et al.* (2003), their work might reflect a decline in population growth rates from the earlier study period.. More recent work by Robbins (2007) places apparent survival of calves at 0.664 (95% CI: 0.517-0.784), a value between those used by Barlow and Clapham (1997) and in addition found productivity to be highly variable and well less than maximum.

Despite the uncertainty accompanying the more recent estimates of observed population growth rate for the Gulf of Maine stock, the maximum net productivity rate was assumed to be 6.5% calculated by Barlow and Clapham (1997) because it represents an observation greater than the default of 0.04 for cetaceans (Barlow *et al.* 1995) but is conservative in that it is well below the results of Zerbini *et al.* (2010).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for the Gulf of Maine stock is 823 whales. The maximum productivity rate is 0.065. The recovery factor is assumed to be 0.10 because this stock is listed as an endangered species under the Endangered Species Act. PBR for the Gulf of Maine humpback whale stock is 2.7 whales.

ANNUAL HUMAN-CAUSED SERIOUS INJURY AND MORTALITY

For the period 2009 through 2013, the minimum annual rate of human-caused mortality and serious injury to the Gulf of Maine humpback whale stock averaged 9 animals per year. This value includes incidental fishery interaction records, 7.4; and records of vessel collisions, 1.6 (Table 2; Henry *et al.* 2015).

In contrast to stock assessment reports before 2007, these averages include humpback mortalities and serious injuries that occurred in the southeastern and mid-Atlantic states that could not be confirmed as involving members of the Gulf of Maine stock. In past reports, only events involving whales confirmed to be members of the Gulf of Maine stock were counted against the PBR. Starting in the 2007 report, we assumed whales were from the Gulf of Maine unless they were identified as members of another stock. At the time of this writing, no whale was identified as a member of another stock. These determinations may change with the availability of new information. Canadian records from the southern side of Nova Scotia were incorporated into the mortality and serious injury rates, to reflect the effective range of this stock as described above. For the purposes of this report, discussion is primarily limited to those records considered to be confirmed human-caused mortalities or serious injuries.

To better assess human impacts (both vessel collision and gear entanglement) there needs to be greater emphasis on the timely recovery of carcasses and complete necropsies. The literature and review of records described here suggest that there are significant human impacts beyond those recorded in the data assessed for serious injury and mortality. For example, a study of entanglement-related scarring on the caudal peduncle of 134 individual humpback whales in the Gulf of Maine suggested that between 48% and 65% had experienced entanglements (Robbins and Mattila 2001). Decomposed and/or unexamined animals (e.g., carcasses reported but not retrieved or no necropsy performed) represent 'lost data', some of which may relate to human impacts.

Background

As with right whales, human impacts (vessel collisions and entanglements) may be slowing recovery of the humpback whale population. Van der Hoop *et al.* (2013) reviewed 1762 mortalities and serious injuries recorded for 8 species of large whales in the Northwest Atlantic for the 40 years 1970–2009. Of 473 records of humpback whales, cause of death could be attributed for 203. Of the 203, 116 (57%) mortalities were caused by entanglements in fishing gear, and 31 (15%) were attributable to vessel strikes.

Robbins and Mattila (2001) reported that males were more likely to be entangled than females. Annually updated inferences made from scar prevalence and multistate models of GOM humpback whales that (1) younger animals are more likely to become entangled than adults, (2) juvenile scarring rates may be trending up, (3) maybe less than 10% of humpback entanglements are ever reported, and (4) 3 % of the population maybe dying annually as the result of entanglements (Robbins 2009, 2010, 2011, 2012). Humpback whale entanglements also occur in relatively high numbers in Canadian waters. Reports of interactions with fixed fishing gear set for groundfish around Newfoundland averaged 365 annually from 1979 to 1987 (range 174-813). An average of 50 humpback whale entanglements (range 26-66) was reported annually between 1979 and 1988, and 12 of 66 humpback whales entangled in 1988 died (Lien *et al.* 1988). A total of 965 humpbacks was reported entangled in fishing gear in Newfoundland and Labrador from 1979 to 2008 (Benjamins *et al.* 2012). Volgenau *et al.* (1995) reported that in Newfoundland and Labrador, cod traps caused the most entanglements and entanglement mortalities (21%) of humpbacks between 1979 and 1992. They also reported that gillnets were the primary cause of entanglements and entanglement mortalities (20%) of humpbacks in the Gulf of Maine between 1975 and 1990. In more recent times, following the collapse of the cod fishery, groundfish gillnets for other fish species and crab pot lines have been the most common sources of humpback entanglement in Newfoundland. Since the crab pot fishery is primarily an offshore activity on the Grand Banks, these entanglements are hard to respond to and are likely underreported. One humpback whale was reported released alive (status unknown) from a herring weir off Grand Manan in 2009 (H. Koopman, UNC Wilmington, pers. comm.). In US waters, Johnson *et al.* (2005) found 40% of humpback entanglements were in trap/ pot gear and 50% were in gillnet, but sample sizes were small and much uncertainty still exists about the frequency of certain gear types involved in entanglement.

Wiley *et al.* (1995) reported that serious injuries attributable to ship strikes are more common and probably more serious than those from entanglements, but this claim is not supported by more recent analysis. Non-lethal interactions with gear are extremely common (see Robbins 2010, 2011, 2012) and recent analysis suggests entanglement serious injuries and mortalities are more common than ship strikes (van der Hoop *et al.* 2013). Furthermore, in the NMFS records for 2009 through 2013, there are only 8 reports of serious injuries and mortalities as a result of collision with a vessel and 41 records of injuries (prorated or serious) and mortalities attributed to entanglement. Because it has never been shown that serious injuries and mortalities related to ships or to fisheries interactions are equally detectable, it is unclear as to which human source of mortality is more prevalent. A major aspect of vessel collision that will be cryptic as a serious injury is blunt trauma, where when lethal it is usually undetectable from an external exam (Moore *et al.* 2013). No whale involved in the recorded vessel collisions had been identified as a member of a stock other than the Gulf of Maine stock at the time of this writing (Henry *et al.* 2015).

Fishery-Related Serious Injuries and Mortalities

A description of fisheries is provided in Appendix III. Two mortalities were observed in the pelagic drift gillnet fishery, one in 1993 and the other in 1995. In winter 1993, a juvenile humpback was observed entangled and dead in a pelagic drift gillnet along the 200-m isobath northeast of Cape Hatteras. In early summer 1995, a humpback was entangled and found dead in a pelagic drift gillnet on southwestern Georges Bank. Additional reports of mortality and serious injury, as well as description of total human impacts, are contained in records maintained by NMFS. A number of these records (11 entanglements involving lobster pot/trap gear) from the 1990–1994 period were the basis used to reclassify the lobster fishery (62 FR 33, Jan. 2, 1997). Large whale entanglements are rarely observed during fisheries sampling operations. However, during 2008, 3 humpback whales were observed as incidental bycatch: 2 in gillnet gear (1 no serious injury; 1 undetermined) and 1 in a purse seine (released alive), in 2011 a humpback was caught on an observed gillnet trip (disentangled and released free of gear; Henry *et al.* 2015), and in 2012 there was an observed interaction with a humpback whale in mid-Atlantic gillnet gear (non-serious injury). A recent review (Cassoff *et al.* 2011) describes in detail the types of injuries that baleen whales, including humpbacks, suffer as a result of entanglement in fishing gear.

For this report, the records of dead, injured, and/or entangled humpbacks (found either stranded or at sea) for the period 2009 through 2013 were reviewed. When there was no evidence to the contrary, events were assumed to involve members of the Gulf of Maine stock. While these records are not statistically quantifiable in the same way as observer fishery records, they provide some indication of the minimum frequency of entanglements. Specifically to this stock, if the calculations of Robbins (2011, 2012) are reasonable then the 3% mortality due to entanglement that she calculates equates to a minimum average rate of 25, which is nearly 10 times PBR.

Table 2. Confirmed human-caused mortality and serious injury records of humpback whales (*Megaptera novaeangliae*) where the cause was assigned as either an entanglement (EN) or a vessel strike (VS): 2009–2013 [a]

Date[b]	Injury Determination	ID	Location[b]	Assigned Cause	Value against PBR[c]	Country[d]	Gear Type[e]	Description
2/8/2009	Mortality	-	Cape Fear, NC	EN	1	XU	NP	Evidence of entanglement at mouthline, peduncle, & pectoral w/ associated hemorrhaging. Emaciated.
2/16/2009	Mortality	-	Nags Head, NC	EN	1	XU	NP	Evidence of entanglement involving anchoring or heavily weighted gear w/ associated hemorrhaging.

2/25/2009	Serious Injury	-	off Sandy Hook, NJ	EN	1	US	NR	Anchored. Disentangled but SI due to deformed body position that did not substantially improve after disentanglement.
4/9/2009	Prorated Injury	-	off Provincetown MA	EN	0.75	XU	NR	Full configuration unknown.
4/11/2009	Prorated Injury	-	off Gloucester, MA	EN	0.75	XU	NR	Configuration unclear--unknown if body wrap is loose or constricting.
5/23/2009	Prorated Injury	-	off Provincetown MA	EN	0.75	XU	NR	Full configuration unknown.
6/9/2009	Serious Injury	Inukshuk	off Provincetown MA	EN	1	US	NR	Constricting body wrap.
9/12/2009	Prorated Injury	2008 Calf of Touchdown	off White Island, Nova Scotia	EN	0.75	CN	WE	Swam out of entrapment in weir, but carrying some gear in an unknown configuration.
9/16/2009	Prorated Injury	-	off Halifax, Nova Scotia	EN	0.75	XC	NR	Full configuration unknown.
10/20/2009	Serious Injury	-	off Halifax, Nova Scotia	EN	1	CN	GN	Disentangled, but in poor condition: emaciated, heavy cyamid load, lethargic.
11/20/2009	Prorated Injury	-	off Goat Island, NC	EN	0.75	XU	NR	Full configuration unknown.
3/7/2010	Serious Injury	-	off Ponte Vedra Beach, FL	EN	1	XU	NR	Constricting body & flipper wraps. May have shed some or all of gear, but severe health decline: emaciated,

								heavy cyamid load.
3/13/2010	Mortality	-	Ocean City Inlet, MD	VS	1	US	-	Skull fractures w/ associated hemorrhaging
5/5/2010	Serious Injury	-	off Northampton, VA	EN	1	XU	NR	Wrap around fluke blades near insertion & trailing gear. Gear likely to become constricting as animal grows.
5/8/2010	Mortality	-	off Point Judith, RI	EN	1	US	GN	Evidence of constricting gear w/ associated hemorrhaging. Fluid filled lungs.
5/15/2010	Mortality	-	Hatteras Inlet, NC	EN	1	XU	NP	Live stranding -euthanized. Necrotic infected wounds at base of flukes & chronic abrasions on head.
5/28/2010	Mortality	-	off Martha's Vineyard, MA	EN	1	XU	GU	Evidence of entanglement w/ associated bruising & edema.
6/10/2010	Mortality	-	Jones Beach State Park, NY	VS	1	US	-	Extensive hemorrhage & edema on right dorsal lateral surface.
7/4/2010	Mortality	-	off Ocean City Inlet, MD	VS	1	US	-	Extensive hemorrhage & edema to left lateral area.
7/26/2010	Prorated Injury	-	off Chatham, MA	EN	0.75	XU	NR	Full configuration unknown.
8/13/2010	Serious Injury	-	off Orleans, MA	EN	1	US	PT	Partial disentangleme nt, but remaining head wrap likely to become

								constricting.
8/20/2010	Serious Injury	Chili	off Provincetown MA	EN	1	XU	NR	Embedded wraps;health decline: thin, moderate cyamids, sloughing skin, fluke discoloration
9/10/2010	Prorated Injury	-	off White Head Island, New Brunswick	EN	0.75	XC	NR	Full configuration unknown.
10/2/2010	Prorated Injury	-	off Provincetown MA	EN	0.75	XU	NR	Full configuration unknown. Unable to confirm if a resight of 8/20/10 event.
11/27/2010	Mortality	-	off Grand Manan Island, New Brunswick	EN	1	XC	NR	Evidence of constricting wraps on fluke, peduncle, & pectoral
12/23/2010	Serious Injury	-	off Port Everglades Inlet, FL	EN	1	XU	NP	Evidence of recent constricting entanglement & severe health decline.
1/7/2011	Serious Injury	-	off Oregon Inlet, NC	EN	1	US	GN	Extensive entanglement w/ netting covering majority of body including head, blowholes, & flukes. Immobile & drifting.
2/1/2011	Serious Injury	EKG	off Bar Harbor, ME	EN	1	US	NR	Anchored. Cuts were made to gear but whale remained anchored.
3/7/2011	Mortality	-	Thorofare Bay, NC	VS	1	US	-	Live stranded w/ 8 deep lacerations across back. Euthanized.

4/11/2011	Prorated Injury	-	off Rockport, MA	EN	0.75	XU	NR	Full configuration unknown.
5/5/2011	Mortality	-	Little Compton, RI	VS	1	US	-	Hemorrhaging at left jaw associated w/ blunt trauma.
5/27/2011	Mortality	-	Island Beach State Park, NJ	VS	1	US	-	5 broken vertebral processes along left side w/ associated hemorrhaging.
5/30/2011	Prorated Injury	-	off Orleans, MA	EN	0.75	XU	NR	Full configuration unknown.
7/2/2011	Serious Injury	-	off Provincetown MA	EN	1	XU	NP	Young whale. Missing flukes attributed to chronic entanglement. Laceration due to VS appears minor. Significant health decline: emaciated, swimming by use of pectorals only
7/9/2011	Prorated Injury	-	off Monomoy Island, MA	EN	0.75	XU	NR	Full configuration unknown.
7/10/2011	Prorated Injury	-	off Monomoy Island, MA	EN	0.75	XU	NR	Report of two entangled whales but could not confirm that both were entangled. Full configuration unknown.
7/21/2011	Prorated Injury	-	off Oregon Inlet, NC	EN	0.75	XU	NR	Full configuration unknown.
10/10/2011	Serious Injury	Clutter	off Grand Manan Island, New Brunswick	EN	1	XC	NR	Embedded wraps at fluke insertion.
4/29/2012	Serious Injury	-	off Chatham, MA	EN	1	US	NR	SI based on description of body position which indicates

								anchored
7/29/2012	Serious Injury	-	off Gloucester, MA	EN	1	XU	NR	Calf w/ line cutting into peduncle
8/4/2012	Serious Injury	Aphid	off Provincetown MA	EN	1	XU	NR	Line exiting both sides of mouth, under flippers, twisting together aft of the dorsal fin & trailing 75 ft past flukes; no wraps. Health decline: thin w/ graying skin.
8/21/2012	Prorated Injury	2011 Calf of Wizard	off Provincetown MA	EN	0.75	XU	MF	Full configuration unknown
8/24/2012	Serious Injury	Forceps	off Provincetown MA	EN	1	US	NR	Closed, possibly weighted, bridle w/ large tangle of line just above left eye. SI due to odd behavior & apparent difficulty staying at the surface.
04/03/2013	Mortality	-	off Ft Story, VA	VS	1	US	-	Fractured orbitals & ribs w/ associated bruising
09/13/2013	Mortality	-	York River, VA	VS	1	US	-	6 lacerations penetrate into muscle w/ associated hemorrhaging
09/16/2013	Prorated Injury	-	off Chatham, MA	EN	0.75	XU	NR	Partial disentanglement; original & final configurations unknown

09/28/2013	Mortality	-	off Saltaire, NY	EN	1	XU	GU	Embedded line in mouth w/ associated hemorrhaging & necrosis; evidence of constriction at pectorals, peduncle & fluke w/ associated hemorrhaging; emaciated
10/01/2013	Mortality	-	Buzzards Bay, MA	EN	1	US	NP	Evidence of underwater entrapment & subsequent drowning.
10/04/2013	Serious Injury	-	off Chatham, MA	EN	1	XU	NR	Full configuration unknown, but evidence of health decline: emaciation & pale skin
Five-year averages		Shipstrike (US/CN/XU/XC)			1.60 (1.60/ 0.00/ 0.00/ 0.00)			
		Entanglement (US/CN/XU/XC)			7.4 (1.8/ 0.35/ 4.55/ 0.70)			
a. For more details on events please see Henry *et al.* 2015.								
b. The date sighted and location provided in the table are not necessarily when or where the serious injury or mortality occurred; rather, this information indicates when and where the whale was first reported beached, entangled, or injured.								
c. Mortality events are counted as 1 against PBR. Serious injury events have been evaluated using NMFS guidelines (NOAA 2012)								
d. CN=Canada, US=United States, XC=Unassigned 1st sight in CN, XU=Unassigned 1st sight in US								
e. H=hook, GN=gillnet, GU=gear unidentifiable, MF=monofilament, NP=none present, NR=none recovered/received, PT=pot/trap, WE=weir								

Other Mortality

Between November 1987 and January 1988, at least 14 humpback whales died after consuming Atlantic mackerel containing a dinoflagellate saxitoxin (Geraci *et al.* 1989). The whales subsequently stranded or were recovered in the vicinity of Cape Cod Bay and Nantucket Sound, and it is highly likely that other unrecorded mortalities occurred during this event. During the first six months of 1990, seven dead juvenile (7.6 to 9.1 m long) humpback whales stranded between North Carolina and New Jersey. The significance of these strandings is unknown.

Between July and September 2003, an Unusual Mortality Event (UME) that included 16 humpback whales was invoked in offshore waters of coastal New England and the Gulf of Maine. Biotoxin analyses of samples taken from some of these whales found saxitoxin at very low/questionable levels and domoic acid at low levels, but neither were adequately documented and therefore no definitive conclusions could be drawn. Seven humpback whales were considered part of a large whale UME in New England in 2005. Twenty-one dead humpback whales found between 10 July and 31 December 2006 triggered a humpback whale UME declaration. Causes of these UME events have not been determined.

STATUS OF STOCK

NMFS has conducted a global humpback whale status review (Bettridge *et al.* 2015), and recently proposed revising the ESA listing of humpback whales (80 FR 22303, April 21, 2015). Although recent estimates of abundance indicate a stable or growing humpback whale population, the stock may be below OSP in the U.S. Atlantic EEZ. The detected level of U.S. fishery-caused mortality and serious injury derived from the available records, which is likely biased low, is more than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant or approaching a zero mortality and serious injury rate. This is a strategic stock because the average annual human-related mortality and serious injury exceeds PBR, and because the North Atlantic humpback whale is an endangered species.

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FIN WHALE (*Balaenopteraphysalus*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The Scientific Committee of the International Whaling Commission (IWC) has proposed stock boundaries for North Atlantic fin whales. Fin whales off the eastern United States, Nova Scotia, and the southeastern coast of Newfoundland are believed to constitute a single stock under the present IWC scheme (Donovan 1991). Although the stock identity of North Atlantic fin whales has received much recent attention from the IWC, current understanding of stock boundaries remains uncertain. The existence of a subpopulation structure was suggested by local depletions that resulted from commercial overharvesting (Mizroch *et al.* 1984).

A genetic study conducted by Bérubé*et al.*(1998) using both mitochondrial and nuclear DNA provided strong support for an earlier population model proposed by Kellogg (1929) and others. This postulates the existence of several subpopulations of fin whales in the North Atlantic and Mediterranean with limited gene flow among them. Bérubé*et al.*(1998) also proposed that the North Atlantic population showed recent divergence due to climatic changes (i.e., postglacial expansion), as well as substructuring over even relatively short distances. The genetic data are consistent with the idea that different subpopulations use the same feeding ground, a hypothesis that was also originally proposed by Kellogg (1929). More recent genetic studies have called into question conclusions drawn from early allozyme work (Olsen *et al.* 2014) and North Atlantic fin whales show a very low rate of genetic diversity throughout their range excluding the Mediteranean (Pampoulie*et al*. 2008).

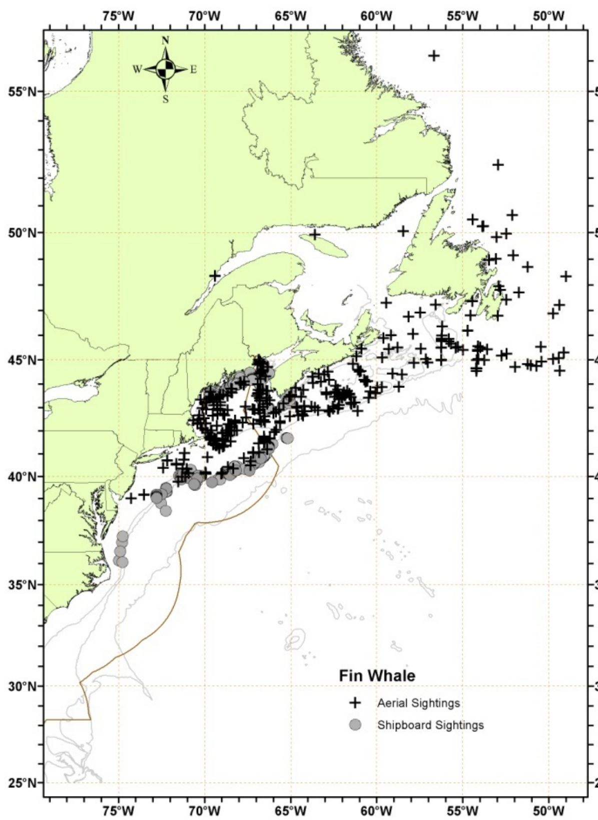

Figure 1.*Distribution of fin whale sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1995, 1998, 1999, 2002, 2004, 2006, 2007, 2008, 2010 and 2011 and DFO's 2007 TNASS survey. Isobaths are the 100-m, 1000-m and 4000-m depth contours.*

Fin whales are common in waters of the U. S. Atlantic Exclusive Economic Zone (EEZ), principally from Cape Hatteras northward (Figure 1). Fin whales accounted for 46% of the large whales and 24% of all cetaceans sighted over the continental shelf during aerial surveys (CETAP 1982) between Cape Hatteras and Nova Scotia during 1978–82. While much remains unknown, the magnitude of the ecological role of the fin whale is impressive. In this region fin whales are the dominant large cetacean species during all seasons, having the largest standing stock, the largest food requirements, and therefore the largest influence on ecosystem processes of any cetacean species (Hain *et al.* 1992; Kenney *et al.* 1997).

New England waters represent a major feeding ground for fin whales. There is evidence of site fidelity by females, and perhaps some segregation by sexual, maturational, or reproductive class in the feeding area (Agler *et al.* 1993). Seipt*et al.* (1990) reported that 49% of fin whales sighted on the Massachusetts Bay area feeding grounds were resighted within the same year, and 45% were resighted in multiple years. The authors suggested that fin whales on these grounds exhibited patterns of seasonal occurrence and annual return that in some respects were similar to those shown for humpback whales. This was reinforced by Clapham and Seipt (1991), who showed maternally-directed site fidelity for fin whales in the Gulf of Maine.

Hain *et al.* (1992), based on an analysis of neonate stranding data, suggested that calving takes place during October to January in latitudes of the U.S. mid-Atlantic region; however, it is unknown where calving, mating, and wintering occur for most of the population. Results from the Navy's SOSUS program (Clark 1995) indicated a substantial deep-ocean distribution of fin whales. It is likely that fin whales occurring in the U.S. Atlantic EEZ undergo migrations into Canadian waters, open-ocean areas, and perhaps even subtropical or tropical regions. However, the popular notion that entire fin whale populations make distinct annual migrations like some other mysticetes has questionable support in the data; in the North Pacific, year-round monitoring of fin whale calls found no evidence for large-scale migratory movements (Watkins *et al.* 2000).

POPULATION SIZE

The best abundance estimate available for the western North Atlantic fin whale stock is 1,618 (CV=0.33; Palka 2012). This is the estimate derived from the 2011 NOAA shipboard surveys and is considered best because it represents the most current data in spite of the survey not including all of the stock's range. The next most recent survey excluded U.S. waters.

Earlier abundance estimates

Please see Appendix IV for earlier abundance estimates. As recommended in the GAMMS II Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable and should not be used for PBR determinations.

Recent surveys and abundance estimates

An abundance estimate of 3,522 (CV=0.27; J. Lawson, DFO, pers. comm.) fin whales was generated from the TNASS in July–August 2007. This aerial survey covered the area from northern Labrador to the Scotian Shelf, providing full coverage of the Atlantic Canadian coast (Lawson and Gosselin 2009). The abundance estimates from this survey have been corrected for perception and availability bias, when possible. In general this involved correcting for perception bias using mark-recapture distance sampling, and correcting for availability bias using dive/surface times, as reported in the literature, and the Laake (1997) analysis method (Lawson and Gosselin 2011).

An abundance estimate of 1,595 (CV=0.33) fin whales was generated from a shipboard and aerial survey conducted during June–August 2011 (Palka 2012). The aerial portion that contributed to the abundance estimate covered 5,313 km of tracklines that were over waters north of New Jersey from the coastline to the 100-m depth contour, through the U.S. and Canadian Gulf of Maine and up to and including the lower Bay of Fundy. The shipboard portion covered 3,107 km of tracklines that were in waters offshore of North Carolina to Massachusetts (waters that were deeper than the 100-m depth contour out to beyond the U.S. EEZ). Both sighting platforms used a double-platform data collection procedure, which allows estimation of abundance corrected for perception bias of the detected species (Laake and Borchers 2004). Estimation of the abundance was based on the independent observer approach assuming point independence (Laake and Borchers 2004) and calculated using the multiple-covariate distance sampling (MCDS) option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009).The abundance estimates of fin whales include a percentage of the estimate of animals identified as fin/sei whales (the two species being sometimes hard to distinguish).The percentage used is the ratio of positively identified fin whales to the total number of positively identified fin whales and positively identified sei whales; the CV of the abundance estimate includes the variance of the estimated fraction.

An abundance estimate of 23 (CV=0.87) fin whales was generated from a shipboard survey conducted concurrently (June–August 2011) in waters between central Virginia and central Florida. This shipboard survey included shelf-break and inner continental slope waters deeper than the 50-m depth contour within the U.S. EEZ. The survey employed two independent visual teams searching with 25× bigeye binoculars. A total of 4,445 km of tracklines was surveyed, yielding 290 cetacean sightings. The majority of sightings occurred along the continental shelf break with generally lower sighting rates over the continental slope. Estimation of the abundance was based on the independent observer approach assuming point independence (Laake and Borchers 2004) and calculated using the mark-recapture distance sampling option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009). Although this is the best abundance estimate available, the survey from which it was derived did not include a significant portion of the stock’s range.

Table 1. Summary of recent abundance estimates for western North Atlantic fin whales with month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Jul-Aug 2007	N. Labrador to Scotian Shelf	3,522	0.27
Jun-Aug 2011	Central Virginia to lower Bay of Fundy	1,595	0.33
Jun-Aug 2011	Central Florida to Central Virginia	23	0.76
Jun-Aug 2011	Central Florida to lower Bay of Fundy (COMBINED)	1,618	0.33

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for fin whales is 1,618 (CV=0.33). The minimum population estimate for the western North Atlantic fin whale is 1,234.

Current Population Trend

A trend analysis has not been conducted for this stock. The statistical power to detect a trend in abundance for this stock is poor due to the relatively imprecise abundance estimates and long survey interval. For example, the power to detect a precipitous decline in abundance (i.e., 50% decrease in 15 years) with estimates of low precision (e.g., CV > 0.30) remains below 80% (alpha = 0.30) unless surveys are conducted on an annual basis (Taylor *et al.* 2007).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. Based on photographically identified fin whales, Aglere*t al.* (1993) estimated that the gross annual reproduction rate was 8%, with a mean calving interval of 2.7 years.

For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 1,234. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factoris 0.10 because the fin whale is listed as endangered under the Endangered Species Act (ESA). PBR for the western North Atlantic fin whale is 2.5.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

For the period 2009 through 2013, the minimum annual rate of human-caused mortality and serious injury to fin whales was 3.55 per year. This value includes incidental fishery interaction records, 1.75; and records of vessel collisions, 1.8(Table 2; Henry *et al.* 2015)Annual rates calculated from detected mortalities should not be considered an unbiased representation of human-caused mortality, but they represent a definitive lower bound. Detections are haphazard and not the result of a designed sampling scheme. As such they represent a minimum estimate of human-caused mortalitywhich is almost certainly biased low.

Fishery-Related Serious Injury and Mortality

No confirmed fishery-related mortalities or serious injuries of fin whales have been reported in the NMFS Sea Sampling bycatch database. A review of the records of stranded, floating, or injured fin whales for the period 2009 through 2013 on file at NMFS found 3 records with substantial evidence of fishery interactions causing mortality (Henry *et al.* 2015). Serious injury determination of non-fatal fishery interaction records yielded a value of 5.75 (Henry *et al.* 2015). The resultant estimated minimum annual rate of serious injury and mortality from fishery interactions for this fin whale stock is 1.75. These records are not statistically quantifiable in the same way as the observer fishery records, and they almost surely undercount entanglements for the stock.

Table 2. Confirmed human-caused mortality and serious injury records of fin whales (*Balaenoptera physalus*) where the cause was assigned as either an entanglement (EN) or a vessel strike (VS): 2009–2013[a]

Date[b]	Injury Determination	ID	Location[b]	Assigned Cause	Value against PBR[c]	Country[d]	Gear Type[e]	Description
4/27/2009	Prorated Injury	-	off Portsmouth NH	EN	0.75	XU	NR	Full configuration unknown.
9/9/2009	Prorated Injury	-	off Campobello Island, New Brunswick	EN	0.75	XC	NR	Partial disentanglement, but final configuration unknown.
10/1/2009	Mortality	-	off Jersey City, NJ	VS	1	US	-	Fresh carcass w/ broken pectoral, hematomas, & abrasions.
10/9/2009	Prorated Injury	-	off Long Island, Nova Scotia	EN	0.75	XC	GU	Full configuration unknown. Cannot confirm gear free. Indication of poor health, but incomplete description and no photos.
3/18/2010	Mortality	-	South Delaware Bay Beach, DE	VS	1	US	-	Fractured skull w/ associated hemorrhaging.Abrasion mid-dorsal consistent w/ being folded over the bow of a ship.
9/3/2010	Mortality	-	Cape Henlopen State Park, DE	VS	1	US	-	Large laceration & vertebral fractures w/ associated hemorrhaging.
1/1/2011	Mortality	-	off Portland, ME	EN	1	XU	NP	Fresh carcass w/ evidence of constricting gear.
6/5/2011	Mortality	-	off Long Branch, NJ	VS	1	US	-	Extensive hemorrhage & soft tissue damage to the dorsal & right lateral thoracic region.
7/2/2011	Serious Injury	F100	Gulf of St. Lawrence	EN	1	CN	PT	Deep lacerations at peduncle. Unconfirmed if gear free.

7/24/2011	Mortality	-	Cheticamp, Nova Scotia	EN	1	CN	NP	Fresh carcass w/ evidence of extensive entanglement.
9/21/2011	Mortality	-	off Atlantic City, NJ	EN	1	US	NP	Fresh carcass w/ evidence of extensive entanglement.
1/23/2012	Mortality	-	Ocean City, NJ	VS	1	US	-	Hemorrhaging along right, midlateral surface.
2/19/2012	Mortality	-	Norfolk, VA	VS	1	US	-	Deep laceration on head. Skeletal fractures of rostrum and vertebrae. Extensive hemorrhaging.
7/16/2012	Prorated Injury	-	off Portland, ME	EN	0.75	XU	NR	Full configuration unknown.
7/30/2012	Prorated Injury	0631	off Portsmouth, NH	EN	0.75	XU	NR	Full configuration unknown.
8/10/2012	Mortality	-	Hampton Bays, NY	VS	1	US	-	Extensive bruising along right lateral and ventral aspects.
10/7/2012	Mortality	-	Boston Harbor, MA	VS	1	US	-	Deep mid-line impression with associated hemorrhaging consistent with being folded across bow of ship.
1/13/2013	Mortality	-	East Hampton, NJ	VS	1	US	-	Fracturing of left cranium with associated hematoma
6/6/2013	Serious Injury	Capitaine Crochet	St. Lawrence Marine Park, Quebec	EN	1	CN	PT	Pot resting on upper jaw w/ bridle lines embedding in mouth; health decline: emaciation
Five-year averages		Shipstrike (US/CN/XU/XC)			1.80 (1.80/ 0.00/ 0.00/ 0.00)			
		Entanglement (US/CN/XU/XC)			1.75 (0.20/ 0.60/ 0.65/ 0.30)			
a. For more details on events please see Henry *et al.* 2015.								
b. The date sighted and location provided in the table are not necessarily when or where the serious injury or mortality occurred; rather, this information indicates when and where the whale was first reported beached, entangled, or injured.								
c. Mortality events are counted as 1 against PBR. Serious injury events have been evaluated using NMFS guidelines (NOAA 2012)								
d. CN=Canada, US=United States, XC=Unassigned 1st sight in CN, XU=Unassigned 1st sight in US								
e. H=hook, GN=gillnet, GU=gear unidentifiable, MF=monofilament, NP=none present, NR=none recovered/received, PT=pot/trap, WE=weir								

Other Mortality

After reviewing NMFS records for 2009 through 2013, nine were found that had sufficient information to confirm the cause of death as collisions with vessels (Table 2; Henry *et al.* 2015.). These records constitute an annual rate of serious injury or mortality of 1.8 fin whales from vessel collisions.

STATUS OF STOCK

This is a strategic stock because the fin whale is listed as an endangered species under the ESA. The total level of human-caused mortality and serious injury is unknown. NMFS records represent coverage of only a portion of the area surveyed for the population estimate for the stock. The total U.S. fishery-related mortality and serious injury for this stock derived from the available records is likely biased low and is not less than 10% of the calculated PBR. Therefore entanglement rates cannot be considered insignificant and approaching a zero mortality and serious injury rate. The status of this stock relative to OSP in the U.S. Atlantic EEZ is unknown. There are insufficient data to determine the population trend for fin whales.

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SEI WHALE (*Balaenoptera borealis borealis*): Nova Scotia Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Mitchell and Chapman (1977) reviewed the sparse evidence on stock identity of northwestern Atlantic sei whales, and suggested two stocks—a Nova Scotia stock and a Labrador Sea stock. The range of the Nova Scotia stock includes the continental shelf waters of the northeastern U.S., and extends northeastward to south of Newfoundland. The Scientific Committee of the International Whaling Commission (IWC), while adopting these general boundaries, noted that the stock identity of sei whales (and indeed all North Atlantic whales) was a major research problem (Donovan 1991). In the absence of evidence to the contrary, the proposed IWC stock definition is provisionally adopted, and the "Nova Scotia stock" is used here as the management unit for this stock assessment. The IWC boundaries for this stock are from the U.S. east coast to Cape Breton, Nova Scotia, thence east to longitude 42^{o} W. Recent telemetry evidence offers some support that sei whales foraging in the Labrador Sea winter in the Azores and constitute a separate stock (Prieto *et al*. 2014).

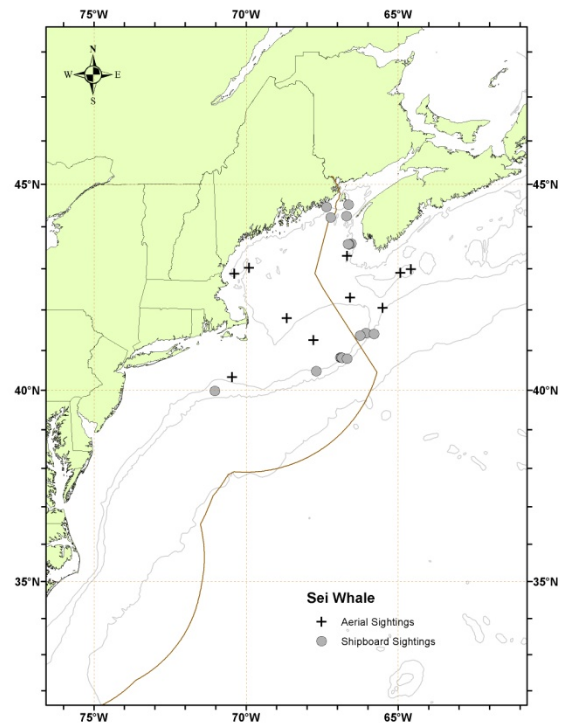

Figure 1. *Distribution of sei whale sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1995, 1998, 1999, 2002, 2004, 2006, 2007, 2008, 2010 and 2011. Isobaths are the 100-m, 1000-m and 4000-m depth contours.*

Indications are that, at least during the feeding season, a major portion of the Nova Scotia sei whale stock is centered in northerly waters, perhaps on the Scotian Shelf (Mitchell and Chapman 1977). The southern portion of the species' range during spring and summer includes the northern portions of the U.S. Atlantic Exclusive Economic Zone (EEZ)—the Gulf of Maine and Georges Bank. Spring is the period of greatest abundance in U.S. waters, with sightings concentrated along the eastern margin of Georges Bank and into the Northeast Channel area, and along the southwestern edge of Georges Bank in the area of Hydrographer Canyon (CETAP 1982). NMFS aerial surveys since 1999 have found concentrations of sei and right whales along the northern edge of Georges Bank in the spring. The sei whale is often found in the deeper waters characteristic of the continental shelf edge region (Hain *et al.* 1985), and NMFS aerial surveys found substantial numbers of sei whales in this region, in particular south of Nantucket, in the spring of 2001. Similarly, Mitchell (1975) reported that sei whales off Nova Scotia were often distributed closer to the 2,000-m depth contour than were fin whales.

This general offshore pattern of sei whale distribution is disrupted during episodic incursions into shallower, more inshore waters. Although known to eat fish in other oceans, sei whales (like right whales) are largely planktivorous, feeding primarily on euphausiids and copepods (Flinn *et al.* 2002). A review of prey preferences by Horwood (1987) showed that, in the North Atlantic, sei whales seem to prefer copepods over all other prey species. In Nova Scotia sampled stomachs from captured sei whales showed a clear preference for copepods between June and October, and euphausiids were taken only in May and November (Mitchell 1975). Sei whales are reported in some years in more inshore locations, such as the Great South Channel (in 1987 and 1989) and Stellwagen Bank (in 1986) areas (R.D. Kenney, pers. comm.; Payne *et al.* 1990). An influx of sei whales into the southern Gulf of Maine occurred in the summer of 1986 (Schilling *et al.* 1993). Such episodes, often punctuated by years or even decades of absence from an area, have been reported for sei whales from various places worldwide (Jonsgård and Darling 1977).

Based on analysis of records from the Blandford, Nova Scotia, whaling station, where 825 sei whales were taken between 1965 and 1972, Mitchell (1975) described two "runs" of sei whales, in June-July and in September-

October. He speculated that the sei whale stock migrates from south of Cape Cod and along the coast of eastern Canada in June and July, and returns on a southward migration again in September and October; however, such a migration remains unverified.

POPULATION SIZE

The summer 2011 abundance estimate of 357 (CV=0.52; Palka 2012) is considered the best available for the Nova Scotia stock of sei whales. However, this estimate must be considered conservative because all of the known range of this stock was not surveyed, and because of uncertainties regarding population structure and whale movements between surveyed and unsurveyed areas.

Earlier abundance estimates

Please see appendix IV for earlier abundance estimates. As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable and should not be used for PBR determinations.

Recent surveys and abundance estimates

An abundance estimate of 357 (CV=0.52) sei whales was generated from a shipboard and aerial survey conducted during June–August 2011 (Palka 2012). The aerial portion that contributed to the abundance estimate covered 5,313 km of tracklines that were over waters from north of New Jersey from the coastline to the 100-m depth contour, through the U.S. and Canadian Gulf of Maine and up to and including the lower Bay of Fundy. The shipboard portion covered 3,107 km of tracklines that were in waters offshore of Virginia to Massachusetts (waters that were deeper than the 100-m depth contour out to beyond the U.S. EEZ). Both sighting platforms used a double-platform data collection procedure, which allows estimation of abundance corrected for perception bias of the detected species (Laake and Borchers 2004). Estimation of the abundance was based on the independent observer approach assuming point independence (Laake and Borchers 2004) and calculated using the multiple-covariate distance sampling (MCDS) option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009). The abundance estimates of sei whales include a percentage of the estimate of animals identified as fin/sei whales (the two species being sometimes hard to distinguish). The percentage used is the ratio of positively identified sei whales to the total of positively identified fin whales and positively identified sei whales; the CV of the abundance estimate includes the variance of the estimated fraction. Although this is the best estimate available for this stock, it should be noted that the abundance survey from which it was derived excluded waters off the Scotian Shelf, an area encompassing a large portion of the stated range of the stock.

Table 1. Summary of recent abundance estimates for Nova Scotia sei whales with month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Jun-Aug 2011	Central Virginia to lower Bay of Fundy	357	0.52

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by (Wade and Angliss 1997). The best estimate of abundance for the Nova Scotia stock sei whales is 357 (CV=0.52). The minimum population estimate is 236.

Current Population Trend

A trend analysis has not been conducted for this stock. The statistical power to detect a trend in abundance for this stock is poor due to the relatively imprecise abundance estimates and long survey interval. For example, the power to detect a precipitous decline in abundance (i.e., 50% decrease in 15 years) with estimates of low precision (e.g., CV > 0.30) remains below 80% (alpha = 0.30) unless surveys are conducted on an annual basis (Taylor *et al.* 2007).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 236. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factoris 0.10 because the sei whale is listed as endangered under the Endangered Species Act (ESA). PBR for the Nova Scotia stock of the sei whale is 0.5.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

For the period 2009 through 2013, the minimum annual rate of human-caused mortality and serious injury to sei whales was 0.4. This value includes incidental fishery interaction records, 0, and records of vessel collisions, 0.4 (Table 2; Henry *et al*. 2015). Annual rates calculated from detected mortalities should not be considered an unbiased estimate of human-caused mortality, but they represent a definitive lower bound. Detections are haphazard, incomplete, and not the result of a designed sampling scheme. As such they represent a minimum estimate of human-caused mortality which is almost certainly biased low.

Fishery-Related Serious Injury and Mortality

No confirmed fishery-related mortalities or serious injuries of sei whales have been reported in the NMFS Sea Sampling bycatch database. A review of the records of stranded, floating, or injured sei whales for the period 2009 through 2013 on file at NMFS found no records with substantial evidence of fishery interactions causing serious injury or mortality (Table 2), which results in an annual serious injury and mortality rate of 0 sei whales from fishery interactions.

Table 2. Confirmed human-caused mortality and serious injury records of Sei Whales (*Balaenoptera borealis*) where the cause was assigned as either an entanglement (EN) or a vessel strike (VS): 2009–2013 [a]

Date[b]	Injury Determination	ID	Location[b]	Assigned Cause	Value against PBR[c]	Country[d]	Gear Type[e]	Description
5/19/2009	Mortality		off Rehobeth Beach, DE	VS	1	US	-	Posterior portion of skull & right mandible fractured. Hemorrhaging dorsal to left Pectoral.
3/26/2011	Mortality		Virginia Beach, VA	VS	1	US	-	Jaw, scapula, rib & vertebral fractures along right side w/ associated hemorrhaging.
Five-year averages		Shipstrike (US/CN/XU/XC)			0.40 (0.40/ 0.00/ 0.00/ 0.00)			
		Entanglement (US/CN/XU/XC)			0			
a. For more details on events please see Henry *et al.* 2015.								

b. The date sighted and location provided in the table are not necessarily when or where the serious injury or mortality occurred; rather, this information indicates when and where the whale was first reported beached, entangled, or injured.	
c. Mortality events are counted as 1 against PBR. Serious injury events have been evaluated using NMFS guidelines (NOAA 2012)	
d. CN=Canada, US=United States, XC=Unassigned 1st sight in CN, XU=Unassigned 1st sight in US	
e. H=hook, GN=gillnet, GU=gear unidentifiable, MF=monofilament, NP=none present, NR=none recovered/received, PT=pot/trap, WE=weir	

Other Mortality

For the period 2009 through 2013 files at NMFS included two records with substantial evidence of vessel collisions causing serious injury or mortality (Table 2), which results in an annual rate of serious injury and mortality of 0.4 sei whales from vessel collisions.

STATUS OF STOCK

This is a strategic stock because the sei whale is listed as an endangered species under the ESA. The total U.S. fishery-related mortality and serious injury for this stock derived from the available records was less than 10% of the calculated PBR, and therefore could be considered insignificant and approaching a zero mortality and serious injury rate. However, evidence for fisheries interactions with large whales are subject to imperfect detection, and caution should be used in interpreting these results. The status of this stock relative to OSP in the U.S. Atlantic EEZ is unknown. There are insufficient data to determine population trends for sei whales.

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MINKE WHALE (*Balaenoptera acutorostrata acutorostrata*): Canadian East Coast Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Minke whales have a cosmopolitan distribution in temperate, tropical and high-latitude waters. In the North Atlantic, there are four recognized populations—Canadian East Coast, west Greenland, central North Atlantic, and northeastern North Atlantic (Donovan 1991). These divisions were defined by examining segregation by sex and length, catch distributions, sightings, marking data, and pre-existing ICES boundaries. However, there were very few data from the Canadian East Coast population. Anderwald *et al.* (2011) found no evidence for geographic structure comparing these putative populations but did, using individual genotypes and likelihood assignment methods, identify two cryptic stocks distributed across the North Atlantic. Until better information is available, minke whales off the eastern coast of the United States are considered to be part of the Canadian East Coast stock, which inhabits the area from the western half of the Davis Strait (45ºW) to the Gulf of Mexico. It is also uncertain if there are separate sub-stocks within the Canadian East Coast stock.

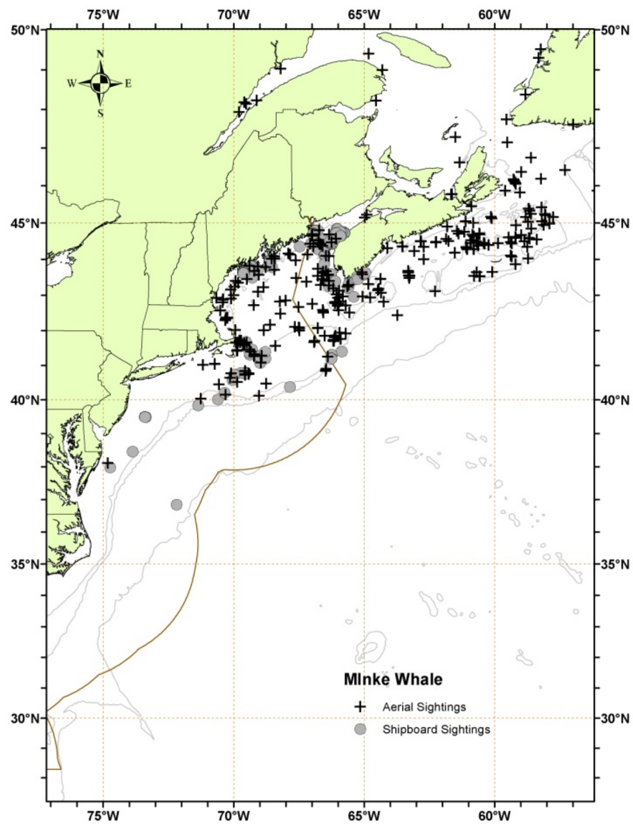

Figure 1. *Distribution of minke whale sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1995, 1998, 1999, 2002, 2004, 2006, 2007, 2008, 2010, and 2011and DFO's 2007 TNASS survey. Isobaths are the 100-m, 1000-m and 4000-m depth contours.*

The minke whale is common and widely distributed within the U.S. Atlantic Exclusive Economic Zone (EEZ) (CETAP 1982). There appears to be a strong seasonal component to minke whale distribution. Spring to fall are times of relatively widespread and common occurrence, and when the whales are most abundant in New England waters, while during winter the species appears to be largely absent (e.g., Risch *et al.* 2013). Like most other baleen whales, minke whales generally occupy the continental shelf proper (< 100 m deep), rather than the continental shelf-edge region. Records summarized by Mitchell (1991) hint at a possible winter distribution in the West Indies, and in the mid-ocean south and east of Bermuda. As with several other cetacean species, the possibility of a deep-ocean component to the distribution of minke whales exists but remains unconfirmed.

POPULATION SIZE

The best recent abundance estimate for this stock is 20,741 (CV=0.30) minke whales. This is the estimate derived from the Canadian Trans-North Atlantic Sighting Survey (TNASS) in July-August 2007 and is considered best because, while it did not cover any U.S. waters, the survey covered more of the minke whale range than the other surveys reported here.

Earlier estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions As recommended in the GAMMS II Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable for the determination of the current PBR.

Recent surveys and abundance estimates

An abundance estimate of 20,741 (CV=0.30) minke whales was generated from the TNASS in July-August 2007. This survey covered from northern Labrador to the Scotian Shelf, providing full coverage of the Atlantic Canadian coast (Lawson and Gosselin 2009). The abundance estimates from this survey have been corrected for perception and availability bias, when possible. In general this involved correcting for perception bias using mark-recapture distance sampling, and correcting for availability bias using dive/surface times, as reported in the literature, and the Laake *et al.* (1997) analysis method (Lawson and Gosselin 2011).

An abundance estimate of 2,591 (CV=0.81) minke whales was generated from a shipboard and aerial survey conducted during June-August 2011 (Palka 2012). The aerial portion that contributed to the abundance estimate covered 5,313 km of tracklines that were over waters north of New Jersey from the coastline to the 100-m depth contour through the U.S. and Canadian Gulf of Maine, and up to and including the lower Bay of Fundy. The shipboard portion covered 3,107 km of tracklines that were in waters offshore of central Virginia to Massachusetts (waters that were deeper than the 100-m depth contour out to beyond the U.S. EEZ). Both sighting platforms used a double-platform data collection procedure, which allows estimation of abundance corrected for perception bias of the detected species (Laake and Borchers, 2004). Estimation of the abundance was based on the independent-observer approach assuming point independence (Laake and Borchers 2004) and calculated using the multiple-covariate distance sampling (MCDS) option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009).

Table 1. Summary of recent abundance estimates for the Canadian East Coast stock of minke whales (*Balaenoptera acutorostrata acutorostrata*) by month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation. (CV).

Month/Year	Area	N_{best}	CV
Jul-Aug 2007	N. Labrador to Scotian Shelf	20,741	0.30
Jul-Aug 2011	Central Virginia to lower Bay of Fundy	2,591	0.81

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for the Canadian East Coast stock of minke whales is 20,741animals (CV=0.30). The minimum population estimate is 16,199 animals.

Current Population Trend

A trend analysis has not been conducted for this stock. The statistical power to detect a trend in abundance for this stock is poor due to the relatively imprecise abundance estimates and long survey interval. For example, the power to detect a precipitous decline in abundance (i.e., 50% decrease in 15 years) with estimates of low precision (e.g., CV > 0.30) remains below 80% (alpha = 0.30) unless surveys are conducted on an annual basis (Taylor *et al.* 2007).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. Life history parameters that could be used to estimate net productivity are that females mature between 6 and 8 years of age, and pregnancy rates are approximately 0.86 to 0.93. Based on these parameters, the calving interval is between 1 and 2 years. Calves are probably born during October to March after 10 to 11 months gestation and nursing lasts for less than 6 months. Maximum ages are not known, but for Southern Hemisphere minke whales maximum age appears to be about 50 years (IWC 1991; Katona *et al.* 1993).

For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 16,199. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 , the default value for stocks of unknown status relative to OSP, and the CV of the average mortality estimate is less than 0.3 (Wade and Angliss 1997). PBR for the Canadian east coast minke whale is 162.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

During 2009 to 2013, the average annual minimum detected human-caused mortality and serious injury was 7.9 minke whales per year (0.2 minke whales per year from observed U.S. fisheries, 6.5 minke whales per year (unknown CV) from U.S. and Canadian fisheries using strandings and entanglement data, and 1.2 per year from ship strikes.

Data to estimate the mortality and serious injury of minke whales come from the Northeast Fisheries Science Center Observer Program, the At-Sea Monitor Program, and from records of strandings and entanglements in U.S. and Canadian waters. For the purposes of this report, mortalities and serious injuries from reports of strandings and entanglements considered confirmed human-caused mortalities or serious injuries are shown in Table 2 while those recorded by the Observer or At-Sea Monitor Programs are shown in Table 3.

Detected interactions in the strandings and entanglement data should not be considered an unbiased representation of human-caused mortality. Detections are haphazard and not the result of a designed sampling scheme. As such they represent a minimum estimate, which is almost certainly biased low.

Fishery Information

Detailed fishery information is reported in Appendix III.

Earlier Interactions

For more details on the historical fishery interactions prior to 1999, see Waring *et al.* (2007).

In 2002, one minke whale mortality and one live release were attributed to the lobster trap fishery. A June 2003 mortality, while wrapped in lobster gear, cannot be confirmed to have become entangled in the area, and so is not attributed to the fishery. Annual mortalities due to the northeast/mid-Atlantic Lobster Trap/Pot fishery, as determined from strandings and entanglement records that have been audited, were 1 in 1991, 2 in 1992, 1 in 1994, 1 in 1995, 0 in 1996, 1 in 1997, 0 in 1998 to 2001, 1 in 2002, and 0 in 2003 through 2011. See Appendix V for more information on historical takes.

U.S.

Northeast Mid-water Trawl Fishery (Including Pair Trawl)

During July 2013, one minke whale was observed dead in the mid-water otter trawl on Georges Bank. Due to the small sample size of observed takes, an expanded estimate was not calculated. Annual average estimated minke whale mortality and serious injury from the mid-Atlantic mid-water trawl (including pair trawl) during 2009 to 2013 was 0.2 (Table 3).

Pelagic Longline

In 2010, a minke whale was caught but released alive (no serious injury) in the pelagic longline fishery, South Atlantic Bight fishing area (Garrison and Stokes 2012).

Other Fisheries

The audited NE Regional Office/NMFS entanglement/stranding database contains records of minke whales, of which the confirmed mortalities and serious injuries from the last five years are reported in Table 2. During 2009 to 2013, as determined from stranding and entanglement records confirmed to be of U.S. origin or first sighted in U.S. waters, the minimum detected average annual mortality and serious injury was 3.75 minke whales per year in U.S. fisheries (Table 2). Most cases where gear was recovered and identified involved gillnet or pot/trap gear.

CANADA

Read (1994) reported interactions between minke whales and gillnets in Newfoundland and Labrador, in cod traps in Newfoundland, and in herring weirs in the Bay of Fundy. Hooker *et al.* (1997) summarized bycatch data from a Canadian fisheries observer program that placed observers on all foreign fishing vessels operating in

Canadian waters, on between 25% and 40% of large Canadian fishing vessels (greater than 100 feet long), and on approximately 5% of smaller Canadian fishing vessels. During 1991 through 1996, no minke whales were observed taken.

Herring Weirs

During 1980 to 1990, 15 of 17 minke whales were released alive from herring weirs in the Bay of Fundy. During January 1991 to September 2002, 26 minke whales were trapped in herring weirs in the Bay of Fundy. Of these 26, 1 died (H. Koopman, pers. comm.) and several (number unknown) were released alive and unharmed (A. Westgate, pers. comm.). Weir interactions that may have resulted in serious injury to minke whales are reported in Table 2.

Other Fisheries

Mortalities and serious injuries that were likely a result of an interaction with an unknown Canadian fishery are detailed in Table 2. During 2009 to 2013, as determined from stranding and entanglement records confirmed to be of Canadian origin or first sighted in Canadian waters, the minimum detected average annual mortality and serious injury was 2.75 minke whales per year in Canadian fisheries (Table 2; prorated value).

Table 2. Confirmed human-caused mortality and serious injury records of minke whales (*Balaenoptera acutorostrata acutorostrata*): 2009–2013[a]

Date[b]	Injury determination	ID	Location[b]	Assigned Cause[f]	Value against PBR[c]	Country[d]	Gear Type[e]	Description
4/19/2009	Prorated Injury	-	Grand Le Pierre, Labrador	EN	0.75	CN	PT	Partial disentanglement. Original and final configuration unknown.
5/20/2009	Mortality	-	off Point Pleasant, NJ	VS	1	US	-	Large hemorrhage at right pectoral
6/3/2009	Serious Injury	-	Tadoussac, Quebec	EN	1	CN	NR	Tight wrap on rostrum.
7/16/2009	Prorated Injury	-	Grand Manan Island, New Brunswick	ET	0.75	CN	WE	Live in weir. Not present the next day. Unclear if whale swam out or drowned.
8/11/2009	Serious Injury	-	off Plymouth, MA	EN	1	XU	NR	Constricting wrap; health decline: poor skin condition
9/2/2009	Prorated Injury	-	off Pumpkin Island, ME	EN	0.75	XU	NR	Full configuration unknown.
10/11/2009	Serious Injury	-	off Truro, MA	EN	1	US	MT	In net & on deck for short period. Released & swam off.
6/16/2010	Mortality	-	Goose River, Prince Edward Island	EN	1	CN	NP	Deep laceration consistent w/ entanglement at base of fluke w/ associated hemorrhage

7/2/2010	Mortality	-	Naufrage, Prince Edward Island	EN	1	CN	NP	Evidence of body entanglement & constriction at mouthline
7/9/2010	Mortality	-	Fire Island Inlet, NY	VS	1	US	-	3-4 large dorsal lacerations associated w/ fractured ribs
7/27/2010	Prorated Injury	-	off Bliss Island, New Brunswick	ET	0.75	CN	WE	Live in weir. Not present next day. Unclear if whale swam out or drowned.
8/21/2010	Serious Injury	-	off Plymouth Harbor, MA	EN	1	XU	NR	Embedded rostrum wrap.
5/6/2011	Mortality	-	off Martha's Vineyard, MA	EN	1	US	PT	Anchored in gear. Embedded line at fluke. Evidence of entanglement w/ associated hemorrhaging at mouth corners & insertion of pectorals
6/3/2011	Serious Injury	-	Tadoussac, Quebec	EN	1	CN	NR	Tight rostrum wrap.
7/17/2011	Prorated Injury	-	off Nahant, MA	EN	0.75	XU	NR	Full configuration unknown.
7/24/2011	Prorated Injury	-	off North Truro, MA	EN	0.75	XU	NR	Full configuration unknown
8/4/2011	Mortality	-	Sandy Hook Bay, NJ	VS	1	US	-	4 propeller lacerations across dorsal surface. Fractured ribs w/associated hemorrhaging
8/26/2011	Mortality	-	Horseshoe Cove, NJ	EN	1	US	NP	Fresh carcass w/ evidence of extensive entanglement
8/29/2011	Mortality	-	Moriches Bay, NY	VS	1	US	-	Extensive hemorrhage & edema along dorsal & both lateral surfaces
9/7/2011	Prorated Injury	-	Greenspond, Newfoundland	EN	0.75	CN	GN	Partially disentangled from anchoring gear. Final configuration unknown.

9/19/2011	Prorated Injury	-	Northumberland Strait, Prince Edward Island	EN	0.75	CN	NR	Partially disentangled from anchoring gear. Final configuration unknown
10/6/2011	Mortality	-	off Matinicus Island, ME	EN	1	US	PT	Fresh carcass anchored in gear
12/7/2011	Mortality	-	Carolina Beach, NC	VS	1	US	-	Healed deep & superficial propeller lacerations; internal lesions associated w/ deep lacerations indicative of peritonitis & infection
12/19/2011	Mortality	-	off Grand Manan Island, New Brunswick	EN	1	CN	PT	Live entanglement; recovered dead in gear the following day. Constricting peduncle wraps
2/4/2012	Prorated Injury	-	off Virginia Beach, VA	EN	0.75	XU	CE	Reported with hook/monofilament gear. Attachment point unknown
3/16/2012	Mortality	-	Ipswich, MA	EN	1	US	NP	Evidence of extensive, constricting gear w/ associated hemorrhaging
5/15/2012	Serious Injury	-	Sable Island Bank, Canada	EN	1	CN	PT	Disentangled from gear embedded down to bone of peduncle.
6/21/2012	Serious Injury	-	off Frenchboro, ME	EN	1	XU	NR	Constricting body wrap, flipper pinned, embedded in mouthline; emaciated
6/23/2012	Mortality	-	Newark, NJ	VS	1	US	-	Fresh carcass on bow of ship. Deep laceration across ventral surface; COD - disembowlment & hypovolemic shock
6/26/2012	Mortality	-	Renews Rock, Newfoundland	EN	1	CN	PT	Fresh carcass w/ constricting gear around peduncle

6/30/2012	Mortality	-	off Naufrage, Prince Edward Island	EN	1	CN	PT	Fresh carcass anchored in gear
7/1/2012	Prorated Injury	-	off Portsmouth, NH	EN	0.75	XU	NR	Full configuration unknown
7/1/2012	Mortality	-	Northern Lake Harbor, Prince Edward Island	EN	1	CN	PT	Constricting gear w/ associated hemorrhaging; COD - drowning
7/13/2012	Prorated Injury	-	off Jonesport, ME	EN	0.75	US	NR	Anchored. Partial disentanglement; Final configuration unknown
7/17/2012	Serious Injury	-	off Chatham, MA	EN	1	XU	NR	Tight wrap across back; health decline: emaciated
8/2/2012	Prorated Injury	-	off Provincetown, MA	EN	0.75	XU	NR	Full configuration unknown
8/5/2012	Mortality	-	Chatham, MA	EN	1	US	NR	Multiple constricting wraps through & around mouth and on fluke blades; COD - acute underwater entrapment
10/4/2012	Mortality	-	Cliff Island, ME	EN	1	US	NR	Evidence of constricting gear at mouthline, across ventral pleats, & at peduncle
7/23/2013	Prorated Injury	-	off Newport, RI	EN	0.75	XU	NR	Full configuration unknown
8/17/2013	Serious Injury	-	off Newburyport, MA	EN	1	XU	NR	Constricting rostrum wrap cutting into upper lip
8/31/2013	Mortality	-	Miminegash, Prince Edward Island	EN	1	CN	NP	Fresh carcass w/ evidence of extensive, constricting gear
10/04/2013	Prorated Injury	-	off Seal Harbor, ME	EN	0.75	US	NR	Anchored, partially disentangled, final configuration unknown
Five-year averages			Ship strike (US/CN/XU/XC)		1.20 (1.20/ 0.00/ 0.00/ 0.00)			
			Entanglement (US/CN/XU/XC)		6.5 (1.70/ 2.75/ 2.05/ 0.00)			
a. For more details on events please see Henry *et al.* 2015.								
b. The date sighted and location provided in the table are not necessarily when or where the serious injury or mortality occurred; rather, this information indicates when and where the whale was first reported beached, entangled, or injured.								

c. Mortality events are counted as 1 against PBR. Serious injury events have been evaluated using NMFS guidelines (NOAA 2012)
d. CN=Canada, US=United States, XC=Unassigned 1st sight in CN, XU=Unassigned 1st sight in US
e. H=hook, GN=gillnet, GU=gear unidentifiable, MF=monofilament, MT=midwater trawl, NP=none present, NR=none recovered/received, PT=pot/trap, WE=weir
f. Assigned cause: EN=entanglement, VS=vessel strike, ET=entrapment.

Table 3. Summary of the incidental mortality and serious injury of Canadian East Coast stock of minke whales (*Balaenoptera acutorostrata acutorostrata*) by commercial fishery including the years sampled, the type of data used, the annual observer coverage, the serious injuries and mortalities recorded by on-board observers, the estimated annual serious injury and mortality, the estimated CV of the combined annual mortality and the mean annual mortality (CV in parentheses).

Fishery	Years	Data Type[a]	Observer Coverage[b]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Estimated CVs	Mean Combined Annual Mortality
Northeast Mid-water Trawl - Including Pair Trawl	09-13	Obs. Data Weighout Trip Logbook	.42, .41, .17, .45, .37	0, 0, 0, 0, 0	0, 0, 0, 0, 1	0, 0, 0, 0, 0	0, 0, 0, 0, 1	0, 0, 0, 0, 1	0, 0, 0, 0, 0	0.2 (0)
TOTAL										0.2 (0)

[a] Observer data (Obs. Data), used to measure bycatch rates, are collected within the Northeast Fisheries Observer Program and mandatory Vessel Trip Reports (VTR) (Trip Logbook) are used to determine the spatial distribution of landings and fishing effort.

[b] Northeast mid-water trawl (including pair trawl) fisheries coverage is ratios based on trips.

Other Mortality

North Atlantic minke whales have been and continue to be hunted. From the Canadian East Coast population, documented whaling occurred from 1948 to 1972 with a total kill of 1,103 animals (IWC 1992). Animals from other North Atlantic minke populations are presently being harvested.

U.S.

Minke whales inhabit coastal waters during much of the year and are thus susceptible to collision with vessels. During 2009, one minke whale was confirmed dead due to a ship strike off New Jersey. In 2010 a juvenile male minke was discovered killed by ship strike off Fire Island, New York. In 2011, three juvenile minkes were confirmed dead due to ship strikes: a female off Sandy Hook, New Jersey, a female off Moriches, New York, and a male off Carolina Beach, North Carolina. In 2012, a confirmed vessel strike resulted in a mortality off Newark, New Jersey. Thus, during 2009–2013, as determined from stranding and entanglement records, the minimum detected annual average was 1.2 minke whales per year struck by ships in U.S. waters or first seen in U.S. waters (Table 2; Henry *et al.* 2015).

In October 2003, an Unusual Mortality Event was declared involving minke whales and harbor seals along the coast of Maine; since then, the number of minke whale stranding reports has returned to normal.

On 11 October 2009, the NOAA research vessel FSV Delaware II captured a minke whale during mid-water trawling operations associated with the 2009 Atlantic Herring Acoustics survey. Although brought on deck, the animal was released alive and appeared to exhibit healthy behavior upon release. This record was evaluated under the serious injury determination guidelines (NOAA 2012) and included in Table 2 as a serious injury.

CANADA

The Nova Scotia Stranding Network documented whales and dolphins stranded on the coast of Nova Scotia between 1991 and 1996 (Hooker *et al.* 1997). Researchers with the Department of Fisheries and Oceans, Canada documented strandings on the beaches of Sable Island (Lucas and Hooker 2000). Starting in 1997, minke whales stranded on the coast of Nova Scotia were recorded by the Marine Animal Response Society (MARS) and the Nova Scotia Stranding Network. For the time period of they reported the following: 5 in 2009 (including one minke released alive from a weir), 0 in 2010, 4 in 2011 (including 2 animals released or relocated), 12 in 2012 (including one minke released alive from a weir), and 0 in 2013. The events that are determined to be human-caused serious injury or mortality are included in Table 2.

The Whale Release and Strandings program has reported the following minke whale stranding mortalities in Newfoundland and Labrador for the time period of this report: 1 in 2009, 1 in 2010, 0 in 2011, 3 in 2012, and 0 in 2013. Those that have been determined to be human-caused serious injury or mortality are included in Table 2 (Ledwell and Huntington 2010, 2011, 2012, 2012b, 2013). The 2011 Bay of Fundy minke whale entanglement mortality reported in Table 2 was reported by the Nova Scotia Marine Animal Response Society (T. Wimmer, pers. comm.).

During 2009–2013, as determined from stranding and entanglement records, the minimum detected annual average was 0 minke whales per year struck by ships in Canadian waters or first seen in Canadian waters (Table 2; Henry *et al.* 2015).

STATUS OF STOCK

Minke whales are not listed as threatened or endangered under the Endangered Species Act, and the Canadian East Coast stock is not considered strategic under the Marine Mammal Protection Act. The total U.S. fishery-related mortality and serious injury for this stock is less than 10% of the calculated PBR and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate. The status of minke whales relative to OSP in the U.S. Atlantic EEZ is unknown.

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RISSO'S DOLPHIN (*Grampus griseus*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Risso's dolphins are distributed worldwide in tropical and temperate seas (Jefferson *et al*. 2008, 2014), and in the Northwest Atlantic occur from Florida to eastern Newfoundland (Leatherwood *et al*. 1976; Baird and Stacey 1991). Off the northeastern U.S. coast, Risso's dolphins are distributed along the continental shelf edge from Cape Hatteras northward to Georges Bank during spring, summer, and autumn (CETAP 1982; Payne *et al*. 1984) (Figure 1). In winter, the range is in the mid-Atlantic Bight and extends outward into oceanic waters (Payne *et al*. 1984). In general, the population occupies the mid-Atlantic continental shelf edge year round, and is rarely seen in the Gulf of Maine (Payne *et al*. 1984). During 1990, 1991 and 1993, spring/summer surveys conducted along the continental shelf edge and in deeper oceanic waters sighted Risso's dolphins associated with strong bathymetric features, Gulf Stream warm-core rings, and the Gulf Stream north wall (Waring *et al*. 1992, 1993; Hamazaki 2002). There is no information on stock structure of Risso's dolphin in the western North Atlantic, or to determine if separate stocks exist in the Gulf of Mexico and Atlantic. Thus, it is plausible that the stock could actually contain multiple demographically independent populations that should themselves be stocks, because the current stock spans multiple eco-regions (Longhurst 1998; Spalding *et al*. 2007). In 2006, a rehabilitated adult male Risso's dolphin stranded and released in the Gulf of Mexico off Florida was tracked via satellite-linked tag to waters off Delaware (Wells *et al*. 2009). The Gulf of Mexico and Atlantic stocks are currently being treated as two separate stocks.

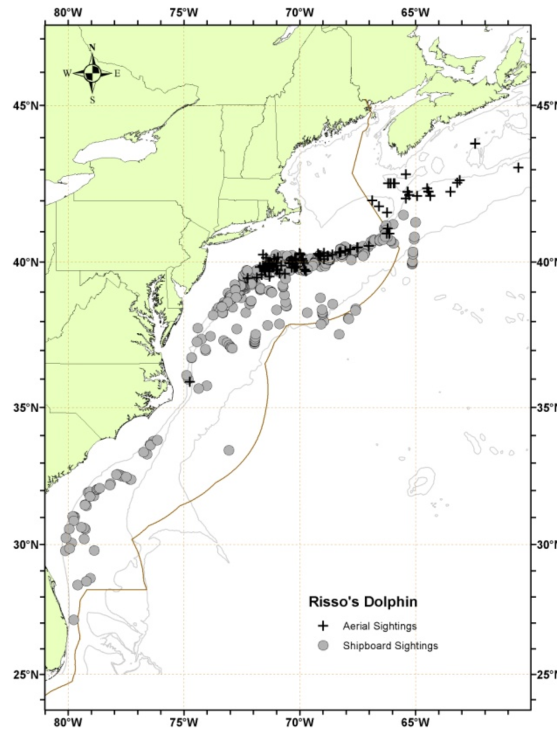

Figure 1. *Distribution of Risso's dolphin sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1995, 1998, 1999, 2002, 2004, 2006, 2007, 2008 2010 and 2011. Isobaths are the 100-m, 1,000-m, and 4,000-m depth contours.*

POPULATION SIZE

The best abundance estimate for Risso's dolphins is the sum of the estimates from the 2011 surveys—18,250 (CV = 0.46; Palka 2012).

Earlier abundance estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions. As recommended in the GAMMS II Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable for the determination of the current PBR.

Recent surveys and abundance estimates

An abundance estimate of 15,197 (CV = 0.55) Risso's dolphins was generated from a shipboard and aerial survey conducted during June–August 2011 (Palka 2012). The aerial portion that contributed to the abundance estimate covered 5,313 km of tracklines that were over waters north of New Jersey from the coastline to the 100-m depth contour, through the U.S. and Canadian Gulf of Maine and up to and including the lower Bay of Fundy. The shipboard portion covered 3,107 km of tracklines that were in waters offshore of central Virginia to Massachusetts (waters that were deeper than the 100-m depth contour out to beyond the U.S. EEZ). Both sighting platforms used a double-platform data-collection procedure, which allows estimation of abundance corrected for perception bias of the detected species (Laake and Borchers, 2004). Shipboard data were inspected to determine if there was significant responsive movement to the ship (Palka and Hammond 2001). Because there was evidence of responsive (evasive) movement of this species to the ship, estimation of the abundance was based on Palka and Hammond (2001) and the independent-observer approach assuming full independence (Laake and Borchers 2004), and calculated using the mark-recapture distance sampling option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009).

An abundance estimate of 3,053 (CV = 0.44) Risso's dolphins was generated from a shipboard survey conducted concurrently (June–August 2011) in waters between central Virginia and central Florida. This shipboard survey included shelf-break and inner continental slope waters deeper than the 50-m depth contour within the U.S. EEZ. The survey employed the double-platform methodology searching with 25×150 "bigeye" binoculars. A total of 4,445 km of tracklines was surveyed, yielding 290 cetacean sightings. The majority of sightings occurred along the continental shelf break with generally lower sighting rates over the continental slope. Estimation of the abundance was based on the independent-observer approach assuming point independence (Laake and Borchers 2004) and calculated using the mark-recapture distance sampling option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009).

Table 1. Summary of recent abundance estimates for the western North Atlantic Risso's dolphin (*Grampus griseus*), by month, year, and area covered during each abundance survey, resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Jun-Aug 2011	Central Virginia to lower Bay of Fundy	15,197	0.55
Jun-Aug 2011	Central Florida to Central Virginia	3,053	0.44
Jun-Aug 2011	Central Florida to lower Bay of Fundy (COMBINED)	18,250	0.46

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for Risso's dolphins is 18,250 (CV = 0.46), obtained from the 2011 surveys. The minimum population estimate for the western North Atlantic Risso's dolphin is 12,619.

Current Population Trend

A trend analysis has not been conducted for this stock. The statistical power to detect a trend in abundance for this stock is poor due to the relatively imprecise abundance estimates and long survey interval. For example, the power to detect a precipitous decline in abundance (i.e., 50% decrease in 15 years) with estimates of low precision (e.g., CV > 0.30) remains below 80% (alpha = 0.30) unless surveys are conducted on an annual basis (Taylor *et al.* 2007).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al*. 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 12,619. The maximum productivity rate is 0.04, the default value for cetaceans (Barlow *et al.* 1995). The recovery factor, , is 0.5, the default value for stocks of unknown status relative to OSP, and the CV of the average mortality estimate is less than 0.3 (Wade and Angliss 1997). PBR for the western North Atlantic stock of Risso's dolphin is 126.

ANNUAL HUMAN-CAUSED MORTALITY

Total annual estimated average fishery-related mortality or serious injury to this stock during 2009–2013 was 54 Risso's dolphins (CV = 0.26; Table 2).

Fishery Information

Detailed fishery information is reported in Appendix III.

Earlier Interactions

One Risso's dolphin mortality was observed in the mid-Atlantic midwater trawl fishery in 2008. No bycatch estimate was developed, so the 2008 average annual serious injury and mortality attributed to the mid-Atlantic midwater trawl was calculated as a minimum value of 1 animal.

Historically, fishery interactions have been documented with Risso's dolphins in squid and mackerel trawl activities (1977–1991), the pelagic drift gillnet fishery (1989–1998), the pelagic pair trawl fishery (1992), and the mid-Atlantic gillnet fishery (2007). See Appendix V for more information on historical takes.

Pelagic Longline

Pelagic longline bycatch estimates of Risso's dolphins for 2009–2013 are documented in Garrison and Stokes (2010, 2012a, 2012b, 2013, 2014). Most of the estimated marine mammal bycatch was from U.S. Atlantic EEZ waters between South Carolina and Cape Cod. There is a high likelihood that dolphins released alive with ingested gear or gear wrapped around appendages will not survive (Wells *et al.* 2008). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Northeast Bottom Trawl

One Risso's dolphin was observed taken in northeast bottom trawl fisheries in 2010 (Table 2). This is the first time this species was observed taken in this fishery. New serious injury criteria were applied to all observed interactions retroactive back to 2007 (Waring *et al.* 2014, 2015*;* Wenzel *et al.* 2015). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Mid-Atlantic Bottom Trawl

Risso's dolphin was observed taken in mid-Atlantic bottom trawl fisheries (Table 2). New serious injury criteria were applied to all observed interactions retroactive back to 2007 (Waring *et al.* 2014, 2015; Wenzel *et al.* 2015). No seriously injured Risso's dolphins have been observed in this fishery. It was discovered in 2010 that a small segment of the mid-Atlantic bottom trawl fleet was equipping fishing nets with acoustic deterrent devices (i.e., pingers). To the extent possible, the use of pingers on bottom trawl gear has been taken into account when estimating bycatch mortality of Risso's dolphins. See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Northeast Sink Gillnet

In the northeast sink gillnet fishery, Risso's dolphin interactions have historically been rare, but in 2012 and 2013 one animal was observed each year in the waters south of Massachusetts (Hatch and Orphanides 2014; 2015). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Table 2. Summary of the incidental serious injury and mortality of Risso's dolphin (*Grampus griseus*) by commercial fishery including the years sampled, the type of data used, the annual observer coverage, the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury, the estimated CV of the combined estimates and the mean of the combined estimates (CV in parentheses).

Fishery	Years	Data Type [a]	Observer Coverage [b]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Estimated CVs	Mean Combined Annual Mortality
Pelagic Longline [c]	09-13	Obs. Data Logbook	.14, .08, .09, .07, .09	2, 0, 2, 1, 1	0, 0, 0, 0, 0	11, 0, 12, 15, 1.9	0, 0, 0, 0. 0	11, 0, 12, 15, 1.9	.71, 0, .63, 1.0, 1.0	8.1 (0.47)
Northeast Sink Gillnet	09-13	Obs. Data, Trip Logbook, Allocated Dealer Data	.04, .17, .19, .15, .11	0, 0, 0, 0, 0	0, 0, 0, 1, 1	0, 0, 0, 0, 0	0, 0, 0, 6, 23	0, 0, 0, 6, 23	0, 0, 0, .87, 1	5.8 (0.81)
Northeast Bottom Trawl	09-13	Obs. Data Dealer Data VTR Data	.09, .16, .26, .17, .15	0, 0, 0, 0, 0	0, 1, 0, 0, 0	0, 0, 0, 0, 0	3, 2, 3, 0 , 0	3, 2, 3, 0, 0	.53, .55, .55, 0, 0	1.6 (0.32)
Mid-Atlantic Bottom Trawl [d]	09-13	Obs. Data Dealer Data	.05, .06, .08, .05, .06	0, 0, 0, 0 , 0	0, 15, 2, 1, 4	0, 0, 0, 0 , 0	23, 54, 62, 7, 46	23, 54, 62, 7, 46	.50, .74, .56, 1.0, .71	38 (.33)
TOTAL										54 (0.26)

a Observer data (Obs. Data) are used to measure bycatch rates and the data are collected within the Northeast Fisheries Observer Program. NEFSC collects landings data (unallocated Dealer Data and Allocated Dealer Data) which are used as a measure of total landings and mandatory Vessel Trip Reports (VTR) (Trip Logbook) are used to determine the spatial distribution of landings and fishing effort. Total landings are used as a measure of total effort for the coastal gillnet fishery.

b The observer coverages for the northeast and mid-Atlantic sink gillnet fishery are ratios based on tons of fish landed. Northeast bottom trawl, mid-Atlantic bottom trawl, northeast mid-water and mid-Atlantic mid-water trawl fishery coverages are ratios based on trips. Total observer coverage reported for gillnet and bottom trawl gear in the years starting in 2010 include samples collected from traditional fisheries observers in addition to fishery at-sea monitors through the Northeast Fisheries Observer Program (NEFOP). For 2010 only the NEFOP observed data were reported in this table, since the at-sea monitoring program just started in May 2010. Both at-sea monitor and traditional fisheries observer data were used for 2011 and onwards.

c Estimates can include data pooled across years, so years without observed SI or Mortality may still have an estimated value.

d Fishery related bycatch rates were estimated using an annual stratified ratio-estimator.

Other mortality

From 2009 to 2013, 38 Risso's dolphin strandings were recorded along the U.S. Atlantic coast (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 20 August 2014). Eight animals had indications of human interaction, four of which were fishery interactions. Indications of human interaction are not necessarily the cause of death (Table 3).

Table 3. Risso's dolphin (*Grampus griseus*) reported strandings along the U.S. Atlantic coast and Puerto Rico, 2009–2013.

STATE	2009	2010	2011	2012	2013	TOTALS
Maine	0	0	0	0	0	0
Massachusetts[a,d]	4	0	0	0	3	7
Rhode Island	0	0	1	0	0	1
New York	0	0	1	0	2	3
New Jersey	1	0	0	0	0	1
Maryland	0	1	0	0	1	2

Virginia[b]	2	4	1	0	0	7
North Carolina[c]	3	2	1	2	1	9
Georgia	1	0	0	0	0	1
Florida	0	0	2	2	2	6
Puerto Rico	0	0	1	0	0	1
TOTAL	**11**	**7**	**6**	**4**	**9**	**38**
a. One of the 2009 animals had propeller wounds.						
b. One of the 2009 animals showed signs of human interaction.						
c. Two animals in 2009 showed signs of fishery interaction. One animal in 2010 classified as human interaction. Two animals in 2012 showed signs of fishery interaction. One animal in 2013 classified as human interaction.						
d. 2008 includes 4 animals mass stranded in Massachusetts, 3 of which were released alive.						

Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that die or are seriously injured may not wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction.

STATUS OF STOCK

Risso's dolphins are not listed as threatened or endangered under the Endangered Species Act and the Western North Atlantic stock is not considered strategic under the Marine Mammal Protection Act. The 2009–2013 average annual human-related mortality does not exceed PBR. The total U.S. fishery mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching a zero mortality and serious injury rate. The status of Risso's dolphins relative to OSP in the U.S. Atlantic EEZ is unknown. Population trends for this species have not been investigated.

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LONG-FINNED PILOT WHALE (*Globicephala melas melas*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are two species of pilot whales in the western Atlantic—the long-finned pilot whale, *Globicephala melas melas*, and the short-finned pilot whale, *G. macrorhynchus*. These species are difficult to differentiate at sea and cannot be reliably visually identified during either abundance surveys or observations of fishery mortality without high-quality photographs (Rone and Pace 2012); therefore, the ability to separately assess the two species in U.S. Atlantic waters is complex and requires additional information on seasonal spatial distribution. The long-finned pilot whale is distributed from North Carolina to North Africa (and the Mediterranean) and north to Iceland, Greenland and the Barents Sea (Sergeant 1962; Leatherwood *et al.* 1976; Abend 1993; Bloch *et al.* 1993; Abend and Smith 1999). The stock structure of the North Atlantic population is uncertain (ICES 1993; Fullard *et al.* 2000). Morphometric (Bloch and Lastein 1993) and genetic (Siemann 1994; Fullard *et al.* 2000) studies have provided little support for stock separation across the Atlantic (Fullard *et al.* 2000). However, Fullard *et al.* (2000) have proposed a stock structure that is related to sea-surface temperature: 1) a cold-water population west of the Labrador/North Atlantic current, and 2) a warm-water population that extends across the Atlantic in the Gulf Stream.

In U.S. Atlantic waters, pilot whales (*Globicephala* sp.) are distributed principally along the continental shelf edge off the northeastern U.S. coast in winter and early spring (CETAP 1982; Payne and Heinemann 1993; Abend and Smith 1999; Hamazaki 2002). In late spring, pilot whales move onto Georges Bank and into the Gulf of Maine and more northern waters, and remain in these areas through late autumn (CETAP 1982; Payne and Heinemann 1993). Pilot whales tend to occupy areas of high relief or submerged banks. They are also associated with the Gulf Stream wall and thermal fronts along the continental shelf edge (Waring *et al.* 1992). Long-finned and short-finned pilot whales overlap spatially along the mid-Atlantic shelf break between New Jersey and the southern flank of Georges Bank (Payne and Heinemann 1993). Long-finned pilot whales have occasionally been observed stranded as far south as South Carolina, and short-finned pilot whales have occasionally been observed stranded as far north as Massachusetts. The latitudinal ranges of the two species therefore remain uncertain, although south of Cape Hatteras, most pilot whale sightings are expected to be short-finned pilot whales, while north of ~42°N most pilot whale sightings are expected to be long-finned pilot whales (Figure 1).

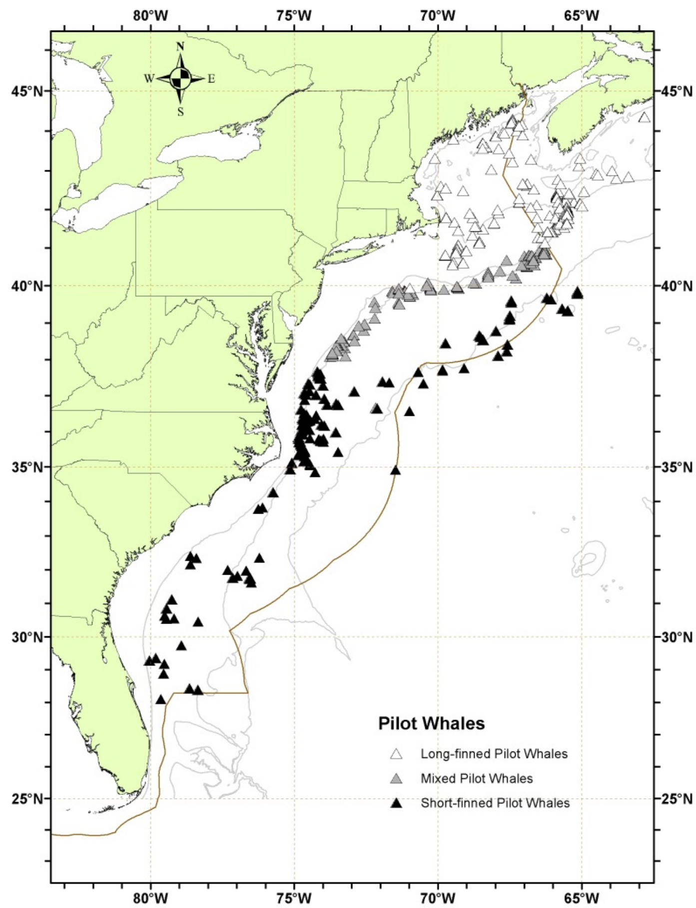

Figure 1. *Distribution of long-finned (open symbols), short-finned (black symbols), and possible mixed (gray symbols; could be either species) pilot whale sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1998, 1999, 2002, 2004, 2006, 2007 and 2011. The inferred distribution of the two species is preliminary and is valid for June-August only. Isobaths are the 100-m, 1,000-m, and 4,000-m depth contours.*

POPULATION SIZE

The best available estimate for long-finned pilot whales in the western North Atlantic is 5,636 (CV=0.63; Table 1). This estimate is from summer 2011 surveys covering waters from central Virginia to the lower Bay of Fundy. The best available abundance estimate is from the shipboard survey conducted during the summer of 2011 because this is the most recent survey. It should be noted, however, that these surveys did not include areas of the Scotian Shelf where the highest densities of pilot whales were observed in the summer of 2006, therefore they represent an underestimation of the overall abundance of this stock. Because long-finned and short-finned pilot whales are difficult to distinguish at sea, sightings data are reported as *Globicephala sp*. These survey data have been combined with an analysis of the spatial distribution of the 2 species based on genetic analyses of biopsy samples to derive separate abundance estimates (NMFS unpublished data; see below).

Earlier estimates

Please see appendix IV for a summary of abundance estimates including earlier estimates and survey descriptions. As recommended in the GAMMS II Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable for the determination of the current PBR. Due to changes in survey methodology, these historical data should not be used to make comparisons with more current estimates.

Recent surveys and abundance estimates for *Globicephala* sp.

An imprecise abundance estimate of 16,058 (CV=0.79) pilot whales was generated from the Canadian Trans-North Atlantic Sighting Survey (TNASS) in July–August 2007 (Lawson and Gosselin 2011). This aerial survey covered the area from northern Labrador to the Scotian Shelf, providing full coverage of the Atlantic Canadian coast. Estimation of the abundance was based on the independent-observer approach assuming point independence (Laake and Borchers 2004) and calculated using the mark-recapture distance sampling option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009). Estimates from this survey were corrected using the g(0) values obtained from the integration of perception and availability biases (Tables 1 and 2 in Lawson and Gosselin 2011), or using g(0) values from Palka (2012). This survey covered habitats expected to contain long-finned pilot whales exclusively.

An abundance estimate of 11,865 (CV=0.57) *Globicephala* sp. was generated from aerial and shipboard surveys conducted during June–August 2011 between central Virginia and the lower Bay of Fundy (Palka 2012). The aerial portion covered 6,850 km of tracklines over waters north of New Jersey between the coastline and the 100-m depth contour through the U.S. and Canadian Gulf of Maine, and up to and including the lower Bay of Fundy. Pilot whales were not observed during the aerial portion of the survey. The shipboard portion covered 3,811 km of tracklines between central Virginia and Massachusetts in waters deeper than the 100-m depth contour out to beyond the U.S. EEZ. Both sighting platforms used a double-platform data-collection procedure, which allows estimation of abundance corrected for perception bias of the detected species (Laake and Borchers 2004). Estimation of the abundance was based on the independent-observer approach assuming point independence (Laake and Borchers 2004) and calculated using the mark-recapture distance sampling option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009). The vessel portion of this survey included habitats where both short-finned and long-finned pilot whales occur. The estimated abundance of long-finned pilot whales from this survey was 5,636 (CV=0.63).

An abundance estimate of 16,946 (CV=0.43) *Globicephala* sp. was generated from a shipboard survey conducted concurrently (June-August 2011) in waters between central Virginia and central Florida. This shipboard survey included shelf-break and inner continental slope waters deeper than the 50-m depth contour within the U.S. EEZ. The survey employed two independent visual teams searching with 25× bigeye binoculars. A total of 4,445 km of tracklines was surveyed, yielding 290 cetacean sightings. The majority of sightings occurred along the continental shelf break north of Cape Hatteras, North Carolina, with a lower number of sightings over the continental slope in the southern portion of the survey. Estimation of the abundance was based on the independent-observer approach assuming point independence (Laake and Borchers 2004) and calculated using the mark-recapture distance sampling option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009). This survey included habitats where only short-finned pilot whales are expected to occur.

Spatial Distribution and Abundance Estimates for *Globicephala melas*

Biopsy samples from pilot whales were collected during summer months (June–August) from South Carolina to the southern flank of Georges Bank between 1998 and 2007. These samples were identified to species using genetic analysis of mitochondrial DNA sequences. A portion of the mtDNA genome was sequenced from each biopsy sample collected in the field, and genetic species identification was performed through phylogenetic reconstruction of the haplotypes. Stranded specimens that were morphologically identified to species were used to assign clades in the phylogeny to species and thereby identify all samples. The probability of a sample being from a long-finned (or short-finned) pilot whale was evaluated as a function of sea-surface temperature and water depth using logistic regression. This analysis indicated that the probability of a sample coming from a long-finned pilot whale was near 1 at water temperatures <22°C, and near 0 at temperatures >25°C. The probability of a long-finned pilot whale also decreased with increasing water depth. Spatially, during summer months, this regression model predicts that all pilot whales observed in offshore waters near the Gulf Stream are most likely short-finned pilot whales. The area of overlap between the 2 species occurs primarily along the shelf break off the coast of New Jersey between 38°N and 40°N latitude. This habitat model was used to partition the abundance estimates from surveys conducted during the summer of 2011. The sightings from the southeast shipboard survey covering waters from Florida to central Virginia were predicted to consist entirely of short-finned pilot whales. The aerial portion of the northeast surveys covered the Gulf of Maine and the Bay of Fundy and surveys where the model predicted that only long-finned pilot whales would occur, but no pilot whales were observed. The vessel portion of the northeast survey recorded a mix of both species along the shelf break, and the sightings in offshore waters near the Gulf Stream were predicted to consist predominantly of short-finned pilot whales. The abundance estimate for long-finned pilot whales from the northeast summer 2011 vessel survey was 5,636 (CV=0.63; NMFS unpublished data). The summer 2011 aerial survey of the Gulf of Maine to the Bay of Fundy did not include areas of the Scotian Shelf where the highest densities of pilot whales were observed in the summer of 2006, therefore the 2011 summer surveys are an underestimation of the overall abundance of this stock.

Table 1. Summary of recent abundance estimates for the western North Atlantic long-finned pilot whale (*Globicephala melas melas*) by month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
July-Aug 2007	N. Labrador to Scotian Shelf	16,058	0.79
Jun-Aug 2011	central Virginia to Lower Bay of Fundy	5,636	0.63

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for western North Atlantic long-finned pilot whales is 5,636 animals (CV=0.63). The minimum population estimate for long-finned pilot whales is 3,464.

Current Population Trend

A trend analysis has not been conducted for this stock. There are 2 abundance estimates for *Globicephala* spp. from summer 1998 (14,909; CV=0.26) and summer 2004 surveys (31,139; CV=0.27), and 1 abundance estimate of *G. melas* from summer 2011 surveys (5,636; CV=0.63). Because the 1998 and 2004 surveys did not derive separate abundance estimates for each pilot whale species, comparisons to the 2011 estimate are inappropriate.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a “recovery” factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for long-finned pilot whales is 3,464. The maximum productivity rate is 0.04, the default value for cetaceans. The “recovery” factor is 0.5 because this stock is of unknown status relative to OSP and the CV of the average mortality estimate is less than 0.3 (Wade and Angliss 1997). PBR for the western North Atlantic long-finned pilot whale is 35.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Total annual observed average fishery-related mortality or serious injury during 2009–2013 was 31 for long-finned pilot whales (CV=0.14; see Table 2). In bottom trawls and mid-water trawls and in the gillnet fisheries, mortalities were more generally observed north of 40°N latitude and in areas expected to have a higher proportion of long-finned pilot whales. Takes in these fisheries were examined individually using model-based predictions, and in all cases these animals were assigned as long-finned pilot whales. Based on biopsy and photo-identification data, it is likely that the recent bycatch of pilot whales in the pelagic longline fishery is restricted to short-finned pilot whales.

Fishery Information

The commercial fisheries that could potentially interact with this stock in the Atlantic Ocean are the Category I northeast sink gillnet and the Atlantic Ocean, Caribbean, Gulf of Mexico large pelagic longline fisheries; and the Category II northeast bottom trawl and northeast mid-water trawl (including pair trawl) fisheries. Detailed fishery information is reported in Appendix III.

Earlier Interactions

Historically, fishery interactions have been documented with pilot whales in the Atlantic pelagic drift gillnet fishery, Atlantic tuna pair trawl and tuna purse seine fisheries, northeast and mid-Atlantic gillnet fisheries, northeast and mid-Atlantic bottom trawl fisheries, northeast midwater trawl fishery, and the pelagic longline fishery. See Appendix V for more information on historical takes.

Northeast Sink Gillnet

One pilot whale was caught in this fishery in 2010. According to modeled species distribution, this whale was a long-finned pilot whale. See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Pelagic Longline

Most of the estimated marine mammal bycatch in the U.S. pelagic longline fishery was recorded in U.S. Atlantic EEZ waters between South Carolina and Cape Cod (Garrison 2007). Bycatch of long-finned pilot whales has occurred in the past. However, available seasonal biopsy data and genetic analyses indicate that recent pilot whale bycatch in the pelagic longline fishery is restricted to short-finned pilot whales, therefore the mortality and serious injury due to the pelagic longline fishery is not included in the estimated mortality of the long-finned pilot whale.

Northeast Bottom Trawl

New serious injury criteria were applied to all observed interactions retroactive during 2007–2011 and annually since 2012 (Waring *et al*. 2014, 2015, Wenzel *et al*. 2015; see Table 2). In addition to takes observed by fisheries observers, the Marine Mammal Authorization Program (MMAP) (http://www.nmfs.noaa.gov/pr/interactions/mmap/) included 2 self-reported incidental takes (mortalities) of pilot whales in bottom trawl gear off Maine and Massachusetts during 2008, and 2 self-reported incidental takes (mortalities) in trawl gear off Maine and Rhode Island during 2011. Fishery-related bycatch rates for years 2009–2013 were estimated using an annual stratified ratio-estimator. These mortality estimates replace the 2008–2011 annual estimates reported in the 2013 stock assessment report that were generated using a different method described in Rossman (2010). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Northeast Mid-Water Trawl (Including Pair Trawl)

In September 2011, one pilot whale was taken in the northeast mid-water trawl fishery on the northern flank of Georges Bank. Another pilot whale was taken in a mid-water trawl in 2012. Three were taken in 2013 near the western edge of Georges Bank. Using model-based predictions, these takes have all been assigned as long-finned pilot whales. Due to small sample sizes, the ratio method was used to estimate the bycatch rate (observed takes per observed hours the gear was in the water) for each year, where the paired and single northeast mid-water trawls were pooled and only hauls that targeted herring or mackerel were used. The VTR herring and mackerel data were used to estimate the total effort. Estimated annual fishery-related mortalities were 0 in 2009 to 2010 (Table 2). Expanded estimates of fishery mortality for 2011, 2012, and 2013 are not available, and so for those years the raw number is provided. See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

CANADA

Unknown numbers of long-finned pilot whales have been taken in Newfoundland, Labrador, and Bay of Fundy groundfish gillnets; Atlantic Canada and Greenland salmon gillnets; and Atlantic Canada cod traps (Read 1994).

Table 2. Summary of the incidental mortality and serious injury of long-finned pilot whales (*Globicephala melas melas.*) by commercial fishery including the years sampled (Years), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Est. CVs) and the mean of the combined estimates (CV in parentheses). These are minimum observed counts as expanded estimates are not available.

Fishery	Years	Data Type[a]	Observer Coverage[b]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Est. CVs	Mean Annual Mortality
Northeast Sink Gillnet	09-13	Obs. Data, Logbook, Dealer Data	.04, .17, .19, .15, .11	0, 0, 0, 0, 0	0, 1, 0, 0, 0	0, 0, 0, 0, 0	0, 3, 0, 0, 0	0, 3, 0, 0, 0	0, .82, 0, 0, 0	0.6 (0.82)
Northeast Bottom Trawl [b]	09-13	Obs. Data Logbook	.09, .16, .26, .17. .15	2,1,3,3,0	1,9,9,7,4	3, 6, 12, 10, 0	10, 24, 43, 23, 16	13, 30, 55, 33, 16	.70, .43, .18, .32, .42	29.4 (0.15)
Northeast Mid-Water Trawl - Including Pair Trawl [c]	09-13	Obs. Data Dealer Data VTR Data	.42, .41, .17, .45, .37	0,0,0,0, 0	0,0,1,1,3	0,0,0,0,0	0,0,1,1,3	0, 0, 1, 1, 3	na, na, na, na, na	1.0 (na)
TOTAL										31 (0.14)

[a] Observer data (Obs. Data) are used to measure bycatch rates and the data are collected within the Northeast Fisheries Observer Program (NEFOP). NEFSC collects landings data (unallocated Dealer Data and Allocated Dealer Data) which are used as a measure of total landings and mandatory Vessel Trip Reports (VTR) (Trip Logbook) are used to determine the spatial distribution of landings and fishing effort. Total landings are used as a measure of total effort for the coastal gillnet fishery..

[b] The observer coverages for the northeast sink gillnet fishery are ratios based on tons of fish landed. Northeast bottom trawl and northeast mid-water trawl fishery coverages are ratios based on trips. Total observer coverage reported for gillnet and bottom trawl gear in the years starting in 2010 include samples collected from traditional fisheries observers in addition to fishery at-sea monitors through the Northeast Fisheries Observer Program (NEFOP). For 2010 only the NEFOP observed data were reported in this table, since the at-sea monitoring program just started in May 2010. Both at-sea monitor and traditional fisheries observer data were used for 2011 and onwards

[c] Fishery related bycatch rates for years 2009–2013 were estimated using an annual stratified ratio-estimator. [c] Expanded estimates for 2009–2013 are not available for this fishery.

Other Mortality

Pilot whales have a propensity to mass strand throughout their range, but the role of human activity in these events is unknown. From 2009 to 2013, 44 short-finned pilot whales (*Globicephala macrorhynchus*), 34 long-finned pilot whales (*Globicephala melas melas*), and 6 pilot whales not specified to the species level (*Globicephala* sp.) were reported stranded between Maine and Florida, including the Exclusive Economic Zone (EEZ) (Table 3).

Short-finned pilot whales strandings have been reported stranded as far north as Block Island, Rhode Island (2001); and Cape Cod, Massachusetts (2011), although the majority of the strandings occurred from North Carolina southward (Table 3). Long-finned pilot whales have been reported stranded as far south as Florida, where 2 long-finned pilot whales were reported stranded in Florida in November 1998, though their flukes had been apparently cut off, so it is unclear where these animals actually may have died. One additional long-finned pilot whale stranded in South Carolina in 2003, though the confidence in the species identification was only moderate. A genetic sample from this animal has subsequently been sequenced and mitochondrial DNA analysis supports the long-finned pilot whale identification.

During 2009–2013, several human and/or fishery interactions were documented in stranded pilot whales within the U.S. EEZ. One long-finned pilot whale that stranded in Massachusetts in 2009 was classified as a fishery interaction because it had a piece of monofilament line in its stomach. A short-finned pilot whale stranded in North Carolina in 2010 had evidence of longline interaction. Two long-finned pilot whale stranding mortalities in 2011 in Massachusetts were classified as human interaction cases, one due to onlookers trying to refloat the animal, and another with tow rope around the tail most likely tied on postmortem. Also in 2011, a short-finned pilot whale in North Carolina was classified as a fishery interaction and a short-finned pilot whale in New Jersey was found with a healed but abscessed bullet wound. In 2012, 3 short-finned pilot whales had evidence of fishery interaction, two of them in South Carolina and one in North Carolina. During 2013 no evidence of human interaction was documented for stranded pilot whales.

Table 3. Pilot whale (*Globicephala macrorhynchus* [SF], *Globicephala melas melas* [LF] *and Globicephala* sp. [Sp]) strandings along the Atlantic coast, 2009–2013. Strandings which were not reported to species have been reported as *Globicephala* sp. The level of technical expertise among stranding network personnel varies, and given the potential difficulty in correctly identifying stranded pilot whales to species, reports to specific species should be viewed with caution.

STATE	2009			2010			2011			2012			2013			TOTALS		
	SF	LF	Sp	SF	LF	Sp	SF	LF	Sp	SF	LF	Sp	SF	LF	Sp	SF	LF	Sp
Nova Scotia[a]	0	0	15	0	0	11	0	0	19	0	0	3	0	15	0	0	15	48
Newfoundland and Labrador[b]	0	0	1	0	0	1	0	0	8	0	0	6	0	1	1	0	1	17
Maine	0	3	0	0	0	0	0	1	0	0	1	0	0	0	0	0	5	0
Massachusetts[c]	0	4	0	0	2	0	3	4	0	0	3	0	0	3	0	3	16	0
Rhode Island	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	4	0
New York	0	1	0	0	0	0	0	1	0	0	1	0	0	2	0	0	5	0
New Jersey	1	1	0	0	0	0	1	0	1	0	0	0	0	1	0	2	2	1
Maryland	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0
Virginia[d]	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	1	2
North Carolina[d]	2	0	0	1	0	0	1	0	0	1	0	0	0	0	0	5	0	0
South Carolina[d]	0	0	0	0	0	1	0	0	0	3	0	1	1	0	1	4	0	3
Florida[e]	0	0	0	4	0	0	2	0	0	23	0	0	0	0	0	29	0	0
TOTALS - U.S. & EEZ	**4**	**11**	**0**	**5**	**2**	**3**	**7**	**8**	**1**	**27**	**6**	**1**	**1**	**7**	**1**	**44**	**34**	**6**

[a] Data supplied by Nova Scotia Marine Animal Response Society (pers. comm.). Strandings in 2011 include one mass stranding of 6-8 whales (one of which died) and 2 animals with ropes tied around their tail stocks. Strandings in 2013 include one fishery entanglement (bait net) and one mass stranding of 4 animals.

[b] (Ledwell and Huntington 2010, 2011, 2012, 2013). 2011 included 2 mom/calf pairs. Not included in 2011 total was group of 6 pilot whales shepherded out of a narrow channel.

[c] One of the 2009 animals was classified as a fishery interaction.

[d] Signs of fishery interactions were observed on one short-finned pilot whale stranded in 2010 and one stranded in 2011, both in North Carolina. Signs of fishery interaction were observed on one short-finned pilot whale in North Carolina and two in South Carolina in 2012. A mass stranding of 3 whales occurred in South Carolina in 2012.

[e] A mass stranding of 3whales occurred in 2010, and a mass stranding of 2 whales in 2011.

Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury, particularly for offshore species such as pilot whales, because not all of the whales that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

HABITAT ISSUES

A potential human-caused source of mortality is from polychlorinated biphenyls (PCBs) and chlorinated pesticides (DDT, DDE, dieldrin, etc.), moderate levels of which have been found in pilot whale blubber (Taruski *et al.* 1975; Muir *et al.* 1988; Weisbrod *et al.* 2000). Weisbrod *et al.* (2000) reported that bioaccumulation levels were more similar in whales from the same stranding group than in animals of the same sex or age. Also, high levels of toxic metals (mercury, lead, cadmium) and selenium were measured in pilot whales harvested in the Faroe Island drive fishery (Nielsen *et al.* 2000). Similarly, Dam and Bloch (2000) found very high PCB levels in pilot whales in the Faroes. The population effect of the observed levels of such contaminants is unknown.

STATUS OF STOCK

The long-finned pilot whale is not listed as threatened or endangered under the Endangered Species Act, and the western North Atlantic stock is not considered strategic under the Marine Mammal Protection Act. Total U.S. fishery-related mortality and serious injury for long-finned pilot whales does not exceed PBR but is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. The status of this stock relative to OSP in the U.S. Atlantic EEZ is unknown. There are insufficient data to determine the population trends for this stock.

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SHORT-FINNED PILOT WHALE (*Globicephala macrorhynchus*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are 2 species of pilot whales in the western North Atlantic - the long-finned pilot whale, *Globicephala melas melas,* and the short-finned pilot whale, *G. macrorhynchus*. These species are difficult to differentiate at sea and cannot be reliably visually identified during either abundance surveys or observations of fishery mortality without high-quality photographs (Rone and Pace 2012); therefore, the ability to separately assess the 2 species in U.S. Atlantic waters is complex and requires additional information on seasonal spatial distribution. Undifferentiated pilot whales (*Globicephala* sp.) in the western North Atlantic occur primarily near the continental shelf break ranging from Florida to the Nova Scotia Shelf (Mullin and Fulling 2003). Long-finned and short-finned pilot whales overlap spatially along the mid-Atlantic shelf break between New Jersey and the southern flank of Georges Bank (Payne and Heinemann 1993). Long-finned pilot whales have occasionally been observed stranded as far south as South Carolina, and short-finned pilot whales have occasionally been observed stranded as far north as Massachusetts. The latitudinal ranges of the two species therefore remain uncertain, although south of Cape Hatteras, most pilot whale sightings are expected to be short-finned pilot whales, while north of ~42°N most pilot whale sightings are expected to be long-finned pilot whales (Figure 1). In addition, short-finned pilot whales are documented along the continental shelf and continental slope in the northern Gulf of Mexico (Hansen *et al.* 1996; Mullin and Hoggard 2000; Mullin and Fulling 2003), and they are also known from the wider Caribbean. A May 2011 mass stranding of 23 short-finned pilot whales in the Florida Keys has been considered to be Gulf of Mexico stock whales based on stranding location, yet two tagged and released individuals from this stranding travelled directly into the Atlantic (Wells *et al.* 2013). Studies are currently being conducted at the Southeast Fisheries Science Center to evaluate genetic population structure in short-finned pilot whales. Pending these results, the *Globicephala macrorhynchus* population occupying U.S. Atlantic waters is considered separate from both the northern Gulf of Mexico stock and short-finned pilot whales occupying Caribbean waters.

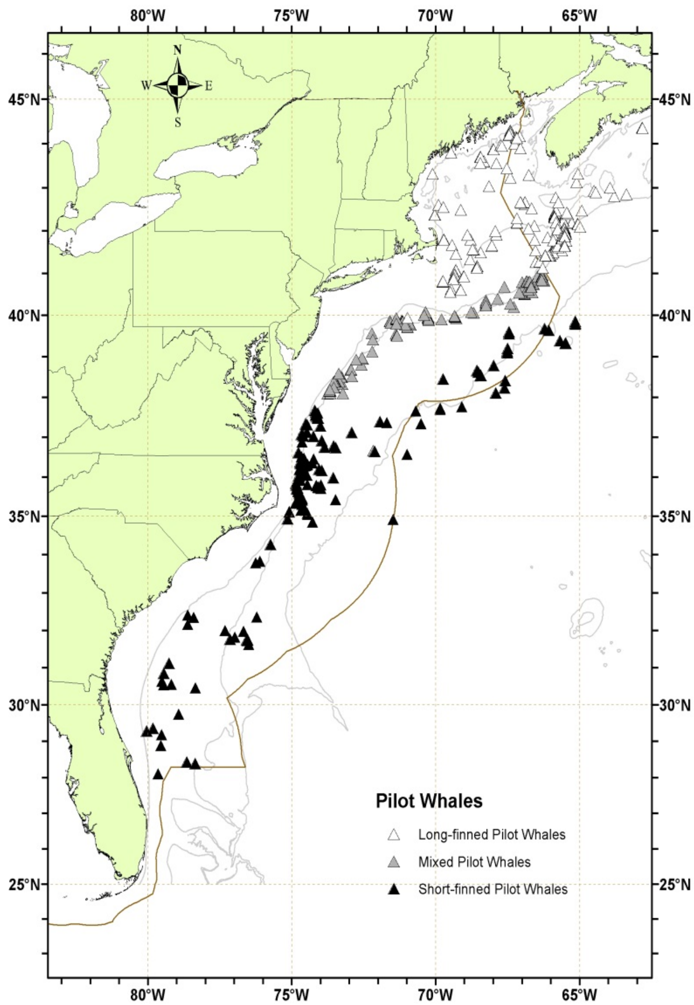

Figure 1. *Distribution of long-finned (open symbols), short-finned (black symbols), and possibly mixed (gray symbols; could be either species) pilot whale sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1998, 1999, 2002, 2004, 2006, 2007 and 2011. The inferred distribution of the two species is preliminary and is valid for June-August only. Isobaths are the 100-m, 1,000-m, and 4,000-m depth contours.*

POPULATION SIZE

The best available estimate for short-finned pilot whales in the western North Atlantic is 21,515 (CV=0.37; Table 1). This estimate is from summer 2011 surveys covering waters from central Florida to the lower Bay of Fundy. Sightings from vessel and aerial surveys were strongly concentrated along the continental shelf break; however, pilot whales were also observed over the continental slope in waters associated with the Gulf Stream (Figure 1). The best available abundance estimates are from aerial and shipboard surveys conducted during the summer of 2011 because these are the most recent surveys covering the full range of pilot whales in U.S. Atlantic waters. Because long-finned and short-finned pilot whales are difficult to distinguish at sea, sightings data are reported as *Globicephala sp*. These survey data have been combined with an analysis of the spatial distribution of the 2 species based on genetic analyses of biopsy samples to derive separate abundance estimates (NMFS unpublished data; see below).

Earlier Estimates

Please see appendix IV for a summary of abundance estimates including earlier estimates and survey descriptions. Due to changes in survey methodology, these historical data should not be used to make comparisons with more current estimates. In addition, as recommended in the GAMMS II Workshop Report (Wade and Angliss 1997), estimates older than 8 years are deemed unreliable for the determination of a current PBR.

Recent surveys and abundance estimates for *Globicephala* sp.

An abundance estimate of 11,865 (CV=0.57) *Globicephala* sp. was generated from aerial and shipboard surveys conducted during June-August 2011 between central Virginia and the lower Bay of Fundy. The aerial portion covered 6,850 km of tracklines over waters north of New Jersey between the coastline and the 100-m depth contour through the U.S. and Canadian Gulf of Maine, and up to and including the lower Bay of Fundy. Pilot whales were not observed during the aerial portion of the survey. The shipboard portion covered 3,811 km of tracklines between central Virginia and Massachusetts in waters deeper than the 100-m depth contour out to beyond the U.S. EEZ. Both sighting platforms used a double-platform data collection procedure, which allows estimation of abundance corrected for perception bias of the detected species (Laake and Borchers 2004). Estimation of the abundance was based on the independent observer approach assuming point independence (Laake and Borchers 2004) and calculated using the mark-recapture distance sampling option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009). The vessel portion of this survey included habitats where both short-finned and long-finned pilot whales occur. The estimated abundance of short-finned pilot whales from this survey was 4,569 (CV=0.57).

An abundance estimate of 16,946 (CV=0.43) *Globicephala* sp. was generated from a shipboard survey conducted concurrently (June-August 2011) in waters between central Virginia and central Florida. This shipboard survey included shelf-break and inner continental slope waters deeper than the 50-m depth contour within the U.S. EEZ. The survey employed two independent visual teams searching with 25x150 "bigeye" binoculars. A total of 4,445 km of tracklines was surveyed, yielding 290 cetacean sightings. The majority of sightings occurred along the continental shelf break north of Cape Hatteras, North Carolina, with a lower number of sightings over the continental slope in the southern portion of the survey. Estimation of the abundance was based on the independent observer approach assuming point independence (Laake and Borchers 2004) and calculated using the mark-recapture distance sampling option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009). This survey included habitats that are expected to exclusively contain short-finned pilot whales.

Spatial Distribution and Abundance Estimates for *Globicephala macrorhynchus*

Pilot whale biopsy samples were collected during summer months (June-August) from South Carolina to the southern flank of Georges Bank between 1998 and 2007. These samples were identified to species using genetic analysis of mitochondrial DNA sequences. A portion of the mtDNA genome was sequenced from each biopsy sample collected in the field, and genetic species identification was performed through phylogenetic reconstruction of the haplotypes. Samples from stranded specimens that were morphologically identified to species were used to assign clades in the phylogeny to species and thereby identify all survey samples. The probability of a sample being from a short-finned (or long-finned) pilot whale was evaluated as a function of sea surface temperature and water depth using logistic regression. This analysis indicated that the probability of a sample coming from a short-finned pilot whale was near 0 at water temperatures <22°C, and near 1 at temperatures >25°C. The probability of a short-finned pilot whale also increased with increasing water depth. Spatially, during summer months, this regression model predicts that all pilot whales observed in offshore waters near the Gulf Stream are most likely short-finned pilot whales. The area of overlap between the 2 species occurs primarily along the shelf break off the coast of New Jersey between 38°N and 40°N latitude. This model was used to partition the abundance estimates from surveys conducted during the summer of 2011. The sightings from the southeast shipboard survey covering waters from Florida to central Virginia were predicted to consist entirely of short-finned pilot whales. The aerial portion of the northeast surveys covered the Gulf of Maine and the Bay of Fundy where the model predicted that only long-finned pilot whales would occur, but no pilot whales were observed. The vessel portion of the northeast survey recorded a mix of both species along the shelf break, and the sightings in offshore waters near the Gulf Stream were predicted to consist predominantly of short-finned pilot whales. The best abundance estimate for short-finned pilot whales is thus the sum of the southeast survey estimate (16,946; CV=0.43) and the estimated number of short-finned pilot whales from the northeast vessel survey (4,569; CV=0.57). The best available abundance estimate is thus 21,515 (CV=0.37).

Table 1. Summary of recent abundance estimates for the western North Atlantic short-finned pilot whale (*Globicephala macrorhynchus*) by month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Jun-Aug 2011	central Virginia to Lower Bay of Fundy	4,569	0.57
Jun-Aug 2011	central Florida to central Virginia	16,946	0.43
Jun-Aug 2011	central Florida to lower Bay of Fundy (COMBINED)	21,515	0.37

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for western North Atlantic *Globicephala macrorhnychus* is 21,515 animals (CV=0.37). The minimum population estimate is 15,913.

Current Population Trend

A trend analysis has not been conducted for this stock. There are 2 abundance estimates for *Globicephala* spp. from summer 1998 (14,909; CV=0.26) and summer 2004 surveys (31,139; CV=0.27), and 1 abundance estimate of *G. macrorhynchus* from summer 2011 surveys (21,515; CV=0.37). Because the 1998 and 2004 surveys did not derive separate abundance estimates for each pilot whale species, comparisons to the 2011 estimate are inappropriate.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a “recovery” factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for short-finned pilot whales is 15,913. The maximum productivity rate is 0.04, the default value for cetaceans. The “recovery” factoris 0.5 because the stock's status relative to OSP is unknown and the CV of the average mortality estimate is less than 0.3 (Wade and Angliss 1997). PBR for the western North Atlantic short-finned pilot whale is 159.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The estimated mean annual fishery-related mortality and serious injury during 2009–2013 due to the pelagic longline fishery was 148 short-finned pilot whales (CV=0.20; Table 2). The total annual fishery-related mortality and serious injury for this stock during 2009–2013 is unknown because in addition to observed takes in the pelagic longline fishery, there was a self-reported take in the unobserved hook and line fishery during 2013. Because the hook and line fishery is unobserved, an estimate of total bycatch cannot be made.

All bycatch from the pelagic longline fishery in the Atlantic was assigned to the short-finned pilot whale stock. The highest bycatch rates of undifferentiated pilot whales in the pelagic longline fishery were observed during

September–November along the mid-Atlantic coast (Garrison 2007). Biopsy samples and photo-identification data collected during October-November 2011 in this region indicated that all of the animals observed within the region of pelagic longline bycatch during these months were short-finned pilot whales (NMFS unpublished data). During the remainder of the year, pilot whale bycatch in the pelagic longline fishery was likewise restricted to waters where short-finned pilot whales are expected to occur almost exclusively. Therefore, it is likely that the bycatch of pilot whales in the pelagic longline fishery is restricted to short-finned pilot whales.

In bottom trawl, mid-water trawl, and gillnet fisheries, mortalities are more generally observed north of 40°N latitude and in areas expected to have a higher proportion of long-finned pilot whales. Takes and bycatch estimates for these fisheries are attributed to the long-finned pilot whale stock.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock in the Atlantic Ocean are the Category I Atlantic Ocean, Caribbean, Gulf of Mexico large pelagic longline; Atlantic Highly Migratory Species (high seas longline); and northeast sink gillnet fisheries; the Category II northeast bottom trawl; northeast mid-water trawl (including pair trawl); mid-Atlantic mid-water trawl; and mid-Atlantic bottom trawl fisheries; and the Category III U.S. Atlantic tuna purse seine fishery and the Atlantic portion of the Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fishery. All recent gillnet and trawl interactions have been assigned to long-finned pilot whales using model-based predictions. Detailed fishery information is reported in Appendix III.

Earlier Interactions

See Appendix V for information on historical takes.

Pelagic Longline

Most of the estimated marine mammal bycatch in the U.S. pelagic longline fishery was recorded in U.S. Atlantic EEZ waters between South Carolina and Cape Cod (Garrison 2007). Pilot whales are frequently observed to feed on hooked fish, particularly big-eye tuna (NMFS unpublished data). Between 1992 and 2013, 226 pilot whales were observed released alive, including 136 that were considered seriously injured, and 6 mortalities were observed (Johnson *et al.* 1999; Yeung 2001; Garrison 2003, 2005; Garrison and Richards 2004; Fairfield Walsh and Garrison 2006; Fairfield-Walsh and Garrison 2007; Fairfield and Garrison 2008; Garrison *et al.* 2009; Garrison and Stokes 2010, 2012a,b, 2013, 2014). January-March bycatch was concentrated on the continental shelf edge northeast of Cape Hatteras, NC. Bycatch was recorded in this area during April-June, and takes also occurred north of Hydrographer Canyon (southeast of Nantucket) in water over 1,000 fathoms (1830 m) deep during April-June. During the July-September period, takes occurred on the continental shelf edge east of Cape Charles, Virginia, and on Block Canyon slope (due south of Narragansett Bay) in over 1,000 fathoms of water. October-December bycatch occurred between the 20- and 50-fathom (37- and 92-m) isobaths between Barnegat Bay, NJ and Cape Hatteras, NC.

Available seasonal biopsy data and genetic analyses indicate that recent pilot whale bycatch in the pelagic longline fishery is restricted to short-finned pilot whales. See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Table 2. Summary of the incidental mortality and serious injury of short-finned pilot whales (*Globicephala macrorhynchus*) by the pelagic longline commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).

Fishery	Years	Vessels[a]	Data Type[b]	Observer Coverage[c]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Est. CVs	Mean Annual Mortality
Pelagic Longline	09-13	75,80, 83,82, 79	Obs. Data Logbook	.10, .08, .09, .07, .09	5, 5, 18, 14, 13	0, 0, 1, 0, 0	17, 127, 286, 170, 124	0, 0, 19, 0, 0	17, 127, 305, 170, 124	.70, .78, .29, .33, .32	148 (.20)

[a] Number of vessels in the fishery is based on vessels reporting effort to the pelagic longline logbook. [b] Observer data (Obs. Data) are used to measure bycatch rates and the data are collected within the Northeast Fisheries Observer Program (NEFOP) and the Southeast Pelagic Longline Observer Program. [c] Proportion of sets observed

Hook and Line

During 2009–2013, there was 1 self-reported take (in 2013) in which a short-finned pilot whale was hooked and entangled by a charterboat fisherman off Cape Hatteras. The animal was released alive and considered seriously injured (Maze-Foley and Garrison in prep).

Other Mortality

Pilot whales have a propensity to mass strand throughout their range, but the role of human activity in these events is unknown. Between 2 and 168 pilot whales have stranded annually, either individually or in groups, along the eastern U.S. seaboard since 1980 (NMFS 1993, stranding databases maintained by NMFS NER, NEFSC and SEFSC). From 2009–2013, 44 short-finned pilot whales (*Globicephala macrorhynchus*), 34 long-finned pilot whales (*Globicephala melas melas*), and 6 pilot whales not specified to the species level (*Globicephala* sp.) were reported stranded between Maine and Florida, including the Exclusive Economic Zone (EEZ) (Table 3).

Table 3. Pilot whale (*Globicephala macrorhynchus* [SF], *Globicephala melas melas* [LF] *and Globicephala* sp. [Sp]) strandings along the Atlantic coast, 2009–2013. Strandings which were not reported to species have been reported as *Globicephala* sp. The level of technical expertise among stranding network personnel varies, and given the potential difficulty in correctly identifying stranded pilot whales to species, reports to specific species should be viewed with caution.

STATE	2009			2010			2011			2012			2013			TOTALS		
	SF	LF	Sp	SF	LF	Sp	SF	LF	Sp	SF	LF	Sp	SF	LF	Sp	SF	LF	Sp
Nova Scotia[a]	0	0	15	0	0	11	0	0	19	0	0	3	0	15	0	0	15	48
Newfoundland and Labrador[b]	0	0	1	0	0	1	0	0	8	0	0	6	0	1	1	0	1	17
Maine	0	3	0	0	0	0	0	1	0	0	1	0	0	0	0	0	5	0
Massachusetts[c]	0	4	0	0	2	0	3	4	0	0	3	0	0	3	0	3	16	0
Rhode Island	0	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	4	0
New York	0	1	0	0	0	0	0	1	0	0	1	0	0	2	0	0	5	0
New Jersey	1	1	0	0	0	0	1	0	1	0	0	0	0	1	0	2	2	1
Maryland	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0
Virginia[d]	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	1	2
North Carolina[d]	2	0	0	1	0	0	1	0	0	1	0	0	0	0	0	5	0	0
South Carolina[d]	0	0	0	0	0	1	0	0	0	3	0	1	1	0	1	4	0	3
Florida[e]	0	0	0	4	0	0	2	0	0	23	0	0	0	0	0	29	0	0
TOTALS - U.S. & EEZ	**4**	**11**	**0**	**5**	**2**	**3**	**7**	**8**	**1**	**27**	**6**	**1**	**1**	**7**	**1**	**44**	**34**	**6**

[a] Data supplied by Nova Scotia Marine Animal Response Society (pers. comm.). Strandings in 2011 include one mass stranding of 6-8 whales (one of which died) and 2 animals with ropes tied around their tail stocks. Strandings in 2013 include one fishery entanglement (bait net) and one mass stranding of 4 animals.
[b] (Ledwell and Huntington 2009; 2010; 2011; 2012a,b; 2013). 2011 included 2 mom/calf pairs. Not included in 2011 total was group of 6 pilot whales shepherded out of a narrow channel.

[c] One of the 2009 animals was classified as a fishery interaction.

[d] Signs of fishery interactions were observed on one short-finned pilot whale stranded in 2010 and one stranded in 2011, both in North Carolina. Signs of fishery interaction were observed on one short-finned pilot whale in North Carolina and two in South Carolina in 2012. A mass stranding of 3 whales occurred in South Carolina in 2012.

[e] A mass stranding of 3whales occurred in 2010, and a mass stranding of 2 whales in 2011.

Short-finned pilot whales strandings (*Globicephala macrorhynchus*) have been reported as far north as Block Island, Rhode Island (2001), and Cape Cod, Massachusetts (2011), although the majority of the strandings occurred from North Carolina southward (Table 3). Long-finned pilot whales (*Globicephala melas*) have been reported stranded as far south as Florida, where 2 long-finned pilot whales were reported stranded in November 1998, though their flukes had been apparently cut off, so it is unclear where these animals actually may have died. One additional long-finned pilot whale stranded in South Carolina in 2003, though the confidence in the species identification was only moderate. This animal has subsequently been sequenced and mitochondrial DNA analysis supports the long-finned pilot whale identification..

During 2009–2013, several human and/or fishery interactions were documented in stranded pilot whales within the U.S. and EEZ. A short-finned pilot whale stranded in North Carolina in 2010 had evidence of longline interaction. In 2011, a short-finned pilot whale in North Carolina was classified as a fishery interaction and a short-finned pilot whale in New Jersey was found with a healed but abscessed bullet wound. In 2012, 3 short-finned pilot whales had evidence of fishery interaction, two of them in South Carolina and one in North Carolina. During 2013 no evidence of human interactions was documented for stranded pilot whales.

Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury, particularly for offshore species such as pilot whales, because not all of the whales that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

HABITAT ISSUES

A potential human-caused source of mortality is from polychlorinated biphenyls (PCBs) and chlorinated pesticides (DDT, DDE, dieldrin, etc.), moderate levels of which have been found in pilot whale blubber (Taruski *et al.* 1975; Muir *et al.* 1988; Weisbrod *et al.* 2000). Weisbrod *et al.* (2000) reported that bioaccumulation levels were more similar in whales from the same stranding group than in animals of the same sex or age. Also, high levels of toxic metals (mercury, lead, cadmium) and selenium were measured in pilot whales harvested in the Faroe Island drive fishery (Nielsen *et al.* 2000). Similarly, Dam and Bloch (2000) found very high PCB levels in pilot whales in the Faroes. The population effect of the observed levels of such contaminants is unknown.

STATUS OF STOCK

The short-finned pilot whale is not listed as threatened or endangered under the Endangered Species Act, and the western North Atlantic stock is not considered strategic under the Marine Mammal Protection Act. The 2009–2013 average annual human-related mortality and serious injury does not exceed PBR. Total U.S. fishery-related mortality and serious injury attributed to short-finned pilot whales exceeds 10% of the calculated PBR and therefore cannot be considered to be insignificant and approaching zero mortality and serious injury rate. The status of this stock relative to OSP in the U.S. Atlantic EEZ is unknown. There are insufficient data to determine the population trends for this stock.

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ATLANTIC WHITE-SIDED DOLPHIN (*Lagenorhynchus acutus*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

White-sided dolphins are found in temperate and sub-polar waters of the North Atlantic, primarily in continental shelf waters to the 100-m depth contour. In the western North Atlantic the species inhabits waters from central West Greenland to North Carolina (about 35˚N) and perhaps as far east as 29˚W in the vicinity of the mid-Atlantic Ridge (Evans 1987; Hamazaki 2002; Doksaeter *et al.* 2008; Waring *et al.* 2008). Distribution of sightings, strandings and incidental takes suggest the possible existence of three stock units: Gulf of Maine, Gulf of St. Lawrence and Labrador Sea stocks (Palka *et al.* 1997). Evidence for a separation between the population in the southern Gulf of Maine and the Gulf of St. Lawrence population comes from the reduced density of summer sightings along the Atlantic side of Nova Scotia. This was reported in Gaskin (1992), is evident in Smithsonian stranding records and in Canadian/west Greenland bycatch data (Stenson *et al.* 2011) and was obvious during summer abundance surveys that covered waters from Virginia to the Gulf of St. Lawrence and during the Canadian component of the Trans-North Atlantic Sighting Survey in the summer of 2007 (Lawson and Gosselin 2009). White-sided dolphins were seen frequently in Gulf of Maine waters and in waters at the mouth of the Gulf of St. Lawrence, but only a relatively few sightings were recorded between these two regions. This trend is less obvious since 2007.

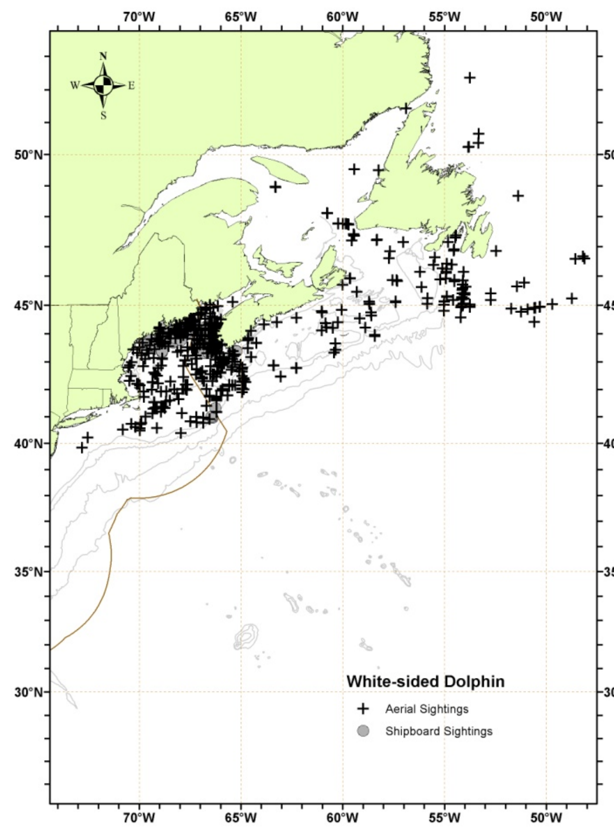

Figure 1. *Distribution of white-sided dolphin sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1995, 1998, 1999, 2002, 2004, 2006, 2007, 2008, 2010, and 2011, and DFO's 2007 TNASS survey. Isobaths are the 100-m, 1000-m and 4000-m depth contours.*

The Gulf of Maine population of white-sided dolphins is most common in continental shelf waters from Hudson Canyon (approximately 39˚N) to Georges Bank, and in the Gulf of Maine and lower Bay of Fundy. Sighting data indicate seasonal shifts in distribution (Northridge *et al.* 1997). During January to May, low numbers of white-sided dolphins are found from Georges Bank to Jeffreys Ledge (off New Hampshire), with even lower numbers south of Georges Bank, as documented by a few strandings collected on beaches of Virginia to South Carolina. From June through September, large numbers of white-sided dolphins are found from Georges Bank to the lower Bay of Fundy. From October to December, white-sided dolphins occur at intermediate densities from southern Georges Bank to southern Gulf of Maine (Payne and Heinemann 1990). Sightings south of Georges Bank, particularly around Hudson Canyon, occur year round but at low densities. The Virginia and North Carolina observations appear to represent the southern extent of the species' range during the winter months. On 4 May 2008 a stranded 17-year old male white-sided dolphin with severe pulmonary distress and reactive lymphadenopathy stranded in South Carolina (Powell *et al.* 2011). In the absence of additional strandings or sightings, this stranding seems to be an out-of-range anomaly. The seasonal spatial distribution of this species appears to be changing during the last few years. There is evidence for an earlier distributional shift during the 1970s, from primarily offshore waters into the Gulf of Maine, hypothesized to be related to shifts in abundance of pelagic fish stocks resulting from depletion of herring by foreign distant-water fleets (Kenney *et al*. 1986).

Recent stomach-content analysis of both stranded and incidentally caught white-sided dolphins in U.S. waters determined that the predominant prey were silver hake (*Merluccius bilinearis*), spoonarm octopus (*Bathypolypus bairdii*) and haddock (*Melanogrammus aeglefinus*). Sand lances (*Ammodytes* spp.) were only found in the stomach of one stranded white-sided dolphin. Seasonal variation in diet was indicated; pelagic Atlantic herring (*Clupea harengus*) was the most important prey in summer, but was rare in winter (Craddock *et al.* 2009).

POPULATION SIZE

The best available current abundance estimate for white-sided dolphins in the western North Atlantic stock is 48,819 (CV= 0.61), resulting from a June–August 2011survey.

Earlier abundance estimates

Please see Appendix IV for earlier abundance estimates. As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable to determine the current PBR.

Recent surveys and abundance estimates

An abundance estimate of 24,422 (CV=0.49) white-sided dolphins was generated from the Canadian Trans-North Atlantic Sighting Survey in July–August 2007. This aerial survey covered waters from northern Labrador to the Scotian Shelf, providing full coverage of the Atlantic Canadian coast (Lawson and Gosselin 2009). The abundance estimates from this survey have been corrected for perception and availability bias, when possible. In general this involved correcting for perception bias using mark-recapture distance sampling (MRDS), and correcting for availability bias using dive/surface times, as reported in the literature, and the Laake et al. (1997) analysis method (Lawson and Gosselin 2011).

An abundance estimate of 48,819 (CV=0.61) white-sided dolphins was generated from a shipboard and aerial survey conducted during June–August 2011 (Palka 2012). The aerial portion that contributed to the abundance estimate covered 5,313 km of tracklines that were over waters north of New Jersey from the coastline to the 100-m depth contour through the U.S. and Canadian Gulf of Maine and up to and including the lower Bay of Fundy. The shipboard portion covered 3,107 km of tracklines that were in waters offshore of central Virginia to Massachusetts (waters that were deeper than the 100-m depth contour out to beyond the U.S. EEZ). Both sighting platforms used a double-platform data-collection procedure, which allows estimation of abundance corrected for perception bias of the detected species (Laake and Borchers, 2004). Estimation of the abundance was based on the independent-observer approach assuming point independence (Laake and Borchers 2004) and calculated using the MRDS option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009).

No white-sided dolphins were detected in the aerial and ship abundance surveys that were conducted concurrently (June-August 2011) in waters between central Virginia and central Florida. This shipboard survey included shelf-break and inner continental slope waters deeper than the 50-m depth contour within the U.S. EEZ. The survey employed the double-platform methodology searching with 25x150 “bigeye” binoculars. A total of 4,445 km of tracklines was surveyed, yielding 290 cetacean sightings.

Table 1. Summary of recent abundance estimates for western North Atlantic stock of white-sided dolphins (*Lagenorhynchus acutus*) , by month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Jul-Aug 2007	N. Labrador to Scotian Shelf	24,422	0.49
Jun-Aug 2011	Central Virginia to lower Bay of Fundy	48,819	0.61

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by (Wade and Angliss 1997). The best estimate of abundance for the western North Atlantic stock of white-sided dolphins is 48,819 (CV=0.61). The minimum population estimate for these white-sided dolphins is 30,403.

Current Population Trend

A trend analysis has not been conducted for this stock. The statistical power to detect a trend in abundance for this stock is poor due to the relatively imprecise abundance estimates and long survey interval. For example, the power to detect a precipitous decline in abundance (i.e., 50% decrease in 15 years) with estimates of low precision (e.g., CV > 0.30) remains below 80% (alpha = 0.30) unless surveys are conducted on an annual basis (Taylor *et al.* 2007).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. Life history parameters that could be used to estimate net productivity include: calving interval is 2-3 years; lactation period is 18 months; gestation period is 10–12 months and births occur from May to early August, mainly in June and July; length at birth is 110 cm; length at sexual maturity is 230–240 cm for males, and 201–222 cm for females; age at sexual maturity is 8–9 years for males and 6–8 years for females; mean adult length is 250 cm for males and 224 cm for females (Evans 1987); and maximum reported age for males is 22 years and for females, 27 years (Sergeant *et al.* 1980).

For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 30,403. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 , the default value for stocks of unknown status relative to OSP, and the CV of the average mortality estimate is less than 0.3 (Wade and Angliss 1997). PBR for the western North Atlantic stock of white-sided dolphin is 304.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Total annual estimated average fishery-related mortality or serious injury to this stock during 2009–2013 was 102 (CV=0.17) white-sided dolphins (Table 2).

Fishery Information

Detailed fishery information is reported in Appendix III.

Earlier Interactions

Historically, fishery interactions have been documented with white-sided dolphins in the Joint Venture and Foreign Atlantic mackerel fishery (1977–1991), the Atlantic pelagic drift gillnet fishery (1991–1998), the U.S. J.V midwater (pelagic) trawl fishery (2001), the mid-Atlantic gillnet fishery (1997), Northeast midwater pair trawls (2002, 2005), and the mid-Atlantic bottom trawl (1997, 2005, 2007). See Appendix V for more information on historical takes.

U.S.

Northeast Sink Gillnet

Annual white-sided dolphin mortalities were estimated using annual ratio-estimator methods (Table 2; Orphanides 2013; Hatch and Orphanides 2014, 2015). Recently white-sided dolphin bycatch has occurred mostly in the Gulf of Maine, with a few south of Cape Cod. Bycatch occurred nearly year round, though mostly in the winter and summer. There are large inter-annual differences in the magnitude of the level of bycatch, which may be due to inter-annual differences in the number of white-sided dolphins using the Gulf of Maine, as has been seen in the series of past abundance estimates for this species. See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for long-term bycatch information.

Northeast Bottom Trawl

Fishery-related bycatch rates for years 2009–2013 were estimated using an annual stratified ratio-estimator (Lyssikatos 2015). Between 2008 and 2013, all white-sided dolphin bycatch occurred in the Gulf of Maine and Georges Bank eco-regions, primarily during the winter (January–April) season when sea surface temperatures are less than 10° C. See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for long-term bycatch information.

Mid-Atlantic Mid-water Trawl Fishery (Including Pair Trawl)

In March 2009 an animal was observed taken in a pair trawl targeting mackerel south of Hudson Canyon. No white-sided dolphin interactions with this fishery were observed in 2010–2013. Due to small sample sizes, the ratio method was used to estimate the bycatch rate (observed white-sided dolphin takes per observed hours the gear was in the water) for each year, where the paired and single mid-Atlantic mid-water trawls were pooled and only hauls that targeted herring and mackerel were used. The VTR herring and mackerel data were used to estimate the total effort in the bycatch estimate (Palka, pers. comm.). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for long-term bycatch information.

Table 2. Summary of the incidental mortality of North Atlantic stock of white-sided dolphins (*Lagenorhynchus acutus*) by commercial fishery including the years sampled, the type of data used , the annual observer coverage, the serious injuries and mortalities recorded by on-board observers, the estimated annual serious injury and mortality, the estimated CV of the combined annual mortality and the mean annual mortality (CV in parentheses).

Fishery	Years	Data Type [a]	Observer Coverage [b]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Estimated CVs	Mean Combined Annual Mortality
Northeast Sink Gillnet[c]	09-13	Obs. Data Weighout Trip Logbook	.04, .17, .19, .15, .11	0, 0, 1, 0, 0	0, 6, 5, 1, 1	0, 4, 1, 0, 0	0, 62, 17, 9, 4	0, 66,18, 9, 4	0, .90, .43, .92, 1.03	19 (0.62)
Northeast Bottom Trawl	09-13	Obs. Data Trip Logbook	.09, .16, .26, 0.17, .15	0, 0, 2, 0, 0	31, 10, 47, 9, 8	3, 1, 3, 0, 0	168, 36, 138, 27, 33	168, 36, 138, 27, 33	.28, .32, .24, .47, .31	82 (0.15)
Mid-Atlantic Mid-water Trawl - Including Pair Trawl	09-13	Obs. Data Weighout Trip Logbook	.13, .25, .41, .21, .07	0, 0, 0, 0, 0	1, 0, 0, 0, 0	0, 0, 0, 0, 0	4, 0, 0, 0, 0	4, 0, 0, 0	.92, 0, 0, 0	0.8 (0.92)
Total										102(0.17)

a Observer data (Obs. Data), used to measure bycatch rates, are collected within the Northeast Observer Program and At-sea Monitoring Program. NEFSC collects landings data (unallocated Dealer Data or Allocated Dealer Data) which are used as a measure of total landings and mandatory Vessel Trip Reports (VTR) (Trip Logbook) are used to determine the spatial distribution of landings and fishing effort in the sink gillnet, bottom trawl and mid-water trawl fisheries. In addition, the Trip Logbooks are the primary source of the measure of total effort (tow duration) in the mid-water and bottom trawl fisheries.

b Observer coverage is defined as the ratio of observed to total metric tons of fish landed for the gillnet fisheries ,.and the ratio of observed to total trips for bottom trawl and Mid-Atlantic mid-water trawl (including pair trawl) fisheries. Beginning in May 2010 total observer coverage reported for bottom trawl and gillnet gear includes samples collected from the at-sea monitoring program in addition to traditional observer coverage through the Northeast Fisheries Observer Program (NEFOP).

c After 1998, a weighted bycatch rate was applied to effort from both pingered and non-pingered hauls within the stratum where white-sided dolphins were observed taken. During the years 1997, 1999, 2001, 2002, and 2004, respectively, there were 2, 1, 1, 1, and 1 observed white-sided dolphins taken on pingered trips. No takes were observed on pinger trips during 1995, 1996, 1998, 2000, 2005 through 2007. Three of the 2008 takes were on non-pingered hauls and the fourth take was recorded as pinger condition unknown. Of the six 2010 observed takes, 4 were in pingered nets and 2 in non-pingered nets. Four of the 2011 takes were in pingered nets. The 2012 take was in a non-pingered net. The 2013 take was in a pingered net.

d Waring *et al*. 2014,2015, Wenzel *et al*. 2015.

CANADA

There is little information available that quantifies fishery interactions involving white-sided dolphins in Canadian waters. Two white-sided dolphins were reported caught in groundfish gillnet sets in the Bay of Fundy during 1985 to 1989, and 9 were reported taken in West Greenland between 1964 and 1966 in the now non-operational salmon drift nets (Gaskin 1992). Several (number not specified) were also taken during the 1960s in the now non-operational Newfoundland and Labrador groundfish gillnets. A few (number not specified) were taken in an experimental drift gillnet fishery for salmon off West Greenland which took place from 1965 to 1982 (Read 1994).

Hooker *et al.* (1997) summarized bycatch data from a Canadian fisheries observer program that placed observers on all foreign fishing vessels operating in Canadian waters, on 25-40% of large Canadian fishing vessels (greater than 100 feet long), and on approximately 5% of smaller Canadian fishing vessels. Bycaught marine mammals were noted as weight in kilos rather than by the numbers of animals caught. Thus the number of individuals was estimated by dividing the total weight per species per trip by the maximum recorded weight of each species. During 1991 through 1996, an estimated 6 white-sided dolphins were observed taken. One animal was from a longline trip south of the Grand Banks (43º 10'N 53º 08'W) in November 1996 and the other 5 were taken in the bottom trawl fishery off Nova Scotia in the Atlantic Ocean; 1 in July 1991, 1 in April 1992, 1 in May 1992, 1 in April 1993, 1 in June 1993 and 0 in 1994 to 1996.

Estimation of small cetacean bycatch for Newfoundland fisheries using data collected during 2001 to 2003 (Benjamins *et al.* 2007) indicated that, while most of the estimated 862 to 2,228 animals caught were harbor porpoises, a few were white-sided dolphins caught in the Newfoundland nearshore gillnet fishery and offshore monkfish/skate gillnet fisheries.

Herring Weirs

During the last several years, one white-sided dolphin was released alive and unharmed from a herring weir in the Bay of Fundy (A. Westgate, pers. comm.). Due to the formation of a cooperative program between Canadian fishermen and biologists, it is expected that most dolphins and whales will be able to be released alive. Fishery information is available in Appendix III.

Other Mortality

U.S.

During 2009–2013 there were 159 documented Atlantic white-sided dolphin strandings on the U.S. Atlantic coast (Table 3; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 20 August 2014). Forty-one of these animals were released alive. Human interaction was indicated in 8 records during this period. Of these, one was classified as a fishery interaction.

Mass strandings involving up to a hundred or more animals at one time are common for this species. The causes of these strandings are not known. Because such strandings have been known since antiquity, it could be presumed that recent strandings are a normal condition (Gaskin 1992). It is unknown whether human causes, such as fishery interactions and pollution, have increased the number of strandings. In an analysis of mortality causes of stranded marine mammals on Cape Cod and southeastern Massachusetts between 2000 and 2006, Bogomolni *et al.* (2010) found 69% (46 of 67) of stranded white-sided dolphins were involved in mass-stranding events with no significant cause determined, and 21% (14 of 67) were classified as disease-related.

Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that die or are seriously injured may not wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction.

CANADA

Small numbers of white-sided dolphins have been hunted off southwestern Greenland and they have been taken deliberately by shooting elsewhere in Canada (Reeves *et al.* 1999). The Nova Scotia Stranding Network documented whales and dolphins stranded on the coast of Nova Scotia during 1991 to 1996 (Hooker *et al.* 1997). Researchers with Dept. of Fisheries and Oceans, Canada documented strandings on the beaches of Sable Island during 1970 to 1998 (Lucas and Hooker 2000). More recently whales and dolphins stranded on the coast of Nova Scotia have been recorded by the Marine Animal Response Society and the Nova Scotia Stranding Network (Table 3; Marine Animal Response Society, pers. comm.). In addition, stranded white-sided dolphins in Newfoundland and Labrador are being recorded by the Whale Release and Strandings Program (Table 3; Ledwell and Huntington 2010; 2011; 2012a; 2012b; 2013).

Table 3. North Atlantic stock of white-sided dolphin (*Lagenorhynchus acutus*) reported strandings along the U.S. and Canadian Atlantic coast, 2009–2013.						
Area	Year					**Total**
	2009	2010	2011	2012	2013	
Maine	1	1	2	1	1	6
New Hampshire	1	0	0	2	0	3
Massachusetts[a,b]	22	50	42	3	10	127
Rhode Island	1	0	1	1	1	4
Connecticut	1	0	0	0	0	1
New York	3	1	0	3	2	9
New Jersey	2	0	1	0	0	3
Delaware	1	0	1	0	0	2
Maryland	0	0	1	0	0	1
Virginia	0	0	0	0	0	0
North Carolina	1	0	1	0	0	2
South Carolina	0	0	0	0	0	0
Georgia	0	0	1	0	0	1
TOTAL US	**33**	**52**	**50**	**10**	**14**	**159**
Nova Scotia[c]	4	2	6	5	7	24
Newfoundland and Labrador[d]	3	2	0	3	0	8
GRAND TOTAL	**40**	**56**	**56**	**18**	**21**	**191**

a Records of mass strandings in Massachusetts during this period are: September 2009 - 3 events of 2, 3 and 4 animals (all but 1 released alive); April 2009 - 3 animals (all released alive); March 2010 - 7 animals (one dead calf, 6 adults released alive), 16 animals (5 dead, 11 released alive) and 3 animals (one released alive); April 2010 - 2 animals (released alive); July 2010 - 2 animals (released alive); March 2011 - 4 animals (2 released alive), 2 animals (released alive); April 2013 2 animals (one released alive); December 2013 - 3 animals (all released alive).

b In 2009, the 4 animals that mass-stranded in September and were released alive, as well as a March stranding that a bystander had attempted to rescue were classified at human interactions. In 2010, 2 animals in Massachusetts were classified as human interactions, one of them a fishery interaction. In 2011, one animal was classified as human interaction due to post-mortem mutilation.

c Data supplied by Nova Scotia Marine Animal Response Society (pers. comm.).

d (Ledwell and Huntington 2010, 2011, 2012a, 2012b, 2013).

STATUS OF STOCK

White-sided dolphins are not listed as threatened or endangered under the Endangered Species Act. The Western North Atlantic stock of white-sided dolphins is not considered strategic under the Marine Mammal Protection Act The estimated average annual human-related mortality does not exceed PBR but is not less than 10% of the calculated PBR; therefore, it cannot be considered to be insignificant and approaching zero mortality and serious injury rate. The status of white-sided dolphins, relative to OSP, in the U.S. Atlantic EEZ is unknown. A trend analysis has not been conducted for this species.

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SHORT-BEAKED COMMON DOLPHIN (*Delphinus delphis delphis*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The short-beaked common dolphin (*Delphinus delphis delphis*) may be one of the most widely distributed species of cetaceans, as it is found world-wide in temperate and subtropical seas. In the North Atlantic, short-beaked common dolphins are commonly found along the shoreline of Massachusetts in mass-stranding events (Bogomolni et al. 2010; Sharp et al. 2014), as well as found over the continental shelf between the 100-m and 2000-m isobaths and over prominent underwater topography and east to the mid-Atlantic Ridge (29˚W) (Doksaeter *et al.* 2008; Waring *et al*. 2008) and are associated with Gulf Stream features (CETAP 1982; Selzer and Payne 1988; Waring *et al.* 1992; Hamazaki 2002).. The species is less common south of Cape Hatteras, although schools have been reported as far south as the Georgia/South Carolina border (32º N) (Jefferson *et al*. 2009). They have seasonal movements where they are found from Cape Hatteras northeast to Georges Bank (35˚ to 42˚N) during mid-January to May (Hain *et al.* 1981; CETAP 1982; Payne *et al.* 1984). Short-beaked common dolphins move onto Georges Bank, Gulf of Maine, and the Scotian Shelf from mid-summer to autumn. Selzer and Payne (1988) reported very large aggregations (greater than 3,000 animals) on Georges Bank in autumn. Short-beaked common dolphins were occasionally found in the Gulf of Maine (Selzer and Payne 1988), more often in the last few years (Figure 1). Migration onto the Scotian Shelf and continental shelf off Newfoundland occurs during summer and autumn when water temperatures exceed 11ºC (Sergeant *et al.* 1970; Gowans and Whitehead 1995).

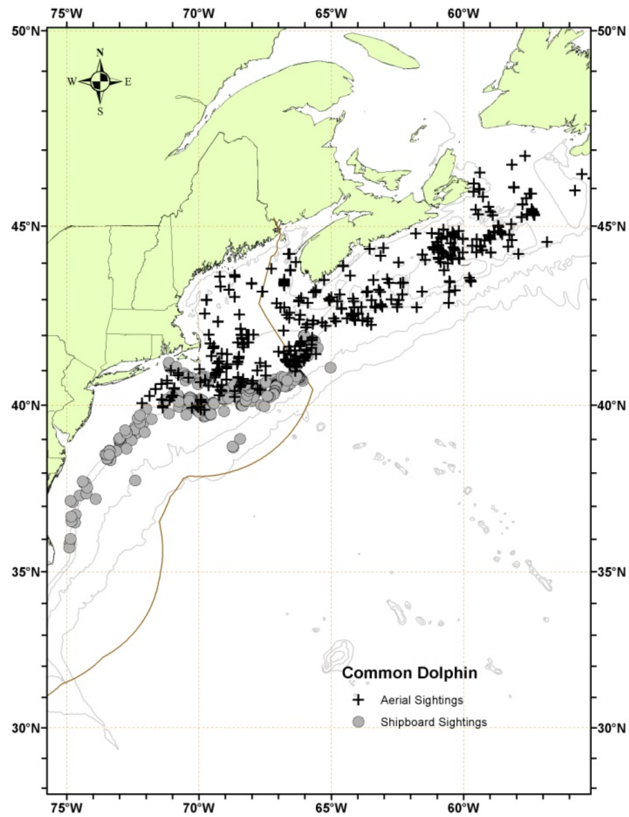

Figure 1. *Distribution of common dolphin sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1998, 1999, 2002, 2004, 2006, 2007, 2010 and 2011 and DFO's 2007 TNASS survey. Isobaths are the 100-m, 1000-m and 4000-m depth contours.*

Westgate (2005) tested the proposed one-population-stock model using a molecular analysis of mitochondrial DNA (mtDNA), as well as a morphometric analysis of cranial specimens. Both genetic analysis and skull morphometrics failed to provide evidence ($p>0.05$) of more than a single population in the western North Atlantic, supporting the proposed one-stock model. However, when western and eastern North Atlantic short-beaked common dolphin mtDNA and skull morphology were compared, both the cranial and mtDNA results showed evidence of restricted gene flow ($p<0.05$) indicating that these two areas are not panmictic. Cranial specimens from the two sides of the North Atlantic differed primarily in elements associated with the rostrum. These results suggest that short-beaked common dolphins in the western North Atlantic are composed of a single panmictic group whereas gene flow between the western and eastern North Atlantic is limited (Westgate 2005, 2007).

POPULATION SIZE

The current best abundance estimate for short-beaked common dolphins off the U.S. or Canadian Atlantic coast is 173,486 (CV=0.55). This is the estimate derived from the Canadian Trans-North Atlantic Sighting Survey (TNASS) in July–August 2007 and is considered best because it covered more of the short-beaked common dolphin range than the other surveys.

Earlier estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions. As recommended in the GAMMS II Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable to determine a current PBR.

Recent surveys and abundance estimates

An abundance estimate of 173,486 (CV=0.55) short-beaked common dolphins was generated from the TNASS in July–August 2007 (Lawson and Gosselin 2009). This aerial survey covered waters from northern Labrador to the Scotian Shelf, providing full coverage of the Atlantic Canadian coast. The abundance estimates from this survey have been corrected for perception and availability bias, when possible. In general this involved correcting for perception bias using mark-recapture distance sampling (MRDS), and correcting for availability bias using dive/surface times, as reported in the literature, and the Laake (1997) analysis method (Lawson and Gosselin in 2011).

An abundance estimate of 67,191 (CV=0.29) short-beaked common dolphins was generated from a shipboard and aerial survey conducted during June–August 2011 (Palka 2012). The aerial portion that contributed to the estimate covered 5,313 km of tracklines that were over waters north of New Jersey from the coastline to the 100-m depth contour through the U.S. and Canadian Gulf of Maine and up to and including the lower Bay of Fundy. The shipboard portion covered 3,107 km of tracklines between central Virginia and Massachusetts in waters deeper than the 100-m depth contour out to beyond the U.S. EEZ. Both sighting platforms used a double-platform data-collection procedure, which allows estimation of abundance corrected for perception bias of the detected species (Laake and Borchers 2004). Estimation of the abundance was based on the independent-observer approach assuming point independence (Laake and Borchers 2004) and calculated using the MRDS option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009).

An abundance estimate of 2,993 (CV=0.87) short-beaked common dolphins was generated from a shipboard survey conducted concurrently (June–August 2011) in waters between central Virginia and central Florida. This shipboard survey included shelf-break and inner continental slope waters deeper than the 50-m depth contour within the U.S. EEZ. The survey employed a double-platform visual team procedure searching with 25×150 “bigeye” binoculars. A total of 4,445 km of tracklines was surveyed, yielding 290 cetacean sightings. The majority of sightings occurred along the continental shelf break with generally lower sighting rates over the continental slope. Estimation of the abundance was based on the independent-observer approach assuming point independence (Laake and Borchers 2004) and calculated using the mark-recapture distance sampling option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009).

Table 1. Summary of recent abundance estimates for western North Atlantic short-beaked common dolphin (*Delphinus delphis delphis*) by month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
July-Aug 2007	N. Labrador to Scotian Shelf	173,486	0.55
Jul-Aug 2011	Central Virginia to lower Bay of Fundy	67,191	0.29
Jun-Aug 2011	Central Florida to Central Virginia	2,993	0.87
Jun-Aug 2011	Central Florida to lower Bay of Fundy (COMBINED)	70,184	0.28

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for short-beaked common dolphins is 173,486 animals (CV=0.55) derived from the 2007 TNASS survey. The minimum population estimate for the western North Atlantic short-beaked common dolphin is 112,531.

Current Population Trend

A trend analysis has not been conducted for this stock. The statistical power to detect a trend in abundance for this stock is poor due to the relatively imprecise abundance estimates and long survey interval. For example, the power to detect a precipitous decline in abundance (i.e., 50% decrease in 15 years) with estimates of low precision (e.g., CV > 0.30) remains below 80% (alpha = 0.30) unless surveys are conducted on an annual basis (Taylor *et al.* 2007).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. Life history parameter information that could be used to estimate net productivity are there is a peak in parturition during July and August with an average birth day of 28 July. Gestation lasts about 11.7 months and lactation lasts at least a year. Given these results western North Atlantic female short-beaked common dolphins are likely on a 2-3 year calving interval. Females become sexually mature earlier (8.3 years and 200 cm) than males (9.5 years and 215 cm) as males continue to increase in size and mass. There is significant sexual dimorphism present with males being on average about 9% larger in body length (Westgate 2005; Westgate and Read 2007).

For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 112,531 animals. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5, the default value for stocks of unknown status and the CV of the average mortality estimate is less than 0.3 (Wade and Angliss 1997). PBR for the western North Atlantic stock of short-beaked common dolphin is 1,125.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Total annual estimated average fishery-related mortality or serious injury to this stock during 2009–2013 was 363 (CV=0.11) short-beaked common dolphins.

Fishery information

Detailed fishery information is reported in Appendix III.

Earlier Interactions

Historically, US fishery interactions have been documented with short-beaked common dolphins in the northeast and mid-Atlantic gillnet fisheries, northeast and mid-Atlantic bottom trawl fisheries, northeast and mid-Atlantic mid-water trawl fishery, and the pelagic longline fishery. See Appendix V for more information on historical takes.

Northeast Sink Gillnet

In 1990, an observer program was started by NMFS to investigate marine mammal takes in the northeast sink gillnet fishery (Appendix III). Short-beaked common dolphin bycatch in the northern Gulf of Maine occurs primarily from June to September, while in the southern Gulf of Maine, bycatch occurs from January to May and September to December. See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

A study of the effects of two different hanging ratios in the bottom-set monkfish gillnet fishery on the bycatch of cetaceans and pinnipeds was conducted by NEFSC in 2009 and 2010 with 100% observer coverage. Commercial fishing vessels from Massachusetts and New Jersey were used for the study, which took place south of the Harbor Porpoise Take Reduction Team Cape Cod South Management Area (south of 40° 40′N) in February–April. Researchers purposely picked an area of historically high bycatch rates in order to have a chance of finding a significant difference. Eight research strings of fourteen nets each were fished and 159 hauls were completed during the course of the 2009–2010 study. Results showed that while a 0.33 mesh performed better at catching commercially important finfish than a 0.50 mesh, there was no statistical difference in cetacean or pinniped bycatch rates between the two hanging ratios. One short-beaked common dolphin was caught in this study south of New England in 72 hauls during 2009 and one animal was caught in 72 hauls during the 2010 experiment in the mid-

Atlantic (A.I.S., Inc. 2010). These 2 takes are included in the observed interactions and added to the total estimates in Table 2, although these animals and the fishing effort from this experiment were not included in the estimation of the bycatch rate that was expanded to the rest of the fishing effort.

Mid-Atlantic Gillnet

Short-beaked common dolphins were taken in observed trips during most years; see Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

A study of the effects of tie-downs and bycatch rates of Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*) in both control and experimental gillnet gear operating in Statistical Area 612 (off New York and New Jersey) between 14 November and 18 December 2010 had 100% observer coverage. This experimental fishery captured 6 short-beaked common dolphins and 3 unidentified dolphins (unidentified due to lack of photos) during this time period (Fox *et al.* 2011). These 6 takes are included in the observed interactions and added to the total estimates, though these interactions and their associated fishing effort were not included in bycatch rate calculations that was expanded to the rest of the fishery (Table 2).

Northeast Bottom Trawl

This fishery is active in New England waters in all seasons. Revised serious injury guidelines were applied for this period (Waring *et al.* 2014; 2015; Wenzel *et al*. 2015). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Mid-Atlantic Bottom Trawl

Revised serious injury guidelines were applied for this period (Waring *et al*. 2014, 2015; Wenzel *et al*. 2015). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Northeast Mid-water Trawl Fishery (Including Pair Trawl)

A short-beaked common dolphin mortality was observed in this fishery in 2010, and another in 2012 (Table 2). An expanded bycatch estimate has not been calculated so the minimum raw count is reported.

Pelagic Longline

In only 2009, a short-beaked common dolphin mortality was observed in the pelagic longline fishery in the mid-Atlantic Bight fishing area (Garrison and Stokes 2010). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Table 2. Summary of the incidental serious injury and mortality of North Atlantic short-beaked common dolphins (*Delphinus delphis delphis*) by commercial fishery including the years sampled, the type of data used, the annual observer coverage, the serious injuries and mortalities recorded by on-board observers, the estimated annual serious injury and mortality, the combined serious injury and mortality estimate, the estimated CV of the annual combined serious injury and mortality and the mean annual serious injury and mortality estimate (CV in parentheses).

Fishery	Years	Data Type[a]	Observer Coverage[b]	Observed Serious Injury[e]	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Estimated CVs	Mean Annual Combined Mortality
Northeast Sink Gillnet[d]	09-13	Obs. Data, Trip Logbook, Allocated Dealer Data	.04, .17, .19, .15, .11	0, 0, 0, 0, 0	3, 4, 6, 6, 5	0, 0, 0, 0, 0	43, 69, 49, 95, 104	43, 69, 49, 95, 104	.77, .81, .71, .40, .46	70 (.26)

Mid-Atlantic Gillnet[d]	09-13	Obs. Data, Trip Logbook, Allocated Dealer Data	.03, .04, .02, .02, .03	0, 0, 0, 0, 0	0, 10, 3, 1, 2	0, 0, 0, 0, 0	0, 30, 29, 15, 62	0, 30, 29, 15, 62	0, .48, .53, .93, .67	27(.36)
Northeast Mid-water Trawl - Including Pair Trawl	09-13	Obs. Data Trip Logbook	.42, .54, .41, .45, .37	0, 0, 0, 0, 0	0, 1, 0, 1, 0	0, 0, 0, 0, 0	0, na, 0, na, 0	0, 1, 0, 1, 0	0, 1, 0, 1, 0	0.4
Northeast Bottom Trawl[c]	09-13	Obs. Data Trip Logbook	.09, .16, .26, .17, .15	0, 2, 0, 0, 0	5, 29, 22, 10, 4	1, 3, 2, 0, 0	23, 111, 70, 40, 17	24, 114, 72, 40, 17	.60, .32, .37, .54, .54	53.4 (.21)
Mid-Atlantic Bottom Trawl[c]	09-13	Obs. Data Trip Logbook	.05, .06, .08, .05, .06	0, 0, 1, 1, 0	12, 2, 29, 32, 24	5, 1, 8, 7, 0	162, 20, 263, 316, 269	167, 21, 271, 323, 269	.46, .96, .25, .26, .29	210.2 (.17)
Pelagic Longline	09-13	Obs. Data Logbook	.10, .08, .09, .07, .09	0, 0, 0, 0, 0	1, 0, 0, 0	0, 0, 0, 0, 0	8.5, 0, 0, 0	8.5, 0, 0, 0	1.0, 0, 0, 0	1.7 (1.0)
TOTAL										363 (.11)

a. Observer data (Obs. Data), used to measure bycatch rates, are collected within the Northeast Fisheries Observer Program and At-sea Monitoring Program. NEFSC collects landings data (unallocated Dealer Data or Allocated Dealer Data) which are used as a measure of total landings and mandatory Vessel Trip Reports (VTR) (Trip Logbook) are used to determine the spatial distribution of landings and fishing effort.

b. Observer coverage is defined as the ratio of observed to total metric tons of fish landed for the gillnet fisheries ,.and the ratio of observed to total trips for bottom trawl and Mid-Atlantic mid-water trawl (including pair trawl) fisheries. Beginning in May 2010 total observer coverage reported for bottom trawl and gillnet gear includes samples collected from the at-sea monitoring program in addition to traditional observer coverage through the Northeast Fisheries Observer Program (NEFOP).

c. Fishery related bycatch rates for years 2009–2013 were estimated using an annual stratified ratio-estimator.

d. One short-beaked common dolphin was incidentally caught in 2009 in the northeast gillnet fishery and one in 2010 in the mid-Atlantic gillnet fishery as part of a NEFSC hanging ratio study to examine the impact of gillnet hanging ratio on harbor porpoise bycatch. Six short-beaked common dolphins were caught in a study of the effects of tie-downs on Atlantic Sturgeon bycatch rates conducted in the mid-Atlantic gillnet fishery in 2010. All research takes are included in the observed interactions and added to the total estimates, though these interactions and their associated fishing effort were not included in bycatch rate calculations that was expanded to the rest of the fishery.

e. Serious injuries were evaluated for the 2009–2013 period using new guidelines and include both at-sea monitor and traditional observer data (Waring *et al.* 2014 ; 2015; Wenzel *et al*. 2015)

CANADA

Between January 1993 and December 1994, 36 Spanish deep-water trawlers, covering 74 fishing trips (4,726 fishing days and 14,211 sets), were observed in NAFO Fishing Area 3 (off the Grand Banks) (Lens 1997). A total of 47 incidental catches was recorded, which included one short-beaked common dolphin. The incidental mortality rate for short-beaked common dolphins was 0.007/set. One short-beaked common dolphin was reported as a bycatch mortality in Canadian bottom otter trawl fishing on Georges Bank in 2012 (pers. comm. Marine Animal Response Society, Nova Scotia).

Other Mortality

From 2009 to 2013, 712 short-beaked common dolphins were reported stranded between Maine and Florida (Table 3). The total includes mass-stranded short-beaked common dolphins in Massachusetts during 2009 (a total of

26 in 6 events), 2010 (a total of 30 in 8 events), 2011 (a total of 30 animals in 5 events), 2012 (23 group stranding events), and 2013 (a total of 9 in 3 events), one mass stranding in North Carolina in 2011 (4 animals), and 2 mass strandings in Virginia in 2013 (a total of 6 in 2 events). Five animals in 2009, 11 animals in 2010, 15 animals in 2011, 71 animals in 2012, and 13 in 2013 were released or last sighted alive. In 2009, six short-beaked common dolphins had indications of human interaction, 3 of which were classified as fishery interactions. In 2010, 7 animals were classified as human interactions, 2 of which were fishery interactions (all Massachusetts mass-stranded animals) and 2 of which (Rhode Island) involved animals last sighted free-swimming. In 2011, 3 animals were classified as having human interactions, 2 of which were fishery interactions (one of these was satellite-tagged and released). Twelve human interaction cases were reported in 2012 (7 in Massachusetts, 3 in New York and 2 in New Jersey), 6 of which (2 in Massachusetts, 2 in New York and 1 in New Jersey) were classified as fisheries interactions. In 2013, 10 cases were classified as human interaction, 4 of which were fishery interactions. In an analysis of mortality causes of stranded marine mammals on Cape Cod and southeastern Massachusetts between 2000 and 2006, Bogomolni (2010) reported that 61% of stranded short-beaked common dolphins were involved in mass-stranding events, and 37% of all the short-beaked common dolphin stranding mortalities were disease-related.

The Marine Animal Response Society of Nova Scotia reported one short-beaked common dolphin stranded in 2009, one (released alive) in 2010, 2 (one a fisheries interaction) in 2011, and 0 in 2012 and 2013 (Tonya Wimmer, pers. comm.).

Table 3. Short-beaked common dolphin (*Delphinus delphis delphis*) reported strandings along the U.S. Atlantic coast, 2009–2013.

STATE	2009	2010	2011	2012	2013	**TOTALS**
Maine	0	1	0	2	0	**3**
Massachusetts[a]	53	71	64	221	48	**457**
Rhode Island[c]	6	7	5	6	6	**30**
Connecticut	0	1	0	0	0	**1**
New York [b, c]	7	9	17	13	24	**70**
New Jersey[c]	6	14	9	14	19	**62**
Delaware[c]	4	0	1	1	3	**9**
Maryland	2	0	1	1	3	**7**
Virginia[a,c]	2	5	9	4	13	**33**
North Carolina[a],[c]	7	6	18	0	9	**40**
TOTALS	**87**	**114**	**124**	**262**	**125**	**712**

a. Massachusetts mass strandings (2009 - 2,3,3,4,6,8; 2010 - 2,2,3,3,3,4,5,8; 2011-3,3,4,7,13; 2012 - 23 group events ranging from 2 to 22 animals each, 2013 - 4, 3 2). North Carolina mass stranding of 4 animals in 2011. Two mass strandings in Virginia in April 2013 - a group of 4 and a group of 2.

b. Twenty (12 dead, 8 rescued; one of the mortalities classified as human interaction) animals involved in a mass stranding in Suffolk county in 2007. Seven animals involved in 2 mass stranding events in March 2009 (six euthanized, 1 died at site, 2 had signs of fishery interation). In addition, in 2008 3 animals were relocated from the Nansemond River. Three animals (one released alive) involved in mass stranding in NJ in 2012.

c. Six human interaction cases in 2009 (2 Massachusetts, 3 Rhode Island, 1 New York), 3 of which were classified as fishery interactions (2 in Rhode Island and one in Massachusetts). Seven HI cases in 2010 (4 mortalities in MA, 2 released alive in RI, and 1 mortality in New Jersey), 2 of which (Massachusetts) were classified as fishery interactions. Three HI cases in 2011, all in Massachusetts, 2 of which were classified as fishery interactions (but one of those fishery interaction animals was released alive). Twelve HI cases in 2012 (7 in Massachusetts, 3 in New York and 2 in New Jersey), 6 of which (2 in Massachusetts, 2 in New York and 1 in New

Jersey) were classified as fisheries interactions. Ten records with indications of human interactions in 2013 (3 in New York, 1 in Rhode Island and 6 in Massachusetts), 4 of which (1 in Massachusetts and 3 in New York) were classified as fishery interactions.

Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that die or are seriously injured may not wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction. However a recently published human interaction manual (Barco and Moore 2013) and case criteria for human interaction determinations (Moore *at al.* 2013) should help with this.

STATUS OF STOCK

Short-beaked common dolphins are not listed as threatened or endangered under the Endangered Species Act, and the Western North Atlantic stock is not considered strategic under the Marine Mammal Protection Act. The 2009–2013 average annual human-related mortality does not exceed PBR. The total U.S. fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. The status of short-beaked common dolphins, relative to OSP, in the U.S. Atlantic EEZ is unknown. Population trends for this species have not been investigated.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Western North Atlantic Offshore Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are two morphologically and genetically distinct common bottlenose dolphin morphotypes (Duffield *et al.* 1983; Duffield 1986; Mead and Potter 1995; Rosel *et al.* 2009) described as the coastal and offshore forms in the western North Atlantic (Hersh and Duffield 1990; Mead and Potter 1995; Curry and Smith 1997; Rosel *et al.* 2009). The two morphotypes are genetically distinct based upon both mitochondrial and nuclear markers (Hoelzel *et al.* 1998; Rosel *et al.* 2009). The offshore form is distributed primarily along the outer continental shelf and continental slope in the Northwest Atlantic Ocean from Georges Bank (Figure 1; Kenney 1990) to the Florida Keys, where dolphins with characteristics of the offshore type have stranded. However, common bottlenose dolphins have occasionally been sighted in Canadian waters, on the Scotian Shelf, particularly in the Gully (Gowans and Whitehead 1995), and these animals are thought to be of the offshore form.

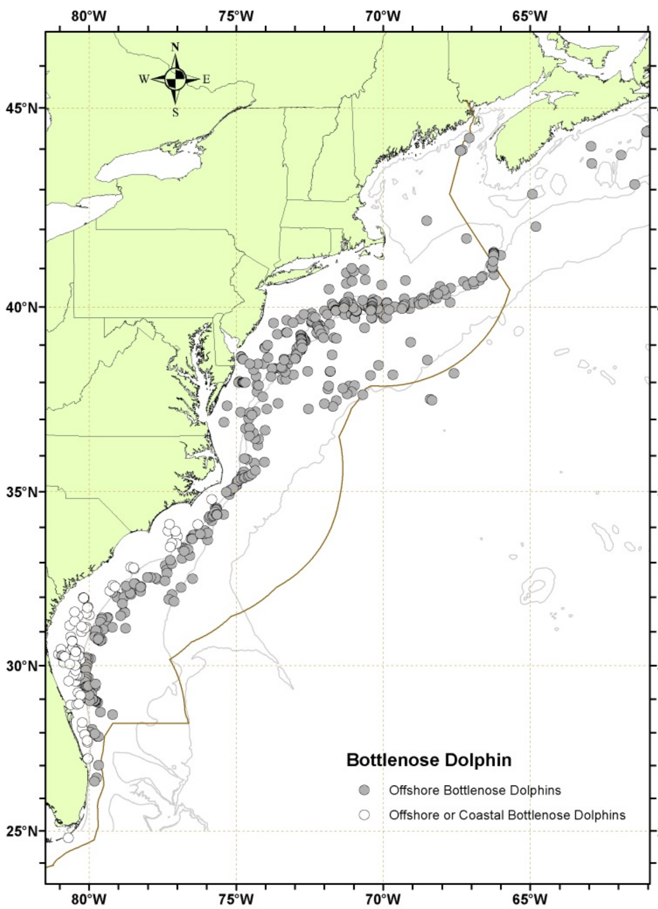

Figure 1. *Distribution of bottlenose dolphin sightings from NEFSC and SEFSC aerial surveys during summer in 1998, 1999, 2002, 2004, 2006 and 2011. Isobaths are the100-m, 1,000-m, and 4,000-m depth contours.*

North of Cape Hatteras, there is separation of the two morphotypes across bathymetry during summer months. Aerial surveys flown during 1979-1981 indicated a concentration of common bottlenose dolphins in waters < 25 m deep corresponding to the coastal morphotype, and an area of high abundance along the shelf break corresponding to the offshore stock (Kenney 1990). Biopsy tissue sampling and genetic analysis demonstrated that common bottlenose dolphins concentrated close to shore were of the coastal morphotype, while those in waters > 40 m depth were from the offshore morphotype (Garrison *et al.* 2003). However, south of Cape Hatteras, North Carolina, the ranges of the coastal and offshore morphotypes overlap to some degree. Torres *et al.* (2003) found a statistically significant break in the distribution of the morphotypes at 34 km from shore based upon the genetic analysis of tissue samples collected in nearshore and offshore waters from New York to central Florida. The offshore morphotype was found exclusively seaward of 34 km and in waters deeper than 34 m. Within 7.5 km of shore, all animals were of the coastal morphotype. More recently, offshore morphotype animals have been sampled as close as 7.3 km from shore in water depths of 13 m (Garrison *et al.* 2003). Systematic biopsy collection surveys were conducted coastwide during the summer and winter between 2001 and 2005 to evaluate the degree of spatial overlap between the two morphotypes. Over the continental shelf south of Cape Hatteras, North Carolina, the two morphotypes overlap spatially, and the probability of a sampled group being from the offshore morphotype increased with increasing depth based upon a logistic regression analysis (Garrison *et al.* 2003). Hersh and Duffield (1990) examined common bottlenose dolphins that stranded along the southeast coast of Florida and found four that had hemoglobin profiles matching that of the offshore morphotype. These strandings suggest the offshore form occurs as far south as southern Florida. The range of the offshore common bottlenose dolphin includes waters beyond the continental slope (Kenney 1990), and offshore common bottlenose dolphins may move between the Gulf of Mexico and the Atlantic (Wells *et al.* 1999).

The western North Atlantic Offshore Stock of common bottlenose dolphins is being considered separate from the Gulf of Mexico Oceanic Stock of common bottlenose dolphins for management purposes. One line of evidence to support this decision comes from Baron *et al.* (2008), who found that Gulf of Mexico common bottlenose dolphin whistles (collected from oceanic waters) were significantly different from those in the western North Atlantic Ocean (collected from continental shelf and oceanic waters) in duration, number of inflection points and number of steps.

POPULATION SIZE

The best available estimate for the offshore stock of common bottlenose dolphins in the western North Atlantic is 77,532 (CV=0.40; Table 1). This estimate is from summer 2011 surveys covering waters from central Florida to the lower Bay of Fundy.

Earlier abundance estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions. As recommended in the GAMMS II Workshop Report (Wade and Angliss 1997), estimates older than 8 years are deemed unreliable for the determination of the current PBR.

Recent surveys and abundance estimates

An abundance estimate of 26,766 (CV=0.52) offshore common bottlenose dolphins was generated from aerial and shipboard surveys conducted during June-August 2011 between central Virginia and the lower Bay of Fundy. The aerial portion covered 6,850 km of tracklines over waters north of New Jersey between the coastline and the 100-m depth contour through the U.S. and Canadian Gulf of Maine, and up to and including the lower Bay of Fundy. The shipboard portion covered 3,811 km of tracklines between central Virginia and Massachusetts in waters deeper than the 100-m depth contour out to beyond the U.S. EEZ. Both sighting platforms used a double-platform data-collection procedure, which allows estimation of abundance corrected for perception bias of the detected species (Laake and Borchers 2004). Estimation of the abundance was based on the independent observer approach assuming point independence (Laake and Borchers 2004) and calculated using the mark-recapture distance sampling option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009).

An abundance estimate of 50,766 (CV=0.55) offshore common bottlenose dolphins was generated from a shipboard survey conducted concurrently (June-August 2011) in waters between central Virginia and central Florida. This shipboard survey included shelf-break and inner continental slope waters deeper than the 50-m depth contour within the U.S. EEZ. The survey employed two independent visual teams searching with 25x150 “bigeye” binoculars. A total of 4,445 km of tracklines was surveyed, yielding 290 cetacean sightings. The majority of sightings occurred along the continental shelf break with generally lower sighting rates over the continental slope. Estimation of the abundance was based on the independent observer approach assuming point independence (Laake and Borchers 2004) and calculated using the mark-recapture distance sampling option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009).

Table 1. Summary of recent abundance estimates for western North Atlantic offshore stock of common bottlenose dolphins (*Tursiops truncatus truncatus*) by month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Jun-Aug 2011	central Virginia to lower Bay of Fundy	26,766	0.52
Jun-Aug 2011	central Florida to central Virginia	50,766	0.55
Jun-Aug 2011	central Florida to lower Bay of Fundy (COMBINED)	77,532	0.40

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best abundance estimate is 77,532 (CV=0.40). The minimum population estimate for western North Atlantic offshore common bottlenose dolphin is 56,053.

Current Population Trend

A trend analysis has not been conducted for this stock. There are 3 abundance estimates from: 1) summer 1998 surveys (29,774; CV=0.25); 2) summer 2002/2004 surveys (81,588; CV=0.17); and 3) summer 2011 surveys (77,532; CV=0.40). Methodological differences between the estimates need to be evaluated before quantifying trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al*. 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a “recovery” factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for offshore common bottlenose dolphins is 56,053. The maximum productivity rate is 0.04, the default value for cetaceans. The “recovery” factoris 0.5, the default value for stocks of unknown status relative to OSP, and the CV of the average mortality estimate is less than 0.3 (Wade and Angliss 1997). PBR for the western North Atlantic offshore common bottlenose dolphin is therefore 561.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The estimated mean annual fishery-related mortality and serious injury of offshore common bottlenose dolphins during 2009–2013 was 43.9 (CV=0.26; Table 2) due to interactions with the northeast sink gillnet, northeast bottom trawl, mid-Atlantic bottom trawl, and pelagic longline fisheries. The total annual fishery-related mortality and serious injury for this stock during 2009–2013 is unknown because in addition to observed takes, there was a self-reported take in the unobserved mid-Atlantic tuna hook and line fishery during 2010.

Fisheries Information

The commercial fisheries that interact, or that potentially could interact, with this stock in the Atlantic Ocean are the Category I Atlantic Ocean, Caribbean, Gulf of Mexico large pelagic longline; mid-Atlantic gillnet; and northeast sink gillnet fisheries; the Category II mid-Atlantic bottom trawl and northeast bottom trawl fisheries; and the Category III Gulf of Maine, U.S. mid-Atlantic tuna, shark, swordfish hook and line/harpoon fishery. Detailed fishery information is reported in Appendix III.

Earlier Interactions

Historically, US fishery interactions have been documented with common bottlenose dolphins in the pelagic drift gillnet fishery, pelagic pair trawl fishery, northeast and mid-Atlantic bottom trawl fisheries, and the northeast and mid-Atlantic gillnet fisheries. See Appendix V for more information on historical takes.

Pelagic Longline

The pelagic longline fishery operates in the U.S. Atlantic (including Caribbean) and Gulf of Mexico EEZ. The estimated annual average serious injury and mortality attributable to the Atlantic Ocean pelagic longline fishery for the 5-year period from 2009 to 2013 was 14.1 common bottlenose dolphins (CV=0.61; Table 2). During 2009–2013, 4 serious injuries to common bottlenose dolphins were observed. During 2012, 3 serious injuries were observed: 2 during quarter 1 in the South Atlantic Bight (SAB) region, and 1 during quarter 3 in the Northeast Coastal (NEC) region (Garrison and Stokes 2013). One serious injury of a common bottlenose dolphin was observed during quarter 4 of 2009 in the Mid-Atlantic Bight (MAB) region (Garrison and Stokes 2010; see also Fairfield and Garrison 2008; Garrison *et al*. 2009; Garrison and Stokes 2012a,b). During 2009 (1 animal), 2010 (1 animal), 2011 (2 animals), 2012 (2 animals), and 2013 (2 animals), 8 common bottlenose dolphins were observed entangled and released alive in the SAB, MAB and NEC regions (Garrison and Stokes 2010; 2012a,b; 2013; 2014). The animals were presumed to have no serious injuries. No common bottlenose dolphin mortalities or serious injuries were observed between 2002 and 2008 (Garrison 2003; Garrison and Richards 2004; Garrison 2005; Fairfield Walsh and Garrison 2006; Fairfield-Walsh and Garrison 2007; Fairfield and Garrison 2008; Garrison *et al*. 2009). However, one common bottlenose dolphin was observed entangled and released alive, presumed to have no serious injuries, in 2005 in the SAB region.

Table 2. Summary of the incidental mortality and serious injury of Atlantic Ocean offshore common bottlenose dolphins (*Tursiops truncatus truncatus*) by commercial fishery including the years sampled (Years), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).

Fishery	Years	Data Type[a]	Observer Coverage[b]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Est. CVs	Mean Annual Mortality
Northeast Sink Gillnet	09-13	Obs. Data Logbook	.04, .17, .19, .15, .11	0,0,0,0,0	0,0,0,0,1	0,0,0,0,0	0,0,0,0,26	0,0,0,0,26	.00,.00,.00,.00,.95	5.2 (.95)
Northeast Bottom Trawl [c]	09-13	Obs. Data Logbook	.09, .16, .26, .17, .15	0,0,0,0,0	4,1,0, 0, 0	0,0,0,0,0	18,4,10, 0, 0	18,4,10, 0, 0	.92,.53,.84, NA, NA	6.4 (.58)
Mid-Atlantic Bottom Trawl [c]	09-13	Obs. Data Logbook	.05, .06, .08, .05, .06	0,0,0,0,0	0,1,5,2, 1, 0	0,0,0,0,0	21,20,34, 16, 0	21,20,34, 16, 0	.45,.34,.31, 1.0, NA	18.2 (.25)
Pelagic Longline	09-13	Obs. Data Logbook	.10, .08, .09, .07, .09	1,0,0,3,0	0,0,0,0,0	8.8,0,0, 61.8,0	0,0,0,0,0	0,8.8,0,0, 61.8	1.00, NA, NA, 0.68, NA	14.1 (.61)
TOTAL										43.9 (.26)

[a] Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Observer Program. Mandatory logbook data were used to measure total effort for the longline fishery. These data are collected at the Southeast Fisheries Science Center (SEFSC).
[b] Proportion of sets observed (for Pelagic Longline).
[c] Fishery related bycatch rates for 2012 were estimated using an annual stratified ratio-estimator using only data from 2012. The 2007-2011 estimates reported in the 2013 stock assessment report were generated using a different method, pooling observer data over the five year time period (2007-2011). Pooled stratified bycatch rates were applied to annual fishing effort data resulting in annual mortality estimates across the 2007-2011 time period.

Northeast Sink Gillnet

During 2009–2013, 1 mortality was observed in 2013 in the northeast sink gillnet fishery. No takes were observed from 2009-2012. New serious injury criteria were applied but there were no observed serious injuries of common bottlenose dolphins in the Northeast region during 2009–2013. See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Northeast Bottom Trawl

During 2009–2013, 5 mortalities were observed in the northeast bottom trawl fishery. New serious injury criteria were applied but there were no observed serious injuries of common bottlenose dolphins in the northeast region during 2009–2013. See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Mid-Atlantic Bottom Trawl

During 2009–2013, 9 mortalities were observed in the mid-Atlantic bottom trawl fishery. New serious injury criteria were applied but there were no observed serious injuries of common bottlenose dolphins in the mid-Atlantic region during 2009–2013. See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Through the Marine Mammal Authorization Program (MMAP), there were 2 self-reported incidental takes (mortalities) involving 3 common bottlenose dolphins in total during 2011 off Rhode Island and New Jersey by fishers trawling for *Loligo* squid.

U.S. Mid-Atlantic Tuna Hook and Line

Through the MMAP, there was 1 self-reported incidental take (serious-injury) of a common bottlenose dolphin during 2010 off North Carolina by a fisher using hook and line targeting tuna.

Other Mortality

Common bottlenose dolphins are among the most frequently stranded small cetaceans along the Atlantic coast. Many of the animals show signs of human interaction (*i.e.*, net marks, mutilation, etc.); however, it is unclear what proportion of these stranded animals is from the offshore stock because most strandings are not identified to morphotype, and when they are, animals of the offshore form are uncommon. For example, only 19 of 185 *Tursiops* strandings in North Carolina were genetically assigned to the offshore form (Byrd *et al.* 2014).

A UME was declared in the summer of 2013 for the mid-Atlantic coast from New York to Brevard County, Florida. Beginning in July 2013, common bottlenose dolphins have been stranding at elevated rates. The total number of stranded common bottlenose dolphins from New York through North Florida (Brevard County) as of mid-October 2014 (1 July 2013 - 19 October 2014) was ~1546. Morbillivirus has been determined to be the cause of the event. Most strandings and morbillivirus positive animals have been recovered from the ocean side beaches rather than from within the estuaries, suggesting that at least so far coastal stocks have been more impacted by this UME than estuarine stocks. It is also possible the offshore stock has been impacted. The UME is still ongoing as of December 2014 when this report was drafted, and work continues to determine the effect of this event on all common bottlenose dolphin stocks in the Atlantic.

STATUS OF STOCK

The common bottlenose dolphin in the western North Atlantic is not listed as threatened or endangered under the Endangered Species Act, and the offshore stock is not considered strategic under the MMPA. Total U.S. fishery-related mortality and serious injury for this stock is less than 10% of the calculated PBR and, therefore, can be considered to be insignificant and approaching the zero mortality and serious injury rate. The status of this stock relative to OSP in the U.S. Atlantic EEZ is unknown. There are insufficient data to determine the population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Western North Atlantic Northern Migratory Coastal Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Geographic Range and Coastal Morphotype Habitat

In the western North Atlantic, the coastal morphotype of common bottlenose dolphins is continuously distributed in nearshore coastal and estuarine waters along the U.S. Atlantic coast south of Long Island, New York, around the Florida peninsula and into the Gulf of Mexico. Based on differences in mitochondrial DNA haplotype frequencies, coastal animals in the northern Gulf of Mexico and the western North Atlantic represent separate stocks (Rosel *et al.* 2009; Duffield and Wells 2002).

The coastal morphotype is morphologically and genetically distinct from the larger, more robust morphotype that occupies habitats further offshore in the western North Atlantic and Gulf of Mexico (Hoelzel *et al.* 1998; Mead and Potter 1995; Rosel *et al.* 2009; Vollmer 2011). Aerial surveys conducted between 1978 and 1982 (Kenney 1990) north of Cape Hatteras, North Carolina, identified two concentrations of bottlenose dolphins, one near the coast within the 25-m isobath and the other further offshore concentrated at the continental shelf edge. The lowest density of bottlenose dolphins was observed over the continental shelf. It was suggested, therefore, that north of Cape Hatteras, North Carolina, the coastal morphotype is restricted to waters < 25 m deep (Kenney 1990). Similar patterns were observed during warm-water months in more recent aerial surveys (Garrison and Yeung 2001; Garrison *et al.* 2003). However, south of Cape Hatteras during both cold water and warm water months, there was no clear longitudinal discontinuity in bottlenose dolphin sightings (Garrison and Yeung 2001; Garrison *et al.* 2003).

To address the question of the distribution of coastal and offshore morphotypes in coastal and continental shelf waters along the Atlantic coast, tissue samples were collected in coastal, shelf and slope waters from New England to Florida between 1997 and 2006. Genetic analyses using mitochondrial DNA sequences of these biopsies identified individual animals to the coastal or offshore morphotype. Using the genetic results from all surveys combined, a logistic regression was used to model the probability that a particular bottlenose dolphin group was of the coastal morphotype as a function of environmental variables including depth, sea surface temperature, and distance from shore. These models were used to partition the bottlenose dolphin groups observed during aerial surveys between the two morphotypes (Garrison *et al.* 2003).

The genetic results and spatial patterns observed in aerial surveys indicate both regional and seasonal differences in the longitudinal distribution of the two morphotypes in coastal Atlantic waters. During warm water months, all biopsy samples collected from coastal waters north of Cape Lookout, North Carolina (< 20 m deep), were of the coastal morphotype, and all samples collected in deeper waters (> 40 m deep) were of the offshore morphotype. South of Cape Lookout, the probability of an observed bottlenose dolphin group being of the coastal morphotype declined with increasing depth. In intermediate depth waters, there was spatial overlap between the two morphotypes. Offshore morphotype bottlenose dolphins were observed at depths as shallow as 13 m, and coastal morphotype dolphins were observed at depths of 31 m and 75 km from shore (Garrison *et al*. 2003).

Cold water month samples were collected primarily from coastal waters in North Carolina and Georgia and the vast majority of them were of the coastal morphotype; however, one offshore morphotype group was sampled during November just south of Cape Lookout only 7.3 km from shore. Coastal morphotype samples were also collected farther away from shore at 33 m depth and 39 km from shore. The logistic regression model for this region indicated a decline in the probability of a coastal morphotype group with increasing distance from shore; however, the model predictions were highly uncertain due to limited sample sizes and spatial overlap between the two morphotypes. Samples collected in Georgia waters also indicated significant overlap between the two morphotypes with a declining probability of the coastal morphotype with increasing depth. A coastal morphotype sample was collected 112 km from shore at a depth of 38 m. An offshore sample was collected in 22 m depth at 40 km from shore. As with the North Carolina model, the Georgia logistic regression predictions are uncertain due to limited sample size and high overlap between the two morphotypes (Garrison *et al.* 2003).

In summary, the primary habitat of the coastal morphotype of bottlenose dolphin in the western North Atlantic extends from Florida to Long Island, New York, during warm water months and in waters less than 20 m deep, including estuarine and inshore waters. South of Cape Lookout, the coastal morphotype also occurs in lower densities over the continental shelf and overlaps spatially with the offshore morphotype.

Distinction Between Coastal and Estuarine Bottlenose Dolphins

In addition to inhabiting coastal nearshore waters, the coastal morphotype of common bottlenose dolphin also inhabits inshore estuarine waters along the U.S. east coast and Gulf of Mexico (Wells *et al.* 1987; Wells *et al.* 1996; Scott *et al.* 1990; Weller 1998; Zolman 2002; Speakman *et al.* 2006; Stolen *et al.* 2007; Balmer *et al.* 2008; Mazzoil *et al.* 2008). There are multiple lines of evidence supporting demographic separation between bottlenose dolphins residing within different estuaries along the Atlantic coast. For example, long-term photo-identification (photo-ID) studies in waters around Charleston, South Carolina, have identified communities of resident dolphins that are seen within relatively restricted home ranges year-round (Zolman 2002; Speakman *et al.* 2006). In Biscayne Bay, Florida, there is a similar community of bottlenose dolphins with evidence of year-round residents that are genetically distinct from animals residing in a nearby estuary in Florida Bay (Litz *et al.* 2012). The Indian River Lagoon system in central Florida also has a long-term photo-ID study, and this study identified year-round resident dolphins repeatedly observed across multiple years (Stolen *et al.* 2007; Mazzoil *et al.* 2008). A few published studies demonstrate that these resident animals are genetically distinct from animals in nearby coastal waters; a study conducted near Jacksonville, Florida, demonstrated significant genetic differences between animals in coastal and estuarine waters (Caldwell 2001; Rosel *et al.* 2009) and animals resident in the Charleston Estuarine System show significant genetic differentiation from animals biopsied in coastal waters of southern Georgia (Rosel *et al*. 2009).

Despite evidence for genetic differentiation between estuarine and coastal populations, the degree of spatial overlap between these populations remains unclear. Photo-ID studies within estuaries demonstrate seasonal immigration and emigration and the presence of transient animals (e.g., Speakman *et al.* 2006). In addition, the degree of movement of resident estuarine animals into coastal waters on seasonal or shorter time scales is poorly understood. Bottlenose dolphins inhabiting primarily estuarine habitats are considered distinct stocks from those inhabiting coastal habitats. Bottlenose dolphin stocks inhabiting coastal waters are the focus of this report.

Definition of the Northern Migratory Coastal Stock

Common bottlenose dolphins occur along the North Carolina coast and as far north as Long Island, New York, during summer months (Kenney 1990; Garrison *et al.* 2003). Initially, a single stock of coastal morphotype bottlenose dolphins was thought to migrate seasonally between New Jersey (warm water months) and central Florida based on seasonal patterns of strandings during a large scale mortality event occurring during 1987-1988 (Scott *et al.* 1988). However, re-analysis of stranding data (McLellan *et al.* 2003) and extensive analysis of genetic (Rosel *et al.* 2009), photo-ID (Zolman 2002), and satellite telemetry (Hohn and Hansen) data demonstrate a complex mosaic of coastal bottlenose dolphin stocks. Integrated analysis of these multiple lines of evidence suggests that there are 5 coastal stocks of bottlenose dolphins: Northern Migratory and Southern Migratory Coastal Stocks, a South Carolina/Georgia Coastal Stock, a Northern Florida Coastal Stock and a Central Florida Coastal Stock.

Among the coastal stocks, the migratory movements and spatial distribution of the Northern Migratory Stock are the best understood based on aerial survey data, tag-telemetry studies, photo-ID data and genetic studies.

Four dolphins tagged during 2003 and 2004 off the coast of New Jersey in late summer moved south to North Carolina and inhabited waters near and just south of Cape Hatteras during cold water months. These animals then moved north to New Jersey again during the following warm water months (Hohn and Hansen). Similarly, a dolphin tagged in late September 1998 off Virginia Beach, Virginia, occurred between Cape Hatteras and Cape Lookout during cold water months (NMFS 2001). There is no evidence suggesting that this animal moved farther south than Cape Lookout during cold water months (NMFS 2001). In addition, there are no matches from long-term photo-ID studies between sites in New Jersey and those south of Cape Hatteras (Urian *et al.* 1999; NMFS 2001). During cold water months, bottlenose dolphins are rarely observed in coastal waters north of the North Carolina/Virginia border, and their northern distribution appears to be limited by water temperatures < 9.5ºC (Garrison *et al.* 2003). Seasonal variation in the densities of animals observed off Virginia Beach, Virginia, also indicates the seasonal migration of dolphins northward during warm water months and then south during cold water months (Barco and Swingle 1996).

Genetic analyses using mitochondrial and nuclear microsatellite data also indicated significant differentiation between bottlenose dolphins occupying coastal waters from the North Carolina/Virginia border to New Jersey during warm water months and those in southern North Carolina and further south (Charleston, South Carolina, coastal Georgia and Jacksonville, Florida). One exception was the comparison using the microsatellite data of animals from Virginia and north to those in southern North Carolina (NMFS 2001; Rosel *et al.* 2009). This finding is thought to be a result of some degree of seasonal spatial overlap between the Northern Migratory Coastal Stock and other stocks occupying coastal waters of North Carolina (Rosel *et al.* 2009) because some of the samples were collected in southern North Carolina during cold water months when multiple stocks are thought to be present.

Toth *et al.* (2012) suggested the Northern Migratory Coastal Stock may be further partitioned in waters off of New Jersey. They identified two clusters of sightings that differed in the presence of a commensal soft-stalked barnacle, *Xenobalanus globicipitis*, in avoidance behavior and in "base coloration". One cluster inhabited waters 0-1.9 km from shore while the other cluster inhabited waters 1.9-6 km from shore. Additional studies are needed to determine whether this apparent partitioning has a genetic basis.

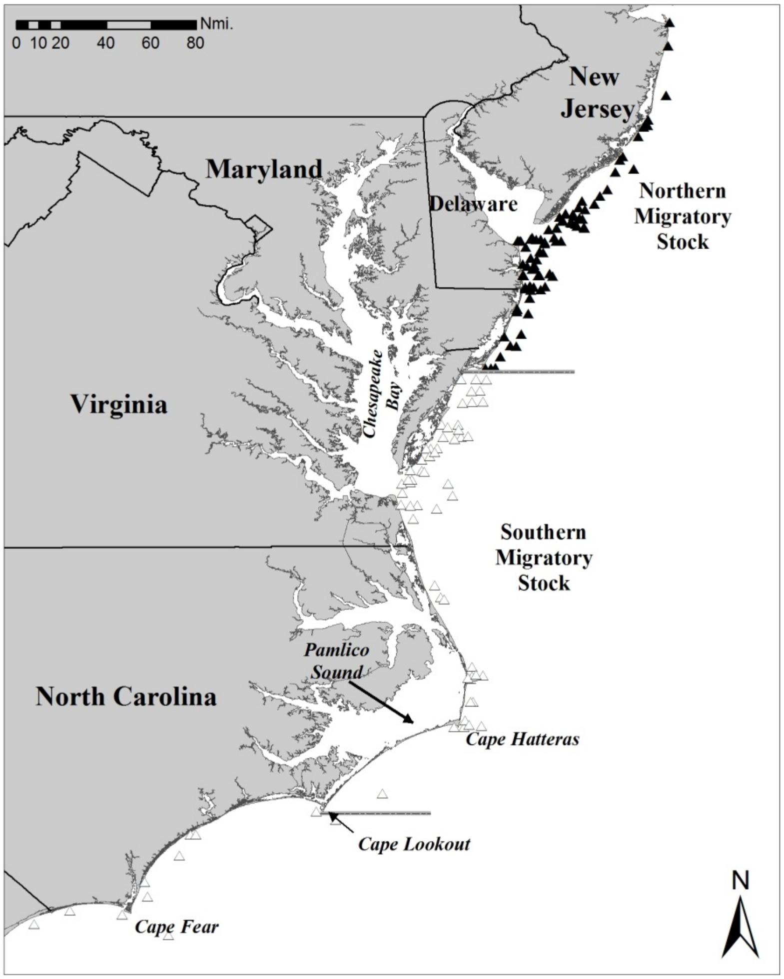

Figure 1. *The distribution of common bottlenose dolphin stocks occupying coastal waters from North Carolina to New Jersey during July-August 2002, 2004, 2010 and 2011. Sighting locations from aerial surveys are plotted as triangle symbols. Sightings assigned to the Northern Migratory Coastal Stock are shown as filled symbols. Horizontal lines intersecting the coast denote the southern boundary for each stock in warm water months.*

Spatial and temporal overlap of the Northern Migratory Coastal Stock with other stocks is likely. During warm water months, overlap with the Southern Migratory Coastal Stock in coastal waters of northern North Carolina and Virginia is possible, but the degree of overlap is unknown. During cold water months, the Northern Migratory Coastal Stock moves southward to waters from Cape Lookout, North Carolina, to north of Cape Hatteras, North Carolina, based upon tag-telemetry studies. The stock overlaps spatially with the Northern North Carolina Estuarine System (NNCES) Stock during this period. These complex seasonal spatial movements and the overlap of coastal and estuarine stocks in the waters of North Carolina greatly limit the ability to fully assess the mortality of each of these stocks.

In summary, spatial distribution data, tag-telemetry studies, photo-ID studies and genetic studies demonstrate the existence of a distinct Northern Migratory Coastal Stock of coastal bottlenose dolphins. During warm water months, this stock occupies coastal waters from the shoreline to approximately the 25-m isobath between the Chesapeake Bay mouth and Long Island, New York (Figure 1). During cold water months, the stock occupies coastal waters from Cape Lookout, North Carolina, to the North Carolina/Virginia border.

POPULATION SIZE

The best available estimate for the Northern Migratory Coastal Stock of common bottlenose dolphins in the western North Atlantic is 11,548 (CV=0.36; Table 1). This estimate is from aerial surveys conducted during the summers of 2010 and 2011 covering waters from Florida to New Jersey.

Earlier abundance estimates

Earlier abundance estimates for the Northern Migratory Coastal stock were derived from aerial surveys conducted during the summer of 2002. Survey tracklines were set perpendicular to the shoreline and included coastal waters to depths of 40 m. These surveys employed two observer teams operating independently on the same aircraft to estimate visibility bias. In summer 2004, an additional aerial survey between central Florida and New Jersey was conducted. As with the 2002 surveys, effort was stratified into 0-20 m and 20-40 m strata with the majority of effort in the shallow depth stratum. Observed common bottlenose dolphin groups from these were partitioned between the coastal and offshore morphotypes based upon analysis of available biopsy samples (Garrison *et al.* 2003). For the region north of Cape Hatteras, North Carolina, there was complete separation between the coastal and offshore morphotypes, with only coastal animals occupying waters < 20 m deep. Therefore, all animals observed in the 0-20 m depth stratum during surveys of this region were assigned to the coastal morphotype (Garrison *et al.* 2003).

Summer surveys are best for estimating the abundance for both the Northern and Southern Migratory Coastal Stocks because they overlap least with other stocks during summer months. An analysis of summer survey data from 1995, 2002 and 2004 demonstrated strong inter-annual variation in the spatial distribution of presumed Northern Migratory and Southern Migratory Coastal Stock animals. Two groups of dolphins in each survey year were identified using a multivariate cluster analysis of sightings based on water temperature, depth and latitude. One group ranged from Cape Lookout, North Carolina, to just north of the Chesapeake Bay mouth, and one ranged farther north along the eastern shore of Virginia to New Jersey. The southern group (i.e., the Southern Migratory Coastal Stock) was found in water temperatures between 26.5 and 28.0°C, and the northern group (i.e., the Northern Migratory Coastal Stock) occurred in cooler waters between 24.5 and 26.0°C. The spatial distribution of these groups was strongly correlated with water temperatures and varied between years. During the summer of 2004, water temperatures were significantly cooler than those during 2002, and animals from both groups were distributed farther south and overlapped spatially. Very few bottlenose dolphins were observed in waters north of Virginia during the summer 2004 survey. Therefore, it was not possible to develop an estimate of abundance for the Northern Migratory Coastal Stock from the summer 2004 survey and so the best abundance estimate for the Northern Migratory Coastal Stock came from the summer 2002 survey when there was little overlap and an apparent separation from the Southern Migratory Coastal Stock at approximately 37.5°N latitude. The resulting abundance estimate for the Northern Migratory Coastal Stock was 9,604 (CV=0.36).

Recent surveys and abundance estimates

The Southeast Fisheries Science Center conducted aerial surveys of continental shelf waters along the U.S. East Coast from southeastern Florida to Cape May, New Jersey, during the summers of 2010 and 2011. The surveys were conducted along tracklines oriented perpendicular to the shoreline that were latitudinally spaced 20 km apart and covered waters from the shoreline to the continental shelf break. The summer 2010 survey was conducted during 24 July–14 August 2010, and 7,944 km of on-effort tracklines completed. A total of 127 common bottlenose dolphin groups were observed including 1,541 animals. During the 2011 summer survey, 8,665 km of trackline were completed between Cape May, New Jersey and Ft. Pierce, Florida. The survey was conducted during 6 July–29 July 2011. The 2011 survey also included more closely spaced “fine-scale” tracklines in waters offshore of New Jersey and Virginia within areas being evaluated for the placement of offshore energy installations. A total of 112 bottlenose dolphin groups were observed including 1,339 animals.

Both the summer 2010 and 2011 surveys were conducted using a two-team approach to develop estimates of visibility bias using the independent observer approach with Distance analysis (Laake and Borchers 2004). However, the detection functions from both surveys indicated a decreased probability of detection near the trackline, which limited the effectiveness of the method for correcting for visibility bias due to a relatively small number of sightings made by both teams near the trackline. Abundance estimates were therefore derived by combining the sightings from both teams during a survey and “left-truncating” the data by analyzing only sightings occurring greater than 100 m from the trackline during the 2010 survey and 50 m during the 2011 survey (see Buckland *et al.* 2001 for left-truncation methodology). Detection functions were fit to these left-truncated data accounting for the effects of survey conditions (e.g., sea state, glare, water color) on the detection probabilities. A bootstrap resampling approach was used to estimate the variance of the estimates. The resulting abundance estimates assume that detection probability at the truncation distance is equal to 1. While the estimates could not be explicitly corrected for this assumption, analyses of the summer 2010 data suggest that this bias is likely small.

The abundance estimates for the Northern Migratory Coastal Stock were based upon tracklines and sightings occurring north of 37.5°N latitude and in waters from the shoreline to the 20-m isobath. Prior analyses suggested that this latitudinal boundary separates the Northern and Southern Migratory Coastal Stocks. The abundance estimate derived from the summer 2010 survey was 12,602 (CV=0.76), and the estimate from the summer 2011 survey was 11,044 (CV=0.36). The best estimate is a weighted average of these two with higher weighting given to the more precise estimate from 2011. The resulting best estimate is 11,548 (CV=0.36).

Table 1. Summary of abundance estimates for the western North Atlantic Northern Migratory Coastal Stock of common bottlenose dolphins. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
July-August 2002	Virginia to New Jersey	9,604	0.36
July-August 2010 and 2011	Virginia to New Jersey	11,548	0.36

Minimum Population Estimate

The minimum population size (Nmin) was calculated as the lower bound of the 60% confidence interval for a lognormally distributed mean (Wade and Angliss 1997). The best estimate for the Northern Migratory Coastal Stock of common bottlenose dolphins is 11,548 (CV=0.36). The resulting minimum population estimate is 8,620.

Current Population Trend

A trend analysis has not been conducted for this stock. There are 2 estimates from the 2002 (9,604; CV=0.36) and 2010/2011 (11,548; CV=0.36) surveys. Methodological differences between the estimates need to be evaluated to quantify trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known for the Northern Migratory Coastal Stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a “recovery” factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of the Northern Migratory Coastal Stock of common bottlenose dolphins is 8,620. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factoris 0.5 because this stock is depleted. PBR for this stock of common bottlenose dolphins is 86.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the Northern Migratory Coastal Stock during 2009–2013 is unknown because this stock is known to interact with unobserved fisheries (see below). The mean annual fishery-related mortality and serious injury for observed fisheries and strandings identified as fishery-caused ranged between 1 and 7.5. No additional mortality and serious injury was documented from other human-caused actions. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 ranged between 1 and 7.5. This range reflects the uncertainty in assigning observed or reported mortalities to a particular stock.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category I mid-Atlantic gillnet fishery; the Category II Chesapeake Bay inshore gillnet; Virginia pound net; mid-Atlantic menhaden purse seine; Atlantic blue crab trap/pot; and mid-Atlantic haul/beach seine fisheries; and the Category III Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fishery. Detailed fishery information is presented in Appendix III.

The primary known source of estimated fishery mortality is the mid-Atlantic coastal gillnet fishery, which has the potential to affect the Northern Migratory Coastal, Southern Migratory Coastal, NNCES and Southern North

Carolina Estuarine System (SNCES) Stocks of common bottlenose dolphin. Additional fishery interactions have been reported in inshore gillnets, Virginia pound nets, blue crab or other pot gear, and Atlantic Ocean commercial passenger fishing vessel (hook and line) gear. However, these additional fisheries have limited or no systematic federal observer coverage, which prevents the estimation of total takes. In addition, at certain times of year, it is not possible to definitively assign mortalities to a specific stock because of the overlap amongst the 4 stocks around North Carolina.

Mid-Atlantic Gillnet

Background

This fishery has the highest documented level of mortality of coastal morphotype common bottlenose dolphins, and the sink gillnet gear in North Carolina is its largest component in terms of fishing effort and observed takes. Because the Northern Migratory, Southern Migratory, NNCES and SNCES bottlenose dolphin stocks all occur in waters off North Carolina, it is not always possible to definitively assign every observed mortality, or extrapolated bycatch estimate, to a specific stock. Between 1995 and 2000 a total of 14 takes occurred, 13 mortalities and 1 live release: 1 in 1995 (mixed finfish), 1 in 1996 (spanish mackerel), 3 in 1998 (1 smooth dogfish, 1 spiny dogfish and 1 in beach-anchored gillnet targeting weakfish), 5 in 1999 (2 spiny dogfish, 1 striped bass, 1 shark, and 1 live release from gear targeting spanish mackerel), 4 in 2000 (1 kingfish, 1 spiny dogfish, 1 bluefish/smooth dogfish, and 1 in beach-anchored gillnet targeting striped bass). The observed takes occurred in gear off North Carolina (n=10), Virginia (n=2) and New Jersey (n=2).

The Bottlenose Dolphin Take Reduction Team was convened in October 2001, in part, to reduce bycatch in gillnet gear. While the Bottlenose Dolphin Take Reduction Plan (BDTRP) was being developed and implemented, there were 7 additional bottlenose dolphin mortalities observed in the mid-Atlantic gillnet fishery from 2001-2006. Three mortalities were observed in 2001 with 1 occurring off of northern North Carolina during April (monkfish fishery) and 2 occurring off of Virginia during November (striped bass fishery). Four additional mortalities were observed along the North Carolina coast near Cape Hatteras: 1 in May 2003 (Spanish mackerel), 1 in September 2005 (Spanish mackerel), 1 in September 2006 (Spanish mackerel), and 1 in October 2006 (king mackerel). The BDTRP was implemented in May 2006 and resulted in changes to gillnet gear configurations and fishing practices.

During 2007-2011 only 1 take was observed by the Southeast Fisheries Observer Program off the coast of northern North Carolina during the month of October. There were no observed takes by the Northeast Fisheries Observer Program (NEFOP) during 2007-2011.

Pre-Take Reduction Plan Mortality Estimation (2002-2006)

All available data from 1995 to 2006 were used to estimate total mortality of common bottlenose dolphins in the mid-Atlantic gillnet fishery. Three alternative approaches were used to estimate a pre-TRP bycatch rate for the period 2002-April 2006. First, a generalized linear model (GLM) approach was used similar to that described in Palka and Rossman (2001). The dataset used in the GLM approach included all observed trips and mortalities from 1995 to April 2006 filtered to include only trips that reflected fishing practices in effect during the period from 2002 to April 2006. Second, a simple ratio estimator of catch per unit effort (CPUE = observed catch / observed effort) was used based directly upon the observed data collected from 2002 to April 2006. Finally, a ratio estimator pooled across years 2002-April 2006 was used to estimate different CPUE values for the pre-TRP period. In each case, the annual reported fishery effort (represented as reported landings) was multiplied by the estimated bycatch rate to develop annual estimates of fishery-related mortality, again similar to the approach in Palka and Rossman (2001). To account for the uncertainty among the 3 alternative approaches, the average of the 3 model estimates (and the associated uncertainty) was used to estimate the mortality of bottlenose dolphins for this fishery (Table 2). The live release from 1999 and 2 takes from beach anchored gillnets reported in the background text were not included in this analysis. Only years 2002-Apr 2006 are reported here as a new analytical approach is described below for the most recent 5-year mortality analysis covering calendar years 2007-2011.

Table 2. Summary of the 2002–2006 incidental mortality of common bottlenose dolphins in the Northern Migratory Coastal Stock in the commercial mid-Atlantic gillnet fisheries. The estimated annual and average mortality estimates are shown for the period prior to the implementation of the Bottlenose Dolphin Take Reduction Plan (pre-BDTRP) and after the implementation of the plan (post-BDTRP). Three alternative modeling approaches were used, and the average of the 3 was used to represent mortality estimates. The minimum and maximum estimates indicate the range of uncertainty in assigning observed bycatch to stock. Observer coverage is measured as a proportion of reported landings (tons of fish landed). Data are derived from the Northeast Observer program, NER dealer data, VMRC landings and NCDMF dealer data. Values in parentheses indicate the CV of the estimate. GLM = generalized linear model.

Period	Year	Observer Coverage	Min Annual Ratio	Min Pooled Ratio	Min GLM	Max Annual Ratio	Max Pooled Ratio	Max GLM
pre-BDTRP	2002	0.01	0	0	24.75 (0.34)	0	0	27.87 (0.33)
	2003	0.01	0	0	11.77 (0.36)	0	0	19.98 (0.30)
	2004	0.02	0	0	14.57 (0.35)	0	0	21.83 (0.33)
	2005	0.03	0	0	14.67 (0.39)	0	0	19.55 (0.32)
	Jan-Apr 2006	0.03	0	0	5.92 (0.37)	0	0	6.50 (0.37)
Annual Avg. pre-BDTRP			Minimum: 4.78 (CV=0.17)			Maximum: 6.38 (CV=0.15)		

During 2002–2006, there were no observed mortalities in the mid-Atlantic gillnet fishery that could potentially be assigned to the Northern Migratory Coastal Stock. Hence, both the annual and pooled ratio estimators of bycatch rate were equal to zero in the pre-BDTRP period. Because the GLM approach included information from prior to 2002, bycatch mortality for the Northern Migratory Coastal Stock was estimated from takes that could have possibly belonged to this stock (Table 2). As stated previously, observed mortalities (and effort) cannot be definitively assigned to a particular stock within certain regions and times of year; therefore, the minimum and maximum possible mortality of the Northern Migratory Coastal Stock are presented for comparison to PBR (Table 2).

Based upon these analyses, the minimum and maximum mean mortality estimates for the Northern Migratory Coastal Stock for the pre-BDTRP period (2002-Apr 2006) were 4.78 (CV=0.17) and 6.38 (CV=0.15) animals per year, respectively (Table 2).

Post-Take Reduction Plan Mortality Estimation (2007-2011)

Different from the pre-BDTRP analytical approach, only 2 alternative approaches were used to estimate common bottlenose dolphin bycatch rates during the post-BDTRP period: 1) a simple annual ratio estimator of CPUE per year based directly upon the observed data from 2007-2011 and 2) a pooled CPUE (where all observer data from 2007–2011 were combined into one sample to estimate CPUE). In each case, the annual reported fishery effort (defined as a fishing trip) was multiplied by the estimated bycatch rate to develop annual estimates of fishery-related mortality. There were not enough observed take events in the post-BDTRP data set to run a GLM. Similar to the pre-BDTRP analytical approach, to account for the uncertainty in these 2 alternative approaches, the average of the 2 model estimates (and the associated uncertainty) were used to estimate the mean mortality of common bottlenose dolphins for this fishery (Table 3). It should be noted that internal waters from New Jersey to Virginia (i.e., Delaware and Chesapeake Bays) may be important habitat to the Northern Migratory Coastal Stock and were included in the estimation of bycatch mortality during 2007–2011.

During 2007–2011, 1 bottlenose dolphin take was observed in 2009 by the Southeast Fishery Observer Program (SEFOP) off northern North Carolina that could potentially be assigned to the NNCES or the Northern or Southern Migratory Coastal Stocks. The animal was observed within 1.1 km of shore in a region where it is possible the estuarine animals can overlap in time and space with coastal migratory bottlenose dolphins. There were no takes observed by the Northeast Fisheries Observer Program (NEFOP) during 2007–2011. The combined NEFOP and SEFOP average observer coverage (measured in trips) for this fishery during 2007–2011 was 2.95% in state waters (0-3 miles) and 8.59% in federal waters (3-200 miles). The low level of coverage in state waters is likely insufficient to consistently detect rare bycatch events of common bottlenose dolphins in the commercial mid-Atlantic gillnet fishery.

Based upon these analyses, the minimum and maximum mean mortality estimates for the Northern Migratory Coastal Stock for the post-BDTRP period (2007-2011) were 0 and 6.77 (CV=0.32) animals per year, respectively (Table 3). However, based on documented serious injury and mortality in this fishery from both federal observer coverage and other data sources (see Table 4), mean annual mortality estimates are likely not zero. Stranding data also documented 2 dolphin mortalities during 2009–2013 recovered with gillnet gear attached: (1) in 2009 in Virginia, a dead dolphin was recovered entangled in gillnet gear; and (2) in 2010 in Delaware, a dead dolphin was recovered with its flukes entangled in monkfish gillnet gear. These 2 mortalities likely belonged to the Northern Migratory Coastal Stock and were included in the stranding database and the stranding totals presented in Table 5.

Table 3. Summary of 2007–2011 incidental mortality estimates of common bottlenose dolphins in the Northern Migratory Coastal Stock in the commercial mid-Atlantic coastal gillnet fisheries. An average from 2 alternative analytical approaches (annual and pooled) was used to estimate total annual bycatch mortality. The minimum and maximum estimates indicate the range of uncertainty in assigning observed bycatch to a stock. Observer coverage is reported on an annual basis for the entire mid-Atlantic coastal gillnet fishery (excluding internal waters) as a proportion of total trips sampled. Data sources include the Northeast and Southeast Fisheries Observer Programs, Greater Atlantic Regional Fisheries Office Vessel Trip Reports, Virginia Marine Resources Commission Fisheries Landings, and North Carolina Division of Marine Fisheries Trip Ticket Program. Values in parentheses indicate the CV of the estimate.

Year	Observer Coverage	Min Annual Ratio	Min Pooled Ratio	Max Annual Ratio	Max Pooled Ratio
2007	0.05	0.00	0.00	0.00	6.36 (1.08)
2008	0.04	0.00	0.00	0.00	6.10 (1.08)
2009	0.04	0.00	0.00	41.26 (0.95)	6.46 (1.08)
2010	0.04	0.00	0.00	0.00	5.23 (1.08)
2011	0.02	0.00	0.00	0.00	5.96 (1.08)
Mean	0.04	0.00	0.00	8.25 (0.95)	6.02 (0.48)
		Mean Minimum: 0.00		Mean Maximum[1]: 6.77 (0.32)	

[1]Mean weighted by inverse of CVs and CV equals inverse of sum of weights

Chesapeake Bay Inshore Gillnet

During 2009–2013, there was 1 documented interaction between common bottlenose dolphins and inshore gillnet gear in Chesapeake Bay. In 2013 in Maryland, a dead dolphin was recovered entangled in 9-inch stretched mesh gillnet gear. This animal likely belonged to either the Northern or Southern Migratory Coastal Stock, and was included in the stranding database and the stranding totals presented in Table 5 (Northeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 17 June 2014). There is no observer coverage of this fishery within Maryland waters of Chesapeake Bay; within Virginia waters of Chesapeake Bay, there is a low level of observer coverage (<1%).

Virginia Pound Net

Historical and recent stranding network data report interactions between common bottlenose dolphins and pound nets in Virginia. During 2009–2013, 3 bottlenose dolphin strandings (mortalities) which could have belonged to the Northern Migratory Coastal Stock were entangled in pound net gear in Virginia (2 in 2009, 1 in 2011; Northeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 17 June 2014). An additional 13 dolphins that could have belonged to the Northern Migratory Coastal Stock stranded with twisted twine markings indicative of interactions with pound net gear. These interactions occurred primarily inside estuarine waters near the mouth of the Chesapeake Bay and in summer months.

Mid-Atlantic Menhaden Purse Seine

The mid-Atlantic menhaden purse seine fishery historically reported an annual incidental take of 1 to 5 common bottlenose dolphins (NMFS 1991, pp. 5-73). This information has not been updated for some time. There has been very limited observer coverage since 2008, but no takes have been observed (see Appendix III).

Atlantic Blue Crab Trap/Pot

During 2009–2013, there were no reports of a common bottlenose dolphin from the Northern Migratory Coastal Stock entangled in trap/pot gear. Because there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab traps/pots. However, stranding data indicate that interactions with trap/pot gear occur at some unknown level in North Carolina (Byrd *et al*. 2014) and other regions of the southeast U.S. (Noke and Odell 2002; Burdett and McFee 2004).

Mid-Atlantic Haul/Beach Seine

There were no reports of mortality or serious injury during 2009–2013 in the mid-Atlantic haul/beach seine fishery, and no estimate of bycatch mortality is available. The mid-Atlantic haul/beach seine fishery had limited observer coverage by the NEFOP in 2009-2011. No observer coverage was allocated to this fishery in 2012 or 2013. Recent evidence for bycatch risk in this gear is limited. The most recent documented interaction is from 2007 when 1 dolphin was killed in a multifilament beach seine during a research project performed by the North Carolina Division of Marine Fisheries. This animal likely belonged to either the Northern Migratory or Southern Migratory Coastal Stock based on its location north of Oregon Inlet during June.

Hook and Line

During 2009–2013, 4 dolphin mortalities likely belonging to the Northern Migratory Coastal Stock were documented as interacting with hook and line gear. Three mortalities occurred during 2009 (2 in New Jersey, 1 in Virginia), and 1 occurred during 2012 (in Virginia). These mortalities were included in the stranding database and are included in the stranding totals presented in Table 5. It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Other Mortality

Historically, there have been occasional mortalities of bottlenose dolphins during research activities including both directed live capture studies, turtle relocation trawls, and fisheries surveys; however, none were documented during 2009–2013. All mortalities from known sources for the Northern Migratory Coastal Stock are summarized in Table 4.

Table 4. Summary of annual reported and estimated mortality of common bottlenose dolphins from the Northern Migratory Coastal Stock during 2009–2013 from observer and stranding data. Where minimum and maximum values are reported in individual cells, there is uncertainty in the assignment of mortalities to this particular stock due to spatial overlap with other common bottlenose dolphin stocks in certain areas and seasons. This is especially the case for strandings where the maximum number reported may truly be a minimum because not all strandings are detected. Therefore, to account for both scenarios, the maximum numbers under the total column are reported as the maximum greater than or equal to what was recovered.

Year	Mid-Atlantic Gillnet		Chesapeake Bay Inshore Gillnet (strandings)	Virginia Pound Net (strandings and observed)	Hook and Line (strandings)	Total[b]
	Min/Max estimate extrapolated from observer data (only through 2011)[a]	Interactions known from stranding data				
2009	Min = 0 Max = 23.86	Min = 0 Max = 1	0	Min = 0 Max = 2	3	Min = 3 Max ≥ 28.86
2010	Min = 0 Max = 2.62	1	0	0	0	Min = 1 Max ≥2.62
2011	Min = 0 Max = 2.98	0	0	Min = 0 Max = 1	0	Min = 0 Max ≥ 3.98
2012	No estimate[c]	0	0	0	1	1
2013	No estimate[c]	0	Min = 0 Max = 1	0	0	Min = 0 Max ≥ 1
Annual Average Mortality (2009–2013)				Minimum Estimated = 1 Maximum Estimated ≥ 7.5		

[a] Where given, these numbers are the average of the 2 minimum and 2 maximum mortality estimates for that year from Table 3.
[b] In years with bycatch estimates for the mid-Atlantic gillnet fishery, stranded animals recovered with gillnet gear attached would be accounted for in the estimate for that year. Therefore, stranded animals with attached gear are only included in the Total column when no bycatch estimate has been calculated for that year.
[c] Mortality analyses that use observer data are updated every 3 years. The next update is scheduled for 2015 and will include mortality estimates for years 2012-2014.

Strandings

Between 2009 and 2013, 1013 common bottlenose dolphins that could be potentially assigned to the Northern Migratory Coastal Stock stranded along the Atlantic coast between North Carolina and New York (Table 5; Northeast Regional Marine Mammal Stranding Network; Southeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014 (SER) and 17 June 2014 (NER)). It could not be determined if there was evidence of human interaction (HI) for 670 of these strandings, and for 248 it was determined there was no evidence of HI. The remaining 95 showed evidence of HI, of which 71 (75%) were fisheries interactions (Table 5). It should be recognized that evidence of HI does not indicate cause of death, but rather only that there was evidence of interaction with a fishery (e.g., line marks, net marks) or evidence of a boat strike, gunshot wound, mutilation, etc., at some point. Also, stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered

(Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

The assignment of animals to a particular stock is impossible in some seasons and regions, particularly in North Carolina, Virginia and Maryland. Therefore, the counts in Table 5 likely include some animals from the Southern Migratory Coastal and NNCES Stocks and therefore overestimate the number of strandings for the Northern Migratory Coastal Stock; those strandings that could not be definitively assigned to the Northern Migratory Coastal Stock were also included in the counts for these other stocks as appropriate. In addition, stranded carcasses are not routinely identified to either the offshore or coastal morphotype of bottlenose dolphin, therefore, it is possible that some of the reported strandings were of the offshore form though that number is likely to be low (Byrd *et al*. 2014).

A UME was declared in the summer of 2013 for the mid-Atlantic coast from New York to Brevard County, Florida. Beginning in July 2013, bottlenose dolphins have been stranding at elevated rates. The total number of stranded bottlenose dolphins from New York through North Florida (Brevard County) as of mid-October 2014 (1 July 2013 - 19 October 2014) was ~1546. Morbillivirus has been determined to be the cause of the event. Most strandings and morbillivirus positive animals have been recovered from the ocean side beaches rather than from within the estuaries, suggesting that at least so far coastal stocks have been more impacted by this UME than estuarine stocks. However, the UME is still ongoing as of December 2014 when this report was drafted, and work continues to determine the effect of this event on all bottlenose dolphin stocks in the Atlantic.

Table 5. Strandings of common bottlenose dolphins from North Carolina to New York during 2009 – 2013 that could have belonged to the Northern Migratory Coastal Stock. Assignments to stock were based upon the understanding of the seasonal movements of this stock. However, in waters of North Carolina and Virginia there is likely overlap with other stocks during particular times of year. HI = Evidence of Human Interaction, CBD = Cannot Be Determined whether an HI occurred or not. NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014 (SER) and 17 June 2014 (NER).

State	**2009**			**2010**			**2011**			**2012**			**2013**		
Type	HI Yes	HI No	CBD	HI Yes	HI No	CBD	HI Yes	HI No	CBD	HI Yes	HI No	CBD	HI Yes	HI No	CBD
North Carolina[a]	1[b]	3	18	4[c]	9	14	6[d]	16	22	11[e]	14	16	2[f]	21	36
Virginia[g]	10[h]	5	51	7[i]	6	33	7[j]	3	36	11[k]	7	37	9[l]	17	130
Maryland	0	0	1	1[m]	3	2	2[n]	1	4	0	2	2	3[o]	16	37
Delaware	1	0	10	3[p]	1	6	2	2	6	1	3	11	3[q]	1	56
New Jersey	4[r]	11	2	0	11	2	1[s]	14	4	2	10	10	3	56	90
New York	0	0	2	0	1	0	0	1	2	1[t]	2	4	0	12	26

Annual Total	119	103	129	144	518

[a] Strandings for North Carolina include data for November-April north of Cape Lookout when Northern Migratory Coastal animals may be in coastal waters. The stock identity of these strandings is highly uncertain and likely also includes animals from the NNCES Stock.
[b] Includes 1 fisheries interaction (FI).
[c] Includes 4 FIs.
[d] Includes 5 FIs.
[e] Includes 10 FIs, 2 of which had markings indicative of interactions with gillnet gear (mortalities).
[f] Includes 2 FIs, 1 of which had markings indicative of interactions with gillnet gear (mortality).
[g] Strandings from Virginia were assigned to stock based upon both location and time of year. Some of the strandings assigned to the Northern Migratory Coastal Stock could possibly be assigned to the Southern Migratory Coastal Stock or NNCES Stock.
[h] Includes 9 FIs. Two FIs were entanglement interactions in Virginia pound nets (mortalities); 4 FIs were mortalities with twisted twine markings indicative of interactions with Virginia pound net gear; 1 FI was an entanglement interaction with hook and line gear (mortality).
[i] Includes 7 FIs. Five FIs were mortalities with twisted twine markings indicative of interactions with Virginia pound
[j] Includes 6 FIs. One FI was an entanglement interaction in a Virginia pound net (mortality) and 2 FIs were mortalities with twisted twine markings indicative of interactions with Virginia pound net gear.
[k] Includes 7 FIs. One FI was an entanglement interaction with hook and line gear (mortality) and 1 FI was a mortality with twisted twine markings indicative of interactions with Virginia pound net gear.
[l] Includes 6 FIs, 1 of which was a mortality with twisted twine markings indicative of interactions with Virginia pound net gear.
[m] Includes 1 FI.
[n] Includes 1 FI.
[o] Includes 3 FIs, 1 of which was an entanglement interaction with gillnet gear (mortality, Chesapeake Bay inshore gillnet fishery).
[p] Includes 2 FIs, 1 of which was an entanglement interaction with gillnet gear (mortality, mid-Atlantic gillnet fishery).
[q] Includes 2 FIs.
[r] Includes 3 FIs, 2 of which were interactions with hook and line gear (mortalities).
[s] Includes 1 FI.
[t] Includes 1 FI.

HABITAT ISSUES

The coastal and estuarine habitats occupied by the coastal morphotype are adjacent to areas of high human population and some are highly industrialized. The blubber of stranded dolphins examined during the 1987-1988 mortality event contained very high concentrations of organic pollutants (Kuehl *et al.* 1991). More recent studies have examined persistent organic pollutant concentrations in common bottlenose dolphin tissues from several estuaries along the Atlantic coast and have likewise found evidence of high blubber concentrations particularly in estuaries near Charleston, South Carolina, and Beaufort, North Carolina (Hansen *et al.* 2004), and in portions of Biscayne Bay, Florida (Litz *et al.* 2007). The concentrations found in male dolphins from both of these sites exceeded toxic threshold values that may result in adverse effects on health or reproductive rates (Schwacke *et al.* 2002; Hansen *et al.* 2004). Studies of contaminant concentrations relative to life history parameters showed higher levels of mortality in first-born offspring and higher contaminant concentrations in these calves and in primiparous females (Wells *et al.* 2005). The exposure to environmental pollutants and subsequent effects on population health is an area of concern and active research.

STATUS OF STOCK

Common bottlenose dolphins are not listed as threatened or endangered under the Endangered Species Act, but the Northern Migratory Coastal Stock is a strategic stock due to the depleted listing under the MMPA. From 1995 to 2001, NMFS recognized only a single stock of coastal bottlenose dolphins in the WNA, and the entire stock was listed as depleted. This stock structure was revised in 2002 to recognize both multiple stocks and seasonal management units and again in 2008 and 2009 to recognize resident estuarine stocks and migratory and resident coastal stocks. This stock retains the depleted designation as a result of its origins from the original western North Atlantic Coastal Stock. PBR for the Northern Migratory Coastal Stock is 86 and so the zero mortality rate goal, 10% of PBR, is 8.6. The documented mean annual human-caused mortality for this stock for 2009–2013 ranged between a minimum of 1 and a maximum of 7.5. However, these estimates are biased low for the following reasons: 1) the total U.S. human-caused mortality and serious injury for the Northern Migratory Coastal Stock cannot be directly estimated because of the spatial overlap among the stocks of bottlenose dolphins that occupy waters of North Carolina and Virginia; 2) the mean annual fishery-related mortality from the mid-Atlantic gillnet fishery does not include estimates from the observer component for years 2012-2013; and 3) there are several commercial fisheries operating within this stock's boundaries that have little to no observer coverage. Therefore, the documented mortalities must be considered minimum estimates of total fishery-related mortality. There is insufficient information available to determine whether the total fishery-related mortality and serious injury is insignificant and approaching a zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Western North Atlantic Southern Migratory Coastal Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Geographic Range and Coastal Morphotype Habitat

In the western North Atlantic, the coastal morphotype of common bottlenose dolphins is continuously distributed in nearshore coastal and estuarine waters along the U.S. Atlantic coast south of Long Island, New York, around the Florida peninsula and into the Gulf of Mexico. Based on differences in mitochondrial DNA haplotype frequencies, coastal animals in the northern Gulf of Mexico and the western North Atlantic represent separate stocks (Rosel *et al.* 2009; Duffield and Wells 2002).

The coastal morphotype is morphologically and genetically distinct from the larger, more robust morphotype that occupies habitats further offshore in the western North Atlantic and Gulf of Mexico (Hoelzel *et al.* 1998; Mead and Potter 1995; Rosel *et al.* 2009; Vollmer 2011). Aerial surveys conducted between 1978 and 1982 (Kenney 1990) north of Cape Hatteras, North Carolina, identified two concentrations of bottlenose dolphins, one near the coast within the 25-m isobath and the other further offshore concentrated at the continental shelf edge. The lowest density of bottlenose dolphins was observed over the continental shelf. It was suggested, therefore, that north of Cape Hatteras, North Carolina, the coastal morphotype is restricted to waters < 25 m deep (Kenney 1990). Similar patterns were observed during warm water months in more recent aerial surveys (Garrison and Yeung 2001; Garrison *et al.* 2003). However, south of Cape Hatteras during both cold water and warm water months, there was no clear longitudinal discontinuity in bottlenose dolphin sightings (Garrison and Yeung 2001; Garrison *et al.* 2003).

To address the question of the distribution of coastal and offshore morphotypes in waters south of Cape Hatteras, tissue samples were collected in coastal, shelf and slope waters from New England to Florida between 1997 and 2006. Genetic analyses using mitochondrial DNA sequences of these biopsies identified individual animals to the coastal or offshore morphotype. Using the genetic results from all surveys combined, a logistic regression was used to model the probability that a particular bottlenose dolphin group was of the coastal morphotype as a function of environmental variables including depth, sea surface temperature, and distance from shore. These models were used to partition the bottlenose dolphin groups observed during aerial surveys between the two morphotypes (Garrison *et al.* 2003).

The genetic results and spatial patterns observed in aerial surveys indicate both regional and seasonal differences in the longitudinal distribution of the two morphotypes in coastal Atlantic waters. During warm water months, all biopsy samples collected from coastal waters north of Cape Lookout, North Carolina (< 20 m deep), were of the coastal morphotype, and all samples collected in deeper waters (> 40 m deep) were of the offshore morphotype. South of Cape Lookout, the probability of an observed bottlenose dolphin group being of the coastal morphotype declined with increasing depth. In intermediate depth waters, there was spatial overlap between the two morphotypes. Offshore morphotype bottlenose dolphins were observed at depths as shallow as 13 m, and coastal morphotype dolphins were observed at depths of 31 m and 75 km from shore (Garrison *et al*. 2003).

Cold water month samples were collected primarily from coastal waters in North Carolina and Georgia and the vast majority of them were of the coastal morphotype; however, one offshore morphotype group was sampled during November just south of Cape Lookout only 7.3 km from shore. Coastal morphotype samples were also collected farther away from shore at 33 m depth and 39 km from shore. The logistic regression model for this region indicated a decline in the probability of a coastal morphotype group with increasing distance from shore; however, the model predictions were highly uncertain due to limited sample sizes and spatial overlap between the two morphotypes. Samples collected in Georgia waters also indicated significant overlap between the two morphotypes with a declining probability of the coastal morphotype with increasing depth. A coastal morphotype sample was collected 112 km from shore and a depth of 38 m. An offshore sample was collected in 22 m depth at 40 km from shore. As with the North Carolina model, the Georgia logistic regression predictions are uncertain due to limited sample size and high overlap between the two morphotypes (Garrison *et al.* 2003).

In summary, the primary habitat of the coastal morphotype of bottlenose dolphin in the western North Atlantic extends from Florida to Long Island, New York, during warm water months and in waters less than 20 m deep, including estuarine and inshore waters. South of Cape Lookout, the coastal morphotype also occurs in lower densities over the continental shelf and overlaps spatially with the offshore morphotype.

Distinction Between Coastal and Estuarine Bottlenose Dolphins

In addition to inhabiting coastal nearshore waters, the coastal morphotype of common bottlenose dolphin also inhabits inshore estuarine waters along the U.S. east coast and Gulf of Mexico (Wells *et al.* 1987; Wells *et al.* 1996; Scott *et al.* 1990; Weller 1998; Zolman 2002; Speakman *et al.* 2006; Stolen *et al.* 2007; Balmer *et al.* 2008; Mazzoil *et al.* 2008). There are multiple lines of evidence supporting demographic separation between bottlenose dolphins residing within different estuaries along the Atlantic coast. For example, long-term photo-identification (photo-ID) studies in waters around Charleston, South Carolina, have identified communities of resident dolphins that are seen within relatively restricted home ranges year-round (Zolman 2002; Speakman *et al.* 2006). In Biscayne Bay, Florida, there is a similar community of bottlenose dolphins with evidence of year-round residents that are genetically distinct from animals residing in a nearby estuary in Florida Bay (Litz *et al.* 2012). The Indian River Lagoon system in central Florida also has a long-term photo-ID study, and this study identified year-round resident dolphins repeatedly observed across multiple years (Stolen *et al.* 2007; Mazzoil *et al.* 2008). A few published studies demonstrate that these resident animals are genetically distinct from animals in nearby coastal waters; a study conducted near Jacksonville, Florida, demonstrated significant genetic differences between animals in coastal and estuarine waters (Caldwell 2001; Rosel *et al.* 2009), and animals resident in the Charleston Estuarine System show significant genetic differentiation from animals biopsied in coastal waters of southern Georgia (Rosel *et al.* 2009).

Despite evidence for genetic differentiation between estuarine and coastal populations, the degree of spatial overlap between these populations remains unclear. Photo-ID studies within estuaries demonstrate seasonal immigration and emigration and the presence of transient animals (e.g., Speakman *et al.* 2006). In addition, the degree of movement of resident estuarine animals into coastal waters on seasonal or shorter time scales is poorly understood. Bottlenose dolphins inhabiting primarily estuarine habitats are considered distinct stocks from those inhabiting coastal habitats. Bottlenose dolphin stocks inhabiting coastal waters are the focus of this report.

Definition of the Southern Migratory Coastal Stock

Initially, a single stock of coastal morphotype common bottlenose dolphins was thought to migrate seasonally between New Jersey (warm water months) and central Florida based on seasonal patterns in strandings during a large scale mortality event occurring during 1987-1988 (Scott *et al.* 1988). However, re-analysis of stranding data (McLellan *et al.* 2003) and extensive analysis of genetic (Rosel *et al.* 2009), photo-ID (Zolman 2002), and satellite telemetry (Hohn and Hansen, NMFS unpublished data) data demonstrate a complex mosaic of coastal bottlenose dolphin stocks. Integrated analysis of these multiple lines of evidence suggests that there are 5 coastal stocks of bottlenose dolphins: the Northern Migratory and Southern Migratory Stocks, a South Carolina/Georgia Coastal Stock, a Northern Florida Coastal Stock and a Central Florida Coastal Stock.

Among the coastal stocks, the migratory movements and spatial distribution of the Southern Migratory Stock are the most poorly understood. Stable isotope analysis conducted using biopsy samples from free-ranging animals sampled in estuarine, nearshore coastal and offshore habitats suggested migratory movement of animals in coastal waters between Georgia in the cold water months and southern North Carolina during warm water months. In that study, $^{15}N\backslash^{14}N$, and $^{34}S\backslash^{32}S$ ratios of animals sampled off of Georgia during cold water months were similar to those of animals sampled in waters off of southern North Carolina, near Cape Fear, during cold water months (Knoff 2004). Satellite tag telemetry studies also provide evidence for a stock of dolphins migrating seasonally along the coast between North Carolina and northern Florida. Four dolphins were tagged during November 2004 just south of Cape Fear, North Carolina. One of these animals remained along the South Carolina and southern North Carolina coasts throughout January-February while another migrated south to Northern Florida through February. During March-June, these animals moved further north of the tagging site to Cape Hatteras, North Carolina. The tags did not last beyond June, and therefore, the movements of these animals after that time is unknown (Hohn and Hansen, NMFS unpublished data).

Genetic analyses indicate significant differentiation between bottlenose dolphins occupying coastal waters from the North Carolina/Virginia border to New Jersey during warm water months and those in southern North Carolina and further south (Rosel *et al.* 2009). In addition, tagging studies of animals occupying New Jersey waters during the warm water months indicate that animals from the Northern Migratory Coastal Stock do not move south of Cape Lookout, North Carolina during cold water months. These data support the hypothesis that the Northern Migratory Coastal Stock is distinct from the Southern Migratory Coastal Stock.

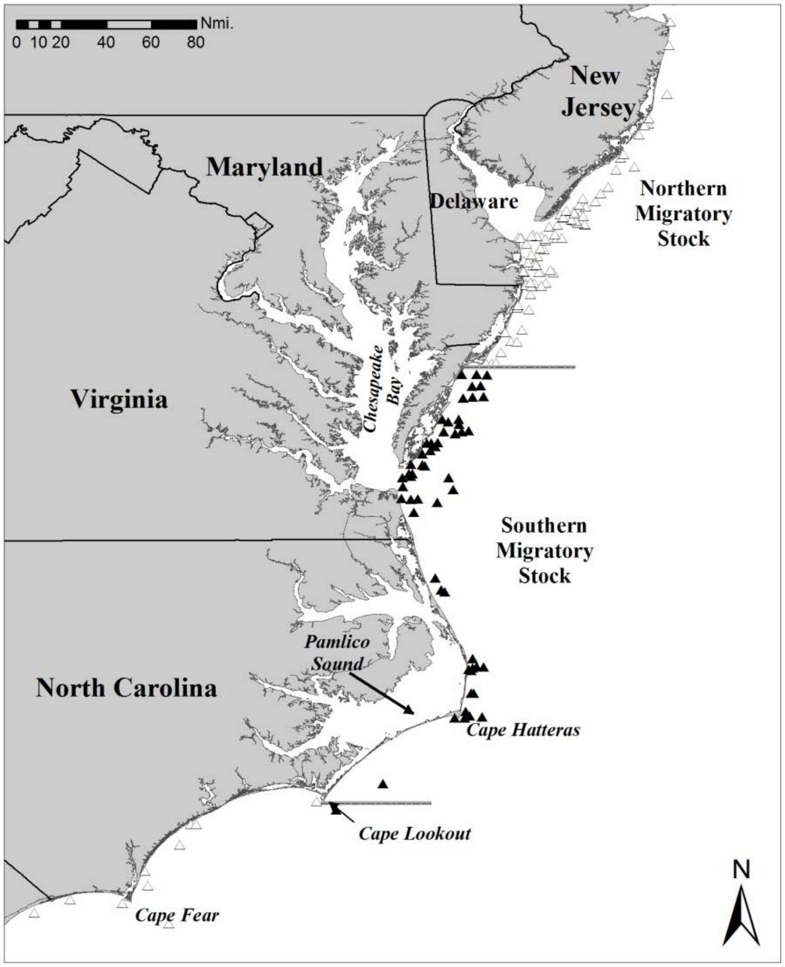

Figure 1. *The distribution of common bottlenose dolphin stocks occupying coastal waters from North Carolina to New Jersey during July-August 2002, 2004, 2010 and 2011. Sighting locations from aerial surveys are plotted as triangle symbols. Sightings assigned to the Southern Migratory Coastal Stock are shown as filled symbols. Horizontal lines intersecting the coast denote the northern and southern boundaries for the Southern Migratory Coastal Stock in warm water months.*

In summary, the limited data available support the definition of a Southern Migatory Stock of coastal morphotype bottlenose dolphins; however, there is a large amount of uncertainty in its spatial movements. The seasonal movements are best described by tag telemetry data. During October-December, telemetry data suggest this stock occupies waters of southern North Carolina (south of Cape Lookout) where it may overlap spatially with the Southern North Carolina Estuarine System Stock in coastal waters. During January-March, the Southern Migratory Stock appears to move as far south as northern Florida where it overlaps spatially with the South Carolina/Georgia and Northern Florida Coastal Stocks. During April-June, the stock moves north to North Carolina where it overlaps with the Southern North Carolina Estuarine System Stock and the Northern North Carolina Estuarine System Stock. During July-August, the stock is presumed to occupy coastal waters north of Cape Lookout, North Carolina, to the eastern shore of Virginia (Figure 1). It is possible that these animals also occur inside the Chesapeake Bay and in nearshore coastal waters where there is evidence that Northern North Carolina Estuarine System Stock animals also occur.

POPULATION SIZE

The best available estimate for the Southern Migratory Coastal Stock of common bottlenose dolphins in the western North Atlantic is 9,173 (CV=0.46; Table 1). This estimate is from aerial surveys conducted during the summers of 2010 and 2011 covering waters from Florida to New Jersey.

Earlier abundance estimates

Earlier abundance estimates for the Southern Migratory Coastal Stock were derived from aerial surveys conducted during the summer of 2002. Survey tracklines were set perpendicular to the shoreline and included coastal waters to depths of 40 m. These surveys employed two observer teams operating independently on the same aircraft to estimate visibility bias. In summer 2004, an additional aerial survey between central Florida and New

Jersey was conducted. As with the 2002 surveys, effort was stratified into 0-20 m and 20-40 m strata with the majority of effort in the shallow depth stratum. Observed common bottlenose dolphin groups from these were partitioned between the coastal and offshore morphotypes based upon analysis of available biopsy samples (Garrison *et al.* 2003). For the region north of Cape Hatteras, North Carolina, there was complete separation between the coastal and offshore morphotypes, with only coastal animals occupying waters < 20 m deep. Therefore, all animals observed in the 0-20 m depth stratum during surveys of this region were assigned to the coastal morphotype (Garrison *et al.* 2003).

Summer surveys are best for estimating the abundance for both the Northern and Southern Migratory Coastal Stocks because they overlap least with other stocks during summer months. An analysis of summer survey data from 1995, 2002 and 2004 demonstrated strong inter-annual variation in the spatial distribution of presumed Northern and Southern Migratory Coastal Stock animals. Two groups of dolphins in each survey year were identified using a multivariate cluster analysis of sightings based on water temperature, depth and latitude. One group ranged from Cape Lookout, North Carolina, to just north of the Chesapeake Bay mouth, and one ranged farther north along the eastern shore of Virginia to New Jersey. The southern group (i.e., the Southern Migratory Coastal Stock) was found in water temperatures between 26.5 and 28.0°C, and the northern group (i.e., the Northern Migratory Coastal Stock) occurred in cooler waters between 24.5 and 26.0°C. The spatial distribution of these groups was strongly correlated with water temperatures and varied between years. During the summer of 2004, water temperatures were significantly cooler than those during 2002, and animals from both groups were distributed farther south and overlapped spatially. Very few bottlenose dolphins were observed in waters north of Virginia during the summer 2004 survey. Therefore, it was not possible to develop an estimate of abundance for the Southern Migratory Coastal Stock from the summer 2004 survey, and so the best abundance estimate for the Southern Migratory Stock came from the summer 2002 survey when there was little overlap and an apparent separation from the Northern Migratory Coastal Stock at approximately 37.5°N latitude. The resulting abundance estimate for the Southern Migratory Coastal Stock was 12,482 (CV=0.32).

Recent surveys and abundance estimates

The Southeast Fisheries Science Center conducted aerial surveys of continental shelf waters along the U.S. East Coast from southeastern Florida to Cape May, New Jersey, during the summers of 2010 and 2011. The surveys were conducted along tracklines oriented perpendicular to the shoreline that were latitudinally spaced 20 km apart and covered waters from the shoreline to the continental shelf break. The summer 2010 survey was conducted during 24 July–14 August 2010, and 7,944 km of on-effort tracklines were completed. A total of 127 common bottlenose dolphin groups were observed including 1,541 animals. During the 2011 summer survey, 8,665 km of trackline were completed between Cape May, New Jersey, and Ft. Pierce, Florida. The survey was conducted during 6 July - 29 July 2011. The 2011 survey also included more closely spaced "fine-scale" tracklines in waters offshore of New Jersey and Virginia within areas being evaluated for the placement of offshore energy installations. A total of 112 bottlenose dolphin groups were observed including 1,339 animals.

Both the summer 2010 and 2011 surveys were conducted using a two-team approach to develop estimates of visibility bias using the independent observer approach with Distance analysis (Laake and Borchers 2004). However, the detection functions from both surveys indicated a decreased probability of detection near the trackline, which limited the effectiveness of the method for correcting for visibility bias due to a relatively small number of sightings made by both teams near the trackline. Abundance estimates were therefore derived by combining the sightings from both teams during a survey and "left-truncating" the data by analyzing only sightings occurring greater than 100 m from the trackline during the 2010 survey and 50 m during the 2011 survey (see Buckland *et al.* 2001 for left-truncation methodology). Detection functions were fit to these left-truncated data accounting for the effects of survey conditions (e.g., sea state, glare, water color) on the detection probabilities. A bootstrap resampling approach was used to estimate the variance of the estimates. The resulting abundance estimates assume that detection probability at the truncation distance is equal to 1. While the estimates could not be explicitly corrected for this assumption, analyses of the summer 2010 data suggest that this bias is likely small.

The abundance estimates for the Southern Migratory Coastal stock were based upon tracklines and sightings occurring between Cape Lookout, North Carolina, and Assateague, Virginia (37.5°N latitude) and in waters from the shoreline to the 20-m isobath. Prior analyses suggested that this latitudinal boundary separates the Northern and Southern Migratory Coastal Stocks. The abundance estimate derived from the summer 2010 survey was 10,093 (CV=0.52), and the estimate from the summer 2011 survey was 7,472 (CV=0.96). The best estimate is a weighted average of these two with higher weighting given to the more precise estimate from 2010. The resulting best estimate is 9,173 (CV=0.46).

Table 1. Summary of abundance estimates for the western North Atlantic Southern Migratory Coastal Stock of common bottlenose dolphins. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).			
Month/Year	Area	N_{best}	CV
July-August 2002	North Carolina to Virginia	12,482	0.32
July-August 2010 and 2011	North Carolina to Virginia	9,173	0.46

Minimum Population Estimate

The minimum population size (Nmin) was calculated as the lower bound of the 60% confidence interval for a lognormally distributed mean (Wade and Angliss 1997). The best estimate for the Southern Migratory Coastal Stock of common bottlenose dolphins is 9,173 (CV=0.46). The resulting minimum population estimate is 6,326.

Current Population Trend

A trend analysis has not been conducted for this stock. There are 2 estimates from the 2002 (12,482; CV=0.32) and 2010/2011 (9,173; CV=0.46) surveys. Methodological differences among the estimates need to be evaluated to quantify trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known for the Southern Migratory Coastal Stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of the Southern Migratory Coastal Stock of common bottlenose dolphins is 6,326. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factoris 0.5 because this stock is depleted. PBR for this stock of bottlenose dolphins is 63.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the Southern Migratory Coastal Stock during 2009–2013 is unknown because this stock is known to interact with unobserved fisheries (see below). The mean annual fishery-related mortality and serious injury for observed fisheries and strandings identified as fishery-caused ranged between 0 and 11.6. Additional mean annual mortality and serious injury due to other human-caused actions (fishery research) ranged from 0 to 0.4. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 ranged between 0 and 12.0. This range reflects the uncertainty in assigning observed or reported mortalities to a particular stock.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category I mid-Atlantic gillnet fishery; the Category II Chesapeake Bay inshore gillnet; Virginia pound net; Atlantic blue crab trap/pot; North Carolina roe mullet stop net; mid-Atlantic menhaden purse seine; mid-Atlantic haul/beach seine; Southeastern U.S. Atlantic shark gillnet; and Southeast Atlantic gillnet fisheries; and the Category III Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fishery. Detailed fishery information is presented in Appendix III.

With the exception of the mid-Atlantic gillnet fishery and U.S. Atlantic shark gillnet fishery, the above fisheries have limited or no systematic federal observer coverage, which prevents the estimation of total takes. The primary known source of estimated fishery mortality is the mid-Atlantic gillnet fishery, which affects the Northern Migratory, Southern Migratory, Northern North Carolina Estuarine System (NNCES) and Southern North Carolina Estuarine System (SNCES) Stocks of common bottlenose dolphins. Additional commercial trap/pot fisheries may impact the Southern Migratory Coastal Stock. At certain times of year, it is not possible to definitively assign mortalities to a specific stock because of the overlap amongst the 4 stocks around North Carolina.

Mid-Atlantic Gillnet

Background

This fishery has the highest documented level of mortality of coastal morphotype common bottlenose dolphins, and sink gillnet gear in North Carolina is its largest component in terms of fishing effort and observed takes. Because the Northern Migratory Coastal, Southern Migratory Coastal, NNCES and SNCES bottlenose dolphin stocks all occur in waters off of North Carolina, it is not possible to definitively assign every observed mortality, or extrapolated bycatch estimate, to a specific stock. Between 1995 and 2000 a total of 14 takes occurred, 13 mortalities and 1 live release: 1 in 1995 (mixed finfish), 1 in 1996 (spanish mackerel), 3 in 1998 (1 smooth dogfish, 1 spiny dogfish and 1 in beach-anchored gillnet targeting weakfish), 5 in 1999 (2 spiny dogfish, 1 striped bass, 1 shark, and 1 live release from gear targeting spanish mackerel), 4 in 2000 (1 kingfish, 1 spiny dogfish, 1 bluefish/smooth dogfish, and 1 in beach-anchored gillnet targeting striped bass). The observed takes occurred in gear off North Carolina (n=10), Virginia (n=2) and New Jersey (n=2).

The Bottlenose Dolphin Take Reduction Team was convened in October 2001, in part, to reduce bycatch in gillnet gear. While the Bottlenose Dolphin Take Reduction Plan (BDTRP) was being developed and implemented, there were 7 additional bottlenose dolphin mortalities observed in the mid-Atlantic gillnet fishery from 2001-2006. Three mortalities were observed in 2001 with 1 occurring off of northern North Carolina during April (monkfish fishery) and 2 occurring off of Virginia during November (striped bass fishery). Four additional mortalities were observed along the North Carolina coast near Cape Hatteras: 1 in May 2003 (Spanish mackerel), 1 in September 2005 (Spanish mackerel), 1 in September 2006 (Spanish mackerel), and 1 in October 2006 (king mackerel). The BDTRP was implemented in May 2006 and resulted in changes to gillnet gear configurations and fishing practices.

During 2007-2011 only 1 take was observed by the Southeast Fisheries Observer Program off the coast of northern North Carolina during the month of October. There were no observed takes by the Northeast Fisheries Observer Program (NEFOP) during 2007-2011.

Pre-Take Reduction Plan Mortality Estimation (2002-2006)

All available data from 1995 to 2006 were used to estimate total mortality of common bottlenose dolphins in the mid-Atlantic gillnet fishery. Three alternative approaches were used to estimate a pre-BDTRP bycatch rate for the period 2002-April 2006. First, a generalized linear model (GLM) approach was used similar to that described in Palka and Rossman (2001). The dataset used in the GLM approach included all observed trips and mortalities from 1995 to April 2006 filtered to include only trips that reflected fishing practices in effect during the period from 2002 to April 2006. Second, a simple ratio estimator of catch per unit effort (CPUE = observed catch / observed effort) was used based directly upon the observed data collected from 2002 to April 2006. Finally, a ratio estimator pooled across years 2002-April 2006 was used to estimate different CPUE values for the pre-BDTRP period. In each case, the annual reported fishery effort (represented as reported landings) was multiplied by the estimated bycatch rate to develop annual estimates of fishery-related mortality, again similar to the approach in Palka and Rossman (2001). To account for the uncertainty among the 3 alternative approaches, the average of the 3 model estimates (and the associated uncertainty) was used to estimate the mortality of bottlenose dolphins for this fishery (Table 2). The live release from 1999 and 2 takes from beach anchored gillnets reported in the background text were not included in this analysis. Only years 2002-Apr 2006 are reported here as a new analytical approach is described below for the most recent 5-year mortality analysis covering calendar years 2007-2011.

Table 2. Summary of the 2002-2006 incidental mortality of common bottlenose dolphins in the Southern Migratory Coastal Stock in commercial mid-Atlantic gillnet fisheries. The estimated annual and average mortality estimates are shown for the period prior to the implementation of the Bottlenose Dolphin Take Reduction Plan (pre-BDTRP) and after the implementation of the plan (post-BDTRP). Three alternative modeling approaches were used, and the average of the 3 was used to represent mortality estimates. The minimum and maximum estimates indicate the range of uncertainty in assigning observed bycatch to stock. Observer coverage is measured as a proportion of reported landings (tons of fish landed). Data are derived from the Northeast Observer program, NER dealer data, VMRC landings and NCDMF dealer data. Values in parentheses indicate the CV of the estimate. GLM = generalized linear model.

Period	Year	Observer Coverage	Min Annual Ratio	Min Pooled Ratio	Min GLM	Max Annual Ratio	Max Pooled Ratio	Max GLM
pre-BDTRP	2002	0.01	0	29.17 (0.97)	6.71 (0.40)	0	67.83 (0.68)	24.22 (0.45)
	2003	0.01	0	34.77 (0.68)	12.35 (0.36)	63.56 (0.99)	47.08 (0.97)	14.00 (0.40)
	2004	0.02	0	81.52 (0.97)	18.93 (0.39)	0	88.56 (0.68)	31.71 (0.45)
	2005	0.03	114.84 (1)	74.05 (0.68)	19.41 (0.42)	123.18 (1.02)	91.01 (0.97)	26.61 (0.45)
	Jan-Apr 2006	0.03	0	0	0.00	0	0	0.32 (0.42)
Annual Avg. pre-BDTRP			Minimum: 21.81 (CV=0.13)			Maximum: 34.03 (CV=0.12)		

During 2002-2006, there were 4 observed takes in the mid-Atlantic gillnet fishery that could potentially be assigned to the Southern Migratory Coastal Stock. Three of these occurred relatively close to shore and in areas of potential overlap with the NNCES Stock. A fourth occurred several kilometers from shore in northern North Carolina during summer months and, therefore, is most likely to be from the Southern Migratory Coastal Stock. As stated previously, observed mortalities (and effort) cannot be definitively assigned to a particular stock within certain regions and times of year; therefore, the minimum and maximum possible mortality of the Southern Migratory Coastal Stock are presented for comparison to PBR (Table 2).

Based upon these analyses, the minimum and maximum mean mortality estimates for the Southern Migratory Coastal Stock for the pre-BDTRP period (2002-Apr 2006) were 21.81 (CV=0.13) and 34.03 (CV=0.12) animals per year, respectively (Table 2).

Post-Take Reduction Plan Mortality Estimation (2007-2011)

Different from the pre-BDTRP analytical approach, only 2 alternative approaches were used to estimate common bottlenose dolphin bycatch rates during the post-BDTRP period: 1) a simple annual ratio estimator of CPUE per year based directly upon the observed data from 2007-2011 and 2) a pooled CPUE (where all observer data from 2007-2011 were combined into one sample to estimate CPUE). In each case, the annual reported fishery effort (defined as a fishing trip) was multiplied by the estimated bycatch rate to develop annual estimates of fishery-related mortality. There were not enough observed take events in the post-BDTRP data set to run a GLM. Similar to the pre-BDTRP analytical approach, to account for the uncertainty in these 2 alternative approaches, the average of the 2 model estimates (and the associated uncertainty) were used to estimate the mean mortality of common bottlenose dolphins for this fishery (Table 3). It should be noted that internal waters of Virginia and Maryland (*i.e.*, Chesapeake Bay) may be important habitat to the Southern Migratory Coastal Stock and were included in the estimation of bycatch mortality during 2007-2011.

During 2007-2011, 1 bottlenose dolphin take was observed (2009) by the Southeast Fishery Observer Program (SEFOP) off northern North Carolina that could potentially be assigned to the NNCES or the Northern or Southern Migratory Coastal Stocks. The animal was observed within 1.1 km of shore in a region where it is possible the estuarine animals can overlap in time and space with coastal migratory bottlenose dolphins. There were no takes observed by the Northeast Fisheries Observer Program (NEFOP) during 2007-2011. The combined NEFOP and SEFOP average observer coverage (measured in trips) for this fishery from 2007-2011 was 2.95% in state waters (0-3 miles) and 8.59% in federal waters (3-200 miles). The low level of coverage in state waters is likely insufficient to consistently detect rare bycatch events of common bottlenose dolphins in the mid-Atlantic commercial gillnet fishery.

Based upon these analyses, the minimum and maximum mean mortality estimates for the Southern Migratory Coastal Stock for the post-BDTRP period (2007-2011) were 0 and 10.94 (CV=0.30) animals per year, respectively (Table 3). However, based on documented serious injury and mortality in this fishery from both federal observer coverage and other data sources (see Table 4), mean annual mortality estimates are likely not zero. Specifically, in 2011 the stranding network recovered a dead dolphin from a fisherman who had incidentally caught it in a small-mesh gillnet targeting spot in southern North Carolina. This animal could have belonged to the Southern Migratory Coastal or SNCES Stock, and was included in the stranding database and the stranding totals in Table 5. Incidental takes have also been documented in research gillnet gear fished similarly to commercial gear (see Other Mortality section).

Table 3. Summary of 2007-2011 incidental mortality of common bottlenose dolphins in the Southern Migratory Coastal Stock in the commercial mid-Atlantic coastal gillnet fisheries. An average from two alternative analytical approaches was used to estimate total bycatch mortality. The minimum and maximum estimates indicate the range of uncertainty in assigning observed bycatch to a stock. Observer coverage is reported on an annual basis for the entire mid-Atlantic coastal gillnet fishery (excluding internal waters) as a proportion of total trips sampled. Data sources include the Northeast and Southeast Fisheries Observer Programs, Greater Atlantic Regional Fisheries Office Vessel Trip Reports, Virginia Marine Resources Commission Fisheries Landings, and North Carolina Division of Marine Fisheries Trip Ticket Program. Values in parentheses indicate the CV of the estimate.

Year	Observer Coverage	Min Annual Ratio	Min Pooled Ratio	Max Annual Ratio	Max Pooled Ratio
2007	0.05	0.00	0.00	0.00	12.01 (0.97)
2008	0.04	0.00	0.00	0.00	10.54 (0.97)
2009	0.04	0.00	0.00	64.18 (0.99)	11.04 (0.97)
2010	0.04	0.00	0.00	0.00	8.23 (0.97)
2011	0.02	0.00	0.00	0.00	8.67 (0.97)
Mean	0.04	0.00	0.00	12.84 (0.99)	10.10 (0.44)
		Mean Minimum: 0.00		Mean Maximum[1]: 10.94 (0.30)	

[1]Mean weighted by inverse of CVs and CV equals inverse of sum of weights

Chesapeake Bay Inshore Gillnet

During 2009–2013, there was 1 documented interaction between common bottlenose dolphins and inshore gillnet gear in Chesapeake Bay. In 2013 in Maryland, a dead dolphin was recovered entangled in 9-inch stretched mesh gillnet gear. This animal likely belonged to either the Northern or Southern Migratory Coastal Stock, and was included in the stranding database and the stranding totals presented in Table 5 (Northeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 17 June 2014). There is no observer coverage of this fishery within Maryland waters of Chesapeake Bay; within Virginia waters of Chesapeake Bay, there is a low level of observer coverage (<1%).

Virginia Pound Net

Historical and recent stranding network data report interactions between common bottlenose dolphins and pound nets in Virginia. During 2009–2013, 5 bottlenose dolphin strandings which could have belonged to the

Southern Migratory Coastal Stock were entangled in pound net gear in Virginia (4 in 2009, 1 in 2011; Northeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 17 June 2014). An additional 15 dolphins that could have belonged to the Southern Migratory Coastal Stock stranded with twisted twine markings indicative of interactions with pound net gear. These interactions occurred primarily inside estuarine waters near the mouth of the Chesapeake Bay and in summer months. The overall impact of the Virginia pound net fishery on the Southern Migratory Coastal Stock is unknown due to the limited information on the stock's movements, particularly whether or not it occurs within waters inside the mouth of the Chesapeake Bay.

Atlantic Blue Crab Trap/Pot

During 2009–2013, there was 1 reported mortality in 2009 of a common bottlenose dolphin entangled in blue crab trap/pot gear that could have belonged to either the Southern Migratory Coastal or SNCES Stock. Because there is no observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab traps/pots. However, stranding data indicate that interactions with trap/pot gear occur at some unknown level in North Carolina (Byrd *et al*. 2014) and other regions of the southeast U.S. (Noke and Odell 2002; Burdett and McFee 2004).

North Carolina Roe Mullet Stop Net

During 2009–2013, there was 1 reported mortality for which an animal was entangled in a stop net. This mortality occurred during November 2013 and the animal likely belonged to the NNCES or Southern Migratory Coastal Stock. This mortality was included in the stranding database and in the stranding totals presented in Table 5. This fishery has not had regular, ongoing federal or state observer coverage. However, the NMFS Beaufort laboratory observed this fishery in 2001-2002 (Byrd and Hohn 2010), and Duke University observed the fishery in 2005-2006 (Thayer *et al.* 2007). Entangled dolphins were not documented during these formal observations, but opportunistically observed historical takes of dolphins entangled in stop nets occurred in 1993 and 1999.

Mid-Atlantic Menhaden Purse Seine

The mid-Atlantic menhaden purse seine fishery historically reported an annual incidental take of 1 to 5 common bottlenose dolphins (NMFS 1991, pp. 5-73). This information has not been updated for some time. There has been very limited observer coverage since 2008, but no takes have been observed (see Appendix III).

Mid-Atlantic Haul/Beach Seine

There were no reports of mortality or serious injury during 2009–2013 in the mid-Atlantic haul/beach seine fishery, and no estimate of bycatch mortality is available. The mid-Atlantic haul/beach seine fishery had limited observer coverage by the NEFOP in 2009-2011. No observer coverage was allocated to this fishery in 2012 or 2013. Recent evidence for bycatch risk in this gear is limited. The most recent documented interaction is from 2007 when 1 dolphin was killed in a multifilament beach seine during a research project performed by the North Carolina Division of Marine Fisheries. This animal likely belonged to either the Northern Migratory or Southern Migratory Coastal Stock based on its location north of Oregon Inlet during June.

Southeastern U.S. Atlantic Shark Gillnet and Southeast Atlantic Gillnet

Gillnet fisheries targeting finfish and sharks operate in southeast waters between North Carolina and southern Florida. Historically, a drift net fishery targeting coastal sharks operated in waters in northern Florida during winter months that could have interacted with the Southern Migratory Stock. Bottlenose dolphin takes (n=2) in the drift net fisheries in this area were documented in 2002 and 2003 (Garrison 2007). Currently, gillnet fisheries include a number of different fishing methods and gear types including drift nets, "strike" fishing and anchored ("sink") gillnets. The majority of this fishing is reported from waters of North Carolina and central Florida, and very little effort is reported during winter months (January-March) within the range of the Southern Migratory Stock.

Hook and Line

During 2009–2013, 5 common bottlenose dolphin strandings (mortalities) that could have belonged to the Southern Migratory Coastal Stock were documented with evidence of hook and line gear ingestion or entanglement. During 2010 in South Carolina an animal that may have belonged to this stock or to the South Carolina/Georgia Coastal Stock was documented with ingested hook and line gear (wrapped around its goosebeak). In 2011 an additional animal stranded in South Carolina that may have belonged to this stock or to the South Carolina/Georgia Coastal Stock, and it had also ingested hook and line gear. In 2011 in Virginia, a dolphin that could have belonged to this stock or the NNCES Stock was documented entangled in hook and line gear. In 2012 in North Carolina, a dolphin that could have belonged to this stock or the NNCES Stock was documented with ingested hook and line gear. Finally, in 2012 in Virginia, a dolphin that could have belonged to this stock or the Northern Migratory Coastal Stock was documented entangled in hook and line gear. These mortalities were included in the stranding database and are included in the stranding totals presented in Table 5. It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Other Mortality

Historically and in recent years there have been occasional mortalities of bottlenose dolphins during research activities. One mortality was observed in research gear during 2009 in a small-mesh gillnet targeting Spanish mackerel, and a second mortality was observed in research gear during 2010 in a medium-mesh gillnet targeting sharks. These mortalities could have belonged to the NNCES or Southern Migratory Coastal Stock. The mortalities were included in the stranding database and are included in Table 5. All mortalities from known sources including commercial fisheries and research-related mortalities for the Southern Migratory Coastal Stock are summarized in Table 4.

Table 4. Summary of annual reported and estimated human-caused mortality of common bottlenose dolphins from the Southern Migratory Coastal Stock during 2009–2013 from observer data, stranding data and research takes. Where minimum and maximum values are reported in individual cells, there is uncertainty in the assignment of mortalities to this particular stock due to spatial overlap with other bottlenose dolphin stocks in certain areas and seasons. This is especially the case for strandings where the maximum number reported may truly be a minimum because not all strandings are detected. Therefore, to account for both scenarios, the maximum numbers under the total column are reported as the maximum greater than or equal to what was recovered.

Year	Mid-Atlantic Gillnet		Chesapeake Bay Inshore Gillnet (strandings)	Virginia Pound Net (strandings and observed)	Blue Crab Pot (strandings)	Hook and Line (strandings)	Research (incidental takes)	Total[b]
	Min/Max estimate extrapolated from observer data (only through 2011)[a]	Interactions known from stranding data or observer data						
2009	Min = 0 Max = 37.61	Min = 0 Max = 1	0	Min = 0 Max = 4	Min = 0 Max = 1	0	Min = 0 Max = 1	Min = 0 Max ≥ 43.61
2010	Min = 0 Max = 4.11	0	0	0	0	Min = 0 Max = 1	Min = 0 Max = 1	Min = 0 Max ≥ 6.11
2011	Min = 0 Max = 4.33	Min = 0 Max = 1	0	Min = 0 Max = 1	0	Min = 0 Max = 2	0	Min = 0 Max ≥ 7.33
2012	No estimate[c]	0	0	0	0	Min = 0 Max = 2	0	Min = 0 Max ≥ 2
2013	No estimate[c]	0	Min = 0 Max = 1	0	0	0	0	Min = 0 Max ≥ 1
Annual Average Mortality (2009–2013)				Minimum Estimated = 0 Maximum Estimated ≥ 12.0				

[a] Where given, these numbers are the average of the 2 minimum and 2 maximum mortality estimates for that year from Table 3.
[b] In years with bycatch estimates for the mid-Atlantic gillnet fishery, stranded animals recovered with gillnet gear attached would be accounted for in the estimate for that year. Therefore, stranded animals with attached gear are only included in the Total column when no bycatch estimate has been calculated for that year.
[c] Mortality analyses that use observer data are updated every 3 years. The next update is scheduled for 2015 and will include mortality estimates for years 2012-2014.

Strandings

During 2009–2013, 895 common bottlenose dolphins stranded along the Atlantic coast between Florida and Virginia that could potentially be assigned to the Southern Migratory Stock (Table 5; Northeast Regional Marine Mammal Stranding Network; Southeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014 (SER) and 17 June 2014 (NER)). It could not be determined if there was evidence of human interaction for 620 of these strandings, and for 175 it was determined there was no evidence of human interaction. The remaining 100 showed evidence of human interactions, of which 73 were fisheries interactions (Table 5). It should be recognized that evidence of human interaction does not indicate cause of death, but rather only that there was evidence of interaction with a fishery (e.g., line marks, net marks) or evidence of a boat strike, gunshot wound, mutilation, etc., at some point. Also, stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

The assignment of animals to a particular stock is impossible in some seasons and regions. During warm water months in North Carolina, Virginia and Maryland, the stock overlaps with the Northern Migratory Coastal, Northern North Carolina Estuarine System and the Southern North Carolina Estuarine System Stocks. During cold water months, the stock overlaps with the Southern North Carolina Estuarine System Stock, the South Carolina/Georgia Coastal Stock, and the Northern Florida Coastal Stock. Therefore, the counts in Table 5 likely include some animals from these other stocks and therefore overestimate the number of strandings for the Southern Migratory Coastal Stock; those strandings that could not be definitively assigned to the Southern Migratory Coastal Stock were also included in the counts for these other stocks as appropriate. In addition, stranded carcasses are not routinely identified to either the offshore or coastal morphotype of bottlenose dolphin, therefore it is possible that some of the reported strandings were of the offshore form though that number is likely to be low (Byrd *et al.* 2014).

An Unusual Mortality Event (UME) was declared in South Carolina during February-May 2011. Six strandings assigned to the Southern Migratory Coastal Stock were considered to be part of the UME. The cause of this UME is still under investigation. A UME was declared in the summer of 2013 for the mid-Atlantic coast from New York to Brevard County, Florida. Beginning in July 2013, bottlenose dolphins have been stranding at elevated rates. The total number of stranded bottlenose dolphins from New York through North Florida (Brevard County) as of mid-October 2014 (1 July 2013 - 19 October 2014) was ~1546. Morbillivirus has been determined to be the cause of the event. Most strandings and morbillivirus positive animals have been recovered from the ocean side beaches rather than from within the estuaries, suggesting that at least so far coastal stocks have been more impacted by this UME than estuarine stocks. However, the UME is still ongoing as of December 2014 when this report was drafted, and work continues to determine the effect of this event on all bottlenose dolphin stocks in the Atlantic.

Table 5. Strandings of common bottlenose dolphins from Virginia to Florida during 2009–2013 that could have belonged to the Southern Migratory Coastal Stock. Assignments to stock were based upon the understanding of the seasonal movements of this stock. However, in waters of North Carolina and Virginia there is likely overlap with other stocks during particular times of year. HI = Evidence of Human Interaction, CBD = Cannot Be Determined whether an HI occurred or not. NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014 (SER) and 17 June 2014 (NER).

State	2009			2010			2011			2012			2013		
Type	HI Yes	HI No	CBD	HI Yes	HI No	CBD	HI Yes	HI No	CBD	HI Yes	HI No	CBD	HI Yes	HI No	CBD
Maryland[a]	0	0	0	0	0	0	0	0	1	0	0	0	1[b]	0	8
Virginia[a]	14[c]	6	54	7[d]	6	38	7[e]	5	31	6[f]	5	32	14[g]	31	280
North Carolina[h]	9[i]	5	19	6[j]	17	18	10[k]	13	20	11[l]	10	12	10[m]	54	63
South Carolina[n] (Dec-Mar)	0	4	2	1[o]	3	1	1[p]	2	5	0	5	2	0	5	12
Georgia[q] (Jan-Feb)	0	0	0	0	0	2	2	0	2	0	1	0	0	1	5
Florida[q] (Jan-Feb)	0	1	1	0	0	3	0	1	4	0	0	2	1	0	3
Annual Total	115			102			104			86			488		

[a] Strandings from Virginia and Maryland were assigned to stock based upon location and time of year with most occurring between May and September that could be assigned to the Southern Migratory Coastal Stock. Some of these strandings could also be assigned to the Northern Migratory Coastal Stock or Northern North Carolina Estuarine System Stock.

[b] Includes 1 fisheries interaction (FI) that was an entanglement interaction with gillnet gear (mortality, Chesapeake Bay inshore gillnet fishery).

[c] Includes 14 FIs, 4 of which were entanglement interactions with Virginia pound nets (mortalities) and 8 FIs that were mortalities with twisted twine markings indicative of interactions with Virginia pound net gear.

[d] Includes 5 FIs, 4 of which were mortalities with twisted twine markings indicative of interactions with Virginia pound net gear.

[e] Includes 6 FIs. One FI was an entanglement interaction with hook and line gear (mortality), 1 was an entanglement interaction in a Virginia pound net (mortality), and 2 were mortalities with twisted twine markings indicative of interactions with Virginia pound net gear.

[f] Includes 3 FIs, 1 of which was an entanglement interaction with hook and line gear (mortality).

[g] Includes 9 FIs, 1 of which was a mortality with twisted twine markings indicative of an interaction with Virginia pound net gear.

[h] Strandings from North Carolina were assigned based on location and time of year. During summer and fall, some of these strandings could also be assigned to the Northern North Carolina Estuarine System or Southern North

Carolina Estuarine System Stocks.
[i] Includes 8 FIs, 1 of which was an entanglement interaction with commercial blue crab trap/pot gear (mortality). Also includes 1 incidental take in research gillnet gear (mortality).
[j] Includes 3 FIs, 1 of which was an and 1 incidental take in research experimental gillnet gear targeting shark (mortality).
[k] Includes 7 FIs, 1 of which was an entanglement interaction with gillnet gear (mortality, mid-Atlantic gillnet fishery).
[l] Includes 8 FIs, 3 of which had markings indicative of interactions with gillnet gear (mortalities), and 1 in which an animal ingested hook and line gear (mortality).
[m] Includes 7 FIs, 1 of which was an entanglement in a stop net (mortality, North Carolina roe mullet stop net fishery).
[n] Strandings in coastal waters from South Carolina during December-March are potentially from the Southern Migratory Coastal Stock or the South Carolina/Georgia Coastal Stock.
[o] Includes 1 FI in which an animal ingested hook and line gear (mortality).
[p] Includes 1 FI in which an animal ingested hook and line gear (mortality).
[q] Strandings in Georgia and northern Florida during January and February could also be assigned to the South Carolina/Georgia or the Northern Florida Coastal Stocks, respectively.

HABITAT ISSUES

The nearshore and estuarine habitats occupied by the coastal morphotype are adjacent to areas of high human population and some are highly industrialized. The blubber of stranded dolphins examined during the 1987-1988 mortality event contained very high concentrations of organic pollutants (Kuehl *et al*. 1991). More recent studies have examined persistent organic pollutant concentrations in common bottlenose dolphin tissues from several estuaries along the Atlantic coast and have likewise found evidence of high blubber concentrations particularly in estuaries near Charleston, South Carolina, and Beaufort, North Carolina (Hansen *et al.* 2004), and in portions of Biscayne Bay, Florida (Litz *et al.* 2007). The concentrations found in male dolphins from both of these sites exceeded toxic threshold values that may result in adverse effects on health or reproductive rates (Schwacke *et al.* 2002; Hansen *et al.* 2004). Studies of contaminant concentrations relative to life history parameters showed higher levels of mortality in first-born offspring and higher contaminant concentrations in these calves and in primiparous females (Wells *et al.* 2005). The exposure to environmental pollutants and subsequent effects on population health is an area of concern and active research.

STATUS OF STOCK

Common bottlenose dolphins are not listed as threatened or endangered under the Endangered Species Act, but the Southern Migratory Coastal Stock is a strategic stock due to the depleted listing under the MMPA. From 1995 to 2001, NMFS recognized only a single migratory stock of coastal morphotype bottlenose dolphins in the western North Atlantic, and the entire stock was listed as depleted. This stock structure was revised in 2002 to recognize both multiple stocks and seasonal management units and again in 2008 and 2009 to recognize resident estuarine stocks and migratory and resident coastal stocks. This stock retains the depleted designation as a result of its origins from the original western North Atlantic Coastal Stock. PBR for the Southern Migratory Coastal Stock is 63 and so the zero mortality rate goal, 10% of PBR, is 6.3. The documented mean annual human-caused mortality for this stock for 2009 – 2013 ranged between a minimum of 0 and a maximum of 12.0. However, these estimates are biased low for the following reasons: 1) the total U.S. human-caused mortality and serious injury for the Southern Migratory Coastal Stock cannot be directly estimated because of the spatial overlap among the stocks of bottlenose dolphins that occupy waters of North Carolina; 2) the mean annual fishery-related mortality from the mid-Atlantic gillnet fishery does not include estimates from the observer component for years 2012-2013; and 3) there are several commercial fisheries operating within this stock's boundaries that have little to no observer coverage. Therefore, the documented mortalities must be considered minimum estimates of total fishery-related mortality. There is insufficient information available to determine whether the total fishery-related mortality and serious injury is approaching a zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Western North Atlantic South Carolina/Georgia Coastal Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Geographic Range and Coastal Morphotype Habitat

In the western North Atlantic, the coastal morphotype of common bottlenose dolphins is continuously distributed in nearshore coastal and estuarine waters along the U.S. Atlantic coast south of Long Island, New York, around the Florida peninsula and into the Gulf of Mexico. Based on differences in mitochondrial DNA haplotype frequencies, coastal animals in the northern Gulf of Mexico and the western North Atlantic represent separate stocks (Duffield and Wells 2002; Rosel *et al.* 2009). The coastal morphotype is morphologically and genetically distinct from the larger, more robust morphotype that occupies habitats further offshore in the western North Atlantic and Gulf of Mexico (Mead and Potter 1995; Hoelzel *et al.* 1998; Rosel *et al.* 2009; Vollmer 2011). Aerial surveys conducted between 1978 and 1982 (Kenney 1990) north of Cape Hatteras, North Carolina, identified two concentrations of bottlenose dolphins, one near the coast within the 25-m isobath and the other further offshore concentrated at the continental shelf edge. The lowest density of bottlenose dolphins was observed over the continental shelf. It was suggested, therefore, that north of Cape Hatteras, North Carolina, the coastal morphotype is restricted to waters <25 m deep (Kenney 1990). Similar patterns were observed during summer months in more recent aerial surveys (Garrison and Yeung 2001; Garrison *et al.* 2003). However, south of Cape Hatteras during both winter and summer months, there was no clear longitudinal discontinuity in bottlenose dolphin sightings (Garrison and Yeung 2001; Garrison *et al.* 2003).

To address the question of the distribution of coastal and offshore morphotypes in waters south of Cape Hatteras, tissue samples were collected in coastal, shelf and slope waters from New England to Florida between 1997 and 2006. Genetic analyses using mitochondrial DNA sequences of these biopsies identified individual animals to the coastal or offshore morphotype. Using the genetic results from all surveys combined, a logistic regression was used to model the probability that a particular bottlenose dolphin group was of the coastal morphotype as a function of environmental variables including depth, sea surface temperature and distance from shore. These models were used to partition the bottlenose dolphin groups observed during aerial surveys between the two morphotypes (Garrison *et al.* 2003).

The genetic results and spatial patterns observed in aerial surveys indicate both regional and seasonal differences in the longitudinal distribution of the two morphotypes in coastal Atlantic waters. During summer months, all biopsy samples collected from coastal waters north of Cape Lookout, North Carolina (<20 m deep) were of the coastal morphotype, and all samples collected in deeper waters (>40 m deep) were of the offshore morphotype. South of Cape Lookout, the probability of an observed bottlenose dolphin group being of the coastal morphotype declined with increasing depth. In intermediate depth waters, there was spatial overlap between the two morphotypes. Offshore morphotype bottlenose dolphins were observed at depths as shallow as 13 m, and coastal morphotype dolphins were observed at depths of 31 m and 75 km from shore (Garrison *et al*. 2003).

Winter samples were collected primarily from coastal waters in North Carolina and Georgia and the vast majority of them were of the coastal morphotype; however, one offshore morphotype group was sampled during November just south of Cape Lookout only 7.3 km from shore. Coastal morphotype samples were also collected farther away from shore at 33 m depth and 39 km from shore. The logistic regression model for this region indicated a decline in the probability of a coastal morphotype group with increasing distance from shore; however, the model predictions were highly uncertain due to limited sample sizes and spatial overlap between the two morphotypes. Samples collected in Georgia waters also indicated significant overlap between the two morphotypes with a declining probability of the coastal morphotype with increasing depth. A coastal morphotype sample was collected 112 km from shore at a depth of 38 m. An offshore sample was collected in 22 m depth at 40 km from shore. As with the North Carolina model, the Georgia logistic regression predictions are uncertain due to limited sample size and high overlap between the two morphotypes (Garrison *et al.* 2003).

In summary, the primary habitat of the coastal morphotype of bottlenose dolphin extends from Florida to Long Island, New York, during summer months and in waters less than 20 m deep, including estuarine and inshore waters. South of Cape Lookout, the coastal morphotype also occurs in lower densities over the continental shelf and overlaps spatially with the offshore morphotype.

Distinction between Coastal and Estuarine Bottlenose Dolphins

In addition to inhabiting coastal nearshore waters, the coastal morphotype of common bottlenose dolphin also inhabits inshore estuarine waters along the U.S. east coast and Gulf of Mexico (Wells *et al.* 1987; Scott *et al.* 1990; Wells *et al.* 1996; Weller 1998; Zolman 2002; Speakman *et al.* 2006; Stolen *et al.* 2007; Balmer *et al.* 2008; Mazzoil *et al*. 2008). There are multiple lines of evidence supporting demographic separation between bottlenose dolphins residing within different estuaries along the Atlantic coast. For example, long-term photo-identification (photo-ID) studies in waters around Charleston, South Carolina, have identified communities of resident dolphins that are seen within relatively restricted home ranges year-round (Zolman 2002; Speakman *et al.* 2006). In Biscayne Bay, Florida, there is a similar community of bottlenose dolphins with evidence of year-round residents that are genetically distinct from animals residing in a nearby estuary in Florida Bay (Litz *et al.* 2012). A long-term photo-ID study in the Indian River Lagoon system in central Florida has also identified year-round resident dolphins repeatedly observed across multiple years (Stolen *et al.* 2007; Mazzoil *et al.* 2008). A few published studies demonstrate that these resident animals are genetically distinct from animals in nearby coastal waters. A study conducted near Jacksonville, Florida, demonstrated significant genetic differences between animals in coastal and estuarine waters (Caldwell 2001; Rosel *et al*. 2009) and animals resident in the Charleston estuarine system show significant genetic differentiation from animals biopsied in coastal waters of southern Georgia (Rosel *et al*. 2009).

Despite evidence for genetic differentiation between estuarine and coastal populations, the degree of spatial overlap between these populations remains unclear. Photo-ID studies within estuaries demonstrate seasonal immigration and emigration and the presence of transient animals (e.g., Speakman *et al.* 2006). In addition, the degree of movement of resident estuarine animals into coastal waters on seasonal or shorter time scales is poorly understood. Bottlenose dolphins inhabiting primarily estuarine habitats are considered distinct stocks from those inhabiting coastal habitats. Bottlenose dolphin stocks inhabiting coastal waters are the focus of this report.

Definition of the South Carolina/Georgia Coastal Stock

Initially, a single stock of coastal morphotype common bottlenose dolphins was thought to migrate seasonally between New Jersey (summer months) and central Florida based on seasonal patterns in strandings during a large scale mortality event occurring during 1987-1988 (Scott *et al.* 1988). However, re-analysis of stranding data (McLellan *et al.* 2003) and extensive analysis of genetic (Rosel *et al.* 2009), photo-ID (Zolman 2002) and satellite telemetry (Hohn and Hansen, NMFS unpublished data) data demonstrate a complex mosaic of coastal bottlenose dolphin stocks. Integrated analysis of these multiple lines of evidence suggests that there are 5 coastal stocks of bottlenose dolphins: the Northern Migratory and Southern Migratory Stocks, a South Carolina/Georgia Coastal Stock, a Northern Florida Coastal Stock and a Central Florida Coastal Stock.

The spatial extent of these stocks, their potential seasonal movements, and their relationships with estuarine stocks are poorly understood. Migratory movement and spatial distribution of the Northern Migratory Coastal Stock is best understood based on tag-telemetry, photo-ID and aerial survey data. This stock migrates seasonally between coastal waters of central North Carolina and New Jersey. It is not thought to overlap with the South Carolina/Georgia Coastal Stock in any season. The Southern Migratory Coastal Stock is defined primarily on satellite tag telemetry studies and is thought to migrate south from waters of southern Virginia and north central North Carolina in the summer to waters south of Cape Fear and as far south as coastal Florida during winter months, where it could overlap with the South Carolina/Georgia Coastal Stock..

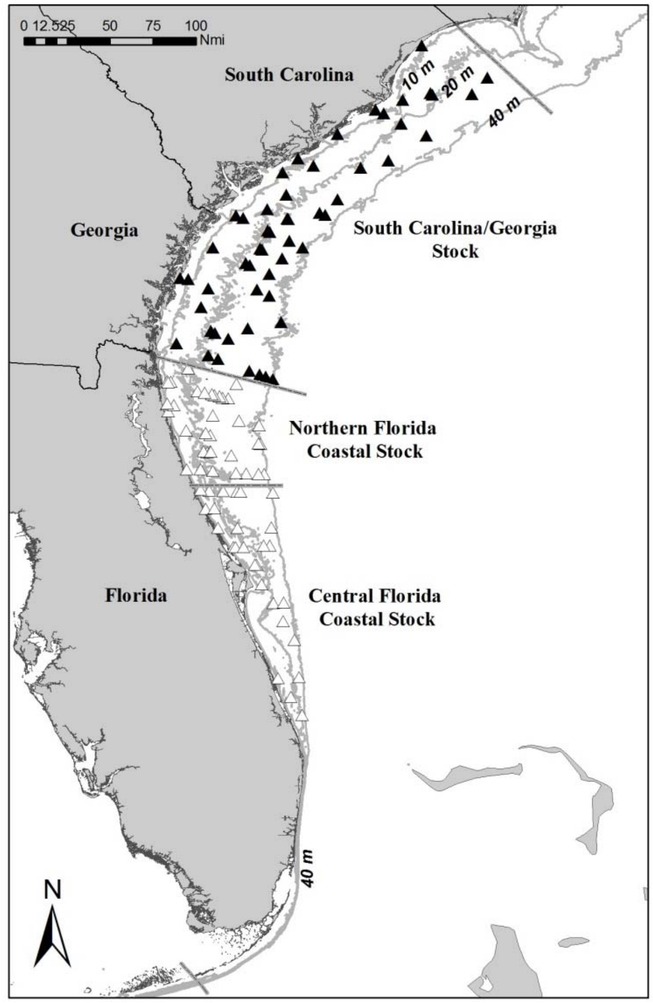

Figure 1. *The South Carolina/Georgia Coastal stock of common bottlenose dolphins (North Carolina/South Carolina border to the Georgia/Florida border). Symbols represent all sightings of bottlenose dolphin groups from NMFS 2010 and 2011 aerial surveys; dark symbols-groups within the boundaries of this stock. In waters >20 m, sightings may include the offshore morphotype of bottlenose dolphins.*

During summer months when the Southern Migratory Stock is found in waters north of Cape Fear, North Carolina, bottlenose dolphins are still seen in coastal waters of South Carolina, Georgia and Florida, indicating the presence of additional stocks of coastal animals. Speakman *et al.* (2006) using photo-ID studies documented dolphins in coastal waters off Charleston, South Carolina, that are not known resident members of the estuarine stock. Genetic analyses of samples from northern Florida, Georgia and central South Carolina (primarily the estuaries around Charleston), using both mitochondrial DNA and nuclear microsatellite markers, indicate significant genetic differences between these areas (NMFS 2001; Rosel *et al.* 2009). This stock assessment report addresses the South Carolina/Georgia Coastal Stock, which is present in coastal Atlantic waters from the North Carolina/South Carolina border south to the Georgia/Florida border (Figure 1). There is no obvious boundary defining the offshore extent of this stock. The combined genetic and logistic regression analysis (Garrison *et al.* 2003) indicated that in waters less than 10 m depth, 70% of the bottlenose dolphins were of the coastal morphotype. Between 10 and 20 m depth, the percentage of animals of the coastal morphotype dropped precipitously and at depths >40 m nearly all (>90%) animals were of the offshore morphotype. However, in winter months, the Southern Migratory Stock (also of the coastal morphotype) moves into this region in waters 10-30 m depth complicating the ability to define ocean-side boundaries for the South Carolina/Georgia Coastal Stock.

POPULATION SIZE

The best available estimate for the South Carolina/Georgia Coastal Stock of common bottlenose dolphins in the western North Atlantic is 4,377 (CV=0.43; Table 1). This estimate is from aerial surveys conducted during the summers of 2010 and 2011 covering waters from Florida to New Jersey.

Earlier abundance estimates

Earlier abundance estimates for the South Carolina/Georgia Coastal stock were derived from aerial surveys conducted during the summer of 2002 and 2004. Survey tracklines were set perpendicular to the shoreline and included coastal waters to depths of 40 m. These surveys employed two observer teams operating independently on the same aircraft to estimate visibility bias. In summer 2004, an additional aerial survey between central Florida and New Jersey was conducted. As with the 2002 surveys, effort was stratified into 0-20 m and 20-40 m strata with the majority of effort in the shallow depth stratum. Observed common bottlenose dolphin groups from these were partitioned between the coastal and offshore morphotypes based upon analysis of available biopsy samples (Garrison *et al.* 2003). The previous best abundance estimate was based upon a weighted average of the estimates from the 2002 and 2004 aerial surveys. This estimate was 7,738 (CV=0.23).

Recent surveys and abundance estimates

The Southeast Fisheries Science Center conducted aerial surveys of continental shelf waters along the U.S. East Coast from southeastern Florida to Cape May, New Jersey, during the summers of 2010 and 2011. The surveys were conducted along tracklines oriented perpendicular to the shoreline that were latitudinally spaced 20 km apart and covered waters from the shoreline to the continental shelf break. The summer 2010 survey was conducted during 24 July–14 August 2010, and 7,944 km of on-effort tracklines were completed. A total of 127 common bottlenose dolphin groups were observed including 1,541 animals. During the 2011 summer survey, 8,665 km of trackline were completed between Cape May, New Jersey and Ft. Pierce, Florida. The survey was conducted during 6 July - 29 July 2011. The 2011 survey also included more closely spaced “fine-scale” tracklines in waters offshore of New Jersey and Virginia within areas being evaluated for the placement of offshore energy installations. A total of 112 bottlenose dolphin groups were observed, including 1,339 animals.

Both the summer 2010 and 2011 surveys were conducted using a two-team approach to develop estimates of visibility bias using the independent observer approach with Distance analysis (Laake and Borchers 2004). However, the detection functions from both surveys indicated a decreased probability of detection near the trackline, which limited the effectiveness of the method for correcting for visibility bias due to a relatively small number of sightings made by both teams near the trackline. Abundance estimates were therefore derived by combining the sightings from both teams during a survey and “left-truncating” the data by analyzing only sightings occurring greater than 100 m from the trackline during the 2010 survey and 50 m during the 2011 survey (Buckland *et al.* 2001). Detection functions were fit to these left-truncated data accounting for the effects of survey conditions (e.g., sea state, glare, water color) on the detection probabilities. A logistic regression model was used to estimate the probability that a given group of dolphins observed during the aerial survey was of the coastal vs. offshore morphotype as a function of water depth (Garrison *et al.* 2003). This probability was incorporated into the abundance estimation to derive an estimate of coastal morphotype dolphins observed during the 2010 and 2011 aerial surveys. A bootstrap resampling approach was used to estimate the variance of the estimates. The resulting abundance estimates assume that detection probability at the truncation distance is equal to 1. While the estimates could not be explicitly corrected for this assumption, analyses of the summer 2010 data suggest that this bias is likely small.

The abundance estimates for the South Carolina/Georgia Coastal Stock were based upon tracklines and sightings occurring between the North Carolina/South Carolina border and the Georgia/Florida border and in waters from the shoreline to the 40-m isobath. The abundance estimate derived from the summer 2010 survey was 6,350 (CV=0.53), and the estimate from the summer 2011 survey was 2,160 (CV=0.59). The best estimate is a weighted average of these two with higher weighting given to the more precise estimate from 2010. The resulting best estimate is 4,377 (CV=0.43).

Table 1. Summary of abundance estimates for the western North Atlantic South Carolina/Georgia Coastal Stock of common bottlenose dolphins. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Summer 2002 and 2004	Georgia/Florida border to South Carolina/North Carolina border	7,738	0.23
Summer 2010 and 2011	Georgia/Florida border to South Carolina/North Carolina border	4,377	0.43

Minimum Population Estimate

The minimum population size (Nmin) for the stock was calculated as the lower bound of the 60% confidence interval for a log-normally distributed mean (Wade and Angliss 1997). The best estimate for the South Carolina/Georgia Coastal Stock is 4,377 (CV=0.43). The resulting minimum population estimate is 3,097.

Current Population Trend

A trend analysis has not been conducted for this stock. There are 2 estimates from the 2002/2004 (7,738; CV=0.23) and 2010/2011 (4,377; CV=0.43) surveys. Methodological differences between the estimates need to be evaluated to quantify trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known for the western North Atlantic coastal morphotype. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a “recovery” factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of the South Carolina/Georgia Coastal Stock of common bottlenose dolphins is 3,097. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is depleted. PBR for this stock of common bottlenose dolphins is 31.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury within the South Carolina/Georgia Coastal Stock Stock during 2009–2013 is unknown because this stock is known to interact with unobserved fisheries (see below). The mean annual fishery-related mortality and serious injury for observed fisheries and strandings identified as fishery-caused ranged between 1.0 and 1.4. Additional mean annual mortality and serious injury due to other human-caused actions (fishery research) was 0.2. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 ranged between 1.2 and 1.6. The range reflects the uncertainty in assigning observed or reported mortalities to a particular stock.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category II Southeastern U.S. Atlantic shark gillnet; Southeast Atlantic gillnet; Southeastern U.S. Atlantic shrimp trawl; and Atlantic blue crab trap/pot fisheries; and the Category III Georgia cannonball jellyfish trawl; and Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fisheries. Limited or no observer data are available for these and other fisheries that may interact with this stock. Detailed fishery information is presented in Appendix III.

Southeastern U.S. Atlantic Shark Gillnet and Southeast Atlantic Gillnet

Gillnet fisheries targeting finfish and sharks operate in southeast waters between North Carolina and southern Florida. These fisheries include a number of different fishing methods and gear types including drift nets, “strike” fishing, and anchored (“sink”) gillnets. The majority of this fishing is reported from waters of North Carolina and central Florida. A small number of trips are reported annually within the bounds of the South Carolina/Georgia Coastal Stock. There has been occasional observer coverage of sets within the stock boundaries. No takes have been observed.

Shrimp Trawl

During 2009–2013, 1 common bottlenose dolphin mortality occurred in association with the shrimp trawl fishery. Through the Marine Mammal Authorization Program, a fisherman self-reported a mortality in 2013 off South Carolina in which a dolphin became entangled in his commercial shrimp trawl. This mortality was also included in the stranding database. Prior to this interaction, the most recent documented interaction was another self-reported take in a commercial shrimp trawl in South Carolina during 2002. No other common bottlenose dolphin mortality or serious injury has been reported to NMFS for the shrimp trawl fishery. There has been very little systematic observer coverage of this fishery during the last decade.

Atlantic Blue Crab Trap/Pot

The blue crab trap pot fishery only rarely fishes in coastal waters of South Carolina and Georgia during winter months. Thus coastal dolphins rarely have the opportunity to encounter trap pots. However, during 2009–2013, 1 stranded carcass was found entangled around its peduncle in commercial blue crab pot, line and buoy gear. In addition to animals included in the stranding database, during 2009–2013, there was 1 at-sea observation in the South Carolina/Georgia Coastal Stock area of a live dolphin entangled in crab trap/pot gear (Maze-Foley and Garrison in prep a,b,c). The observation occurred during 2013, and it could not be determined if the dolphin was seriously injured or not. Because there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab traps/pots.

Georgia Cannonball Jellyfish Trawl

During 2009–2013, 2 common bottlenose dolphins were incidentally captured by commercial fishing vessels trawling for cannonball jellyfish. These mortalities occurred during 2011 and 2012 off the Georgia coast. The Georgia Department of Natural Resources (GADNR) places observers on fishing vessels operating in state and adjacent federal waters to assess bycatch in this permitted experimental fishery (J. Page, GADNR, pers. comm.).

Hook and Line

During 2009–2013, 2 dolphins were documented with ingested hook and line gear. During 2010 in the South Carolina/Georgia Coastal Stock area, 1 dolphin was documented with ingested hook and line gear wrapped around its goosebeak. In 2011 an additional animal was documented with ingested hook and line gear. These dolphins could have belonged to the South Carolina/Georgia Coastal or Southern Migratory Coastal Stocks. These mortalities were both included in the stranding database. It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Other Mortality

In 2012, 1 common bottlenose dolphin mortality occurred incidental to a research trawl off South Carolina. One mortality occurred during 2013 in a recreational gillnet in South Carolina. Because this was a recreational, not commercial net, it does not fall under the Southeast Atlantic gillnet fishery. These mortalities were included in the stranding database.

There were 249 stranded common bottlenose dolphins documented between 2009 and 2013 in the waters of the South Carolina/Georgia Coastal Stock (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). It could not be determined if there was evidence of human interaction for 150 of these strandings, and for 84 it was determined there was no evidence of human interaction. The remaining 15 showed evidence of human interactions, including 8 fishery interactions (FIs). As mentioned above, 1 of the FIs was a carcass found entangled in commercial blue crab trap/pot gear, 2 FIs consisted of ingested hook and line gear, 1 was an entanglement in a commercial shrimp trawl, and 1 was an entanglement with recreational gillnet gear. In addition, 1 mortality occurred in a research trawl. It is worth noting that during winter months, the South Carolina/Georgia Coastal Stock overlaps with the Southern Migratory Coastal Stock and it is currently not possible to distinguish between them. Hence during winter months, stranded dolphins could come from either of these two stocks. Some (56) of the 249 strandings are also included in the stranding total for the Southern Migratory Coastal Stock. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

An Unusual Mortality Event (UME) was declared in South Carolina during February-May 2011. Fourteen strandings assigned to the South Carolina/Georgia Coastal Stock were considered to be part of the UME. The cause of this UME was undetermined. A UME was declared in the summer of 2013 for the mid-Atlantic coast from New York to Brevard County, Florida. Beginning in July 2013, bottlenose dolphins have been stranding at elevated rates. The total number of stranded bottlenose dolphins from New York through North Florida (Brevard County) as of mid-October 2014 (1 July 2013 - 19 October 2014) was ~1546. Morbillivirus has been determined to be the cause of the event. Most strandings and morbillivirus positive animals have been recovered from the ocean side beaches rather than from within the estuaries, suggesting that at least so far coastal stocks have been more impacted by this UME than estuarine stocks. However, the UME is still ongoing as of December 2014 when this report was drafted, and work continues to determine the effect of this event on all bottlenose dolphin stocks in the Atlantic.

HABITAT ISSUES

The nearshore and estuarine habitats occupied by the coastal morphotype are adjacent to areas of high human population and some are highly industrialized. The blubber of stranded dolphins examined during the 1987-1988 mortality event contained very high concentrations of organic pollutants (Kuehl *et al*. 1991). More recent studies have examined persistent organic pollutant concentrations in bottlenose dolphin inhabiting estuaries along the Atlantic coast and have likewise found evidence of high blubber concentrations particularly near Charleston, South Carolina, and Beaufort, North Carolina (Hansen *et al.* 2004). The concentrations found in male dolphins from both of these sites exceeded toxic threshold values that may result in adverse effects on health or reproductive rates (Schwacke *et al.* 2002; Hansen *et al.* 2004). Studies of contaminant concentrations relative to life history parameters showed higher levels of mortality in first-born offspring and higher contaminant concentrations in these calves and in primiparous females (Wells *et al.* 2005). The exposure to environmental pollutants and subsequent effects on population health is an area of concern and active research.

STATUS OF STOCK

Common bottlenose dolphins are not listed as threatened or endangered under the Endangered Species Act, but the South Carolina/Georgia Coastal Stock is a strategic stock due to the depleted listing under the Marine Mammal Protection Act. From 1995 to 2001, NMFS recognized only a single migratory stock of coastal bottlenose dolphins in the western North Atlantic, and the entire stock was listed as depleted. This stock structure was revised in 2002 to recognize both multiple stocks and seasonal management units and again in 2008 and 2010 to recognize resident estuarine stocks and migratory and resident coastal stocks. This stock retains the depleted designation as a result of its origins from the originally delineated depleted coastal migratory stock. PBR for the South Carolina/Georgia Coastal Stock is 31 and so the zero mortality rate goal, 10% of PBR, is 3.1. The documented mean annual human-caused mortality for this stock for 2009–2013 ranged from 1.2 to 1.6. However, there are several commercial fisheries operating within this stock's boundaries and these fisheries have little to no observer coverage. Therefore, the documented mortalities must be considered minimum estimates of total fishery-related mortality. Insufficient information is available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching a zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Western North Atlantic Northern Florida Coastal Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Geographic Range and Coastal Morphotype Habitat

In the western North Atlantic, the coastal morphotype of common bottlenose dolphins is continuously distributed in nearshore coastal and estuarine waters along the U.S. Atlantic coast south of Long Island, New York, around the Florida peninsula and into the Gulf of Mexico. Based on differences in mitochondrial DNA haplotype frequencies, nearshore animals in the northern Gulf of Mexico and the western North Atlantic represent separate stocks (Duffield and Wells 2002; Rosel *et al.* 2009). The coastal morphotype is morphologically and genetically distinct from the larger, more robust morphotype that occupies habitats further offshore in the western North Atlantic and Gulf of Mexico (Mead and Potter 1995; Hoelzel *et al.* 1998; Rosel *et al.* 2009; Vollmer 2011). Aerial surveys conducted between 1978 and 1982 (Kenney 1990) north of Cape Hatteras, North Carolina, identified two concentrations of bottlenose dolphins, one near the coast within the 25-m isobath and the other further offshore concentrated at the continental shelf edge. The lowest density of bottlenose dolphins was observed over the continental shelf. It was suggested, therefore, that north of Cape Hatteras, North Carolina, the coastal morphotype is restricted to waters <25 m deep (Kenney 1990). Similar patterns were observed during summer months in more recent aerial surveys (Garrison and Yeung 2001; Garrison *et al.* 2003). However, south of Cape Hatteras during both winter and summer months, there was no clear longitudinal discontinuity in bottlenose dolphin sightings (Garrison and Yeung 2001; Garrison *et al.* 2003).

To address the question of the distribution of coastal and offshore morphotypes in waters south of Cape Hatteras, tissue samples were collected in coastal, shelf and slope waters from New England to Florida between 1997 and 2006. Genetic analyses using mitochondrial DNA sequences of these biopsies identified individual animals to the coastal or offshore morphotype. Using the genetic results from all surveys combined, a logistic regression was used to model the probability that a particular bottlenose dolphin group was of the coastal morphotype as a function of environmental variables including depth, sea surface temperature and distance from shore. These models were used to partition the bottlenose dolphin groups observed during aerial surveys between the two morphotypes (Garrison *et al.* 2003).

The genetic results and spatial patterns observed in aerial surveys indicate both regional and seasonal differences in the longitudinal distribution of the two morphotypes in coastal Atlantic waters. During summer months, all biopsy samples collected from coastal waters north of Cape Lookout, North Carolina (<20 m deep) were of the coastal morphotype, and all samples collected in deeper waters (>40 m deep) were of the offshore morphotype. South of Cape Lookout, the probability of an observed bottlenose dolphin group being of the coastal morphotype declined with increasing depth. In intermediate depth waters, there was spatial overlap between the two morphotypes. Offshore morphotype bottlenose dolphins were observed at depths as shallow as 13 m, and coastal morphotype dolphins were observed at depths of 31 m and 75 km from shore (Garrison *et al*. 2003).

Winter samples were collected primarily from coastal waters in North Carolina and Georgia and the vast majority of them were of the coastal morphotype; however, one offshore morphotype group was sampled during November just south of Cape Lookout only 7.3 km from shore. Coastal morphotype samples were also collected farther away from shore at 33 m depth and 39 km from shore. The logistic regression model for this region indicated a decline in the probability of a coastal morphotype group with increasing distance from shore; however, the model predictions were highly uncertain due to limited sample sizes and spatial overlap between the two morphotypes. Samples collected in Georgia waters also indicated significant overlap between the two morphotypes with a declining probability of the coastal morphotype with increasing depth. A coastal morphotype sample was collected 112 km from shore at a depth of 38 m. An offshore sample was collected in 22 m depth at 40 km from shore. As with the North Carolina model, the Georgia logistic regression predictions are uncertain due to limited sample size and high overlap between the two morphotypes (Garrison *et al*. 2003).

In summary, the primary habitat of the coastal morphotype of bottlenose dolphin in the western North Atlantic extends from Florida to Long Island, New York, during summer months and in waters less than 20 m deep, including estuarine and inshore waters. South of Cape Lookout, the coastal morphotype also occurs in lower densities over the continental shelf and overlaps spatially with the offshore morphotype.

Distinction between Coastal and Estuarine Bottlenose Dolphins

In addition to inhabiting coastal nearshore waters, the coastal morphotype of common bottlenose dolphin also inhabits inshore estuarine waters along the U.S. east coast and Gulf of Mexico (Wells *et al.* 1987; Scott *et al.* 1990; Wells *et al.* 1996; Weller 1998; Zolman 2002; Speakman *et al.* 2006; Stolen *et al.* 2007; Balmer *et al.* 2008; Mazzoil *et al.* 2008). There are multiple lines of evidence supporting demographic separation between bottlenose dolphins residing within different estuaries along the Atlantic coast. For example, long-term photo-identification (photo-ID) studies in waters around Charleston, South Carolina, have identified communities of resident dolphins that are seen within relatively restricted home ranges year-round (Zolman 2002; Speakman *et al.* 2006). In Biscayne Bay, Florida, there is a similar community of bottlenose dolphins with evidence of year-round residents that are genetically distinct from animals residing in a nearby estuary in Florida Bay (Litz *et al.* 2012). A long-term photo-ID study in the Indian River Lagoon system in central Florida has also identified year-round resident dolphins repeatedly observed across multiple years (Stolen *et al.* 2007; Mazzoil *et al.* 2008). A few published studies demonstrate that these resident animals are genetically distinct from animals in nearby coastal waters. A study conducted near Jacksonville, Florida, demonstrated significant genetic differences between animals in coastal and estuarine waters (Caldwell 2001; Rosel *et al.* 2009) and animals resident in the Charleston estuarine system show significant genetic differentiation from animals biopsied in coastal waters of southern Georgia (Rosel *et al*. 2009).

Despite evidence for genetic differentiation between estuarine and coastal populations, the degree of spatial overlap between these populations remains unclear. Photo-ID studies within estuaries demonstrate seasonal immigration and emigration and the presence of transient animals (e.g., Speakman *et al.* 2006). In addition, the degree of movement of resident estuarine animals into coastal waters on seasonal or shorter time scales is poorly understood. Bottlenose dolphins inhabiting primarily estuarine habitats are considered distinct stocks from those inhabiting coastal habitats. Bottlenose dolphin stocks inhabiting coastal waters are the focus of this report.

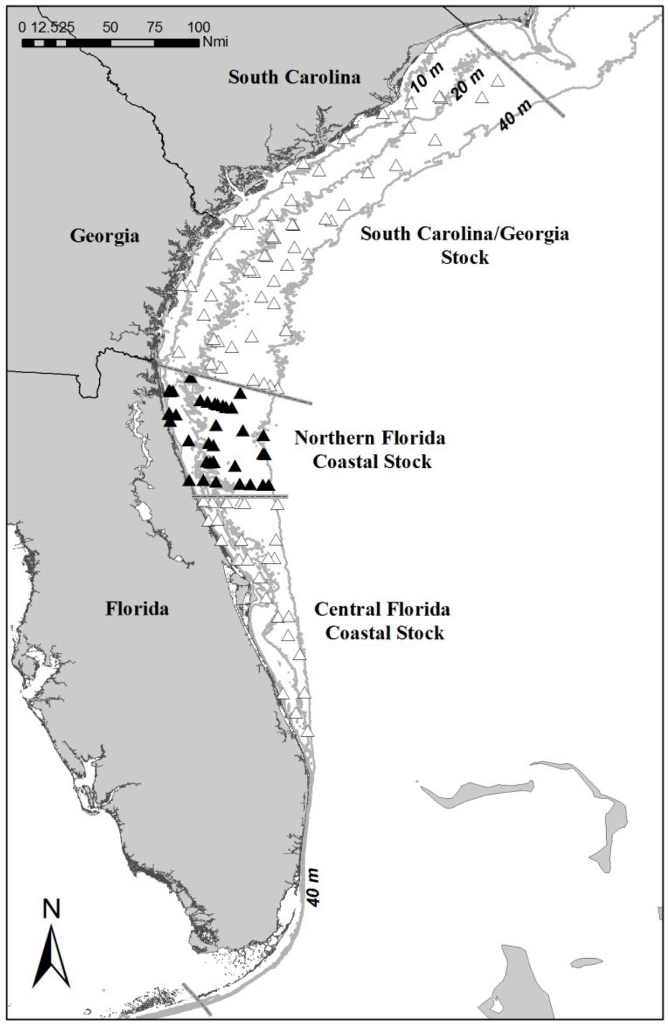

Figure 1. *The Northern Florida Coastal Stock of common bottlenose dolphins (Georgia/Florida border to 29.4°N). Symbols represent all sightings of bottlenose dolphin groups from NMFS 2010 and 2011 aerial surveys; dark symbols- groups within the boundaries of this stock. In waters > 20 m, sightings may include the offshore morphotype of bottlenose dolphins.*

Definition of the Northern Florida Coastal Stock

Initially, a single stock of coastal morphotype common bottlenose dolphins was thought to migrate seasonally between New Jersey (summer months) and central Florida based on seasonal patterns in strandings during a large scale mortality event occurring during 1987-1988 (Scott *et al.* 1988). However, re-analysis of stranding data (McLellan *et al.* 2003) and extensive analysis of genetic (Rosel *et al.* 2009), photo-ID (Zolman 2002) and satellite telemetry (Hansen and Hohn, NMFS unpublished data) data demonstrate a complex mosaic of coastal bottlenose dolphin stocks. Integrated analysis of these multiple lines of evidence suggests that there are five coastal stocks of bottlenose dolphins: the Northern Migratory and Southern Migratory Stocks, a South Carolina/Georgia Coastal Stock, a Northern Florida Coastal Stock and a Central Florida

Coastal Stock.

The spatial extent of these stocks, their potential seasonal movements, and their relationships with estuarine stocks are poorly understood. Migratory movement and spatial distribution of the Northern Migratory Stock is best understood based on tag-telemetry, photo-ID and aerial survey data and migrates seasonally between coastal waters of central North Carolina and New Jersey. It is not thought to overlap with the Northern Florida Coastal Stock in any season. The Southern Migratory Coastal Stock is defined primarily on satellite tag telemetry studies and is thought to migrate south from waters of southern Virginia and north central North Carolina in the summer to waters south of Cape Fear and as far south as coastal Florida during winter months. While it is possible that this stock overlaps during winter with the northern range of the Northern Florida Coastal Stock, more data are needed to confirm this overlap.

During summer months when the Southern Migratory Coastal Stock is found in waters north of Cape Fear, North Carolina, bottlenose dolphins are still seen in coastal waters of South Carolina, Georgia and Florida, indicating the presence of additional stocks of coastal animals. Speakman *et al.* (2006) using photo-ID studies documented dolphins in coastal waters off Charleston, South Carolina, that are not known resident members of the estuarine stock. Genetic analyses of samples from northern Florida, Georgia and central South Carolina (primarily the estuaries around Charleston), using both mitochondrial DNA and nuclear microsatellite markers, indicate significant genetic differences between these areas (NMFS 2001; Rosel *et al.* 2009). This stock assessment report addresses the Northern Florida Coastal Stock, which is present in coastal Atlantic waters from the Georgia/Florida border south to 29.4°N (Figure 1). There is no obvious boundary defining the offshore extent of this stock. The combined genetic and logistic regression analysis (Garrison *et al.* 2003) indicated that in waters less than 10 m depth, 70% of the bottlenose dolphins were of the coastal morphotype. Between 10 and 20 m depth, the percentage of animals of the coastal morphotype dropped precipitously and at depths >40 m nearly all (>90%) animals were of the offshore morphotype. However, in winter months, the Southern Migratory Stock moves into this region in waters 10-30 m depth complicating the ability to define ocean-side boundaries for the Northern Florida Coastal Stock.

POPULATION SIZE

The best available estimate for the Northern Florida Coastal Stock of common bottlenose dolphins in the western North Atlantic is 1,219 (CV=0.67; Table 1). This estimate is from aerial surveys conducted during the summers of 2010 and 2011 covering waters from Florida to New Jersey.

Earlier abundance estimates

Earlier abundance estimates for the Northern Florida Coastal Stock were derived from aerial surveys conducted during the summer of 2002 and 2004. Survey tracklines were set perpendicular to the shoreline and included coastal waters to depths of 40 m. These surveys employed two observer teams operating independently on the same aircraft to estimate visibility bias. In summer 2004, an additional aerial survey between central Florida and New Jersey was conducted. As with the 2002 surveys, effort was stratified into 0-20 m and 20-40 m strata with the majority of effort in the shallow depth stratum. Observed common bottlenose dolphin groups from these were partitioned between the coastal and offshore morphotypes based upon analysis of available biopsy samples (Garrison *et al.* 2003). The previous best abundance estimate was based upon an average of the estimates from the 2002 and 2004 aerial surveys. This estimate was 3,064 (CV=0.24).

Recent surveys and abundance estimates

The Southeast Fisheries Science Center conducted aerial surveys of continental shelf waters along the U.S. East Coast from southeastern Florida to Cape May, New Jersey, during the summers of 2010 and 2011. The surveys were conducted along tracklines oriented perpendicular to the shoreline that were latitudinally spaced 20 km apart and covered waters from the shoreline to the continental shelf break. The summer 2010 survey was conducted during 24 July–14 August 2010, and 7,944 km of on-effort tracklines completed. A total of 127 common bottlenose dolphin groups were observed including 1,541 animals. During the 2011 summer survey, 8,665 km of trackline were completed between Cape May, New Jersey and Ft. Pierce, Florida. The survey was conducted during 6 July - 29 July 2011. The 2011 survey also included more closely spaced “fine-scale” tracklines in waters offshore of New Jersey and Virginia within areas being evaluated for the placement of offshore energy installations. A total of 112 bottlenose dolphin groups were observed including 1,339 animals.

Both the summer 2010 and 2011 surveys were conducted using a two-team approach to develop estimates of visibility bias using the independent observer approach with Distance analysis (Laake and Borchers 2004). However, the detection functions from both surveys indicated a decreased probability of detection near the trackline, which limited the effectiveness of the method for correcting for visibility bias due to a relatively small number of sightings made by both teams near the trackline. Abundance estimates were therefore derived by combining the sightings from both teams during a survey and "left-truncating" the data by analyzing only sightings occurring greater than 100 m from the trackline during the 2010 survey and 50 m during the 2011 survey (Buckland *et al.* 2001). Detection functions were fit to these left-truncated data accounting for the effects of survey conditions (e.g., sea state, glare, water color) on the detection probabilities. A logistic regression model was used to estimate the probability that a given group of dolphins observed during the aerial survey was of the coastal vs. offshore morphotype as a function of water depth (Garrison *et al.* 2003). This probability was incorporated into the abundance estimation to derive an estimate of coastal morphotype dolphins observed during the 2010 and 2011 aerial surveys. A bootstrap resampling approach was used to estimate the variance of the estimates. The resulting abundance estimates assume that detection probability at the truncation distance is equal to 1. While the estimates could not be explicitly corrected for this assumption, analyses of the summer 2010 data suggest that this bias is likely small.

The abundance estimates for the Northern Florida Coastal Stock were based upon tracklines and sightings occurring between the Georgia/Florida border and 29.4°N latitude and in waters from the shoreline to the 40-m isobath. The abundance estimate derived from the summer 2010 survey was 751 (CV=0.83), and the estimate from the summer 2011 survey was 1,730 (CV=0.90). The best estimate is a weighted average of these two with higher weighting given to the more precise estimate from 2010. The resulting best estimate is 1,219 (CV=0.67).

Table 1. Summary of abundance estimates for the western North Atlantic Northern Florida Coastal Stock of common bottlenose dolphins. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Summer 2002 and 2004	Georgia/Florida border to 29.4°N latitude	3,064	0.24
Summer 2010 and 2011	Georgia/Florida border to 29.4°N latitude	1,219	0.67

Minimum Population Estimate

The minimum population size (Nmin) for the stock was calculated as the lower bound of the 60% confidence interval for a log-normally distributed mean (Wade and Angliss 1997). The best estimate for the Northern Florida Coastal Stock is 1,219 (CV=0.67). The resulting minimum population estimate is 730.

Current Population Trend

A trend analysis has not been conducted for this stock. There are 2 estimates from the 2002/2004 (3,064; CV=0.24) and 2010/2011 (1,219; CV=0.67) surveys. Methodological differences between the estimates need to be evaluated to quantify trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known for the western North Atlantic coastal morphotype. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of the Northern Florida Coastal Stock of common bottlenose dolphins is 730. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is depleted. PBR for this stock of common bottlenose dolphins is 7.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the Northern Florida Coastal Stock during 2009–2013 is unknown because this stock is known to interact with unobserved fisheries (see below). The average annual fishery-related mortality and serious injury for strandings identified as fishery-caused was 0.4. No additional mortality or serious injury was documented from other human-caused actions. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 0.4.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category II Southeastern U.S. Atlantic shark gillnet; Southeast Atlantic gillnet; and Atlantic blue crab trap/pot fisheries; and the Category III Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fishery. Only limited observer data are available for these and other fisheries that may interact with this stock. Detailed fishery information is presented in Appendix III.

Southeastern U.S. Atlantic Shark Gillnet and Southeast Atlantic Gillnet

Gillnet fisheries targeting finfish and sharks operate in southeast waters between North Carolina and southern Florida. Historically, a drift net fishery targeting coastal sharks operated in waters including within the Northern Florida Coastal Stock boundaries during winter months. Common bottlenose dolphin takes (n=2) in the drift net fisheries were documented in 2002 and 2003 just south of the range of the Northern Florida Coastal Stock (Garrison 2007). Currently, gillnet fisheries include a number of different fishing methods and gear types including drift nets, “strike” fishing, and anchored (“sink”) gillnets. The majority of this fishing is reported from waters of North Carolina and central Florida. There have been no observed bottlenose dolphin takes within the stock boundaries.

Atlantic Blue Crab Trap/Pot

During 2009–2013, 1 stranded animal (2009 mortality) assigned to the Northern Florida Coastal Stock was entangled in 2 commercial blue crab traps/pots. The 2 traps were wrapped tightly around the tail stock and fluke juncture. Because there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab traps/pots.

Hook and Line

During 2009–2013 in the Northern Florida Coastal Stock area, 1 stranded dolphin (2010 mortality) was documented with ingested hook and line gear. It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Other Mortality

During 2009–2013, 138 stranded common bottlenose dolphins were recovered in the waters of the Northern Florida Coastal Stock (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 13 September 2012). It could not be determined if there was evidence of human interaction for 110 of these strandings, and for 20 it was determined there was no evidence of human interaction. The remaining 8 showed evidence of human interactions, including 3 fishery interactions. As mentioned above, 1 of the fishery interactions was an animal entangled in 2 blue crab traps, and another was an animal that had ingested hook and line gear. It is worth noting that during winter months, the Northern Florida Coastal Stock likely overlaps with the Southern Migratory Coastal Stock and it is currently not possible to distinguish between them. Hence during winter months, stranded dolphins could come from either of these 2 stocks. Some (16) of the 138 strandings are also included in the stranding total for the Southern Migratory Coastal Stock. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

An Unusual Mortality Event (UME) was declared in the summer of 2013 for the mid-Atlantic coast from New York to Brevard County, Florida. Beginning in July 2013, bottlenose dolphins have been stranding at elevated rates. The total number of stranded bottlenose dolphins from New York through North Florida (Brevard County) as of mid-October 2014 (1 July 2013 - 19 October 2014) was ~1546. Morbillivirus has been determined to be the cause of the event. Most strandings and morbillivirus positive animals have been recovered from the ocean side beaches rather than from within the estuaries, suggesting that at least so far coastal stocks have been more impacted by this UME than estuarine stocks. However, the UME is still ongoing as of December 2014 when this report was drafted, and work continues to determine the effect of this event on all bottlenose dolphin stocks in the Atlantic.

HABITAT ISSUES

The nearshore and estuarine habitats occupied by the coastal morphotype are adjacent to areas of high human population and some are highly industrialized. The blubber of stranded dolphins examined during the 1987-1988 mortality event contained very high concentrations of organic pollutants (Kuehl *et al.* 1991). More recent studies have examined persistent organic pollutant concentrations in bottlenose dolphin inhabiting estuaries along the Atlantic coast and have likewise found evidence of high blubber concentrations, particularly near Charleston, South Carolina, and Beaufort, North Carolina (Hansen *et al.* 2004). The concentrations found in male dolphins from both of these sites exceeded toxic threshold values that may result in adverse effects on health or reproductive rates (Schwacke *et al.* 2002; Hansen *et al.* 2004). Studies of contaminant concentrations relative to life history parameters showed higher levels of mortality in first-born offspring and higher contaminant concentrations in these calves and in primiparous females (Wells *et al.* 2005). The exposure to environmental pollutants and subsequent effects on population health is an area of concern and active research.

STATUS OF STOCK

Common bottlenose dolphins are not listed as threatened or endangered under the Endangered Species Act, but the Northern Florida Coastal Stock is a strategic stock due to the depleted listing under the Marine Mammal Protection Act. From 1995 to 2001, NMFS recognized only a single migratory stock of coastal bottlenose dolphins in the western North Atlantic, and the entire stock was listed as depleted. This stock structure was revised in 2002 to recognize both multiple stocks and seasonal management units and again in 2008 and 2010 to recognize resident estuarine stocks and migratory and resident coastal stocks. This stock retains the depleted designation as a result of its origins from the originally delineated depleted coastal migratory stock. PBR for the Northern Florida Coastal Stock is 7 and so the zero mortality rate goal, 10% of PBR, is 0.7. The documented mean annual human-caused mortality for this stock for 2009–2013 was 0.4. However, there are several commercial fisheries operating within this stock's boundaries and these fisheries have little to no observer coverage. Therefore, the documented mortalities must be considered minimum estimates of total fishery-related mortality. Insufficient information is available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching a zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Western North Atlantic Central Florida Coastal Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Geographic Range and Coastal Morphotype Habitat

In the western North Atlantic the coastal morphotype of common bottlenose dolphins is continuously distributed in nearshore coastal and estuarine waters along the U.S. Atlantic coast south of Long Island, New York, around the Florida peninsula and into the Gulf of Mexico. Based on differences in mitochondrial DNA haplotype frequencies, coastal animals in the northern Gulf of Mexico and the western North Atlantic represent separate stocks (Duffield and Wells 2002; Rosel *et al.* 2009).

The coastal morphotype is morphologically and genetically distinct from the larger, more robust morphotype that occupies habitats further offshore in the western North Atlantic and Gulf of Mexico (Mead and Potter 1995; Hoelzel *et al.* 1998; Rosel *et al.* 2009; Vollmer 2011). Aerial surveys conducted between 1978 and 1982 (Kenney 1990) north of Cape Hatteras, North Carolina identified two concentrations of bottlenose dolphins, one near the coast within the 25-m isobath and the other further offshore concentrated at the continental shelf edge. The lowest density of bottlenose dolphins was observed over the continental shelf. It was suggested, therefore, that north of Cape Hatteras, North Carolina, the coastal morphotype is restricted to waters <25 m deep (Kenney 1990). Similar patterns were observed during summer months in more recent aerial surveys (Garrison and Yeung 2001; Garrison *et al.* 2003). However, south of Cape Hatteras during both winter and summer months, there was no clear longitudinal discontinuity in bottlenose dolphin sightings (Garrison and Yeung 2001; Garrison *et al.* 2003).

To address the question of the distribution of coastal and offshore morphotypes in waters south of Cape Hatteras, tissue samples were collected in coastal, shelf and slope waters from New England to Florida between 1997 and 2006. Genetic analyses using mitochondrial DNA sequences of these biopsies identified individual animals to the coastal or offshore morphotype. Using the genetic results from all surveys combined, a logistic regression was used to model the probability that a particular bottlenose dolphin group was of the coastal morphotype as a function of environmental variables including depth, sea surface temperature and distance from shore. These models were used to partition the bottlenose dolphin groups observed during aerial surveys between the two morphotypes (Garrison *et al.* 2003).

The genetic results and spatial patterns observed in aerial surveys indicate both regional and seasonal differences in the longitudinal distribution of the two morphotypes in coastal Atlantic waters. During summer months, all biopsy samples collected from coastal waters north of Cape Lookout, North Carolina (<20 m deep) were of the coastal morphotype, and all samples collected in deeper waters (>40 m deep) were of the offshore morphotype. South of Cape Lookout, the probability of an observed bottlenose dolphin group being of the coastal morphotype declined with increasing depth. In intermediate depth waters, there was spatial overlap between the two morphotypes. Offshore morphotype bottlenose dolphins were observed at depths as shallow as 13 m, and coastal morphotype dolphins were observed at depths of 31 m and 75 km from shore (Garrison *et al*. 2003).

Winter samples were collected primarily from coastal waters in North Carolina and Georgia and the vast majority of them were of the coastal morphotype; however, one offshore morphotype group was sampled during November just south of Cape Lookout only 7.3 km from shore. Coastal morphotype samples were also collected farther away from shore at 33 m depth and 39 km from shore. The logistic regression model for this region indicated a decline in the probability of a coastal morphotype group with increasing distance from shore; however, the model predictions were highly uncertain due to limited sample sizes and spatial overlap between the two morphotypes. Samples collected in Georgia waters also indicated significant overlap between the two morphotypes with a declining probability of the coastal morphotype with increasing depth. A coastal morphotype sample was collected 112 km from shore at a depth of 38 m. An offshore sample was collected in 22 m depth at 40 km from shore. As with the North Carolina model, the Georgia logistic regression predictions are uncertain due to limited sample size and high overlap between the two morphotypes (Garrison *et al.* 2003).

In summary, the primary habitat of the coastal morphotype of bottlenose dolphin in the western North Atlantic extends from Florida to Long Island, New York, during summer months and in waters less than 20 m deep, including estuarine and inshore waters. South of Cape Lookout, the coastal morphotype also occurs in lower densities over the continental shelf and overlaps spatially with the offshore morphotype.

Distinction between Coastal and Estuarine Bottlenose Dolphins

In addition to inhabiting coastal nearshore waters, the coastal morphotype of common bottlenose dolphin also inhabits inshore estuarine waters along the U.S. east coast and Gulf of Mexico (Wells *et al.* 1987; Scott *et al.* 1990; Wells *et al.* 1996; Weller 1998; Zolman 2002; Speakman *et al.* 2006; Stolen *et al.* 2007; Balmer *et al.* 2008; Mazzoil *et al.* 2008). There are multiple lines of evidence supporting demographic separation between bottlenose dolphins residing within different estuaries along the Atlantic coast. For example, long-term photo-identification (photo-ID) studies in waters around Charleston, South Carolina, have identified communities of resident dolphins that are seen within relatively restricted home ranges year-round (Zolman 2002; Speakman *et al.* 2006). In Biscayne Bay, Florida, there is a similar community of bottlenose dolphins with evidence of year-round residents that are genetically distinct from animals residing in a nearby estuary in Florida Bay (Litz *et al.* 2012). A long-term photo-ID study in the Indian River Lagoon system in central Florida has also identified year-round resident dolphins repeatedly observed across multiple years (Stolen *et al.* 2007; Mazzoil *et al.* 2008). A few published studies demonstrate that these resident animals are genetically distinct from animals in nearby coastal waters. A study conducted near Jacksonville, Florida demonstrated significant genetic differences between animals in coastal and estuarine waters (Caldwell 2001; Rosel *et al.* 2009) and animals resident in the Charleston estuarine system show significant genetic differentiation from animals biopsied in coastal waters of southern Georgia (Rosel *et al.* 2009).

Despite evidence for genetic differentiation between estuarine and coastal populations, the degree of spatial overlap between these populations remains unclear. Photo-ID studies within estuaries demonstrate seasonal immigration and emigration and the presence of transient animals (e.g., Speakman *et al.* 2006). In addition, the degree of movement of resident estuarine animals into coastal waters on seasonal or shorter time scales is poorly understood. Bottlenose dolphins inhabiting primarily estuarine habitats are considered distinct stocks from those inhabiting coastal habitats. Bottlenose dolphin stocks inhabiting coastal waters are the focus of this report.

Definition of the Central Florida Coastal Stock

Initially, a single stock of common bottlenose dolphins of the coastal morphotype was thought to migrate seasonally between New Jersey (summer months) and central Florida based on seasonal patterns in strandings during a large scale mortality event occurring during 1987-1988 (Scott *et al.* 1988). However, re-analysis of stranding data (McLellan *et al.* 2003) and extensive analysis of genetic (Rosel *et al.* 2009), photo-ID (Zolman 2002) and satellite telemetry (Hohn and Hansen, NMFS unpublished data) data demonstrate a complex mosaic of coastal bottlenose dolphin stocks. Integrated analysis of these multiple lines of evidence suggests that there are five coastal stocks of bottlenose dolphins: the Northern Migratory and Southern Migratory Stocks, a South Carolina/Georgia Coastal Stock, a Northern Florida Coastal Stock and a Central Florida Coastal Stock.

The spatial extent of these stocks, their potential seasonal movements, and their relationships with estuarine stocks are poorly understood. Migratory movement and spatial distribution of the Northern Migratory Stock is best understood based on tag-telemetry, photo-ID and aerial survey data and migrates seasonally between coastal waters of central North Carolina and New Jersey. It is not thought to overlap with the Central Florida Coastal Stock in any season. The Southern Migratory Coastal Stock is defined primarily on satellite tag telemetry studies and is thought to migrate south from waters of southern Virginia and north central North Carolina in the summer to waters south of Cape Fear and as far south as coastal Florida during winter months. It is unclear whether this stock overlaps with the Central Florida Coastal Stock in any season.

During summer months when the Southern Migratory Coastal Stock is found in waters north of Cape Fear, North Carolina, bottlenose dolphins are still seen in coastal waters of South Carolina, Georgia and Florida, indicating the presence of additional stocks of coastal animals. Speakman *et al.* (2006) using photo-ID studies documented dolphins in coastal waters off Charleston, South Carolina, that are not known resident members of the estuarine stock. Genetic analyses of samples from northern Florida, Georgia and central South Carolina (primarily the estuaries around Charleston), using both mitochondrial DNA and nuclear microsatellite markers indicate significant genetic differences between these areas (NMFS 2001; Rosel *et al.* 2009). This stock assessment report addresses the Central FloridaCoastal stock, which is present in coastal Atlantic waters from 29.4°N south to the western end of Vaca Key (~24.69°N –81.11°W) where the stock boundary for the Florida Keys Stock begins (Figure 1). There has been little study of bottlenose dolphin stock structure in coastal waters of southern Florida, therefore the southern boundary of the Central Florida Stock is uncertain. There is no obvious boundary defining the offshore extent of this stock. The combined genetic and logistic regression analysis (Garrison *et al.* 2003) indicated that in waters less than 10 m depth, 70% of the bottlenose dolphins were of the coastal morphotype. Between 10 and 20 m depth, the percentage of animals of the coastal morphotype dropped precipitously, and at depths >40 m nearly all (>90%) animals were of the offshore morphotype. These spatial patterns may not apply in the Central Florida Coastal Stock, as there is a significant change in the bathymetric slope and a close approach of the Gulf Stream to the shoreline south of Cape Canaveral.

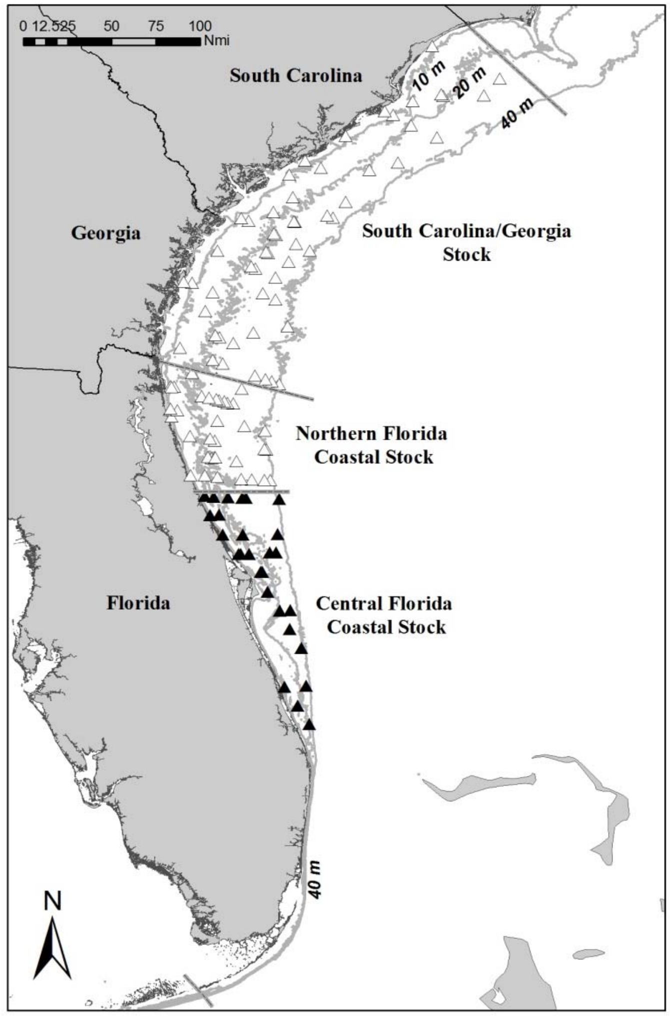

Figure 1. *The Central Florida Coastal stock of common bottlenose dolphins (29.4°N to Vaca Key). Symbols represent all sightings of bottlenose dolphin groups from NMFS 2010 & 2011 aerial surveys; dark symbols- groups within the boundaries of this stock. In waters >20 m, sightings may include the offshore morphotype of bottlenose dolphins.*

POPULATION SIZE

The best available estimate for the Central Florida Coastal Stock of common bottlenose dolphins in the western North Atlantic is 4,895 (CV=0.71; Table 1). This estimate is from aerial surveys conducted during the summers of 2010 and 2011 covering waters from Florida to New Jersey.

Earlier abundance estimates

Earlier abundance estimates for the Central Florida Coastal Stock were derived from aerial surveys conducted during the summer of 2002 and 2004. Survey tracklines were set perpendicular to the shoreline and included coastal waters to depths of 40 m. These surveys employed two observer teams operating independently on the same aircraft to estimate visibility bias. In summer 2004, an additional aerial survey between central Florida and New Jersey was conducted. As with the 2002 surveys, effort was stratified into 0-20 m and 20-40 m strata with the majority of effort in the shallow depth stratum. Observed common bottlenose dolphin groups from these were partitioned between the coastal and offshore morphotypes based upon analysis of available biopsy samples (Garrison *et al.* 2003). The previous best abundance estimate was based upon an average of the estimates from the 2002 and 2004 aerial surveys. This estimate was 6,318 (CV=0.26).

Recent surveys and abundance estimates

The Southeast Fisheries Science Center conducted aerial surveys of continental shelf waters along the U.S. East Coast from southeastern Florida to Cape May, New Jersey, during the summers of 2010 and 2011. The surveys were conducted along tracklines oriented perpendicular to the shoreline that were latitudinally spaced 20 km apart and covered waters from the shoreline to the continental shelf break. The summer 2010 survey was conducted during 24 July–14 August 2010, and 7,944 km of on-effort tracklines completed. A total of 127 common bottlenose dolphin groups were observed including 1,541 animals. During the 2011 summer survey, 8,665 km of trackline were completed between Cape May, New Jersey and Ft. Pierce, Florida. The survey was conducted during during 6 July - 29 July 2011. The 2011 survey also included more closely spaced "fine-scale" tracklines in waters offshore of New Jersey and Virginia within areas being evaluated for the placement of offshore energy installations. A total of 112 bottlenose dolphin groups were sighted including 1,339 animals.

Both the summer 2010 and 2011 surveys were conducted using a two-team approach to develop estimates of visibility bias using the independent observer approach with Distance analysis (Laake and Borchers 2004). However, the detection functions from both surveys indicated a decreased probability of detection near the trackline, which limited the effectiveness of the method for correcting for visibility bias due to a relatively small number of sightings made by both teams near the trackline. Abundance estimates were therefore derived by combining the sightings from both teams during a survey and "left-truncating" the data by analyzing only sightings occurring greater than 100 m from the trackline during the 2010 survey and 50 m during the 2011 survey (Buckland *et al.* 2001). Detection functions were fit to these left-truncated data accounting for the effects of survey conditions (e.g., sea state, glare, water color) on the detection probabilities. A logistic regression model was used to estimate the probability that a given group of dolphins observed during the aerial survey was of the coastal vs. offshore morphotype as a function of water depth (Garrison *et al.* 2003). This probability was incorporated into the abundance estimation to derive an estimate of coastal morphotype dolphins observed during the 2010 and 2011 aerial surveys. A bootstrap resampling approach was used to estimate the variance of the estimates. The resulting abundance estimates assume that detection probability at the truncation distance is equal to 1. While the estimates could not be explicitly corrected for this assumption, analyses of the summer 2010 data suggest that this bias is likely small.

The abundance estimates for the Central Florida Coastal Stock were based upon tracklines and sightings occurring between 29.4°N latitude and Ft. Pierce, Florida and in waters from the shoreline to the 40-m isobath. The abundance estimate derived from the summer 2010 survey was 9,842 (CV=0.84), and the estimate from the summer 2011 survey was 1,338 (CV=0.65). The best estimate is a weighted average of these two with higher weighting given to the more precise estimate from 2011. The resulting best estimate is 4,895 (CV=0.71).

Table 1. Summary of abundance estimates for the western North Atlantic Central Florida Coastal Stock of common bottlenose dolphins. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Summer 2002 and 2004	29.4°N Latitude to Ft. Pierce, FL	6,318	0.26
Summer 2010 and 2011	29.4°N Latitude to Ft. Pierce, FL	4,895	0.71

Minimum Population Estimate

The minimum population size (Nmin) for each stock was calculated as the lower bound of the 60% confidence interval for a log-normally distributed mean (Wade and Angliss 1997). The best estimate for the Central Florida Coastal Stock is 4,895 (CV=0.71). The resulting minimum population estimate is 2,851.

Current Population Trend

A trend analysis has not been conducted for this stock. There are 2 estimates from the 2002/2004 (6,318; CV=0.26) and 2010/2011 (4,895; CV=0.71) surveys. Methodological differences between the estimates need to be evaluated to quantify trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known for the western North Atlantic coastal morphotype. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of the Central Florida Coastal Stock of common bottlenose dolphins is 2,851. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is depleted. PBR for this stock of common bottlenose dolphins is 29.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the Central Florida Coastal Stock during 2009–2013 is unknown because this stock is known to interact with unobserved fisheries (see below). The mean annual fishery-related mortality and serious injury for strandings identified as fishery-caused was 0.2. No additional mortality or serious injury was documented from other human-caused actions. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 0.2.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category II Southeastern U.S. Atlantic shark gillnet; Southeast Atlantic gillnet; Atlantic blue crab trap/pot; and Southeastern U.S. Atlantic, Gulf of Mexico stone crab trap/pot fisheries; and the Category III Florida spiny lobster trap/pot; and Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fisheries. Only limited observer data are available for these and other fisheries that may interact with this stock. Detailed fishery information is presented in Appendix III.

Southeastern U.S. Atlantic Shark Gillnet Fishery and Southeast Atlantic Gillnet

Gillnet fisheries targeting finfish and sharks operate in southeast waters between North Carolina and southern Florida. There have been no observed bottlenose dolphin takes within the stock boundaries since 2003. Historically, a drift net fishery targeting coastal sharks operated in waters including within the Central Florida Coastal Stock boundaries during winter months. Common bottlenose dolphin takes (n=2) were observed in the drift net fisheries targeting sharks in 2002 and 2003 (Garrison 2007). Currently, gillnet fisheries include a number of different fishing methods and gear types including drift nets, "strike" fishing, and anchored ("sink") gillnets. The majority of this fishing is reported from waters of North Carolina and central Florida. However, there has been a significant reduction in the amount of drift gillnet fishing targeting sharks during the last several years.

Trap/Pot

During 2009–2013, 1 stranded animal assigned to the Central Florida Coastal Stock was reported entangled in trap/pot gear. The animal was disentangled and released alive seriously injured (Maze-Foley and Garrison in prep). It was not possible to determine which specific trap/pot fishery (blue crab, stone crab or spiny lobster) interacted with this stranding. Because there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with trap/pot gear.

Hook and Line

During 2009–2013, no interactions were documented involving hook and line gear entanglement or ingestion within the Central Florida Coastal Stock area. Earlier interactions have been documented. It is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Other Mortality

During 2009–2013, 137 stranded common bottlenose dolphins were recovered in the waters of the Central Florida Coastal Stock (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June2014). It could not be determined if there was evidence of human interaction for 90 of these strandings, and for 45 it was determined there was no evidence of human interaction. The remaining 2 showed evidence of human interactions, both of which were fisheries interactions. As mentioned above, 1 animal was reported entangled in trap/pot fishery gear and was released alive seriously injured (Maze-Foley and Garrison in prep). Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al.* 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

The Indian River Lagoon Estuarine System (IRLES) Stock experienced an Unusual Mortality Event (UME) in 2008. From May to August a total of 47 bottlenose dolphins from the IRLES Stock and 1 dolphin from the Central Florida Coastal Stock were considered to be part of this UME (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 13 September 2012). Infectious disease is suspected as a possible cause of this event. A UME was declared in the summer of 2013 for the mid-Atlantic coast from New York to Brevard County, Florida. Beginning in July 2013, bottlenose dolphins have been stranding at elevated rates. The total number of stranded bottlenose dolphins from New York through North Florida (Brevard County) as of mid-October 2014 (1 July 2013 - 19 October 2014) was ~1546. Morbillivirus has been determined to be the cause of the event. Most strandings and morbillivirus positive animals have been recovered from the ocean side beaches rather than from within the estuaries, suggesting that at least so far coastal stocks have been more impacted by this UME than estuarine stocks. However, the UME is still ongoing as of December 2014 when this report was drafted, and work continues to determine the effect of this event on all bottlenose dolphin stocks in the Atlantic.

HABITAT ISSUES

The nearshore and estuarine habitats occupied by the coastal morphotype are adjacent to areas of high human population and some are highly industrialized. The blubber of stranded dolphins examined during the 1987-1988 mortality event contained very high concentrations of organic pollutants (Kuehl *et al*. 1991). More recent studies have examined persistent organic pollutant concentrations in bottlenose dolphin inhabiting estuaries along the Atlantic coast and have likewise found evidence of high blubber concentrations particularly near Charleston, South Carolina, and Beaufort, North Carolina (Hansen *et al.* 2004). The concentrations found in male dolphins from both of these sites exceeded toxic threshold values that may result in adverse effects on health or reproductive rates (Schwacke *et al.* 2002; Hansen *et al.* 2004). Studies of contaminant concentrations relative to life history parameters showed higher levels of mortality in first-born offspring and higher contaminant concentrations in these calves and in primiparous females (Wells *et al.* 2005). The exposure to environmental pollutants and subsequent effects on population health is an area of concern and active research.

STATUS OF STOCK

Common bottlenose dolphins are not listed as threatened or endangered under the Endangered Species Act, but the Central Florida Coastal Stock is a strategic stock due to the depleted listing under the Marine Mammal Protection Act. From 1995 to 2001, NMFS recognized only a single migratory stock of coastal bottlenose dolphins in the western North Atlantic, and the entire stock was listed as depleted. This stock structure was revised in 2002 to recognize both multiple stocks and seasonal management units and again in 2008 and 2010 to recognize resident estuarine stocks and migratory and resident coastal stocks. This stock retains the depleted designation as a result of its origins from the originally delineated depleted coastal migratory stock. PBR for the Central Florida Coastal Stock is 29 and so the zero mortality rate goal, 10% of PBR, is 2.9. The documented mean annual human-caused mortality for this stock for 2009 – 2013 was 0.2. However, there are several commercial fisheries operating within this stock's boundaries and these fisheries have little to no observer coverage. Therefore, the documented mortality must be considered a minimum estimate of total fishery-related mortality. Insufficient information is available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching a zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*) Northern North Carolina Estuarine System Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the western North Atlantic, the coastal morphotype of common bottlenose dolphins is continuously distributed in nearshore coastal and estuarine waters along the U.S. Atlantic coast south of Long Island, New York, around the Florida peninsula and into the Gulf of Mexico. Several lines of evidence support a distinction between dolphins inhabiting coastal waters near the shore and those present primarily in the inshore waters of the bays, sounds and estuaries. Photo-identification (photo-ID) and genetic studies support the existence of resident estuarine animals in several areas (Caldwell 2001; Gubbins 2002; Zolman 2002; Gubbins *et al.* 2003; Mazzoil *et al.* 2005; Litz *et al.* 2012), and similar patterns have been observed in bays and estuaries along the Gulf of Mexico coast (Wells *et al.* 1987; Balmer *et al.* 2008). Recent genetic analyses using both mitochondrial DNA and nuclear microsatellite markers found significant differentiation between animals biopsied in coastal and estuarine areas along the Atlantic coast (Rosel *et al.* 2009), and between those biopsied in coastal and estuarine waters at the same latitude (NMFS unpublished data). Similar results have been found off the west coast of Florida (Sellas *et al.* 2005; Balmer *et al.* 2008).

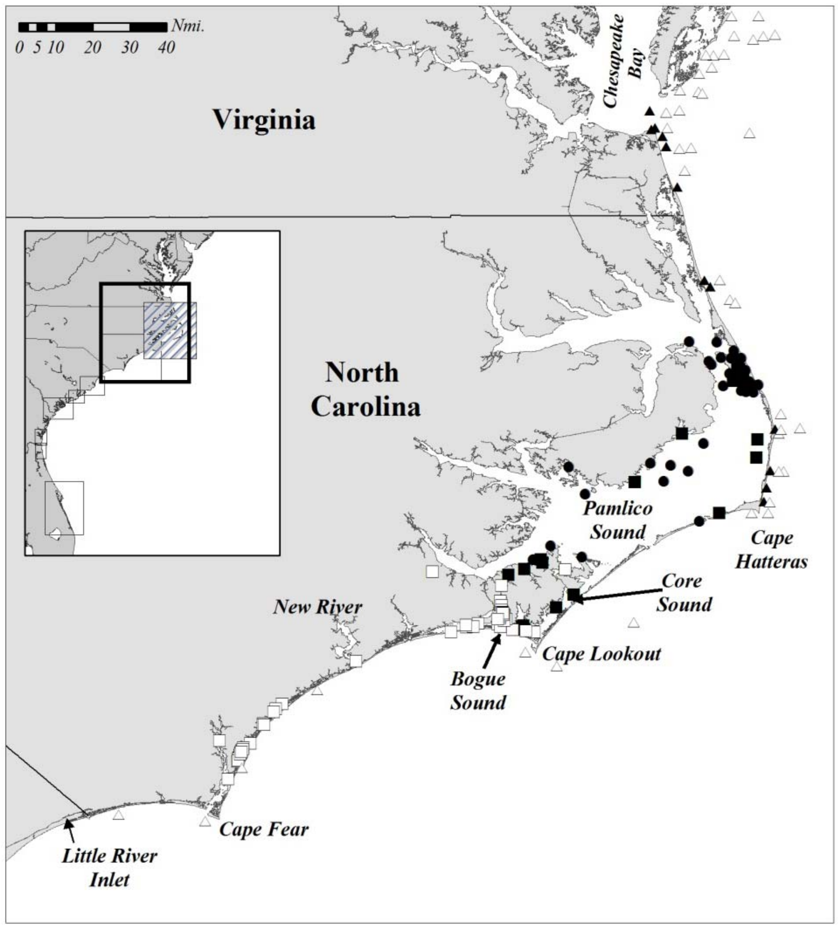

Figure 1. *The distribution of bottlenose dolphins occupying coastal and estuarine waters in North Carolina and Virginia during July-August. Locations are shown from aerial surveys (triangles), satellite-linked telemetry (circles), and photo-identification studies (squares). Sightings assigned to the Northern North Carolina Estuarine System stock are shown with filled symbols (all fall within hatched box in inset map). Photo-identification data are courtesy of Duke University and the University of North Carolina at Wilmington.*

The Northern North Carolina Estuarine System (NNCES) Stock is best defined as animals that occupy primarily estuarine waters of Pamlico Sound during warm water months (July-August). Members of this stock are also thought to make use of coastal waters (<1 km from shore) of North Carolina from Beaufort north to southern Virginia and the lower Chesapeake Bay during this time period. Most of these animals move out of Pamlico Sound during colder water months and occupy coastal waters (< 3km from shore) between the New River and Cape Hatteras. However, some animals continue to be present in Pamlico Sound during cold water months (Goodman *et al*. 2013).

The movements and range of this stock have been inferred from a combination of photo-ID, tag telemetry, stable isotope and genetic data. Animals captured and released near Beaufort, North Carolina, were fitted with satellite-linked transmitters and or freeze-branded during July 1995 (30 animals) (Hansen and Wells 1996), November 1999 (3 animals), April 2000 (8 animals) and April 2006 (5 animals) (Hohn and Hansen, NMFS unpublished data). Long-term photo-ID studies conducted in waters of North Carolina include records of some of these animals and revealed that 18 occupied waters of Pamlico Sound during warm water months. For example, tag telemetry data from one animal that was tagged near Virginia Beach in September 1998 indicated that this animal moved south into waters of Pamlico Sound during October (NMFS unpublished data). During July 2006, the animal was observed during photo-ID surveys within the sound providing evidence that at least some members of this stock may move into nearshore coastal waters along the northern coast of North Carolina and into coastal waters of Virginia and perhaps into Chesapeake Bay (Urian, pers. comm.). In addition, there are photo-ID matches between inshore waters of Virginia Beach, Virginia, and Pamlico Sound (Urian, pers. comm.) that also demonstrate movements of NNCES animals between these areas during warm water months. There are fewer telemetry data for assigned NNCES animals during cold water months. Bottlenose dolphins have been observed in the Pamlico Sound area during cold water months (Goodman Hall *et al*. 2013), however, photo-ID studies, available tag data and stable isotope data indicate that a portion of the stock moves out of Pamlico Sound into coastal waters south of Cape Hatteras during cold water months. Telemetry records show that NNCES animals move as far south as the New River during January and February (NMFS unpublished data). In addition, stable isotope analysis of animals sampled along the beaches of North Carolina between Cape Hatteras and Bogue Inlet during February and March showed very low stable isotope ratios of ^{18}O relative to ^{16}O (referred to as "depleted oxygen", Cortese 2000). One explanation for the depleted oxygen signature is a resident group of dolphins in Pamlico Sound that move into nearby coastal waters in the winter (NMFS 2001).

The movements of animals from the NNCES Stock are distinct from those of the Southern North Carolina Estuarine System Stock (SNCES). Some of the animals tagged or freeze-branded near Beaufort moved south to Cape Fear and occupied nearshore coastal and estuarine waters during cold water months. During warm water months, these animals moved north and occupied inshore and nearshore coastal waters near Cape Lookout including Bogue Sound and Core Sound. It is probable that there is spatial overlap between these 2 estuarine stocks during this time in the waters near Beaufort. However, SNCES Stock animals were not observed to move north of Cape Lookout in coastal waters nor into the main portion of Pamlico Sound during warm water months (NMFS unpublished data; Duke University unpublished data; University of North Carolina at Wilmington unpublished data). These movement patterns are consistent with those seen in resightings of individual dolphins during a photo-ID study that sampled much of the estuarine waters of North Carolina (Read *et al.* 2003). Read *et al.* (2003) suggested that movement patterns, differences in group sizes, and habitats are consistent with 2 stocks of animals occupying estuarine waters of North Carolina. Finally, genetic analysis of samples from animals in waters of southern North Carolina (between Cape Lookout and the North Carolina/South Carolina border) demonstrate significant differentiation from animals occupying waters from Virginia and further north and waters of South Carolina (Rosel *et al.* 2009).

In summary, during warm water months, the NNCES Stock occupies primarily estuarine waters of central and northern North Carolina, particularly Pamlico Sound, as well as nearshore coastal waters (< 1 km from shore) up to Assateague, Virginia, including the lower Chesapeake Bay (Figure 1). It likely overlaps with animals from the Southern Migratory Coastal Stock in coastal waters during these months, and SNCES Stock animals at the northern end of their range. During cold water months, the NNCES Stock primarily moves out of estuarine waters and occupies nearshore coastal waters (< 3km from shore) between the New River and Oregon Inlet. It overlaps with the Northern Migratory Coastal Stock during this period, particularly between Cape Lookout and Cape Hatteras and may overlap with the Southern Migratory Coastal Stock in the smaller region between the New River and Beaufort Inlet. The timing of the seasonal movements into and out of Pamlico Sound and north along the coast likely occurs with some inter-annual variability related to seasonal changes in water temperatures and/or prey availability.

In prior stock assessment reports, the animals within the estuarine waters of Pamlico Sound were included in the abundance estimates and stock assessment reports for the Northern Migratory Coastal Stock and the winter “mixed” North Carolina management unit of coastal bottlenose dolphins (Waring *et al.* 2007). However, they are now recognized as a distinct stock based upon these differences in seasonal ranging patterns and stable isotope signatures.

POPULATION SIZE

The best available abundance estimate for the NNCES Stock is 823 animals (CV=0.06) based upon photo-ID mark-recapture surveys in summer 2013 (Gorgone *et al*. 2014).

Earlier abundance estimates

A photo-ID mark-recapture study was conducted by Urian *et al.* (2013) in July 2006 using similar methods to those in Read *et al.* (2003) and included estuarine waters of North Carolina from and including the Little River Inlet Estuary (near the North Carolina/South Carolina border) to and including Pamlico Sound. The 2006 survey also included coastal waters up to Cape Hatteras extending up to 1 km from shore, consistent with the current understanding of the distribution of this stock. In order to estimate the abundance for the NNCES alone, only sightings north of 34°46' N in central Core Sound were used. The resulting abundance estimate included a correction for the proportion of dolphins with non-distinct fins in the population. The abundance estimate for the NNCES Stock based upon photo-ID mark-recapture surveys in 2006 was 950 animals (CV=0.23, 95% Confidence Interval=516-1,384; Urian *et al*. 2013). Because the survey did not include estuarine waters of Albemarle or Currituck Sounds or more northern estuarine and coastal waters, it is likely that some portion of the NNCES Stock was outside of the boundaries of the survey. Thus, the 2006 abundance estimate was most likely negatively biased.

Read *et al.* (2003) provided the first abundance estimate of common bottlenose dolphins that occur within the estuarine portion of the NNCES Stock range. This estimate, 919 (CV=0.13, 95% Confidence Interval=730-1,190), was based on a photo-ID mark-recapture survey of a portion of North Carolina waters inshore of the barrier islands, conducted during July 2000. Because the survey did not sample all of the estuarine waters where dolphins are known to occur, the estimate of abundance may be negatively biased, In addition, the portion of the stock that may have occurred in coastal waters was not accounted for in this survey. Aerial survey data from 2002 (NMFS) were, therefore, used to account for this portion of the stock in coastal waters. The abundance estimate for the NNCES Stock during 2000-2002 was the combined abundance from estuarine and coastal waters. This combined estimate was 1,387 (CV=0.17).

Recent surveys and abundance estimates

Photo-ID surveys were conducted in Pamlico, Albemarle and Core Sounds and their tributaries during June-July 2013 to provide an abundance estimate for the NNCES Stock (see Gorgone *et al.* 2014). The surveys excluded nearshore coastal waters and inshore waters at the southern extent of the NNCES range (i.e., Bogue Sound, North River, and the southernmost portion of Core Sound) to avoid potential overlap with the SNCES and Southern Migratory Coastal Stocks. Estimates were obtained using closed capture-mark-recapture models and a method described by Eguchi (2014) to correct for dolphins with indistinctive fins. The resulting abundance estimate was 823 (CV=0.06; Gorgone *et al.* 2014).

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for the NNCES Stock is 823 (CV=0.06). The minimum population estimate for the NNCES Stock is 782.

Current Population Trend

A trend analysis has not been conducted for this stock. Gorgone *et al.* (2014) noted that the estimate from 2013 (823; CV=0.06) was similar to the previous 2 estimates from 2006 (950, CV=0.23) and 2000 (919, CV=0.13), but methodological differences among the estimates need to be evaluated to quantify trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of the NNCES Stock of common bottlenose dolphins is 782. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is of unknown status. The resulting PBR for this stock is 7.8 animals.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the NNCES Stock during 2009–2013 is unknown because this stock is known to interact with unobserved fisheries (see below). The mean annual fishery-related mortality and serious injury for observed fisheries and for strandings and at-sea observations identified as fishery-caused ranged between 0.6 and 15.9. Additional mean annual mortality and serious injury due to other human-caused actions (fishery research) ranged from 0.4 to 0.8. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 ranged between 1.0 and 16.7. This range reflects the uncertainty in assigning observed or reported mortalities to a particular stock.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category I mid-Atlantic gillnet fishery; the Category II North Carolina long haul seine; North Carolina inshore gillnet; mid-Atlantic haul/beach seine; Virginia pound net; North Carolina roe mullet stop net; and Atlantic blue crab trap/pot fisheries; and the Category III U.S. mid-Atlantic mixed species stop seine/weir/pound net fishery, which includes the North Carolina pound net fishery; and the Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fishery. The magnitude of the interactions with each of these fisheries is unknown because of both uncertainty in the movement patterns of the stock and the spatial overlap between the NNCES Stock and other common bottlenose dolphin stocks in coastal waters. Observer coverage is also limited or non-existent for most of these fisheries, thus stranding data are used as an indicator of fishery-related interactions. There have been no documented interactions between common bottlenose dolphins of the NNCES Stock and the North Carolina long haul seine fishery or the U.S. mid-Atlantic mixed species stop seine/weir/pound net fishery during 2009–2013; however, it should be noted there is no observer coverage of these fisheries.

Mid-Atlantic Gillnet

Background

This fishery has the highest documented level of mortality of coastal morphotype common bottlenose dolphins, and the sink gillnet gear in North Carolina is its largest component in terms of fishing effort and observed takes. Because the Northern Migratory Coastal, Southern Migratory Coastal, NNCES and SNCES Stocks of bottlenose dolphins all occur in waters off of North Carolina, it is not possible to definitively assign every observed mortality, or extrapolated bycatch estimate, to a specific stock. Between 1995 and 2000 a total of 14 takes occurred, 13 mortalities and 1 live release: 1 in 1995 (mixed finfish), 1 in 1996 (spanish mackerel), 3 in 1998 (1 smooth dogfish, 1 spiny dogfish and 1 in beach-anchored gillnet targeting weakfish), 5 in 1999 (2 spiny dogfish, 1 striped bass, 1 shark, and 1 live release from gear targeting spanish mackerel), 4 in 2000 (1 kingfish, 1 spiny dogfish, 1 bluefish/smooth dogfish, and 1 in beach-anchored gillnet targeting striped bass). The observed takes occurred in gear off North Carolina (n=10), Virginia (n=2) and New Jersey (n=2).

The Bottlenose Dolphin Take Reduction Team was convened in October 2001, in part, to reduce bycatch in gillnet gear. While the Bottlenose Dolphin Take Reduction Plan (BDTRP) was being developed and implemented, there were 7 additional bottlenose dolphin mortalities observed in the mid-Atlantic gillnet fishery from 2001-2006. Three mortalities were observed in 2001 with 1 occurring off of northern North Carolina during April (monkfish fishery) and 2 occurring off of Virginia during November (striped bass fishery). Four additional mortalities were observed along the North Carolina coast near Cape Hatteras: 1 in May 2003 (Spanish mackerel), 1 in September 2005 (Spanish mackerel), 1 in September 2006 (Spanish mackerel), and 1 in October 2006 (king mackerel). The BDTRP was implemented in May 2006 and resulted in changes to gillnet gear configurations and fishing practices.

During 2007-2011 only 1 take was observed by the Southeast Fisheries Observer Program off the coast of northern North Carolina during the month of October. There were no observed takes by the Northeast Fisheries Observer Program (NEFOP) during 2007-2011.

Pre-Take Reduction Plan Mortality Estimation (2002-2006)

All available data from 1995 to 2006 were used to estimate total mortality of common bottlenose dolphins in the mid-Atlantic gillnet fishery. Three alternative approaches were used to estimate a pre-BDTRP bycatch rate for the period 2002-April 2006. First, a generalized linear model (GLM) approach was used similar to that described in Palka and Rossman (2001). The dataset used in the GLM approach included all observed trips and mortalities from 1995 to April 2006 filtered to include only trips that reflected fishing practices in effect during the period from 2002 to April 2006. Second, a simple ratio estimator of catch per unit effort (CPUE = observed catch / observed effort) was used based directly upon the observed data collected from 2002 to April 2006. Finally, a ratio estimator pooled across years 2002-April 2006 was used to estimate different CPUE values for the pre-BDTRP period. In each case, the annual reported fishery effort (represented as reported landings) was multiplied by the estimated bycatch rate to develop annual estimates of fishery-related mortality, again similar to the approach in Palka and Rossman (2001). To account for the uncertainty among the 3 alternative approaches, the average of the 3 model estimates (and the associated uncertainty) was used to estimate the mortality of bottlenose dolphins for this fishery (Table 2). It should be noted that the extrapolated estimates of total mortality include landings from inshore North Carolina waters (see North Carolina Inshore Gillnet section below) where the NNCES Stock is known to occur. The live release from 1999 and takes from beach anchored gillnets reported in the background text were not included in this analysis. Only years 2002-April 2006 are reported here as a new analytical approach is described below for the most recent 5-year mortality analysis covering calendar years 2007-2011.

Table 1. Summary of the 2002-2006 incidental mortality of common bottlenose dolphins in the Northern North Carolina Estuarine System Stock in the commercial mid-Atlantic coastal gillnet fisheries. The estimated annual and average mortality estimates are shown for the period prior to the implementation of the Bottlenose Dolphin Take Reduction Plan (pre-BDTRP) and after the implementation of the plan (post-BDTRP). Three alternative modeling approaches were used, and the average of the 3 was used to represent mortality estimates. The minimum and maximum estimates indicate the range of uncertainty in assigning observed bycatch to stock. Observer coverage is measured as a proportion of reported landings (tons of fish landed). Data are derived from the Northeast Observer program, NER dealer data, and NCDMF dealer data. Values in parentheses indicate the CV of the estimate. GLM = generalized linear model.

Period	Year	Observer Coverage	Min Annual Ratio	Min Pooled Ratio	Min GLM	Max Annual Ratio	Max Pooled Ratio	Max GLM
pre-BDTRP	2002	0.01	0	0	15.64 (0.63)	0	39.45 (0.92)	33.69 (0.38)
	2003	0.01	0	0	11.03 (0.58)	49.46 (0.94)	12.77 (0.92)	19.29 (0.36)
	2004	0.02	0	0	12.10 (0.62)	0	28.46 (0.92)	28.42 (0.34)
	2005	0.03	0	0	11.84 (0.60)	0	22.58 (0.92)	23.01 (0.37)
	Jan-Apr 2006	0.03	0	0	1.40 (0.50)	0	0	1.99 (0.37)
Annual Avg. pre-BDTRP			Minimum: 3.47 (CV=0.30)			Maximum: 19.79 (CV=0.11)		

During 2002-2006, there were 3 observed takes in the mid-Atlantic gillnet fishery that could potentially be assigned to the NNCES Stock. However, in each of these cases, the take also could potentially be assigned to the Southern Migratory Coastal Stock because they occurred in near-shore coastal waters of northern North Carolina. As stated previously, observed mortalities (and effort) cannot be definitively assigned to a particular stock within certain regions and times of year; therefore, the minimum and maximum possible mortality for the NNCES Stock are presented for comparison to PBR (Table 1).

Based upon these analyses, the minimum and maximum mean mortality estimates for the NNCES Stock for the pre-BDTRP period (2002-Apr 2006) were 3.47 (CV=0.30) and 19.79 (CV=0.11) animals per year, respectively (Table 1).

Post-Take Reduction Plan Mortality Estimation (2007-2011)

Different from the pre-BDTRP analytical approach, only 2 alternative approaches were used to estimate common bottlenose dolphin bycatch rates during the post-BDTRP period: 1) a simple annual ratio estimator of CPUE per year based directly upon the observed data from 2007-2011 and 2) a pooled CPUE (where all observer data from 2007-2011 were combined into one sample to estimate CPUE). In each case, the annual reported fishery effort (defined as a fishing trip) was multiplied by the estimated bycatch rate to develop annual estimates of fishery-related mortality. There were not enough observed take events in the post-BDTRP data set to run a GLM. Similar to the pre-BDTRP analytical approach, to account for the uncertainty in these 2 alternative approaches, the average of the 2 model estimates (and the associated uncertainty) were used to estimate the mean mortality of common bottlenose dolphins for this fishery (Table 2). It should be noted that unlike the analytical approach used in the pre-BDTRP analysis, effort from internal North Carolina waters (i.e., Pamlico Sound Estuary) was not included in the 2007-2011 post-TRP analysis. Observer sampling rates in internal waters are low and insufficient to pool with bycatch rates coming from samples collected primarily in coastal/offshore waters. Internal waters are important habitat to the NNCES so this could lead to a downward bias in bycatch mortality estimates (see North Carolina Inshore Gillnet section below).

During 2007-2011, 1 bottlenose dolphin take was observed (2009) by the Southeast Fishery Observer Program (SEFOP) off northern North Carolina that could potentially be assigned to the NNCES or Northern or Southern Migratory Coastal Stocks. The animal was observed within 1.1 km of shore in a region where it is possible the estuarine animals can overlap in time and space with coastal migratory bottlenose dolphins. There were no observed takes by the Northeast Fisheries Observer Program (NEFOP) during 2007-2011. The average percent federal observer coverage (measured in trips) for this fishery during 2007-2011 was 2.95% in state waters (0-3 miles) and 8.59% in federal waters (3-200 miles). The low level of coverage in state waters where the NNCES Stock largely resides is likely insufficient to detect bycatch events of common bottlenose dolphins in the coastal mid-Atlantic commercial gillnet fishery.

Based upon these analyses, the minimum and maximum mean mortality estimates for the NNCES Stock for the post-BDTRP period (2007-2011) were 0 and 16.23 (CV=0.30) animals per year, respectively (Table 2). However, based on documented serious injury and mortality in this fishery from both federal observer coverage and other data sources (see Table 3), mean annual mortality estimates are likely not zero. Incidental takes have been documented in research gillnet gear fished similarly to commercial gear (see Other Mortality section).

Table 2. Summary of 2007-2011 incidental mortality of common bottlenose dolphins in the Northern North Carolina Estuarine System Stock in the commercial mid-Atlantic coastal gillnet fisheries. An average from 2 alternative analytical approaches was used to estimate total bycatch mortality. The minimum and maximum estimates indicate the range of uncertainty in assigning observed bycatch to a stock. Observer coverage is reported on an annual basis for the entire mid-Atlantic coastal gillnet fishery (excluding internal waters) as a proportion of total trips sampled. Data sources include the Northeast and Southeast Fisheries Observer Programs, Greater Atlantic Regional Fisheries Office Vessel Trip Reports, Virginia Marine Resources Commission Fisheries Landings, and North Carolina Division of Marine Fisheries Trip Ticket Program. Values in parentheses indicate the CV of the estimate.

Year	Observer Coverage	Min Annual Ratio	Min Pooled Ratio	Max Annual Ratio	Max Pooled Ratio
2007	0.05	0.00	0.00	0.00	19.39 (0.95)
2008	0.04	0.00	0.00	0.00	16.16 (0.95)
2009	0.04	0.00	0.00	76.77 (0.98)	16.81 (0.95)
2010	0.04	0.00	0.00	0.00	13.92 (0.95)
2011	0.02	0.00	0.00	0.00	16.76 (0.95)
Mean	0.04	0.00	0.00	15.35 (0.98)	16.61 (0.43)
		Mean Minimum: 0.00		Mean Maximum[1]: 16.23 (0.30)	

[1]Mean weighted by inverse of CVs and CV equals inverse of sum of weights

North Carolina Inshore Gillnet

Information on interactions between common bottlenose dolphins and the North Carolina inshore gillnet fishery is based on stranding data. Historically, there was no systematic Federal observer coverage of this fishery. However, from May 2010 through March 2012, the NMFS allocated sea days and observed this fishery for the first time. Average coverage from the NEFOP (measured in trips) was less than 1% and no bycatch was recorded by federal observers. However, the low level of federal observer coverage in internal waters where the NNCES Stock largely resides is likely insufficient to detect bycatch events of common bottlenose dolphins if they were to occur in the inshore commercial gillnet fishery.

Because of sea turtle bycatch in inshore gillnets, the North Carolina Division of Marine Fisheries (NCDMF) has operated systematic coverage of the fall (September-December) flounder gillnet fishery (> 5" mesh) in Pamlico Sound as a part of their Incidental Take Permit under the ESA (Byrd *et al.* 2011). In May 2010, NCDMF expanded the observer coverage to include gillnet effort using nets ≥ 4" mesh in most internal state waters and throughout the year, with a goal of 7-10% coverage. No bycatch of bottlenose dolphins has been recorded by state observers, although stranding data continue to indicate interactions with this fishery occur. During 2009–2013, 2 dead dolphin strandings that could have belonged to the NNCES Stock were recovered entangled in gillnet gear. One of them was found in 2010 in Albemarle Sound with medium-mesh gillnet gear wrapped around its mandible and tongue. The other stranded dolphin was recovered in Roanoke Sound in 2011 with medium-mesh gillnet gear entangled around its rostrum and flipper. The documented interactions in commercial gear represent a minimum known count of interactions with this fishery in the last five years. These animals were included in the stranding database and are included in Table 4.

Mid-Atlantic Haul/Beach Seine

There were no reports of mortality or serious injury during 2009–2013 in the mid-Atlantic haul/beach seine fishery, and no estimate of bycatch mortality is available. The mid-Atlantic haul/beach seine fishery had limited observer coverage by the NEFOP in 2009-2011. No observer coverage was allocated to this fishery in 2012 or 2013. Recent evidence for bycatch risk in this gear is limited. The most recent documented interaction is from 2007 when 1 dolphin was killed in a multifilament beach seine during a research project performed by the North Carolina Division of Marine Fisheries. However, this animal likely belonged to either the Northern Migratory or Southern Migratory Coastal Stock.

Virginia and North Carolina Pound Nets

Historical and recent stranding network data report interactions between common bottlenose dolphins and pound nets in Virginia. During 2009–2013, 3 bottlenose dolphin strandings that could have belonged to the NNCES Stock were entangled in pound net gear in Virginia (Northeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 17 June 2014). An additional 11 dolphins that could have belonged to the NNCES Stock stranded with twisted twine markings indicative of interactions with pound net gear. These interactions occurred in estuarine waters near the mouth of the Chesapeake Bay and primarily in summer months. The overall impact of the Virginia Pound Net fishery on the Northern North Carolina Estuarine System Stock is unknown due to the limited information on the stock's movements, particularly the extent to which it occurs within waters inside the mouth of the Chesapeake Bay. It is also possible that observed interactions with the Virginia pound net fishery involve the Northern or Southern Migratory Coastal Stocks as well.

The pound net is a common fishing gear used in portions of North Carolina's estuarine waters. However, the level of interaction with bottlenose dolphins is unknown. Between 1997 and 2013, there has only been 1 documented mortality (2008) in North Carolina pound net gear, and this came from stranding data (Byrd *et al.* 2014). Also, between 1998 and 2013, NMFS researchers sampled 1,642 pound net trips in North Carolina and did not document an entangled bottlenose dolphin (NMFS unpublished data).

North Carolina Roe Mullet Stop Net

During 2009–2013, there was 1 reported mortality of an animal entangled in a stop net. This mortality occurred during November 2013 and the animal likely belonged to the NNCES or Southern Migratory Coastal Stock. This mortality was included in the stranding database and in the stranding totals presented in Table 4. This fishery has not had regular, ongoing federal or state observer coverage. However, the NMFS Beaufort laboratory observed this fishery in 2001-2002 (Byrd and Hohn 2010), and Duke University observed the fishery in 2005-2006 (Thayer *et al.* 2007). Entangled dolphins were not documented during these formal observations, but opportunistically observed historical takes of dolphins entangled in stop nets occurred in 1993 and 1999.

Atlantic Blue Crab Trap/Pot

During 2009–2013, there were no reported mortalities of common bottlenose dolphins in trap/pot gear that could be assigned to the NNCES Stock. Since there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab trap/pot gear. However, stranding data indicate that interactions occur at some unknown level in North Carolina (Byrd *et al*. 2014) and other regions of the southeast U.S. (Noke and Odell 2002; Burdett and McFee 2004).

Hook and Line

During 2009–2013, 2 dolphins in the stranding database that could have belonged to the NNCES Stock were documented as interacting with hook and line gear. In 2012 in North Carolina, a dolphin that could have belonged to this stock or the Southern Migratory Coastal Stock was documented with ingested hook and line gear. In 2011 in Virginia, a dolphin that could have belonged to this stock or the Southern Migratory Coastal Stock was documented entangled in hook and line gear. These mortalities were included in the stranding database and are included in the stranding totals presented in Table 4. It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Other Mortality

There have been occasional incidental takes of common bottlenose dolphins during research activities. Two incidental takes (mortalities) in research gillnet gear set in coastal waters were documented that could have belonged to the NNCES or Southern Migratory Coastal Stocks: (1) in 2009 during a small mesh gillnet research project targeting Spanish mackerel in North Carolina; and (2) in 2010 during a medium mesh gillnet research project targeting sharks in North Carolina. In addition, 2 incidental takes (1 mortality; 1 live release, could not be determined if seriously injured) in research gillnet gear were documented during 2012 that were attributed to the NNCES Stock. The 2 animals were captured in the same research sink gillnet targeting striped bass in estuarine waters. All research gillnet incidental takes were included in the stranding database and are included in Table 4. All known human-caused mortalities including both commercial fisheries and research related mortalities are summarized in Table 3.

In addition to animals included in the stranding database, during 2009–2013, there was 1 at-sea observation in the NNCES Stock area of a live bottlenose dolphin entangled in unidentified fishing gear. This observation occurred during 2011 and the animal was considered seriously injured (Maze-Foley and Garrison in prep).

Table 3. Summary of annual reported and estimated mortality of common bottlenose dolphins from the Northern North Carolina Estuarine System Stock during 2009–2013 from observer data, stranding data and research takes. Where minimum and maximum values are reported in individual cells, there is uncertainty in the assignment of mortalities to this particular stock due to spatial overlap with other bottlenose dolphin stocks in certain areas and seasons. This is especially the case for strandings where the maximum number reported may truly be a minimum because not all strandings are detected. Therefore, to account for both scenarios, the maximum numbers under the total column are reported as the maximum greater than or equal to what was recovered.

Year	**mid-Atlantic Gillnet**		**Virginia Pound Net (strandings and observed)**	**NC Inshore Gillnet (strandings)**	**NC Roe Mullet Stop Net (strandings)**	**Hook and Line (strandings)**	**Research (incidental takes)**	**Total** [b]
	Min/Max estimate extrapolated from observer data (only through 2011)[a]	Interactions known from stranding data						
2009	Min = 0 Max = 55.19	0	Min = 0 Max = 3	0	0	0	Min = 0 Max = 1	Min = 0 Max ≥ 59.19
2010	Min = 0 Max = 6.96	0	0	1	0	0	Min = 0 Max = 1	Min = 1 Max ≥ 8.96

2011	Min = 0 Max = 8.38	0	0	1	0	Min = 0 Max = 1	0	Min = 1 Max ≥ 10.38
2012	No estimate[c]	0	0	0	0	Min = 0 Max = 1	2	Min = 2 Max ≥ 3
2013	No estimate[c]	0	0	0	Min = 0 Max = 1	0	0	Min = 0 Max ≥ 1
Annual Average Mortality (2009–2013)				Minimum Estimated = 0.8 Maximum Estimated ≥ 16.5				

[a] Where given, these numbers are the average of the 2 minimum and 2 maximum mortality estimates for that year from Table 2.
[b] In years with bycatch estimates for the mid-Atlantic gillnet fishery, stranded animals recovered with gillnet gear attached would be accounted for in the estimate for that year. Therefore, stranded animals with attached gear are only included in the Total column when no bycatch estimate has been calculated for that year.
[c] Mortality analyses that use observer data are updated every 3 years. The next update is scheduled for 2015 and will include mortality estimates for years 2012-2014.

Strandings

Between 2009 and 2013, 810 common bottlenose dolphins stranded along coastal and estuarine waters of North Carolina and Virginia that could be assigned to the NNCES Stock (Table 4; Northeast Regional Marine Mammal Stranding Network, Southeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 17 June 2014 and 11 June 2014). It could not be determined if there was evidence of human interaction (HI) for 569 of these strandings, and for 160 it was determined there was no evidence of human interaction. The remaining 81 showed evidence of human interactions (Table 4). Within estuarine waters of North Carolina, where the probability is very high that strandings are from the NNCES Stock, there were a total of 127 strandings in this 5-year period. In most cases, it was not possible to determine if a HI had occurred due to the decomposition state of the stranded animal. Of the 10 (of 127) estuarine strandings positive for HI, 4 (40%) of them exhibited evidence of fisheries entanglement (e.g., entanglement lesions, attached gear), and 2 were incidental takes from research gillnet gear. It should be recognized that evidence of human interaction does not indicate cause of death, but rather only that there was evidence of interaction with a fishery (e.g., line marks, net marks) or evidence of a boat strike, gunshot wound, mutilation, etc., at some point. Also, stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

The assignment of animals to a particular stock is impossible in some seasons and regions, particularly in coastal waters of North Carolina and Virginia, and estuarine waters near Beaufort Inlet. Therefore, it is likely that the counts in Table 4 include some animals from the Southern Migratory Coastal, Northern Migratory Coastal and Southern North Carolina Estuarine System Stocks, and therefore overestimate the number of strandings for the NNCES Stock; those strandings that could not be definitively assigned to the NNCES Stock were also included in the counts for these other stocks as appropriate. Stranded carcasses are not routinely identified to either the offshore or coastal morphotype of bottlenose dolphin, therefore it is possible that some of the reported strandings were of the offshore form, though that number is likely to be low (Byrd *et al*. 2014).

An Unusual Mortality Event (UME) was declared in the summer of 2013 for the mid-Atlantic coast from New York to Brevard County, Florida. Beginning in July 2013, bottlenose dolphins have been stranding at elevated rates. The total number of stranded bottlenose dolphins from New York through North Florida (Brevard County) as of mid-October 2014 (1 July 2013 - 19 October 2014) was ~1546. Morbillivirus has been determined to be the cause of the event. Most strandings and morbillivirus positive animals have been recovered from the ocean side beaches rather than from within the estuaries, suggesting that at least so far coastal stocks have been more impacted by this

UME than estuarine stocks. However, the UME is still ongoing as of December 2014 when this report was drafted, and work continues to determine the effect of this event on all bottlenose dolphin stocks in the Atlantic.

Table 4. Strandings of common bottlenose dolphins from North Carolina and Virginia that can possibly be assigned to the Northern North Carolina Estuarine System (NNCES) Stock. Strandings observed in North Carolina are separated into those occurring within Pamlico Sound and other estuaries (Estuary) vs. coastal waters. Assignments to stock were based upon the understanding of the seasonal movements of this stock. However, particularly in coastal waters, there is likely overlap between the NNCES Stock and other bottlenose dolphin stocks. HI = Evidence of Human Interaction, CBD = Cannot Be Determined whether an HI occurred or not. NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014 (SER) and 17 June 2014 (NER).

State	**2009**			**2010**			**2011**			**2012**			**2013**		
Type	HI Yes	HI No	CBD	HI Yes	HI No	CBD	HI Yes	HI No	CBD	HI Yes	HI No	CBD	HI Yes	HI No	CBD
North Carolina-Estuary	2	0	9	2[a]	2	21	1[b]	3	8	3[c]	1	15	2[d]	13	45
North Carolina - Coastal	6[e]	3	18	4[f]	18	18	7[g]	20	25	12[h]	15	19	8[i]	46	69
Virginia[j]	12[k]	2	12	4[l]	2	16	5[m]	2	14	1	2	12	12[n]	31	268
Annual Total	64			87			85			80			494		

[a] Includes 2 fisheries interactions (FIs), 1 of which was an entanglement interaction with commercial gillnet gear (mortality, North Carolina inshore gillnet fishery).
[b] An entanglement interaction with commercial gillnet gear (mortality, North Carolina inshore gillnet fishery).
[c] Includes 2 entanglement interactions in research sink gillnet gear (1 mortality; 1 released alive, could not be determined if seriously injured) and 1 FI.
[d] Includes 1 FI.
[e] Includes 5 FIs and 1 incidental take in research gillnet gear.
[f] Includes 3 FIs and 1 incidental take in research experimental gillnet gear targeting shark.
[g] Includes 4 FIs.
[h] Includes 9 FIs, 1 of which involved ingestion of hook and line gear (mortality), and 3 of which had markings indicative of interactions with gillnet gear (mortalities).
[i] Includes 5 FIs, 1 of which was an entanglement in a stop net (mortality, North Carolina roe mullet stop net fishery).
[j] Strandings from Virginia include primarily waters inside Chesapeake Bay during late summer through fall. It is likely that the NNCES Stock overlaps with the Southern Migratory Coastal Stock in this area.
[k] Includes 12 FIs, 3 of which were mortalities entangled in Virginia pound nets and 8 were mortalities with twisted twine markings indicative of interactions with Virginia pound net gear.
[l] Includes 2 FIs, 1 of which was a mortality with twisted twine markings indicative of interaction with Virginia pound net gear.
[m] Includes 5 FIs, 1 of which was an entanglement in hook and line gear (mortality). Two FIs were mortalities with twisted twine markings indicative of interaction with Virginia pound net gear.
[n] Includes 7 FIs.

HABITAT ISSUES

This stock inhabits areas with significant drainage from agricultural, industrial and urban sources, and as such is exposed to contaminants in runoff from those sources. The blubber of 47 bottlenose dolphins captured and released in and around Beaufort contained detectable environmental contaminants, and 7 had unusually high levels of the pesticide methoxychlor (Hansen *et al.* 2004). Schwacke *et al.* (2002) found that the levels of polychlorinated biphenyls (PCBs) observed in female bottlenose dolphins near Beaufort, North Carolina, would likely impair reproductive success, especially of primiparous females.

STATUS OF STOCK

Common bottlenose dolphins in the western North Atlantic are not listed as threatened or endangered under the Endangered Species Act. However, because the total human-caused mortality and serious injury is equal to or greater than 10% of PBR and may exceed PBR, NMFS considers the NNCES Stock to be a strategic stock under the Marine Mammal Protection Act. PBR for the NNCES Stock is 7.8 and so the zero mortality rate goal, 10% of PBR, is 0.8. The documented mean annual human-caused mortality for this stock for 2009 – 2013 ranged between a minimum of 1.0 and a maximum of 16.7. However, these estimates are biased low for the following reasons: 1) the total U.S. human-caused mortality and serious injury for this stock cannot be directly estimated because of the spatial overlap of several stocks of bottlenose dolphins in this area; 2) the mean annual fishery-related mortality from the mid-Atlantic gillnet fishery does not include estimates from the observer component for years 2012-2013; and 3) there are several commercial fisheries operating within this stock's boundaries and these fisheries have little to no observer coverage. Therefore, the documented mortalities must be considered minimum estimates of total fishery-related mortality. The total fishery-related mortality and serious injury for this stock is likely not less than 10% of the calculated PBR and therefore, cannot be considered to be insignificant and approaching a zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine the population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN *(Tursiops truncatus truncatus)* Southern North Carolina Estuarine System Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the western North Atlantic, the coastal morphotype of common bottlenose dolphins is continuously distributed in nearshore coastal and estuarine waters along the U.S. Atlantic coast south of Long Island, New York, around the Florida peninsula and into the Gulf of Mexico. Several lines of evidence support a distinction between dolphins inhabiting primarily coastal waters near the shore and those present primarily in the inshore waters of the bays, sounds and estuaries. Photo-identification (photo-ID) and genetic studies support the existence of resident estuarine animals in several areas (e.g., Caldwell 2001; Gubbins 2002; Zolman 2002; Gubbins *et al.* 2003; Mazzoil *et al.* 2005; Litz *et al.* 2012), and similar patterns have been observed in bays and estuaries along the Gulf of Mexico coast (e.g., Wells *et al.* 1987). Recent genetic analyses using both mitochondrial DNA and nuclear microsatellite markers found significant differentiation between animals biopsied in coastal and estuarine areas along the Atlantic coast (Rosel *et al.* 2009), and between those biopsied in coastal and estuarine waters at the same latitude (NMFS unpublished data). Similar results have been found off the west coast of Florida (Sellas *et al.* 2005; Balmer *et al.* 2008).

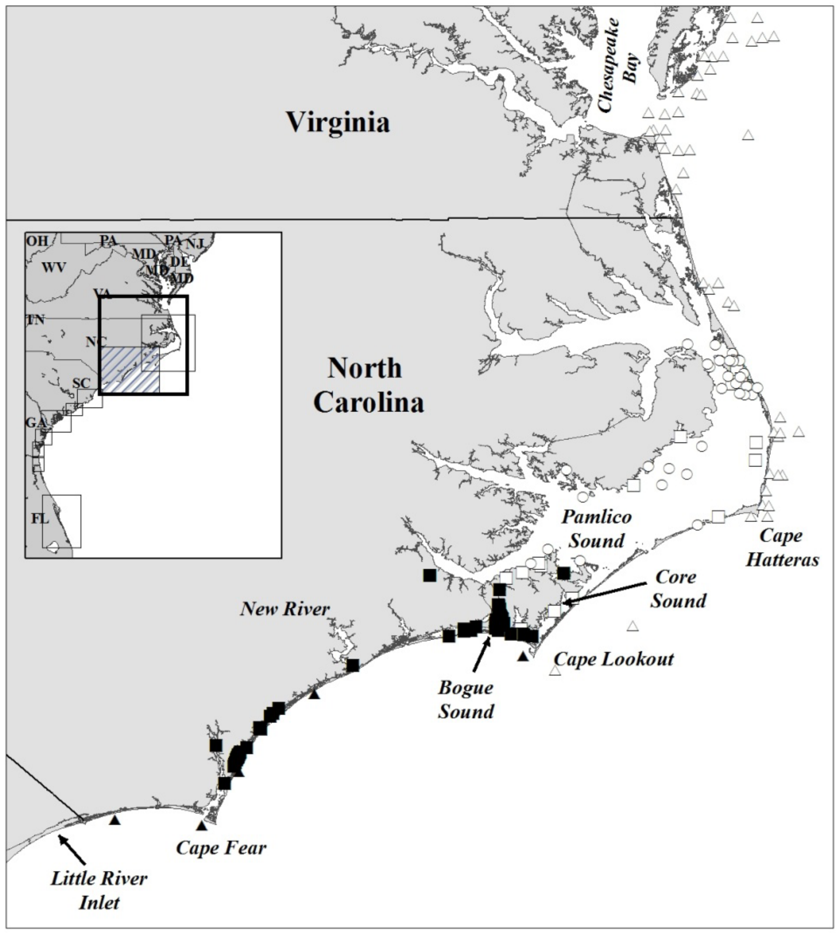

Figure 1. *The distribution of bottlenose dolphins occupying coastal and estuarine waters in North Carolina and Virginia during the period July-September. Locations are shown from aerial surveys (triangles), satellite telemetry (circles) and photo-identification studies (squares). Sightings assigned to the Southern North Carolina Estuarine System stock are shown with filled symbols (all fall within hatched box in inset map). Photo-identification data are courtesy of Duke University and the University of North Carolina at Wilmington.*

The Southern North Carolina Estuarine System (SNCES) Stock is best defined as animals occupying estuarine and nearshore coastal waters (< 3 km from shore) between the Little River Inlet Estuary, inclusive of the estuary (near the North Carolina/South Carolina border), and the New River during cold water months. Members of this stock do not undertake large-scale migratory movements. Instead, they expand their range only slightly northward during warmer months into estuarine waters and nearshore waters (< 3 km from shore) of southern North Carolina as far as central Core Sound, and possibly southern Pamlico Sound.

The movements and range of this stock have been inferred from a combination of photo-ID, tag telemetry and genetic data. Two animals were tagged at Holden Beach, just south of Cape Fear during November 2004, and they remained within waters of southern and central North Carolina throughout the 9-month period when their tags were operational (NMFS unpublished data). Animals captured and released near Beaufort, North Carolina, were fitted with satellite-linked transmitters and/or freeze-branded during July 1995 (30 animals; Hansen and Wells 1996), November 1999 (11 animals), April 2000 (12 animals) and April 2006 (19 animals) (Hohn and Hansen, NMFS unpublished data). Long-term photo-ID studies conducted in waters of North Carolina include records of some of these animals (Read *et al.* 2003; NMFS 2001; Urian *et al*. unpublished manuscript; Duke University unpublished data; University of North Carolina at Wilmington unpublished data; NMFS unpublished data). Of these tagged or freeze-branded animals, at least 8 have been documented to have moved south and occupied estuarine and coastal waters near Cape Fear, south of the New River during cold water months. In addition, genetic analysis of samples from animals in waters of southern North Carolina (between Cape Lookout and the North Carolina/South Carolina border) demonstrate significant genetic differentiation from animals occupying waters from Virginia and further north, and waters of South Carolina (Rosel *et al.* 2009).

The movements of animals from the SNCES Stock are distinct from those of the Northern North Carolina Estuarine System Stock (NNCES). During warm water months, NNCES Stock animals occupy waters of central and northern Pamlico Sound and nearshore coastal waters (< 1 km from shore) perhaps as far north as the Chesapeake Bay. It is probable that there is spatial overlap between these two estuarine stocks during this time in the waters near Beaufort, North Carolina. However, SNCES Stock animals were not observed to move north of Cape Lookout in coastal waters nor into the main portion of Pamlico Sound during warm water months (NMFS unpublished data; Duke University unpublished data; University of North Carolina at Wilmington unpublished data). These movement patterns are consistent with resights of individual dolphins during a photo-ID study that sampled much of the estuarine waters of North Carolina (Read *et al.* 2003). Read *et al.* (2003) suggested that movement patterns, differences in group sizes, and habitats are consistent with 2 stocks of animals occupying estuarine waters of North Carolina.

In summary, during warm water months the SNCES Stock occupies estuarine and nearshore coastal waters (< 3 km from shore) between the Little River at the North Carolina/South Carolina border and Core Sound, including Bogue Sound and southern Pamlico Sound (Figure 1). In the northern portion of its range during these months, it likely overlaps with the NNCES Stock. During cold water months this stock is found only within the southern portion of this range, from the Little River Inlet estuary at the North Carolina/South Carolina border to the New River. In coastal waters (< 3 km from shore), it may overlap with the Southern Migratory Coastal Stock during this period. The timing of the seasonal contraction of the range (and expansion) likely occurs with some inter-annual variability related to seasonal changes in water temperatures and/or prey availability.

In prior stock assessment reports, the animals within this region were referred to as the “Southern North Carolina” coastal stock during summer months, and were part of the winter “mixed” North Carolina management unit of coastal bottlenose dolphins (Waring *et al.* 2009). However, they are now recognized as a distinct stock based upon these differences in seasonal ranging patterns and genetic analyses.

POPULATION SIZE

The current population size of the SNCES Stock is unknown because the survey data are more than 8 years old (Wade and Angliss 1997).

Abundance estimates

A photo-ID mark-recapture study was conducted by Urian *et al.* (2013) in July 2006 using similar methods to those in Read *et al.* (2003) and included estuarine waters of North Carolina from and including the Little River Inlet estuary (near the North Carolina/South Carolina border) to and including Pamlico Sound. The 2006 survey also included coastal waters up to Cape Hatteras extending up to 1km from shore. In order to estimate the abundance for the SNCES alone, only sightings south of 34°46’ N in central Core Sound were used. The resulting abundance estimate included a correction for the proportion of dolphins with non-distinct fins in the population. The abundance estimate for the SNCES Stock based upon photo-ID mark-recapture surveys in 2006 was 188 animals (CV=0.19, 95% confidence interval=118-257; Urian *et al*. 2013). Previously, this was the best available abundance estimate for the SNCES Stock, but was probably negatively biased as the survey covered waters only to 1 km from shore and did not include habitat in southern Pamlico Sound.

Read *et al.* (2003) provided the first abundance estimate for common bottlenose dolphins that occur within the boundaries of the SNCES Stock. This estimate was based on a photo-ID mark-recapture survey of North Carolina waters inshore of the barrier islands, conducted during July 2000. Read *et al.* (2003) estimated the number of animals in the inshore waters of North Carolina occupied by the SNCES Stock at 141 (CV=0.15, 95% confidence interval=112-200). This estimate did not account for the portion of the stock that may have occurred in coastal waters. Aerial survey data from 2002 (NMFS) were, therefore, used to account for the portion of the stock in coastal waters. The abundance estimate for a 3-km strip from Cape Lookout to the North Carolina-South Carolina border was 2,454 (CV=0.53). However, animals from the Southern Migratory Coastal Stock may occur within this 3-km strip during summer months. Therefore, the estimate of abundance within this strip likely included both SNCES animals and Southern Migratory Coastal animals and hence overestimated the abundance of the SNCES Stock.

Minimum Population Estimate

The current minimum population estimate is unknown. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997).

Current Population Trend

A trend analysis has not been conducted for this stock. There are 2 abundance estimates from 2000/2002 and 2006. Methodological differences between the estimates need to be evaluated to quantify trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is currently undetermined. PBR is the product of the minimum population size, one-half the maximum productivity rate, and a “recovery” factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of the SNCES Stock of common bottlenose dolphins is unknown. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is of unknown status.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the SNCES Stock during 2009–2013 is unknown because this stock is known to interact with unobserved fisheries (see below). The mean annual fishery-related mortality and serious injury for observed fisheries and strandings identified as fishery-caused ranged between 0 and 0.4. No additional mortality or serious injury was documented from other human-caused actions. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 ranged between 0 and 0.4. This range reflects the uncertainty in assigning observed or reported mortalities to a particular stock.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category I mid-Atlantic gillnet fishery; the Category II North Carolina inshore gillnet; Atlantic blue crab trap/pot; North Carolina long haul seine; and North Carolina roe mullet stop net fisheries; and the Category III Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fishery. The magnitude of the interactions with these fisheries is unknown because of both uncertainty in the movement patterns of the stock and the spatial overlap between the SNCES Stock and other common bottlenose dolphin stocks in coastal waters. Observer coverage is also limited or non-existent for most of these fisheries, thus stranding data are used as an indicator of fishery-related interactions. There have been no documented interactions between common bottlenose dolphins of the SNCES Stock and the North Carolina long haul seine fishery, the North Carolina roe mullet stop net fishery, or hook and line fisheries during 2009–2013.

Mid-Atlantic Gillnet

Background

This fishery has the highest documented level of mortality of coastal morphotype common bottlenose dolphins, and sink gillnet gear in North Carolina is its largest component in terms of fishing effort and observed takes. Because the Northern Migratory Coastal, Southern Migratory Coastal, NNCES and SNCES Stocks of bottlenose dolphins all occur in waters off of North Carolina, it is not possible to definitively assign every observed mortality, or extrapolated bycatch estimate, to a specific stock. Between 1995 and 2000 a total of 14 takes occurred, 13 mortalities and 1 live release: 1 in 1995 (mixed finfish), 1 in 1996 (spanish mackerel), 3 in 1998 (1 smooth dogfish, 1 spiny dogfish and 1 in beach-anchored gillnet targeting weakfish), 5 in 1999 (2 spiny dogfish, 1 striped bass, 1 shark, and 1 live release from gear targeting spanish mackerel), 4 in 2000 (1 kingfish, 1 spiny dogfish, 1 bluefish/smooth dogfish, and 1 in beach-anchored gillnet targeting striped bass). The observed takes occurred in gear off North Carolina (n=10), Virginia (n=2) and New Jersey (n=2).

The Bottlenose Dolphin Take Reduction Team was convened in October 2001, in part, to reduce bycatch in gillnet gear. While the Bottlenose Dolphin Take Reduction Plan (BDTRP) was being developed and implemented, there were 7 additional bottlenose dolphin mortalities observed in the mid-Atlantic gillnet fishery from 2001-2006. Three mortalities were observed in 2001 with 1 occurring off of northern North Carolina during April (monkfish fishery) and 2 occurring off of Virginia during November (striped bass fishery). Four additional mortalities were observed along the North Carolina coast near Cape Hatteras: 1 in May 2003 (Spanish mackerel), 1 in September 2005 (Spanish mackerel), 1 in September 2006 (Spanish mackerel), and 1 in October 2006 (king mackerel). The BDTRP was implemented in May 2006 and resulted in changes to gillnet gear configurations and fishing practices.

During 2007-2011 only 1 take was observed by the Southeast Fisheries Observer Program off the coast of northern North Carolina during the month of October. There were no observed takes by the Northeast Fisheries Observer Program (NEFOP) during 2007-2011.

Pre-Take Reduction Plan Mortality Estimation (2002-2006)

All available data from 1995 to 2006 were used to estimate total mortality of common bottlenose dolphins in the mid-Atlantic gillnet fishery. Three alternative approaches were used to estimate a pre-BDTRP bycatch rate for the periods 2002-April 2006. First, a generalized linear model (GLM) approach was used similar to that described in Palka and Rossman (2001). The dataset used in the GLM approach included all observed trips and mortalities from 1995 to April 2006 filtered to include only trips that reflected fishing practices in effect during the period from 2002 to April 2006. Second, a simple ratio estimator of catch per unit effort (CPUE = observed catch / observed effort) was used based directly upon the observed data collected from 2002 to April 2006. Finally, a ratio estimator pooled across years 2002-April 2006 was used to estimate different CPUE values for the pre-BDTRP period. In each case, the annual reported fishery effort (represented as reported landings) was multiplied by the estimated bycatch rate to develop annual estimates of fishery-related mortality, again similar to the approach in Palka and Rossman (2001). To account for the uncertainty among the 3 alternative approaches, the average of the 3 model estimates (and the associated uncertainty) was used to estimate the mortality of bottlenose dolphins for this fishery (Table 1). It should be noted that the extrapolated estimates of total mortality include landings from North Carolina inshore waters (see North Carolina Inshore Gillnet section below) where the SNCES Stock is known to occur. The live release from 1999 and 2 takes from beach anchored gillnets reported in the background text were not included in this analysis. Only years 2002-April 2006 are reported here as a new analytical approach is described below for the most recent 5-year mortality analysis covering calendar years 2007-2011.

Table 1. Summary of the 2002-2006 incidental mortality of common bottlenose dolphins in the Southern North Carolina Estuarine System Stock in the commercial mid-Atlantic gillnet fisheries. The estimated annual and average mortality estimates are shown for the period prior to the implementation of the Bottlenose Dolphin Take Reduction Plan (pre-BDTRP) and after the implementation of the plan (post-BDTRP). Three alternative modeling approaches were used, and the average of the 3 was used to represent mortality estimates. The minimum and maximum estimates indicate the range of uncertainty in assigning observed bycatch to stock. Observer coverage is measured as a proportion of reported landings (tons of fish landed). Data are derived from the Northeast Observer program, NER dealer data and NCDMF dealer data. Values in parentheses indicate the CV of the estimate. GLM = generalized linear model.

Period	Year	Observer Coverage	Min Annual Ratio	Min Pooled Ratio	Min GLM	Max Annual Ratio	Max Pooled Ratio	Max GLM
pre-BDTRP	2002	0.01	0	0	1.77 (0.35)	0	0	4.36 (0.30)
	2003	0.01	0	0	3.12 (0.42)	0	0	4.71 (0.34)
	2004	0.02	0	0	2.77 (0.43)	0	0	6.51 (0.36)

	2005	0.03	0	0	1.43 (0.41)	0	0	2.34 (0.30)
	Jan-Apr 2006	0.03	0	0	0.01 (0.70)	0	0	0.32 (0.42)
Annual Avg. pre-BDTRP			Minimum: 0.61 (CV=0.22)			Maximum: 1.22 (CV=0.18)		

During 2002-2006 there were no observed mortalities in the mid-Atlantic gillnet fishery that could potentially be assigned to the SNCES Stock. Hence, both the annual and pooled ratio estimators of bycatch rate were equal to 0 in the pre-BDTRP period. Because the GLM approach included information from prior to 2002, bycatch mortality for the SNCES Stock was estimated from takes that could have possibly belonged to this stock (Table 1). Since observed mortalities (and effort) cannot be definitively assigned to a particular stock within certain regions and times of year, the minimum and maximum possible mortality of the SNCES Stock are presented for comparison to PBR (Table 1).

Based upon these analyses, the minimum and maximum mean mortality estimates for the SNCES Stock for the pre-BDTRP period (2002-Apr 2006) were 0.61 (CV=0.22) and 1.22 (CV=0.18) animals per year, respectively (Table 1).

Post-Take Reduction Plan Mortality Estimation (2007-2011)

During 2007-2011, no bottlenose dolphin takes that could be attributed to the SNCES Stock were observed by the Northeast or Southeast Fishery Observer Programs (NEFOP; SEFOP). The average percent federal observer coverage (measured in trips) for this fishery by the NEFOP and SEFOP during 2007-2011 was 2.95% in state waters (0-3 miles) and 8.59% in federal waters (3-200 miles). The low level of coverage in state waters where this stock can reside is likely insufficient to consistently detect rare bycatch events of common bottlenose dolphins in the mid-Atlantic commercial gillnet fishery. However, based on documented serious injury and mortality in this fishery from other sources (see Table 2), mean annual mortality estimates are likely not zero. Specifically, in 2011 the stranding network recovered a dead dolphin from a fisherman who had incidentally caught it in a small-mesh gillnet targeting spot in North Carolina. This animal could have belonged to the SNCES or Southern Migratory Coastal Stock.

North Carolina Inshore Gillnet

Information about interactions between common bottlenose dolphins and the North Carolina inshore gillnet fishery is based on stranding data. Historically, there was no systematic Federal observer coverage of this fishery. However, from May 2010 through March 2012, the NMFS allocated sea days and observed this fishery for the first time, but future NMFS coverage is uncertain due to funding. Average coverage from the NEFOP (measured in trips) was less than 1%, and no bycatch was recorded by federal observers during this period. However, the low level of federal observer coverage in internal waters where the SNCES stock resides is likely insufficient to detect bycatch events of common bottlenose dolphins if they were to occur in the inshore commercial gillnet fishery.

Because of sea turtle bycatch in inshore gillnets, the North Carolina Division of Marine Fisheries (NCDMF) has been operating their own observer program of the inshore gillnet fishery. Since 2000, the NCDMF has operated systematic coverage of the fall (September-December) flounder gillnet fishery (> 5" mesh) in Pamlico Sound as a part of their Incidental Take Permit under the ESA (Byrd *et al.* 2011). In May 2010, NCDMF expanded the observer coverage to include gillnet effort using nets ≥ 4" mesh in most internal state waters and throughout the year, with a goal of 7-10% coverage. No bycatch of bottlenose dolphins has been recorded by state observers.

Atlantic Blue Crab Trap/Pot

During 2009–2013, there was 1 reported mortality, in 2009, of a common bottlenose dolphin entangled in commercial blue crab trap/pot gear that could have belonged to either the SNCES or Southern Migratory Coastal Stock. Because there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab traps/pots. However, stranding data indicate that interactions occur at some unknown level in North Carolina (Byrd *et al*. 2014) and other regions of the southeast U.S. (Noke and Odell 2002; Burdett and McFee 2004).

Other Mortality

Historically, there have been occasional mortalities of common bottlenose dolphins during research activities including directed live capture studies, turtle relocation trawls and fisheries surveys; however, none were documented during 2009–2013 (see Table 2).

Table 2. Summary of annual reported and estimated mortality of common bottlenose dolphins from the Southern North Carolina Estuarine System Stock during 2009–2013 from observer and stranding data. Where minimum and maximum values are reported in individual cells, there is uncertainty in the assignment of mortalities to this particular stock due to spatial overlap with other bottlenose dolphin stocks in certain areas and seasons. This is especially the case for strandings where the maximum number reported may truly be a minimum because not all strandings are detected. Therefore, to account for both scenarios, the maximum numbers under the total column are reported as the maximum greater than or equal to what was recovered.

Year	Mid-Atlantic Gillnet		NC Inshore Gillnet (strandings)	Blue Crab Pot (strandings)	Total [b]
	Min/Max estimate extrapolated from observer data (only through 2011)[a]	Interactions known from stranding data			
2009	Min = 0 Max = 0	0	0	Min = 0 Max = 1	Min = 0 Max ≥ 1
2010	Min = 0 Max = 0	0	0	0	0
2011	Min = 0 Max = 0	Min = 0 Max = 1	0	0	Min = 0 Max ≥ 1
2012	No estimate[c]	0	0	0	0
2013	No estimate[c]	0	0	0	0
Annual Average Mortality (2009–2013)			Minimum Estimated = 0 Maximum Estimated ≥ 0.4		

[a] Where given, these numbers are the average of the 2 minimum and 2 maximum mortality estimates for that year from Table 2.
[b] In years with bycatch estimates for the mid-Atlantic gillnet fishery, stranded animals recovered with gillnet gear attached would be accounted for in the estimate for that year. Therefore, stranded animals with attached gear are only included in the Total column when no bycatch estimate has been calculated for that year.
[c] Mortality analyses that use observer data are updated every three years. The next update is scheduled for 2015 and will include mortality estimates for years 2012-2014.

Strandings

Between 2009 and 2013, 78 common bottlenose dolphins stranded along coastal and estuarine waters of North Carolina that could be assigned to the SNCES Stock (Table 3; Northeast Regional Marine Mammal Stranding Network, Southeast Regional Marine Mammal Stranding Network; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 17 June 2014 (NER) and 11 June 2014 (SER)). It could not be determined if there was evidence of human interaction for 28 of these strandings, and for 29 it was determined there was no evidence of human interaction. The remaining 21 showed evidence of human interactions, including 18 fisheries interactions (FIs). One FI was a 2009 mortality that was entangled in commercial blue crab trap/pot gear. Another FI was a 2011 mortality entangled in gillnet gear. The gillnet was targeting spot, and falls under the mid-Atlantic gillnet fishery. The remaining FIs could not be assigned to a specific fishery. It should be recognized that evidence of human interaction does not indicate cause of death, but rather only that there was evidence of interaction with a fishery (e.g., line marks, net marks) or evidence of a boat strike, gunshot wound, mutilation, etc., at some point. Also, stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

The assignment of animals to a particular stock is impossible in some seasons and regions. In particular, there is overlap between the SNCES Stock and the Southern Migratory Coastal Stock in coastal waters of southern North Carolina when the Southern Migratory Coastal Stock makes its seasonal migrations north and south. There is also overlap in waters between southern Pamlico Sound and Bogue Sound with the NNCES Stock during late summer and early fall. Therefore, it is likely that the counts in Table 3 include some animals from the Southern Migratory Coastal and/or NNCES Stock and therefore overestimate the number of strandings for the SNCES Stock; those strandings that could not be definitively assigned to the SNCES Stock were also included in the counts for these other stocks as appropriate. Within estuarine waters of southern North Carolina, where the probability is very high that strandings are from the SNCES Stock, there were a total of 16 strandings in this 5 year period. In addition, stranded carcasses are not routinely identified to either the offshore or coastal morphotype of bottlenose dolphin, therefore it is possible that some of the reported strandings were of the offshore form, though that number is likely to be low (Byrd *et al*. 2014). .

An Unusual Mortality Event (UME) was declared in the summer of 2013 for the mid-Atlantic coast from New York to Brevard County, Florida. Beginning in July 2013, bottlenose dolphins have been stranding at elevated rates. The total number of stranded bottlenose dolphins from New York through North Florida (Brevard County) as of mid-October 2014 (1 July 2013 - 19 October 2014) was ~1546. Morbillivirus has been determined to be the cause of the event. Most strandings and morbillivirus positive animals have been recovered from the ocean side beaches rather than from within the estuaries, suggesting that at least so far coastal stocks have been more impacted by this UME than estuarine stocks. However, the UME is still ongoing as of December 2014 when this report was drafted, and work continues to determine the effect of this event on all bottlenose dolphin stocks in the Atlantic.

Table 3. Strandings of common bottlenose dolphins from North Carolina that can possibly be assigned to the Southern North Carolina Estuarine System Stock. Strandings observed in North Carolina are separated into those occurring within estuaries vs. coastal waters. Assignments to stock were based upon the understanding of the seasonal movements of this stock. However, particularly in coastal waters, there is likely overlap between the SNCES Stock and other bottlenose dolphin stocks. HI = Evidence of Human Interaction, CBD = Cannot Be Determined whether an HI occurred or not. NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014.

State	**2009**			**2010**			**2011**			**2012**			**2013**		
Type	HI Yes	HI No	CBD	HI Yes	HI No	CBD	HI Yes	HI No	CBD	HI Yes	HI No	CBD	HI Yes	HI No	CBD
North Carolina - Coastal	3[a]	2	1	3[b]	3	2	5[c]	4	3	3[d]	2	4	3[e]	15	9
North Carolina - Estuary	0	0	2	2[f]	1	2	0	1	1	0	0	1	2[g]	1	3
Annual Total	8			13			14			10			33		

[a] Includes 3 fisheries interactions (FIs), 1 of which was an entanglement interaction with commercial blue crab trap/pot gear (mortality).
[b] Includes 1 FI.
[c] Includes 4 FIs, 1 of which was an entanglement interaction with gillnet gear (mortality, from the mid-Atlantic gillnet fishery).
[d] Includes 3 FIs, one of which had markings indicative of interactions with gillnet gear (mortality).
[e] Includes 3 FIs.
[f] Includes 2 FIs.
[g] Includes 2 FIs.

HABITAT ISSUES

This stock inhabits areas with significant drainage from agricultural, industrial and urban sources, and as such is exposed to contaminants in runoff from those sources. The blubber of 47 bottlenose dolphins captured and released in and around Beaufort, North Carolina, contained contaminants of some level, and 7 had unusually high levels of the pesticide methoxychlor (Hansen *et al.* 2004). Schwacke *et al.* (2002) found that the levels of polychlorinated biphenyls (PCBs) observed in female bottlenose dolphins near Beaufort, North Carolina, would likely impair reproductive success, especially of primiparous females.

STATUS OF STOCK

Common bottlenose dolphins in the western North Atlantic are not listed as threatened or endangered under the Endangered Species Act. However, because the abundance of the SNCES Stock is currently unknown, but likely small and relatively few mortalities and serious injuries would exceed PBR, NMFS considers the SNCES Stock to be a strategic stock under the MMPA. The documented mean annual human-caused mortality for this stock for 2009–2013 ranged between 0 and 0.4. However, these estimates are biased low for the following reasons: 1) the total U.S. human-caused mortality and serious injury for this stock cannot be directly estimated because of the spatial overlap of several stocks of bottlenose dolphins in this area; 2) the mean annual fishery-related mortality from the mid-Atlantic gillnet fishery does not include estimates from the observer component for years 2012-2013; and 3) there are several commercial fisheries operating within this stock's boundaries and these fisheries have little to no observer coverage. Therefore, the documented mortalities must be considered minimum estimates of total fishery-related mortality. There is insufficient information available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching a zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine the population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*) Northern South Carolina Estuarine System Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the western North Atlantic, the coastal morphotype of common bottlenose dolphins is continuously distributed in nearshore coastal and estuarine waters along the U.S. Atlantic coast south of Long Island, New York, to the Florida peninsula. Several lines of evidence support a distinction between dolphins inhabiting coastal waters near the shore and those present in the inshore waters. Photo-identification (photo-ID) studies support the existence of resident estuarine animals in several areas (Caldwell 2001; Gubbins 2002; Zolman 2002; Gubbins *et al.* 2003; Mazzoil *et al.* 2005; Sloan 2006; Litz *et al.* 2012), and similar patterns have been observed in bays and estuaries along the Gulf of Mexico coast (Wells *et al.* 1987; Balmer *et al.* 2008). Recent genetic analyses using both mitochondrial DNA and nuclear microsatellite markers found significant differentiation between animals biopsied in coastal and estuarine areas along the Atlantic coast (Rosel *et al.* 2009), and between those biopsied in coastal and estuarine waters at the same latitude (NMFS unpublished data). Similar results have been found off the west coast of Florida (Sellas *et al.* 2005).

Estuarine waters of central South Carolina are characterized by tidal salt marsh around Bulls Bay and the Cape Romain National Wildlife Refuge, and inlets leading to smaller marsh systems, such as at Murrells Inlet. This region has minimal industrial development. Much of the habitat is a shallow, meso-tidal (2-4 m tidal range) estuary consisting of deep channels, creeks, bays and inlets with tidal mud flats and oyster reefs navigable only at high tide (Petricig 1995; Dame *et al.* 2000; Young and Phillips 2002; Sloan 2006).

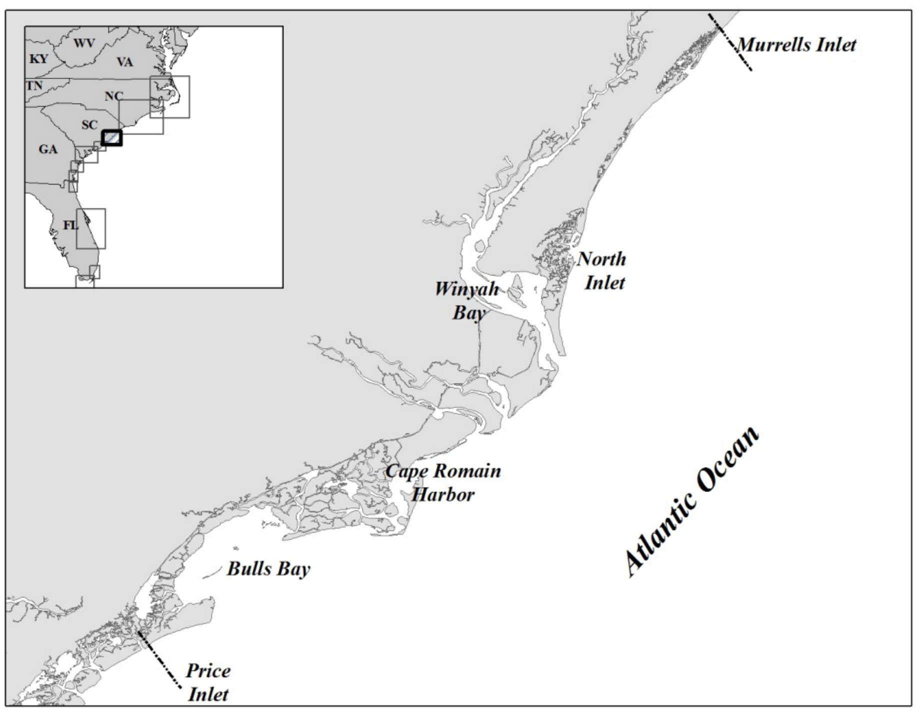

Figure 1. *Geographic extent of the Northern South Carolina Estuarine System (NSCES) Stock. The borders are denoted by dashed lines.*

Sloan (2006) analyzed photo-ID data collected between April-September 2002, July-August 2003 and September 2003 through August 2005 in the Cape Romain National Wildlife Refuge. In total, 1,900 bottlenose dolphins were recorded during 445 sightings, with 121 individuals identified. Only 36% of individuals had dorsal fins that were considered identifiable. Twenty-two year-round residents (sighted 4-20 times and in all 4 water temperature classes: <13°C (cool), 13-19°C (cool transitional), 20-27°C (warm transitional) and >27°C (warm)), 49 seasonal residents (sighted in 1-3 temperature classes over multiple years or 3 temperature classes in the same year), and 50 transients were identified. Sloan (2006) noted that 3 of the 49 seasonal residents were sighted 10-19 times each, and may be residents missed during months with less survey effort. All year-round residents were sighted exclusively within the salt marsh and never in the coastal waters. Twelve year-round residents showed long-term site-fidelity, with 10 individuals sighted over 3 years and 2 individuals sighted over 4 years. Seasonal shifts in abundance were seen and were attributed to shifts in abundance and behavior of prey species (Sloan 2006).

More recently, Brusa (2012) conducted photo-ID surveys in Winyah Bay and North Inlet, South Carolina, to the north of Cape Romain, to examine distribution and home ranges. During May 2011 - February 2012, Brusa (2012) identified 84 dolphins sighted 3 or more times on non-consecutive days, with 71 of those sighted during the warm season (May-October), 2 during the cold season (December-February), and 11 during warm and cold seasons. Similar to Cape Romain, dolphins were present in warm and cold seasons, but found to be less abundant during the cold season. During the warm season, 3 dolphins were sighted in North Inlet only, 38 dolphins in Winyah Bay only, and 41 dolphins were sighted in both North Inlet and Winyah Bay.

Six dolphins identified in the Cape Romain area were matched via the mid-Atlantic Bottlenose Dolphin Catalog (Urian *et al.* 1999) to animals seen in estuarine waters of Winyah Bay and/or North Inlet, one of which had an extensive year-round sighting history in these northern estuarine waters (Sloan 2006). One dolphin seen in the Cape Romain area was also sighted in Murrells Inlet, South Carolina, north of North Inlet (Sloan 2006). However, this animal was sighted only once and so it is difficult to know whether it was an estuarine animal or simply a coastal dolphin that explored these two areas.

Given the results of these photo-ID studies, the Northern South Carolina Estuarine System (NSCES) Stock is delimited as dolphins inhabiting estuarine waters from Murrells Inlet, South Carolina, southwest to Price Inlet, South Carolina, the northern boundary of Charleston Estuarine System Stock (Figure 1). Dolphins may be present as far inland as the Intracoastal Waterway and the stock boundary also includes coastal waters up to 1 km offshore. Murrells Inlet is a small estuarine area and likely does not support its own stock of bottlenose dolphins, but could be utilized by estuarine dolphins from further south. As a result, the stock boundaries for the NSCES Stock include the North Inlet estuary north to Murrells Inlet. North of Murrells Inlet, South Carolina, there is a long stretch of sandy beach with few inlets and no significant estuarine waters. However, these boundaries are subject to change upon further study of dolphin residency patterns in estuarine waters of South Carolina.

POPULATION SIZE

The total number of common bottlenose dolphins residing within the NSCES is unknown. Based on photo-ID data from April-September 2002, July-August 2003, and September 2003-August 2005, 121 individually identified dolphins were observed in the Cape Romain National Wildlife Refuge, and some were identified as year-round residents (Sloan 2006).

Minimum Population Estimate

Present data are insufficient to calculate a minimum population estimate for the NSCES Stock of common bottlenose dolphins.

Current Population Trend

No abundance estimate is available for this stock, and therefore there are insufficient data to assess population trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a “recovery” factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for the NSCES Stock is unknown. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is of unknown status. PBR is unknown for this stock of common bottlenose dolphins.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the NSCES Stock during 2009–2013 is unknown because this stock is known to interact with unobserved fisheries (see below). The mean annual fishery-related mortality and serious injury for strandings identified as fishery-caused was 0.2. No additional mortality or serious injury was documented from other human-caused actions. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 0.2.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category II Southeast Atlantic inshore gillnet fishery and the Atlantic blue crab trap/pot fishery (Appendix III).

Gillnet

During 2009–2013, 1 mortality occurred in 2011 due to an interaction with the Southeast Atlantic inshore gillnet fishery. This mortality was included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, 11 June 2014). It should be noted that there is no systematic observer program for this fishery, so it is not possible to estimate the total number of interactions or mortalities associated with gillnets.

Atlantic Blue Crab Trap/Pot

One of the largest commercial fisheries in South Carolina's coastal waters is the Atlantic blue crab (*Callinectes sapidus*) trap/pot fishery, which operates year round with the predominant fishing occurring from August to November. Burdett and McFee (2004) reviewed common bottlenose dolphin strandings in South Carolina from 1992 to 2003 and found that 24% of the 42 entanglements of dolphins were associated with crab pots with an additional 19% of known entanglements deemed as probable interactions with crab pots.

During 2009–2013 there were no documented interactions with crab trap/pot gear in the NSCES area. It should be noted that there is no systematic observer program for the blue crab fishery.

Other Mortality

From 2009 to 2013, 11 stranded common bottlenose dolphins were reported within the NSCES area, including the 1 above mentioned fisheries interaction with gillnet gear (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, 11 June 2014). Of the 10 remaining strandings, for 2 dolphins, there was no evidence of human interaction, and for 8 dolphins, it could not be determined if there was evidence of human interaction. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

An Unusual Mortality Event (UME) was declared in South Carolina during February-May 2011. One stranding assigned to the NSCES Stock was considered to be part of the UME. The cause of this UME was undetermined. A UME was declared in the summer of 2013 for the mid-Atlantic coast from New York to Brevard County, Florida. Beginning in July 2013, bottlenose dolphins have been stranding at elevated rates. The total number of stranded bottlenose dolphins from New York through North Florida (Brevard County) as of mid-October 2014 (1 July 2013 - 19 October 2014) was ~1546. Morbillivirus has been determined to be the cause of the event. Most strandings and morbillivirus positive animals have been recovered from the ocean side beaches rather than from within the estuaries, suggesting that at least so far coastal stocks have been more impacted by this UME than estuarine stocks. However, the UME is still ongoing as of December 2014 when this report was drafted, and work continues to determine the effect of this event on all bottlenose dolphin stocks in the Atlantic.

STATUS OF STOCK

Common bottlenose dolphins in the western North Atlantic are not listed as threatened or endangered under the Endangered Species Act. However, because the abundance of the NSCES stock is currently unknown, but likely small and relatively few mortalities and serious injuries would exceed PBR, NMFS considers this to be a strategic stock under the Marine Mammal Protection Act. The documented mean annual human-caused mortality for this stock for 2009 – 2013 is 0.2. However, there are commercial fisheries, including crab trap/pot fisheries, operating within this stock's boundaries and these fisheries have little to no observer coverage. The impact of crab trap/pot fisheries on estuarine bottlenose dolphins is currently unknown, but has been shown previously to be considerable in the similar Charleston Estuarine System Stock area (Burdett and McFee 2004). Therefore, the documented mortality must be considered a minimum estimate of total fishery-related mortality. There is insufficient information available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching a zero mortality and serious injury rate. The status of this stock relative to OSP in the U.S. Atlantic EEZ is unknown. There are insufficient data to determine the population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*) Charleston Estuarine System Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the western North Atlantic, the coastal morphotype of common bottlenose dolphins is continuously distributed in nearshore coastal and estuarine waters along the U.S. Atlantic coast south of Long Island, New York, around the Florida peninsula. Several lines of evidence support a distinction between dolphins inhabiting coastal waters near the shore and those present in the inshore waters of the bays, sounds and estuaries. Photo-identification (photo-ID) and genetic studies support the existence of resident estuarine animals in several areas (Caldwell 2001; Gubbins 2002a; Zolman 2002; Gubbins *et al.* 2003; Mazzoil *et al.* 2005; Litz *et al.* 2012), and similar patterns have been observed in bays and estuaries along the Gulf of Mexico coast (Wells *et al.* 1987; Balmer *et al.* 2008). Recent genetic analyses using both mitochondrial DNA and nuclear microsatellite markers found significant differentiation between animals biopsied in coastal and estuarine areas along the Atlantic coast (Rosel *et al.* 2009), and between those biopsied in coastal and estuarine waters at the same latitude (NMFS unpublished data). Similar results have been found off the west coast of Florida (Sellas *et al.* 2005).

The estuarine habitat within and around the Charleston, South Carolina, area is comprised of both developed and undeveloped areas. The Ashley, Cooper and Wando Rivers and the Charleston Harbor are characterized by a high degree of land development and urban areas whereas the Stono River Estuary and North Edisto River have a much lower degree of development. The Charleston Harbor area includes a broad open water habitat, while the other areas consist of river channels and tidal creeks. The Intracoastal Waterway (ICW) consists of miles of undeveloped salt marshes interspersed with developed suburban areas, and it has the least amount of open water habitat.

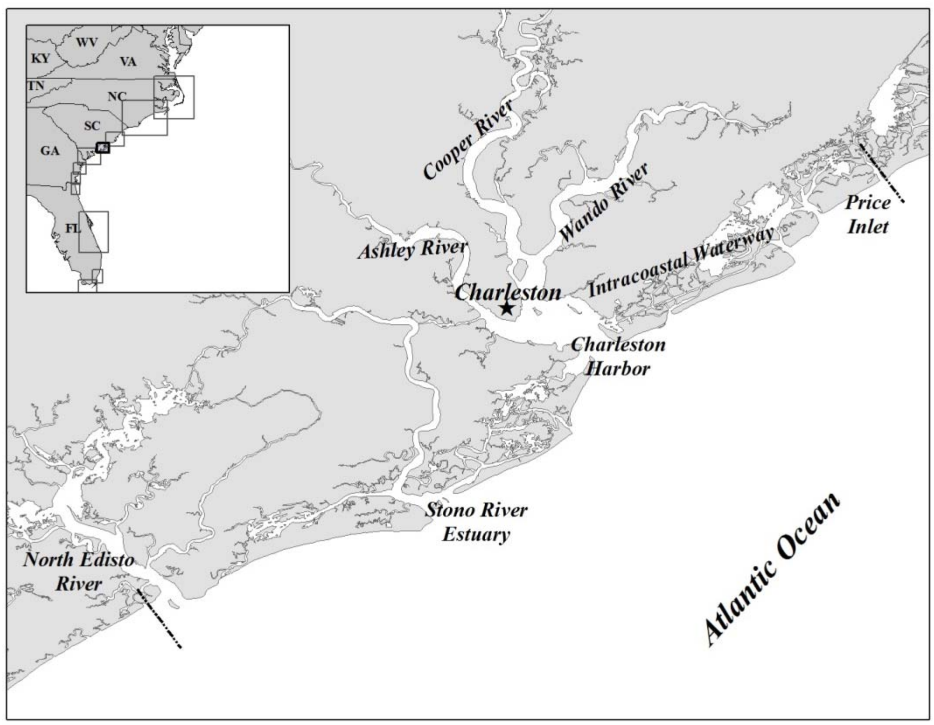

Figure 1. *Geographic extent of the Charleston Estuarine System (CES) stock. Dashed lines denote the boundaries.*

Zolman (2002) analyzed photo-ID data collected in the Stono River Estuary from October 1994 through January 1996 and identified a number of year-round resident dolphins using this area. Zolman (2002) indicated little likelihood that the Stono River Estuary included the entire home range of a dolphin, as individual resident dolphins were observed in other areas, including the North Edisto River and Charleston Harbor.

Satellite telemetry of two female dolphins captured in the Stono River Estuary in October 1999 supported these photo-ID findings. The tag on each dolphin remained functional through January 2000. The first female, along with her dependent calf, visited Charleston Harbor immediately post-capture and later made several forays west to the vicinity of the North Edisto River but for the most part restricted her movements to the lower Stono River Estuary. In contrast, the second female moved frequently between the Stono River Estuary and Charleston Harbor, but not beyond these two areas. These results illustrate the limited range of these dolphins and the connective nature of the areas within the Charleston region (NOAA/NOS/NCCOS unpublished data). Over 30 additional dolphins have been fitted with VHF tags as a part of capture-release health assessments in 1999 (7 dolphins), 2003 (12 dolphins), and 2005 (16 dolphins). Dolphins were captured in the Stono River Estuary, Charleston Harbor, and the Ashley and Wando Rivers. Tagged dolphins were readily relocated within the confines of the Charleston estuarine system and were regularly tracked up to 93 days post-release (NOAA/NOS/NCCOS unpublished data). Again these data underscore the resident nature of dolphins in this region.

Speakman *et al.* (2006) summarized studies carried out from 1994-2003 on bottlenose dolphins throughout the Charleston estuarine system. Individual identifications were made for 839 dolphins, with 115 (14%) sighted between 11 and 40 times. Eighty-one percent (81%) of the 115 individuals were sighted over a period exceeding 5 years while 44% were sighted over a period of 7.7-9.8 years, suggesting long-term residency for some of the dolphins in this area. Using adjusted sighting proportions to correct for unequal survey effort, 42% of the dolphins showed a strong fidelity for a particular area. Among the individuals sighted at least once in the coastal area, 3% were seen only in the coastal area, 62% were seen in the coastal and one other area, 27% were seen in 2 other areas and 8% were seen in 3 additional areas. This finding, that 97% of the dolphins with high sighting frequencies were observed in at least 2 areas, supports the inclusion of the entire area as a single stock, as opposed to multiple stocks (Speakman *et al.* 2006). The number of dolphins observed in Charleston Harbor was 50% greater than in the Stono River Estuary, at least 40% higher than in the North Edisto River and approximately 9 times greater than in the ICW, illustrating that Charleston Harbor is a high use area for this stock (Speakman *et al.* 2006). Also, findings from photo-ID studies indicated that resident dolphins in this stock may use the coastal waters to move between areas, but that resident estuarine animals are distinct from animals that reside in coastal waters or use coastal waters during seasonal migrations (Speakman *et al.* 2006).

Laska *et al.* (2011) investigated movements of dolphins between estuarine and coastal waters in the Charleston estuarine system area by conducting boat-based, photo-ID surveys along 33 km of nearshore coastal waters adjacent to the Stono River Estuary and Charleston Harbor during 2003-2006. Sighting locations as well as all historical (1994-2002) sighting locations were used to classify individuals into a coastal (60% or more of sightings in coastal waters) or estuarine (60% or more of sightings in estuarine waters) community. Most dolphins (68%) identified during the study were classified as coastal, 22% were classified as estuarine, and the remaining 10% showed no preference. Estuarine dolphins were sighted along the coast 1-15 times; the majority of estuarine dolphins (74%) were sighted 1-4 times. The majority (69%) of sightings along the coast were mixed groups of estuarine and coastal dolphins. This study demonstrated that the resident animals utilize nearshore coastal waters as well as estuarine waters, and that estuarine and coastal dolphins frequently interact in this area (Laska *et al.* 2011).

The Charleston Estuarine System (CES) Stock is therefore centered near Charleston, South Carolina. It is bounded to the north by Price Inlet and includes a stretch of the ICW approximately 13 km east-northeast of Charleston Harbor. It continues through Charleston Harbor and includes the main channels and creeks of the Ashley, Cooper and Wando Rivers. The CES Stock also includes all estuarine waters from the Stono River Estuary, approximately 20 km south-southwest of Charleston Harbor, to the North Edisto River another 20km to the west-southwest, and all estuarine waters and tributaries of these rivers. Finally, the CES Stock also includes 1 km of nearshore coastal waters from Price Inlet to the North Edisto River (Figure 1). The southern boundary abuts the northern boundary of the Northern Georgia/Southern South Carolina Estuarine System Stock, previously defined based on a photo-ID project (Gubbins 2002a,b,c). The boundaries of the CES Stock are defined based on long-term photo-ID studies and telemetry work (Speakman *et al.* 2006; Adams *et al.* 2008; Laska *et al.* 2011). The CES Stock boundaries are subject to change upon further study of dolphin residence patterns in estuarine waters of North Carolina, South Carolina and Georgia.

POPULATION SIZE

The total number of common bottlenose dolphins residing within the CES Stock is unknown because previous estimates are greater than 8 years old. As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates greater than 8 years old are deemed unreliable to determine the current PBR. Speakman *et al.* (2010) conducted seasonal (January, April, July, October), photo-ID, mark-recapture surveys during 2004-2006 in the estuarine and coastal waters near Charleston including the Stono River Estuary, Charleston Harbor, and the Ashley, Cooper and Wando Rivers. Pollock's robust design model was applied to the mark-recapture data to estimate abundance. Estimates were adjusted to include the 'unmarked' as well as 'marked' portion of the population for each season. Winter estimates provided the best estimate of the resident estuarine population as transient animals are not thought to be present during winter. The average abundance from January 2005 and January 2006 was 289 (CV=0.03). It is important to note this estimate did not cover the entire range of the CES Stock, and therefore the abundance estimate was negatively biased.

Minimum Population Estimate

The current minimum population estimate is unknown. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997).

Current Population Trend

There are insufficient data to determine the population trends for this stock. Speakman *et al.* (2010) provided abundance estimates from 2004 to 2006 but did not evaluate an interannual trend.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is currently undetermined. PBR is the product of the minimum population size, one-half the maximum productivity rate and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of the CES Stock of common bottlenose dolphins is unknown. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is of unknown status.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the CES Stock during 2009–2013 is unknown because this stock is known to interact with an unobserved fishery (see below). No mortality or serious injury was documented from human-caused actions during 2009–2013.

Fishery Information

This stock interacts with the Category II commercial Atlantic blue crab trap/pot fishery (Appendix III). The only documented reports of fishery-related mortality or serious injury to this stock are associated with the blue crab trap/pot fishery and unidentified fishing gear.

Atlantic Blue Crab Trap/Pot

One of the largest commercial fisheries in South Carolina's coastal waters is the Atlantic blue crab (*Callinectes sapidus*) fishery, which operates year round with the predominant fishing occurring from August to November. Burdett and McFee (2004) reviewed common bottlenose dolphin strandings in South Carolina from 1992 to 2003 and found that 24% of the 42 entanglements of dolphins were associated with crab pots with an additional 19% of known entanglements deemed as probable interactions with crab pots.

Between 2009 and 2013, 2 bottlenose dolphins in the CES were documented as entangled in commercial blue crab trap/pot gear (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 13 September 2012). Both of these animals were disentangled and released alive without serious injury, 1 during 2011 and 1 during 2012 (Maze-Foley and Garrison in prep a,b). The released animals were included in the stranding database (see Table 1). From 2004 to 2008, 4 bottlenose dolphins in the CES were entangled in crab pot gear. These animals were released alive from entangling gear and were not believed to be seriously injured. During 2003, 2 bottlenose dolphins were observed entangled in crab pot lines in the CES, including 1 that was released alive and has been resighted at least 43 times as of December 2012 (NOAA/NOS/NCCOS unpublished data). Because there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab traps/pots.

Other Mortality

There were 102 strandings reported in the CES during 2009–2013 (NOAA National Marine Mammal Health and Stranding Response Database, unpublished data, accessed 11 June 2014; Table 1). It could not be determined if there was evidence of human interaction (HI) for 46 of these strandings, and for 47 it was determined there was no evidence of human interaction. The remaining 9 showed evidence of human interactions, 3 of which were fisheries interactions (FIs). All 3 FIs were live animals that were disentangled and released. As noted above, 2 animals were disentangled from trap/pot gear and released alive without serious injury (Maze-Foley and Garrison in prep a,b). The third was released alive with serious injuries after being disentangled from gear (rope wrapped around the base of its flukes) that was not identified to a specific fishery (Maze-Foley and Garrison in prep a). Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

Table 1. Common bottlenose dolphin strandings occurring in the Charleston Estuarine System, South Carolina from 2009 to 2013, as well as number of strandings for which evidence of human interactions was detected and number of strandings for which it could not be determined (CBD) if there was evidence of human interactions. Data are from the NOAA National Marine Mammal Health and Stranding Response Database (unpublished data, accessed 11 June 2014). Please note human interaction does not necessarily mean the interaction caused the animal's death.

Stock	Category	2009	2010	2011	2012	2013	Total
Charleston Estuarine System	Total Stranded	13	22	24[a]	20	23	102
	Human Interaction						
	---Yes	0	2[b]	2[c]	4[d]	1	9
	---No	5	11	13	8	10	47
	---CBD	8	9	9	8	12	46

[a] This total includes 10 animals that were part of the 2011 UME event in South Carolina.
[b] This total includes 1 FI in which a dolphin was disentangled and released alive with serious injuries due to interaction with unidentified fishing gear.
[c] This total includes 1FI that was disentangled from commercial blue crab trap/pot gear and released alive without serious injury.
[d] This total includes 1FI that was disentangled from commercial blue crab trap/pot gear and released alive without serious injury.

An Unusual Mortality Event (UME) was declared in South Carolina during February-May 2011. Ten strandings assigned to the CES Stock were considered to be part of the UME. The cause of this UME was undetermined. A UME was declared in the summer of 2013 for the mid-Atlantic coast from New York to Brevard County, Florida. Beginning in July 2013, common bottlenose dolphins have been stranding at elevated rates. The total number of stranded bottlenose dolphins from New York through North Florida (Brevard County) as of mid-October 2014 (1 July 2013 - 19 October 2014) was ~1546. Morbillivirus has been determined to be the cause of the event. Most strandings and morbillivirus positive animals have been recovered from the ocean side beaches rather than from within the estuaries, suggesting that at least so far coastal stocks have been more impacted by this UME than estuarine stocks. However, the UME is still ongoing as of December 2014 when this report was drafted, and work continues to determine the effect of this event on all bottlenose dolphin stocks in the Atlantic.

Stranded carcasses are not routinely identified to estuarine or coastal stocks of bottlenose dolphins. In order to address whether a stranded dolphin in the CES was from this estuarine stock or the coastal morphotype stock, the photo-ID catalog of all dolphins individually identified from 1994 through 2012 in the Charleston area was checked against any strandings in the CES for which the animal could be identified (Table 2). Thirty-one (14%) of the 215 stranded dolphins were identifiable, 24 (77%) of which had been previously identified as resident estuarine dolphins belonging to the CES Stock (NOAA/NOS/NCCOS unpublished data). Seven additional dolphins (23%) were identifiable but did not match any dolphins in the Charleston catalog and were thus considered to be part of the coastal morphotype stock. Sixty-seven percent of the estuarine dolphins stranded in the estuarine areas and 86% of the coastal non-resident dolphins stranded along the coast. These limited data indicate that coastal dolphins (not considered part of this stock) stranded predominantly along the coast, whereas 2/3 of the estuarine resident dolphins in this stock stranded in the estuarine areas.

HABITAT ISSUES

This stock inhabits areas of high human population densities, where a large portion of the stock's range is highly industrialized or agricultural. Strandings in South Carolina were greater near urban areas and those with agricultural input, suggesting adverse health effects to estuarine dolphins in these developed areas (McFee and Burdett 2007).

Numerous studies have investigated chemical contaminant concentrations and potential associated health risks for bottlenose dolphins in the CES. An early study measured blubber concentrations of persistent organic pollutants (POPs) and found that samples from male dolphins near Charleston exceeded toxic threshold values that could potentially result in adverse effects on health or reproductive rates (Hansen *et al.* 2004; Schwacke *et al.* 2004). In addition, Fair *et al.* (2007) found that mean total polybrominated diphenyl ethers (PBDE) concentrations, associated with sewage sludge and urban runoff, were 5 times greater in the blubber of Charleston dolphins than levels reported for dolphins in the Indian River Lagoon, and Adams *et al.* (2014) confirmed that PBDE concentrations were higher in CES dolphins that utilized more urbanized/industrialized portions of the area. A broader study by Kucklick *et al.* (2011) demonstrated that while concentrations of some emerging pollutants such as PBDEs were relatively high for dolphins sampled from the CES area as compared to dolphins sampled from 13 other locations long the U.S. Atlantic and Gulf coasts and Bermuda, concentrations of legacy pollutants with well-established toxic effects such as polychlorinated biphenyls (PCBs) and DDT in CES dolphins were more intermediate as compared to the other coastal locations (Kucklick *et al.* 2011).

Perfluoroalkyl compounds (PFCs) have also been measured from the plasma of bottlenose dolphins from the CES area (Adams *et al.* 2008). Using blood samples collected from dolphins near Charleston, Adams *et al.* (2008) found dolphins affiliated with areas characterized by high degrees of industrial and urban land use had significantly higher plasma concentrations of perfluoroctane sulfonate (PFOs), perfluorodecanoic acid (PFDA) and perfluoroundeconic acid (PFUnA) than dolphins which spent most of their time in residential areas with lower developed land use, such as wetland marshes. Dolphins residing predominantly in the Ashley, Cooper and Wando Rivers exhibited significantly greater mean plasma concentration of PFUnA than those associated with Charleston Harbor.

Morbillivirus is a concern for dolphin stocks, particularly long the U.S. Atlantic coast where the disease has been implicated in UMEs. Serum samples from dolphins within the CES area have been found to be negative for titers to both dolphin morbillivirus and porpoise morbillivirus (Rowles *et al.* 2011, Bossart *et al.* 2010), indicating that these dolphins have not been exposed to morbillivirus in recent years. Therefore, CES dolphins likely have little protective antibody titers and could be vulnerable to infection if the disease were to be introduced into the stock.

STATUS OF STOCK

Common bottlenose dolphins in the western North Atlantic are not listed as threatened or endangered under the Endangered Species Act. However, because the abundance of the CES Stock is currently unknown, but likely small and relatively few mortalities and serious injuries would exceed PBR, NMFS considers this to be a strategic stock under the MMPA. There was no documented human-caused mortality or serious injury for this stock during 2009–2013. However, 2 recent entanglements (non-serious injuries) and entanglements in prior years in crab trap/pot fisheries have been documented. The total impact of crab trap/pot fisheries on estuarine bottlenose dolphins is currently unknown, but has been shown previously to be considerable in this area (Burdett and McFee 2004). The crab trap/pot fisheries operating within this stock’s boundaries have no observer coverage. Therefore, any documented mortalities must be considered minimum estimates of total fishery-related mortality. There is insufficient information available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching a zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine the population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*) Northern Georgia/Southern South Carolina Estuarine System Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the western North Atlantic, the coastal morphotype of common bottlenose dolphins is continuously distributed in nearshore coastal and estuarine waters along the U.S. Atlantic coast south of Long Island, New York, to the Florida peninsula. Several lines of evidence support a distinction between dolphins inhabiting coastal waters near the shore and those present in the inshore waters of the bays, sounds and estuaries. Photo-identification (photo-ID) and genetic studies support the existence of resident estuarine animals in several areas (Caldwell 2001; Gubbins 2002a; Zolman 2002; Gubbins *et al.* 2003; Mazzoil *et al.* 2005; Litz *et al.* 2012), and similar patterns have been observed in bays and estuaries along the Gulf of Mexico coast (Wells *et al.* 1987; Balmer *et al.* 2008). Recent genetic analyses using both mitochondrial DNA and nuclear microsatellite markers found significant differentiation between animals biopsied in coastal and estuarine areas along the Atlantic coast (Rosel *et al.* 2009), and between those biopsied in coastal and estuarine waters at the same latitude (NMFS unpublished data). Similar results have been found off the west coast of Florida (Sellas *et al.* 2005).

Estuarine areas in southern South Carolina and northern Georgia are characterized by extensive tidal marshes, shallow lagoonal estuaries, and riverine input (Savannah, Coosawhatchie, Combahee Rivers). Estuarine circulation patterns are dominated mainly by freshwater inflow and tides in South Carolina and Georgia. This region includes the large population centers of Savannah, Georgia, and Hilton Head, South Carolina, which are also areas of significant tourism.

Figure 1. *Geographic extent of the Northern Georgia/Southern South Carolina Estuarine System (NGSSCES) Stock. The borders are denoted by dashed lines.*

From 1994 to 1998, Gubbins (2002a,b,c) surveyed an area around Hilton Head Island bordered on the north by the May River, on the south by the Calibogue Sound, on the west by Savage Creek and on the east by Hilton Head Island. Broad Creek, which bisects Hilton Head Island, and nearshore ocean waters out to 2 km at the mouth of Calibogue Sound were included and were regularly surveyed. Occasional surveys were made around the perimeter of Hilton Head Island. Gubbins (2002b) categorized each dolphin identified in the Hilton Head area as a year-round resident or a seasonal transient based on overall resighting patterns. Residents were seen in all 4 seasons whereas transients were seen only in 1 or 2 seasons. Resident dolphins were observed from 10 to 116 times, whereas transients were observed fewer than 9 times (Gubbins 2002b). Sixty-four percent of the dolphins photographically identified were resighted only once between 1994 and 1998. Both resident and transient dolphins occurred in the waters of Calibogue Sound (Gubbins 2002b,c; Gubbins *et al.* 2003), whereas in the tidal creeks and rivers, primarily small, tight groups of resident dolphins were seen, with only an occasional transient dolphin. Two dolphins were resighted between Hilton Head and Jacksonville, which likely represent transients or seasonal residents (Gubbins 2002b). Gubbins *et al.* (2003) reported dolphin abundance in the Hilton Head area was lowest from February to April, with 2 peaks in abundance observed in May and July. Some dolphins were sighted for short periods in the summer, indicating transients or seasonal residents may move inshore to this area during the summer months.

The Northern Georgia/Southern South Carolina Estuarine System (NGSSCES) Stock is bounded to the north by the southern border of the Charleston Estuarine System Stock at the southern extent of the North Edisto River and extends southwestward to the northern extent of Ossabaw Sound. It includes St. Helena, Port Royal, Calibogue and Wassaw Sounds, as well as the estuarine waters of the rivers and creeks and 1 km of nearshore coastal waters that lie within this area (Figure 1). Photo-ID matches of estuarine animals from the NGSSCES region and the estuarine stocks to the north and south have not been made (Urian *et al.* 1999). The borders are based primarily on results of photo-ID studies conducted by Gubbins (2002a,b,c) in this region, and photo-ID and telemetry research carried out north of this region (Zolman 2002; Speakman *et al.* 2006), and are subject to change upon further study of dolphin residency patterns in estuarine waters of South Carolina and Georgia.

POPULATION SIZE

The total number of common bottlenose dolphins residing within the NGSSCES Stock is unknown. Data collected by Gubbins (2002b) were incorporated into a larger study that used mark-recapture analyses to calculate abundance in 4 estuarine areas along the eastern U.S. coast (Gubbins *et al.* 2003). Sighting records collected only from May through October were used. Based on photo-ID data from 1994 to 1998, 234 individually identified dolphins were observed (Gubbins *et al.* 2003), which included 52 year-round residents and an unspecified number of seasonal residents and transients. Mark-recapture analyses included all the 234 individually identifiable dolphins and the population size for the Hilton Head area was estimated to be 525 dolphins (CV=0.16; Gubbins *et al.* 2003). This was an overestimate of the resident stock abundance within the study area because it included non-resident and seasonally resident dolphins. In addition, the study area did not encompass the entire area occupied by the NGSSCES Stock and therefore this population size cannot be considered a reliable estimate of abundance for this stock. Finally, as recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates greater than 8 years old are deemed unreliable to determine the current PBR.

Minimum Population Estimate

The minimum population estimate for this stock of common bottlenose dolphins is unknown. Present data are insufficient to calculate a minimum population estimate for the Northern Georgia/Southern South Carolina Estuarine System Stock of bottlenose dolphins.

Current Population Trend

No reliable abundance estimate is available for this stock, and therefore there are insufficient data to assess population trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate and a “recovery” factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of the NGSSCES Stock is unknown. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is of unknown status. PBR for the NGSSCES Stock of common bottlenose dolphins is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the NGSSCES Stock during 2009–2013 is unknown because this stock is known to interact with unobserved fisheries (see below). The mean annual fishery-related mortality and serious injury for strandings and at-sea observations identified as fishery-caused was 1.4. No additional mortality or serious injury was documented from other human-caused actions. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 1.4.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category II Atlantic blue crab trap/pot fishery and the Category III Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fishery (Appendix III).

Atlantic Blue Crab Trap/Pot

One of the largest commercial fisheries in South Carolina's coastal waters is the Atlantic blue crab (*Callinectes sapidus*) fishery, which operates year round with the predominant fishing occurring from August to November. Burdett and McFee (2004) reviewed common bottlenose dolphin strandings in South Carolina from 1992 to 2003 and found that 24% of the 42 entanglements of dolphins were associated with crab pots with an additional 19% of known entanglements deemed as probable interactions with crab pots.

Between 2009 and 2013, 5 bottlenose dolphin strandings were reported entangled in crab trap/pot gear in the NGSSCES (Table 1; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). Three of the 5 strandings were mortalities. Two of the 5 animals were released alive, 1 of which was without serious injury and the other was seriously injured (Maze-Foley and Garrison in prep a,b,c). For 2 cases the pot gear was identified as commercial blue crab, for 1 case it was identified as recreational, and the remaining 2 cases were unidentified as to pot gear type. In addition to animals included in the stranding database, in 2009 there was an at-sea observation of a dolphin entangled in a crab pot buoy and line, and this animal was considered seriously injured (Maze-Foley and Garrison in prep a). Because there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab traps/pots.

Hook and Line

During 2009–2013, 2 interactions (mortalities) with hook and line gear were documented within the NGSSCES area. During 2010, 1 dolphin was documented with monofilament line wrapped around its flukes, and 1 dolphin was documented with an ingested fishing lure. Both of these mortalities were included in the stranding database and are included in the stranding totals presented in Table 1. It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Other Mortality

From 2009 to 2013, 105 common bottlenose dolphin strandings were documented within the NGSSCES area (Table 1; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). There was evidence of human interactions for 18 strandings in total, 11 of which were fisheries interactions including the 5 interactions with crab trap/pot gear and 2 interactions with hook and line gear discussed above. No evidence of human interactions was found for 27 strandings, and for the remaining 60 strandings, it could not be determined if there was evidence of human interactions. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

An Unusual Mortality Event (UME) was declared in South Carolina during February-May 2011. Twelve strandings assigned to the NGSSCES Stock were considered to be part of the UME. The cause of this UME was undetermined. A UME was declared in the summer of 2013 for the mid-Atlantic coast from New York to Brevard County, Florida. Beginning in July 2013, bottlenose dolphins have been stranding at elevated rates. The total number of stranded bottlenose dolphins from New York through North Florida (Brevard County) as of mid-October 2014 (1 July 2013 - 19 October 2014) was ~1546. Morbillivirus has been determined to be the cause of the event. Most strandings and morbillivirus positive animals have been recovered from the ocean side beaches rather than from within the estuaries, suggesting that at least so far coastal stocks have been more impacted by this UME than estuarine stocks. However, the UME is still ongoing as of December 2014 when this report was drafted, and work continues to determine the effect of this event on all bottlenose dolphin stocks in the Atlantic.

Table 1. Common bottlenose dolphin strandings occurring in the Northern Georgia/Southern South Carolina Estuarine System Stock area during 2009 to 2013, as well as number of strandings for which evidence of human interactions (HI) was detected and number of strandings for which it could not be determined (CBD) if there was evidence of human interactions. Data are from the NOAA National Marine Mammal Health and Stranding Response Database (unpublished data, accessed 11 June 2014). Please note human interaction does not necessarily mean the interaction caused the animal's death.

Stock	Category	2009	2010	2011	2012	2013	Total
Northern Georga/Southern South Carolina Estuarine System Stock	Total Stranded	9	21	27[a]	21	27	105
	Human Interaction						
	---Yes	3[b]	6[c]	3[d]	2[e]	4[f]	18
	---No	1	10	7	3	6	27
	---CBD	5	5	17	16	17	60

[a] This total includes 12 animals that were part of the 2011 UME event in South Carolina.
[b] This total includes 2 fisheries interactions (FIs), 1 of which was an animal partially disentangled from recreational trap/pot gear by a member of the public and released alive in unknown condition.
[c] This total includes 5 FIs. Two FIs were entanglement interactions in crab trap/pot gear (mortalities), and 2 FIs involved hook and line gear (mortalities).
[d] This total includes 1 FI that was as entanglement interaction in commercial blue crab trap/pot gear (mortality).
[e] This total includes 1 FI.
[f] This total includes 2 FIs, 1 of which was an entanglement interaction with commercial blue crab trap/pot gear (released alive, not seriously injured).

HABITAT ISSUES

This stock inhabits areas with significant drainage from urban and agricultural areas and as such is exposed to contaminants in runoff from those sources. In other estuarine areas where contaminant analyses have been conducted, it has been suggested that exposure to anthropogenic contaminants could potentially result in adverse effects on health or reproductive rates (Schwacke *et al.* 2002; Hansen *et al.* 2004). Analyses of contaminants has been conducted only in the southernmost portion of this stock's range comparing PCB concentrations between dolphins stranded in the Savannah area (Wassaw, Ossabaw and St. Catherine's Sounds) and dolphins using the Turtle/Brunswick River Estuary (TBRE; Pulster and Maryua 2008; Pulster *et al.* 2009). Total PCB concentrations were 10 times higher in dolphins from the TBRE compared to the stranded animals from the Savannah area. The signature of Aroclor 1268, a PCB used in roofing and caulking compounds, was distinct between the TBRE and Savannah area dolphins and closely resembled those of local prey fish species (Pulster and Maruya 2008; Pulster *et al.* 2009).

Illegal feeding or provisioning of wild bottlenose dolphins has been documented in Georgia, particularly near Brunswick and Savannah (Kovacs and Cox 2014; Perrtree *et al.* 2014; Wu 2013). Feeding wild dolphins is defined under the MMPA as a form of 'take' because it can alter the natural behavior and increase the risk of injury or death to wild dolphins. Dolphins in estuarine waters near Savannah recently showed the highest rate of begging behavior reported from any study site worldwide (Perrtree *et al.* 2014). There are emerging questions regarding potential linkages between provisioning wild dolphins, dolphin depredation of recreational fishing gear, and associated entanglement and ingestion of gear (Powell and Wells 2011).

High boat activity in the Hilton Head area could result in a change in movement patterns, alteration of behavior of both dolphins and their prey, disruption of echolocation and masking of communication, physical damage to ears, collisions with vessels and degradation of habitat quality (Richardson *et al.* 1995; Ketten 1998; Gubbins 2002b; Gubbins *et al.* 2003; Mattson *et al.* 2005). The effect of boat and jet ski activity was investigated by Mattson *et al.* (2005) during the summer of 1998 along Hilton Head Island. Dolphins changed behavior more often when boats were present, and group size was significantly larger in the presence of 1 boat and was largest when multiple boats were present. Jet skis elicited a strong and immediate reaction with dolphins remaining below the surface for long periods of time. Dolphins always changed behavior and direction of movement in the presence of shrimp boats, while ships and ferries elicited little to no obvious response. The long-term impacts of such repeated harassment and disturbance on survival and reproduction remain to be determined.

STATUS OF STOCK

Common bottlenose dolphins in the western North Atlantic are not listed as threatened or endangered under the Endangered Species Act. However, because the abundance of the NGSSCES Stock is currently unknown, but likely small, and relatively few mortalities and serious injuries would exceed PBR, NMFS considers this to be a strategic stock under the MMPA. The documented mean annual human-caused mortality and serious injury for this stock for 2009 – 2013 was 1.4. However, there are commercial fisheries, including crab trap/pot fisheries, operating within this stock's boundaries and these fisheries have little to no observer coverage. The impact of crab trap/pot fisheries on estuarine bottlenose dolphins is currently unknown, but has been shown previously to be considerable in the similar Charleston Estuarine System Stock area (Burdett and McFee 2004). Therefore, the documented mortalities and serious injuries must be considered minimum estimates of total fishery-related mortality and serious injury. There is insufficient information available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching a zero mortality and serious injury rate. The status of this stock relative to OSP in the U.S. Atlantic EEZ is unknown. There are insufficient data to determine the population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*) Central Georgia Estuarine System Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the western North Atlantic the coastal morphotype of common bottlenose dolphins is continuously distributed in nearshore coastal and estuarine waters along the U.S. Atlantic coast south of Long Island, New York, to the Florida peninsula. Several lines of evidence support a distinction between dolphins inhabiting coastal waters near the shore and those present in the inshore waters of the bays, sounds and estuaries. Photo-identification (photo-ID) and genetic studies support the existence of resident estuarine animals in several inshore areas of the southeastern United States (Caldwell 2001; Gubbins 2002; Zolman 2002; Mazzoil *et al.* 2005; Litz *et al.* 2012), and similar patterns have been observed in bays and estuaries along the Gulf of Mexico coast (Wells *et al.* 1987; Balmer *et al.* 2008). Recent genetic analyses using both mitochondrial DNA and nuclear microsatellite markers found significant differentiation between animals biopsied in coastal and estuarine areas along the Atlantic coast (Rosel *et al.* 2009), and between those biopsied in coastal and estuarine waters at the same latitude (NMFS unpublished data). Similar results have been found off the west coast of Florida (Sellas *et al.* 2005).

Coastal central and northern Georgia contains an extensive estuarine tidal marsh system in which bottlenose dolphins are documented. The primary river drainages in this region are the Altamaha in central Georgia and the Savannah River at the Georgia-South Carolina border. Much of the coastal marsh and islands in the area have been privately owned since the early 19th century and have therefore experienced little development and the marshes and coastal region are therefore relatively undisturbed. The Sapelo Island National Estuarine Research Reserve, part of NOAA's Estuarine Reserve System, lies in this section of the Georgia coast and includes 4,000 acres of tidal salt marsh.

Figure 1. *Geographic extent of the Central Georgia Estuarine System (CGES) Stock. Dashed lines denote the boundaries.*

The Central Georgia Estuarine System Stock (CGES) is delineated in the estuarine waters of central Georgia (Figure 1). It extends from the northern extent of Ossabaw Sound, where it meets the border with the Northern Georgia/Southern South Carolina Estuarine System Stock, south to the Altamaha River, which provides the border between the CGES and the Southern Georgia Estuarine System Stock. Nearshore (≤ 1km from shore) coastal waters are also included in the CGES Stock boundaries.

The boundaries of this stock are supported by photo-ID and genetic data. Balmer *et al.* (2011) conducted photo-ID studies between 2004 and 2009 in the Turtle/Brunswick River estuary (TBRE) in southern Georgia and in estuarine habitats north of the Altamaha Sound to Sapelo Sound. Photo-ID data revealed strong site fidelity to the two regions and supported Altamaha Sound as an appropriate boundary between the two sites as 85.4% of animals identified did not cross Altamaha Sound (Balmer *et al.* 2013). Just over half the animals that did range across Altamaha Sound had low site fidelity and were believed to be members of the South Carolina/Georgia Coastal Stock. Genetic analysis of mitochondrial DNA control region sequences and microsatellite markers of dolphins biopsied in southern Georgia showed significant genetic differentiation from animals biopsied in northern Georgia and southern South Carolina estuaries as well as from animals biopsied in coastal waters >1 km from shore at the same latitude (NMFS unpublished data). In addition, bottlenose dolphins sampled within the Sapelo Island area exhibited contaminant burdens significantly lower than those sampled to the south in the TBRE (Balmer *et al.* 2011; Kucklick *et al.* 2011) consistent with long-term fidelity to these separate areas.

POPULATION SIZE

During 2008-2009, seasonal, mark-recapture photo-ID surveys were conducted to estimate abundance in a portion of the CGES area from Altamaha Sound north to Sapelo Sound. Estimates from winter were chosen as the best representation of the resident estuarine stock in the area surveyed, and a Markovian emigration model was chosen as the best fit based on the lowest Akaike's Information Criterion value. The estimated average abundance, based on winter 2008 and winter 2009 surveys, was 192 (CV=0.04; Balmer *et al.* 2013). Estimates were adjusted to include the 'unmarked' (not distinctive) as well as 'marked' (distinctive) portion of the population for each winter survey. It is important to note this estimate covered approximately half of the entire range of the CGES Stock, and therefore, the abundance estimate is negatively biased.

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). Though negatively biased, the best estimate for the CGES Stock is 192 (CV=0.04). The resulting minimum population estimate is 185.

Current Population Trend

One abundance estimate is available for this stock, and therefore there are insufficient data to assess population trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a “recovery” factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of the CGES Stock of common bottlenose dolphins is 185. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is of unknown status. PBR for this stock of common bottlenose dolphins is 1.9.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the CGES Stock during 2009–2013 is unknown because this stock is known to interact with an unobserved fishery (see below). No mortality or serious injury was documented from human-caused actions during 2009–2013.

Fishery Information

This stock interacts with the Category II Atlantic blue crab trap/pot fishery (Appendix III).

Atlantic Blue Crab Trap/Pot

During 2009–2013 there were 2 documented interactions with commercial blue crab trap/pot gear in the CGES area. The interactions occurred during 2011 and 2013, and both involved an animal that was disentangled and released alive without serious injury (Maze-Foley and Garrison in prep a,b,c). These animals were included in the stranding database and in the totals in Table 1 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). Since there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab trap/pot gear.

Other Mortality

From 2009 to 2013, 24 common bottlenose dolphins were reported stranded within the CGES (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, 11 June 2014). It could not be determined if there was evidence of human interaction for 20 of these strandings due to most (79%) were in a state of moderate or advanced decomposition when first observed. For 2 dolphins, no evidence of human interactions was detected. The remaining 2 strandings were fishery interactions with commercial crab trap/pot gear, described above. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

An Unusual Mortality Event (UME) was declared in the summer of 2013 for the mid-Atlantic coast from New York to Brevard County, Florida. Beginning in July 2013, bottlenose dolphins have been stranding at elevated rates. The total number of stranded bottlenose dolphins from New York through North Florida (Brevard County) as of mid-October 2014 (1 July 2013 - 19 October 2014) was ~1546. Morbillivirus has been determined to be the cause of the event. Most strandings and morbillivirus positive animals have been recovered from the ocean side beaches rather than from within the estuaries, suggesting that at least so far coastal stocks have been more impacted by this UME than estuarine stocks. However, the UME is still ongoing as of December 2014 when this report was drafted, and work continues to determine the effect of this event on all bottlenose dolphin stocks in the Atlantic.

Table 1. Common bottlenose dolphin strandings occurring in the Central Georgia Estuarine System Stock area during 2009 to 2013, as well as number of strandings for which evidence of human interactions (HI) was detected and number of strandings for which it could not be determined (CBD) if there was evidence of human interactions. Data are from the NOAA National Marine Mammal Health and Stranding Response Database (unpublished data, accessed 11 June 2014). Please note human interaction does not necessarily mean the interaction caused the animal's death.

Stock	Category	2009	2010	2011	2012	2013	Total
Central Georgia Estuarine System Stock	Total Stranded	1	1	6	5	11	24
	Human Interaction						
	---Yes	0	0	1[a]	0	1[b]	2
	---No	0	0	0	1	1	2
	---CBD	1	1	5	4	9	20

[a] This includes 1 fisheries interaction (FI) in which a dolphin was disentangled from commercial blue crab trap/pot gear and released alive without serious injury.
[b] This includes 1 FI in which a dolphin was disentangled from commercial blue crab trap/pot gear and released alive without serious injury.

HABITAT ISSUES

This stock is found in relatively pristine estuarine waters of central Georgia. Much of the area has had been privately owned since the end of the 19th century and not been developed leaving the marshes relatively undisturbed. This stock's area includes the Sapelo Island National Estuarine Research Reserve (SINERR), which is part of NOAA's National Estuarine Research Reserve system (NERR) and several National Wildlife Refuges. Just to the south of this stock's range, however, the estuarine environment around Brunswick, Georgia is highly industrialized and the Environmental Protection Agency has included 4 sites within the Brunswick area as Superfund hazardous waste sites. This region is known to be contaminated with a specific PCB mixture, Aroclor 1268, in soil and sediments, and the transport of these contaminants into the food web through invertebrate and vertebrate fauna has been documented (Kannan *et al.* 1997; Kannan *et al.* 1998; Maruya and Lee 1998). Balmer *et al.* (2013) measured PCB concentrations in dolphins sampled near Sapelo Island and found concentrations, including detection of Aroclor 1268, lower than those found in dolphins from the Brunswick, Georgia area, but still high when compared to other bottlenose dolphin stocks along the eastern seaboard. Given little evidence for movement of dolphins between these two areas (Balmer *et al.* 2011, 2013), the dolphins near Sapelo, Island in the

CGES Stock may be obtaining the high contaminant loads through eating contaminated prey (Balmer *et al.* 2011). Further work is necessary to examine contaminant and movement patterns of dolphin prey species in this region.

Studies have suggested an increased risk of detrimental effects on reproduction and endocrine and immune system function for marine mammals in relation to tissue concentrations of PCBs (De Swart *et al.* 1996; Kannan *et al.* 2000; Schwacke *et al.* 2002). PCB-related health effects on bottlenose dolphins along the Georgia coast were examined through a capture-release health assessment conducted during 2009 in the Brunswick area and in waters near Sapelo Island (Schwacke *et al.* 2012). Results from hematology and serum chemistry indicated abnormalities, most notably that 26% of sampled dolphins were anemic. Also, dolphins showed low levels of thryoid hormone, and thyroid hormones negatively correlated with PCB concentration measured in blubber. In addition, a reduction in innate and acquired immune response was found. T-lymphocyte proliferation and indices of innate immunity decreased with PCB concentration measured in blubber, indicating increased vulnerability to infectious disease. The high levels of PCBs recorded in dolphins from this stock, despite their relatively pristine environment, along with demonstrated PCB-related health effects, raise concern for the long-term health and viability of the stock. Studies of the distribution and health of bottlenose dolphins in this area are ongoing (Sanger *et al.* 2008; Schwacke, pers. comm.).

Illegal feeding or provisioning of wild bottlenose dolphins has been documented in Georgia, particularly near Brunswick and Savannah (Kovacs and Cox 2014; Perrtree *et al.* 2014; Wu 2013). Feeding wild dolphins is defined under the MMPA as a form of 'take' because it can alter the natural behavior and increase the risk of injury or death to wild dolphins.

STATUS OF STOCK

Common bottlenose dolphins in the western North Atlantic are not listed as threatened or endangered under the Endangered Species Act. However, because the abundance of the CGES Stock is small and relatively few mortalities and serious injuries would exceed PBR, NMFS considers this to be a strategic stock under the Marine Mammal Protection Act. PBR for this stock is 1.9, and the zero mortality rate goal, 10% of PBR, is 0.2. There were no documented human-caused mortalities or serious injuries to this stock during 2009 – 2013. However, 2 recent entanglements (non-serious injuries) and entanglements in prior years in both commercial and recreational crab trap/pot fisheries have been documented. While the impact of crab trap/pot fisheries on estuarine bottlenose dolphins is currently unknown, it has been shown previously to be considerable in the similar Charleston Estuarine System Stock area (Burdett and McFee 2004). Therefore, documented mortalities must be considered minimum estimates of total fishery-related mortality. There is insufficient information available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching a zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine the population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*)
Southern Georgia Estuarine System Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the western North Atlantic, the coastal morphotype of common bottlenose dolphins is continuously distributed in nearshore coastal and estuarine waters along the U.S. Atlantic coast south of Long Island, New York, to the Florida peninsula. Several lines of evidence support a distinction between dolphins inhabiting coastal waters near the shore and those present in the inshore waters of the bays, sounds and estuaries. Photo-identification (photo-ID) and genetic studies support the existence of resident estuarine animals in several inshore areas of the southeastern United States (Caldwell 2001; Gubbins 2002; Zolman 2002; Mazzoil *et al.* 2005; Litz *et al.* 2012), and similar patterns have been observed in bays and estuaries along the Gulf of Mexico coast (Wells *et al.* 1987; Balmer *et al.* 2008). Recent genetic analyses using both mitochondrial DNA and nuclear microsatellite markers found significant differentiation between animals biopsied in coastal and estuarine areas along the Atlantic coast (Rosel *et al.* 2009), and between those biopsied in coastal and estuarine waters at the same latitude (NMFS unpublished data). Similar results have been found off the west coast of Florida (Sellas *et al.* 2005).

Coastal southern Georgia contains an extensive estuarine tidal marsh system, punctuated with several river drainages. There is moderate development throughout the region, along with the larger industrialized area around Brunswick, Georgia. The Environmental Protection Agency has included 4 sites within the Brunswick area among the Superfund hazardous waste sites.

Balmer *et al.* (2011) conducted photo-ID studies between 2004 and 2009 in two field sites in south-central Georgia, one in the Turtle/Brunswick River estuary (TBRE) and the second north of the Altamaha River/Sound including the Sapelo Island National Estuarine Research Reserve and extending north to Sapelo Sound. Photo-ID data revealed strong site fidelity to the two regions and supported Altamaha Sound as an appropriate boundary between the two sites as 85.4% of animals identified did not cross Altamaha Sound (Balmer *et al.* 2013). Just over half the animals that did range across Altamaha Sound had low site fidelity and were believed to be members of the South Carolina/Georgia Coastal Stock.

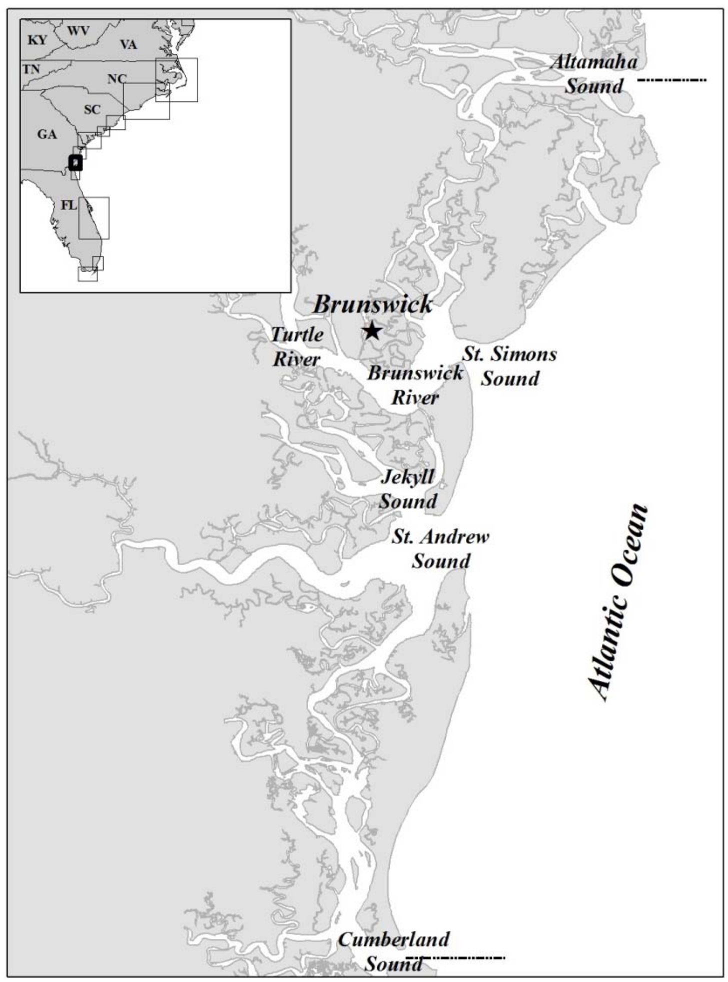

Figure 1. *Geographic extent of the Southern Georgia Estuarine System (SGES) Stock. The borders are denoted by dashed lines.*

Genetic analysis of mitochondrial DNA control region sequences and microsatellite markers of dolphins biopsied in southern Georgia showed significant genetic differentiation from animals biopsied in northern Georgia and southern South Carolina estuaries as well as from animals biopsied in coastal waters >1 km from shore at the same latitude (NMFS unpublished data). In addition, bottlenose dolphins in the TBRE exhibit contaminant burdens consistent with long-term fidelity to the TBRE (Pulster and Maruya 2008; Balmer *et al.* 2011; Kucklick *et al.* 2011).

Therefore, the Southern Georgia Estuarine System Stock (SGES) is bounded in the south by the Georgia/Florida border at the Cumberland River out through Cumberland Sound and in the north by the Altamaha River out through Altamaha Sound inclusive, and encompasses all estuarine waters in between, including but not limited to the Intracoastal Waterway, Hampton River, St. Andrew and Jekyll Sounds and their tributaries, St. Simons Sound and tributaries, and the TBRE system (Figure 1). Although the majority of photo-ID survey effort by Balmer *et al.* (2013) was conducted within the estuaries, opportunistic surveys extending along the coast and satellite-linked telemetry of three individuals suggested that animals within the SGES had ranging patterns that extended into the coastal waters of the TBRE. Thus, the nearshore (≤ 1km from shore) coastal waters from Altamaha Sound to Cumberland Sound were included in the SGES Stock boundaries. The southern boundary abuts the northern boundary of the Jacksonville Estuarine System Stock, previously defined based on photo-ID and genetic data (Caldwell 2001). The northern boundary is defined based on continuity of estuarine habitat, evidence for significantly lower contaminant levels in dolphins from the Sapleo Island area (Balmer *et al.* 2011) and a genetic discontinuity between dolphins sampled in southern Georgia and those sampled in Charleston, South Carolina (Rosel *et al.* 2009). These boundaries are subject to change upon further study of dolphin residency patterns in estuarine waters of central and northern Georgia.

POPULATION SIZE

During 2008-2009, seasonal, mark-recapture, photo-ID surveys were conducted by Balmer *et al.* (2013) to estimate abundance in a portion of the SGES including St. Simons Sound north to and inclusive of Altamaha Sound. Estimates from winter were chosen as the best representation of the portion of resident estuarine stock in the area surveyed, and a random emigration model was chosen as the best fit based on the lowest Akaike's Information Criterion value. The estimated average abundance estimate, based on winter 2008 and winter 2009 surveys, was 194 (CV=0.05; Balmer *et al.* 2013). It is important to note this estimate covered less than half of the entire range of the SGES Stock, and therefore, the abundance estimate is negatively biased.

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). Though negatively biased, the best estimate for the SGES Stock is 194 (CV=0.05). The resulting minimum population estimate is 185.

Current Population Trend

One abundance estimate is available for this stock, and therefore there are insufficient data to assess population trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of the SGES Stock of common bottlenose dolphins is 185. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is of unknown status. PBR for this stock of common bottlenose dolphins is 1.9.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the SGES Stock during 2009–2013 is unknown because this stock is known to interact with an unobserved fishery (see below). No mortality or serious injury was documented from human-caused actions during 2009–2013.

Fishery Information

This stock has the potential to interact with the Category II commercial Atlantic blue crab trap/pot fishery (Appendix III).

Atlantic Blue Crab Trap/Pot

During 2009–2013 there were no documented interactions with crab trap/pot gear in the SGES area. The most recent documented interaction is from 2005. Since there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab traps/pots.

Other Mortality

From 2009 to 2013, 31 common bottlenose dolphins were reported stranded within the SGES (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11June 2014). It could not be determined if there was evidence of human interaction for 28 of these strandings. For the remaining 3 dolphins, no evidence of human interaction was detected. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

An Unusual Mortality Event (UME) was declared in the summer of 2013 for the mid-Atlantic coast from New York to Brevard County, Florida. Beginning in July 2013, bottlenose dolphins have been stranding at elevated rates. The total number of stranded bottlenose dolphins from New York through North Florida (Brevard County) as of mid-October 2014 (1 July 2013 - 19 October 2014) was ~1546. Morbillivirus has been determined to be the cause of the event. Most strandings and morbillivirus positive animals have been recovered from the ocean side beaches rather than from within the estuaries, suggesting that at least so far coastal stocks have been more impacted by this UME than estuarine stocks. However, the UME is still ongoing as of December 2014 when this report was drafted, and work continues to determine the effect of this event on all bottlenose dolphin stocks in the Atlantic.

HABITAT ISSUES

A portion of the stock's range is highly industrialized, and the Environmental Protection Agency has included 4 sites within the Brunswick area as Superfund hazardous waste sites. Specifically, the LCP Chemicals Site contaminated soils, groundwater and adjacent marsh with mercury and polychlorinated biphenyls (PCBs). Mean total polychlorinated biphenyl (PCB) concentrations from dolphins biopsied in the TBRE (Pulster and Maruya 2008; Sanger *et al.* 2008) were significantly higher than dolphins sampled in other areas of the world including other inshore estuarine waters along the Southeast coast of the United States, including the Gulf of Mexico (Schwacke *et al.* 2002; Hansen *et al.* 2004; Litz 2007; Balmer *et al.* 2011; Kucklick *et al.* 2011). PCB congeners measured in tissues of dolphins biopsied in the TBRE system were enriched in highly chlorinated homologs consistent with Aroclor 1268 (Pulster and Maruya 2008; Sanger *et al.* 2008, Balmer *et al.* 2011; Kucklick *et al.* 2011). The TBRE area is known to be contaminated with this specific PCB mixture in soil and sediments, and the transport of these contaminants into the food web through invertebrate and vertebrate fauna has been documented (Kannan *et al.* 1997; Kannan *et al.* 1998; Maruya and Lee 1998).

Studies have suggested an increased risk of detrimental effects on reproduction and endocrine and immune system function for marine mammals in relation to tissue concentrations of PCBs (De Swart *et al.* 1996; Kannan *et al.* 2000; Schwacke *et al.* 2002). PCB-related health effects on bottlenose dolphins along the Georgia coast were examined through a capture-release health assessment conducted during 2009 in the TBRE and in waters near Sapelo Island (Schwacke *et al.* 2012). Results from hematology and serum chemistry indicated abnormalities, most notably that 26% of sampled dolphins were anemic. Also, dolphins showed low levels of thryoid hormone, and thyroid hormones negatively correlated with PCB concentration measured in blubber. In addition, a reduction in innate and acquired immune response was found. T-lymphocyte proliferation and indices of innate immunity decreased with PCB concentration measured in blubber, indicating increased vulnerability to infectious disease. Overall, the results plainly showed that bottlenose dolphins are susceptible to PCB-related health effects (Schwacke *et al.* 2012). Thus, the high levels of PCBs recorded in dolphins from this stock, along with demonstrated PCB-related health effects, raise concern for the long-term health and viability of the stock. Studies of the distribution and health of bottlenose dolphins in this area are ongoing (Sanger *et al.* 2008; Schwacke, pers. comm.).

Illegal feeding or provisioning of wild bottlenose dolphins has been documented in Georgia, particularly near Brunswick and Savannah (Kovacs and Cox 2014; Perrtree *et al.* 2014; Wu 2013). Feeding wild dolphins is defined under the MMPA as a form of 'take' because it can alter the natural behavior and increase the risk of injury or death to wild dolphins.

STATUS OF STOCK

Common bottlenose dolphins in the western North Atlantic are not listed as threatened or endangered under the Endangered Species Act. However, because the abundance of the SGES Stock is small and relatively few mortalities and serious injuries would exceed PBR, NMFS considers this to be a strategic stock under the Marine Mammal Protection Act. PBR for this stock is 1.9 and so the zero mortality rate goal, 10% of PBR, is 0.2. There have been no documented human-caused mortalities to this stock during 2009 – 2013. Entanglements in both commercial and recreational crab pot fisheries have been documented in prior years, and while the impact of crab trap/pot fisheries on estuarine bottlenose dolphins is currently unknown, it has been shown previously to be considerable in the similar Charleston Estuarine System Stock area (Burdett and McFee 2004). Therefore, documented mortalities must be considered minimum estimates of total fishery-related mortality. Detrimental impacts of high pollutant burdens may be a significant issue for this stock due to the high mean total polychlorinated biphenyl (PCB) concentrations found in the blubber of animals in this region. There is insufficient information available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching a zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine the population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*) Jacksonville Estuarine System Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

In the western North Atlantic, the coastal morphotype of common bottlenose dolphins is continuously distributed in nearshore coastal and estuarine waters along the U.S. Atlantic coast south of Long Island, New York, to the Florida peninsula. Several lines of evidence support a distinction between dolphins inhabiting coastal waters near the shore and those present in the inshore waters of the bays, sounds and estuaries. Photo-identification (photo-ID) and genetic studies support the existence of resident estuarine animals in several areas (Caldwell 2001; Gubbins 2002; Zolman 2002; Gubbins *et al.* 2003; Mazzoil *et al.* 2005; Litz *et al.* 2012), and similar patterns have been observed in bays and estuaries along the Gulf of Mexico coast (Wells *et al.* 1987; Balmer *et al.* 2008). Recent genetic analyses using both mitochondrial DNA and nuclear microsatellite markers found significant differentiation between animals biopsied in coastal and estuarine areas along the Atlantic coast (Rosel *et al.* 2009), and between those biopsied in coastal and estuarine waters at the same latitude (NMFS unpublished data). Similar results have been found off the west coast of Florida (Sellas *et al.* 2005).

The estuarine habitat around Jacksonville, Florida, is composed of several large brackish rivers, including St. Mary's, Amelia, Nassau, Fort George and St. Johns River (Figure 1). The St. Johns River is a deep, swift moving river with heavy boat and shipping activity (Caldwell 2001). The remainder of the area is made up of tidal marshes and riverine systems averaging 2m in depth over sand, mud or oyster beds, and is bisected by the Intracoastal Waterway.

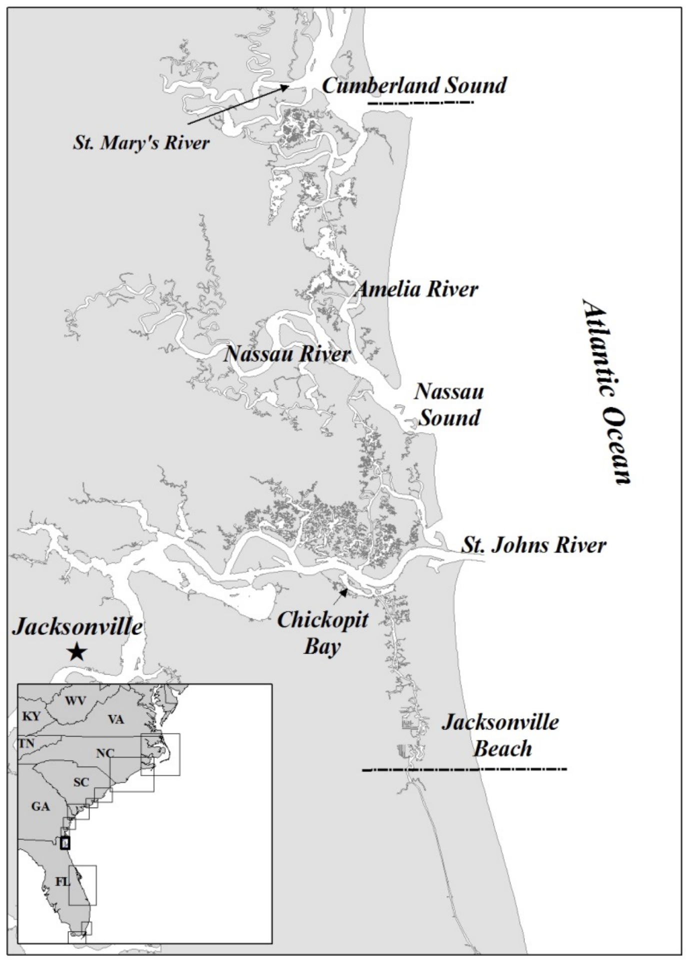

Figure 1. *Geographic extent of the Jacksonville Estuarine System (JES) Stock. The borders are denoted by dashed lines.*

Caldwell (2001) investigated the social structure of bottlenose dolphins inhabiting the estuarine waters between the St. Mary's River and Jacksonville Beach, Florida, using photo-ID and behavioral data obtained from December 1994 through December 1997. Three behaviorally different communities were identified during this study, namely the estuarine waters north of St. Johns River (termed the Northern area), the estuarine waters south of St. Johns River (the Southern area) and the coastal area, all of which differed in density, habitat fidelity and social affiliation patterns. Caldwell (2001) found that dolphins inhabiting the Northern area were the most isolated, with 96% of the groups observed containing dolphins that had been photographically identified only in this area, demonstrating strong year-round site fidelity. Cluster analyses suggested that dolphins using the Northern area did not socialize with those using the Southern area. In the Southern area, 78% of the groups were photographed only in this region (Caldwell 2001). However, these dolphins migrated into and out of the Jacksonville area each year, returning to the area during 3 consecutive summers, suggesting the Southern area dolphins may show summer site fidelity as opposed to the year-round fidelity demonstrated in the Northern area. Caldwell (2001) found that dolphins found in the coastal areas were highly mobile, had fluid social affiliations, were not sighted more than 8 times over the entire study and showed no long-term (>4 months) site fidelity. Three of these dolphins were also sighted off South Carolina, behind shrimp boats. These coastal dolphins are thus considered to be members of the coastal morphotype stocks.

Caldwell (2001) also examined genetic differentiation among the Northern, Southern and coastal areas of the study site using mitochondrial DNA sequences and microsatellite data. Both mitochondrial DNA haplotype and microsatellite allele frequencies differed significantly between the Northern and Southern sampling areas. Differentiation between the Southern sampling area and the coast was lower, but still significant. These genetic data are in line with the behavioral analyses. However, sample sizes were small for these estuarine regions (n≤25) and genetic analyses did not account for the high number of closely related individuals within the dataset. Further analyses are necessary to confirm the results.

Gubbins *et al.* (2003) identified oscillating abundance year round for dolphins within the estuarine waters of this area, with low numbers reported in January and December. There was a positive correlation between dolphin abundance and water temperature, with peak numbers seen when water temperatures rose above 16°C.

The Jacksonville Estuarine System (JES) Stock has been defined as a separate estuarine stock primarily by the results of these photo-ID and genetic studies. It is bounded in the north by the Florida/Georgia border at Cumberland Sound, abutting the southern border of the Southern Georgia Estuarine System Stock, and extends south to Jacksonville Beach, Florida. Despite the strong fidelity to the Northern and Southern areas observed by Caldwell (2001), some dolphins were photographed outside their preferred areas, supporting the proposal to include both these areas within the boundaries of the JES Stock. Future analyses may provide additional information on the importance of the Southern area to the resident stock, and thus the inclusion of both areas in this stock boundary may be modified with additional data or further analyses.

Dolphins residing within estuaries south of this stock down to the northern boundary of the Indian River Lagoon Estuarine System Stock are currently not included in any Stock Assessment Report. There are insufficient data to determine whether animals south of the JES Stock exhibit affiliation to the JES Stock, the IRLES Stock to the south or are simply transient animals associated with coastal stocks. Further research is needed to establish affinities of dolphins in this region. It should be noted that during 2009–2013, there were 32 stranded bottlenose dolphins in this region in estuarine waters, including 3 interactions with hook and line fishing gear (1 mortality, 1 serious injury, 1 live release without serious injury) and 2 entanglements in blue crab trap/pot gear (1 mortality and 1 live release without serious injury) (Maze-Foley and Garrison in prep a,b). In addition to animals included in the stranding database, in estuarine waters south of JES there were 3 at-sea observations of dolphins entangled in hook and line gear, crab trap/pot gear and thick line. All 3 dolphins were considered not seriously injured (Maze-Foley and Garrison in prep a,b).

POPULATION SIZE

The total number of common bottlenose dolphins residing within the JES Stock is unknown because previous estimates are greater than 8 years old. As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates greater than 8 years old are deemed unreliable to determine the current PBR. Data collected by Caldwell (2001) were incorporated into a larger study that used mark-recapture analyses to calculate abundance in 4 estuarine areas along the eastern U.S. coast (Gubbins *et al.* 2003). Sighting records collected only from May through October were used, as this limited time period was determined to reduce the possibility of violating the mark-recapture model's assumption of geographic closure and mark retention. Based on photo-ID data from 1994 to 1997, 334 individually identified dolphins were observed (Gubbins *et al.* 2003), which included an unspecified number of seasonal residents and transients. Mark-recapture analyses included all the 334 individually identifiable dolphins, and the population size for the JES Stock was calculated to be 412 residents (CV=0.06; Gubbins *et al.* 2003). This was an overestimate of the stock abundance in the area covered by the study because it included non-resident and seasonally resident dolphins. Caldwell (2001) indicated that 122 dolphins were resighted at least 10 times in the JES, with 33 individuals observed primarily in the Northern area, and 89 individuals reported to use the Southern area.

Minimum Population Estimate

Present data are insufficient to calculate a minimum population estimate for the JES Stock of common bottlenose dolphins.

Current Population Trend

One abundance estimate is available for this stock, and therefore there are insufficient data to assess population trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for the JES Stock is unknown. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is of unknown status. PBR is unknown for this stock.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the JES Stock during 2009–2013 is unknown because this stock is known to interact with unobserved fisheries (see below). The mean annual fishery-related mortality and serious injury for strandings and at-sea observations identified as fishery-caused was 1.2. No additional mortality or serious injury was documented from other human-caused actions. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 1.2.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category II Atlantic blue crab trap/pot; and Southeastern U.S. Atlantic, Gulf of Mexico stone crab trap/pot fisheries; and the Category III Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fishery (Appendix III).

Crab Trap/Pot

Between 2009 and 2013, 7 strandings within the JES area displayed evidence of interaction with a trap/pot fishery (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). Three carcasses were entangled in crab trap gear (identified as commercial blue crab trap gear in 2 cases and unidentified trap/pot gear in the third), and 4 live animals were observed entangled in commercial blue crab trap line and buoys. One of the live animals was determined to be seriously injured and 3 were determined to be not seriously injured (Maze-Foley and Garrison in prep a,b,c). Because there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab traps/pots.

Hook and Line

During 2009–2013, 1 live animal was documented entangled in hook and line gear and debris within the JES area, and this animal was considered seriously injured (Maze-Foley and Garrison in prep b). This animal was included in the stranding database and in the stranding totals presented in Table 1. It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Other Mortality

During 2009–2013, 71 strandings were documented within the JES area, including 18 strandings with evidence of a human interaction. Human interactions were from numerous sources, including the 7 crab trap/pot interactions and 1 hook and line gear interaction noted above, as well as entanglement in an Aerobie frisbee, and also evidence of 3 boat collisions (Table 1; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). For 7 strandings, no evidence of human interactions was found, and for 46 strandings, it could not be determined if there was evidence of human interactions. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al.* 2012; Wells *et al.* 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al.* 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

In addition to animals included in the stranding database, in 2013 there was an at-sea observation in the JES area of a dolphin entangled in unidentified fishing gear, and this dolphin was determined to be seriously injured

(Maze-Foley and Garrison in prep c).

An Unusual Mortality Event (UME) was declared for the St. Johns River area during May-September 2010, including 14 strandings assigned to the JES Stock and 4 strandings within estuaries to the south not currently included in any stock assessment report. The cause of this UME is undetermined. A UME was declared in the summer of 2013 for the mid-Atlantic coast from New York to Brevard County, Florida. Beginning in July 2013, bottlenose dolphins have been stranding at elevated rates. The total number of stranded bottlenose dolphins from New York through North Florida (Brevard County) as of mid-October 2014 (1 July 2013 - 19 October 2014) was ~1546. Morbillivirus has been determined to be the cause of the event. Most strandings and morbillivirus positive animals have been recovered from the ocean side beaches rather than from within the estuaries, suggesting that at least so far coastal stocks have been more impacted by this UME than estuarine stocks. However, several confirmed morbillivirus positive animals have been recovered from within the JES Stock area. The UME is still ongoing as of December 2014 when this report was drafted, and work continues to determine the effect of this event on all bottlenose dolphin stocks in the Atlantic.

Table 1. Common bottlenose dolphin strandings occurring in the Jacksonville Estuarine System, South Carolina, from 2009 to 2013, as well as number of strandings for which evidence of human interactions (HI) was detected and number of strandings for which it could not be determined (CBD) if there was evidence of human interactions. Data are from the NOAA National Marine Mammal Health and Stranding Response Database (unpublished data, accessed 11 June 2014). Please note human interaction does not necessarily mean the interaction caused the animal's death.

Stock	Category	2009	2010	2011	2012	2013	Total
Jacksonville Estuarine System	Total Stranded	7	17[a]	7	13	27	71
	Human Interaction						
	---Yes	3[b]	1[c]	2[d]	6[e]	6[f]	18
	---No	0	4	1	0	2	7
	---CBD	4	12	4	7	19	46

[a] 14 of these strandings were part of the St. Johns River UME during May-September 2010.
[b] This total includes 1 entanglement interaction with crab trap/pot gear (mortality).
[c] This HI was an entanglement interaction with crab trap/pot gear (released alive, not seriously injured).
[d] These HIs include 1 mortality from an entanglement in commercial blue crab trap/pot gear and 1 animal observed entangled in and trailing unknown material/gear that was seriously injured.
[e] This total includes 3 entanglement interactions with commercial blue crab trap/pot gear (1 mortality, 1 animal released alive seriously injured, and 1 animal released alive not seriously injured). Also included is 1 entanglement interaction with hook and line gear and debris (serious injury).
[f] This total includes 1 entanglement interaction with commercial blue crab trap/pot gear (not seriously injured). In addition, another live animal was considered not seriously injured after being disentangled from an Aerobie (frisbee).

HABITAT ISSUES

This stock inhabits areas with significant drainage from industrial and urban sources, and as such is exposed to contaminants in runoff from them. No contaminant analyses have yet been conducted in this area. In other estuarine areas where such analyses have been conducted, it has been suggested that exposure to anthropogenic contaminants could potentially result in adverse effects on health or reproductive rates (Schwacke *et al.* 2002; Hansen *et al.* 2004).

STATUS OF STOCK

Common bottlenose dolphins in the western North Atlantic are not listed as threatened or endangered under the Endangered Species Act. However, because the abundance of the JES Stock is currently unknown, but likely small, and relatively few mortalities and serious injuries would exceed PBR, NMFS considers this to be a strategic stock under the MMPA. The documented mean annual human-caused mortality for this stock for 2009 – 2013 was 1.2. However, there are commercial fisheries, including crab trap/pot fisheries, operating within this stock's boundaries and these fisheries have little to no observer coverage. The impact of crab trap/pot fisheries on estuarine bottlenose dolphins is currently unknown, but has been shown previously to be considerable in the similar Charleston Estuarine System Stock area (Burdett and McFee 2004). Therefore, the documented mortalities must be considered minimum estimates of total fishery-related mortality. There is insufficient information available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching a zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine the population trends for this stock.

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Indian River Lagoon Estuarine System Stock

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Multiple studies utilizing varying methods such as freeze-branding, photo-ID and radio telemetry support the designation of bottlenose dolphins in the Indian River Lagoon (IRL) as a distinct stock. Odell and Asper (1990) reported that none of the 133 freeze-branded dolphins from the IRL were observed outside of the system during their 4-year monitoring period from 1979 to 1982 and suggested that there may be an additional discrete group of dolphins in the southern end of the system. A stranded dolphin from the IRL that was rehabilitated, freeze-branded and released into the IRL was recaptured 14 years later in the IRL during a health assessment project (Mazzoil *et al.* 2008b). Photo-ID studies have provided evidence that some dolphins in the IRL exhibit both short-term and long-term site fidelity (Mazzoil *et al.* 2005; Mazzoil *et al.* 2008a). During a 5-year study (1996-2001) in the IRL, 67 individual dolphins were sighted 8 or more times, which included 11 dolphins freeze-branded from the Odell and Asper (1990) study that were sighted at least once (Mazzoil *et al.* 2005). In addition, Mazzoil *et al.* (2008a) suggested that at least 3 different dolphin communities exist within the IRL based on analyses of photo-ID data. Radio-tracking of 2 rehabilitated dolphins stranded in the IRL indicated that neither dolphin left the IRL from the time of release until their deaths in 100 days and 7days, respectively (Mazzoil *et al.* 2008b). A photo-ID study conducted from 2006-2008 provided evidence for spatial separation and minimal

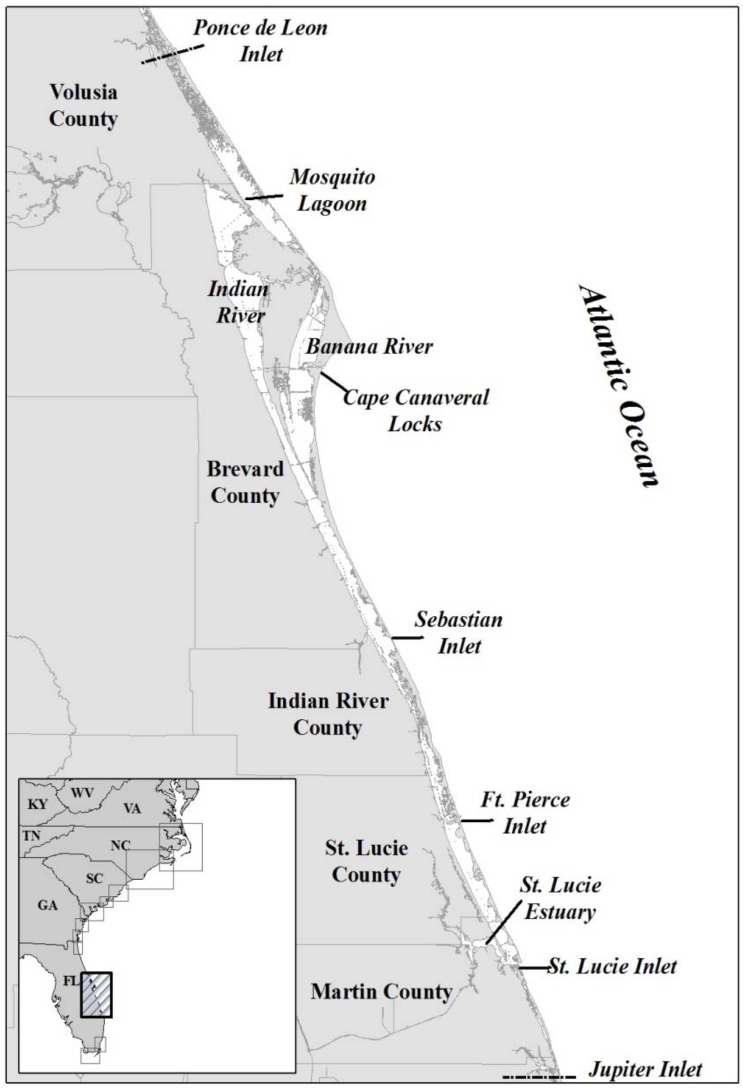

Figure 1. *Geographic extent of the Indian River Lagoon Estuarine System (IRLES) Stock. Dashed lines denote the boundaries.*

degree of movement between dolphins in the IRL and those occurring in the nearshore coastal waters of the Atlantic Ocean between Sebastian and St. Lucie Inlets (Mazzoil *et al.* 2008a). However, results from aerial surveys to estimate abundance during 2002-2004 (Durden *et al.* 2011, described under "Population Size" below) seem to contradict an exclusively resident population, and rather suggest movements of IRL dolphins between adjacent estuarine and/or coastal waters. There is still a need to better understand movement patterns between the IRL and adjacent coastal and estuarine waters. The boundaries of this stock are subject to change upon further study.

The Indian River Lagoon Estuarine System (IRLES) Stock on the Atlantic coast of Florida extends from Ponce de Leon Inlet in the north to Jupiter Inlet in the south and encompasses all estuarine waters in between (Figure 1), including but not limited to the Intracoastal Waterway, Mosquito Lagoon, Indian River, Banana River and the St. Lucie Estuary. Five inlets and the Cape Canaveral Locks connect the IRLES to the Atlantic Ocean. This definition of the IRLES has been used by a number of researchers (e.g., Kent *et al.* 2008) and is the most expansive definition. Some researchers truncate the southern border at the St. Lucie Inlet.

Dolphins residing within estuaries north and south of this stock are currently not included in any Stock Assessment Report. There are insufficient data to determine whether animals south of the IRLES exhibit affiliation to the Biscayne Bay Stock or are simply transient animals associated with coastal stocks. Similarly, there are insufficient data to determine whether animals in estuarine waters north of the IRLES exhibit affiliation to the IRLES Stock or to the Jacksonville Estuarine System Stock to the north or are simply transients. There is relatively limited estuarine habitat along the coastline south of the IRLES but some potentially suitable habitat north of the IRLES. Further research is needed to establish affinities of dolphins in these regions. It should be noted that during 2009–2013, there were 32 stranded bottlenose dolphins in the region north of the IRLES in enclosed waters, including 3 interactions with hook and line fishing gear (1 mortality, 1 serious injury, 1 live release without serious injury) and 2 entanglements in blue crab trap/pot gear (1 mortality and 1 live release without serious injury) (Maze-Foley and Garrison in prep a,b). During 2009–2013 there were 3 estuarine stranding south of the IRLES. In addition to animals included in the stranding database, in estuarine waters north of the IRLES there were 3 at-sea observations of dolphins entangled in hook and line gear, crab trap/pot gear and thick line. All 3 dolphins were considered not seriously injured (Maze-Foley and Garrison in prep a,b).

POPULATION SIZE

Population size estimates for this stock are greater than 8 years old and therefore the current population size for the stock is considered unknown (Wade and Angliss 1997). Abundance estimates ranging from 206 to 816 dolphins (Leatherwood 1979; Thompson 1981; Leatherwood 1982; Burn *et al.* 1987; Mullin *et al.* 1990) were made in the 1970's and 1980's in response to common bottlenose dolphin live-capture fisheries where 68 dolphins were permanently removed between 1973 and 1988 for display in marine parks and use by the military (Scott 1990). No dolphins have been removed from the IRLES since 1989. Abundances based on aerial and small boat-based strip- or line-transect surveys were estimated to establish capture quotas or to assess the impact of the removals (Scott 1990). Scott (1990) suggested that a large number of bottlenose dolphins moved into the IRLES during the summer from the adjacent Atlantic Ocean. However, preliminary analyses of extensive photo-ID data collected throughout the IRLES and the adjacent Atlantic from 2002 to 2008 do not support this hypothesis and indicate very few bottlenose dolphins move between the IRLES and the Atlantic Ocean (Mazzoil *et al.* 2011). During photo-ID studies conducted in the IRLES for 3 years from 2002 to 2005, 615 bottlenose dolphins with distinct dorsal fins were identified (Mazzoil *et al.* 2008a). This number of dolphins is comparable to the larger abundances previously estimated (506-816 dolphins) which were based on small boat surveys (Mullin *et al.* 1990) and a mark-recapture study (Burn *et al.* 1987) and were probably less negatively biased compared to the aerial surveys. Seasonal aerial surveys were conducted from summer 2002 through spring 2004 (Durden *et al.* 2011). Abundance estimates were lowest in summer and highest in winter, ranging from 362 (CV=0.29) for summer 2003 to 1316 (CV=0.24) for winter 2002-2003 with an overall mean abundance of 662 (CV=0.09). These results also do not support Scott (1990) regarding dolphin movements into the IRLES during summer. The pattern of larger winter estimates occurred in both years of the Durden *et al.* (2011) study and was pronounced in two areas, Mosquito Lagoon and southern Indian River.

Minimum Population Estimate

Present data are insufficient to calculate a minimum population estimate for the IRLES Stock of common bottlenose dolphins.

Current Population Trend

There are insufficient data to determine the population trends for this stock because of significant methodological differences in the surveys over time.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of the IRLES Stock of common bottlenose dolphins is unknown. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is of unknown status. PBR for the IRLES Stock of common bottlenose dolphins is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the IRLES Stock during 2009–2013 is unknown because this stock is known to interact with unobserved fisheries (see below). The mean annual fishery-related mortality and serious injury for strandings and at-sea observations identified as fishery-caused was 4.4. No additional mortality or serious injury was documented from other human-caused actions. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 4.4.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category II Atlantic blue crab trap/pot; and Southeastern U.S. Atlantic, Gulf of Mexico stone crab trap/pot fisheries; and the Category III Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fishery (Appendix III).

Crab Trap/Pot

Interactions between common bottlenose dolphins and the blue crab fishery in the IRLES have been documented. Noke and Odell (2002) observed behaviors that included dolphins closely approaching crab boats, begging, feeding on discarded bait and crab pot tipping to remove bait from the pot. Of the dolphins sighted during this 1-year study, 16.6% interacted with crab boats and these interactions peaked during summer months. Also during the 1-year study, in March 1998 a dolphin was found dead, entangled in float lines with 3 crab pots attached (Noke and Odell 2002).

Between 2009 and 2013, 3 bottlenose dolphins were documented entangled in commercial blue crab trap/pot gear (i.e., rope and/or pots attached), and disentanglement efforts were made for each. All 3 were released alive without serious injuries (Maze-Foley and Garrison in prep a,b). The 3 cases were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). Since there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab trap/pot gear.

Hook and Line

Stranding data from 1997 through 2009 were used to investigate hook and line gear interactions with common bottlenose dolphins in the IRLES (Stolen *et al.* 2012). During the 13-year study, 57 dolphins (16% of dolphins examined) were found with evidence of fishing gear (single or multi-strand line, fishing hooks, metal sinkers, swivels, and/or lures). Forty-five dolphins ingested gear, 10 dolphins had gear externally wrapped or embedded, and in 2 instances gear was present both externally and internally. In total, 18 interactions (32%) with gear were considered fatal (gear was cause of death) and 23 (40%) were considered incidental (gear did not cause significant tissue or functional damage). While ingested gear was more common than external gear interactions, in most cases it was considered not fatal. However, interactions involving ingested line wrapped around the base of the larynx were always fatal. Occurrence of gear entanglements was less frequent than ingestion of gear but was almost always considered severe and often fatal. Stolen *et al.* (2012) noted that the nature of this study resulted in a conservative estimate of the effects of hook and line fishing for several reasons, including: nonlethal effects of gear interactions could not be determined; carcasses with gear interactions may not always be found by stranding personnel; and animals decompose rapidly in Florida making entanglement difficult to document.

Between 2009 and 2013, there were 25 documented strandings with evidence of hook and line fishery interaction (see Other Mortality below). Nineteen of the 25 were mortalities, 1 was released alive with serious injuries, and 5 were released alive without serious injuries (Maze-Foley and Garrison in prep a,b,c). It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Other Mortality

A common bottlenose dolphin live-capture fishery operating between 1973 and 1988 in the IRLES permanently removed 68 bottlenose dolphins for display in marine parks and for use by the military (Scott 1990). No dolphins have been removed from the IRLES since 1989.

A total of 227 common bottlenose dolphin strandings were documented within the IRLES from 2009 through 2013 (Table 2; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). Evidence of human interactions (e.g., fishing gear or debris entanglement or ingestion, mutilation, boat collision) was detected for 36 strandings; no evidence of human interactions was found for 42 animals, and for the remaining 149 animals, it could not be determined if there was evidence of human interactions. Thirty of the 36 strandings for which evidence of human interactions was detected involved fisheries interactions, including the 3 crab trap/pot interactions discussed above. Bottlenose dolphins are known to become entangled in, or ingest recreational and commercial fishing gear (Wells and Scott 1994; Gorzelany 1998; Wells *et al.* 1998; Wells *et al.* 2008; Stolen *et al.* 2012). Twenty-five strandings showed evidence of interaction with hook and line fishing gear, including entanglement in or ingestion of monofilament line, hooks or lures. These interactions may or may not have been the cause of the animal's death, and in some cases the relationship between the gear and cause of death could not be determined.

Two identified dolphins from the IRLES were disentangled from fishing gear multiple times. One dolphin was disentangled and released alive on 3 separate occasions (Maze-Foley and Garrison in prep a), and subsequently stranded dead entangled in fishing gear. The second dolphin stranded dead as a result of tail fluke entanglement in fishing gear following 3 prior disentanglement and live release interventions.

In addition to animals included in the stranding database, in 2010 and 2012, there were at-sea observations in the IRLES area of a dolphin entangled in fishing gear (wrapped around body parts). Both dolphins were considered seriously injured (Maze-Foley and Garrison in prep a,b).

There are a number of difficulties associated with the interpretation of stranding data. It is possible that some of the stranded dolphins may have been from a nearby coastal stock, although the proportion of stranded dolphins belonging to another stock cannot be determined because it is often unclear from where the stranded carcasses originated. However, preliminary analyses of photo-ID data suggest that many of the stranded dolphins with distinct dorsal fins found within the IRLES had been photographed within the estuary previously, and furthermore, many of them were found within their known photo-ID home ranges (Mazzoil *et al.*, in preparation). Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al.* 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

Bottlenose dolphin stranding data from 1977 to 2005 were analyzed by Stolen *et al.* (2007) to examine spatio-temporal aspects of strandings, age/sex specific mortality patterns and human-related mortality in the IRLES. Stolen *et al.* (2007) reported that 834 total dolphins stranded during the time frame of the study, which ranged from a low of 11 animals in 1985 to a high of 61 animals in 2001. Significant findings were: more strandings occurred in spring and summer; more of the strandings were males; and juveniles stranded more frequently, followed by adults, then calves (Stolen *et al.* 2007). Human interaction (HI) (e.g., gear and debris entanglement or ingestion, mutilation, boat collision) was reported in 10.2% (n=85) of strandings. Significantly more males showed evidence of HI than females. Most strandings with HI evidence were reported in spring and summer and found in Brevard County (n=64). Ingestion of or entanglement in recreational fishing gear accounted for 54.1% (n=46), and commercial fishing interaction accounted for 23.5% (n=20) of strandings where HI was recorded (Stolen *et al.* 2007).

The IRLES Stock has experienced several Unusual Mortality Events (UMEs). In 2001, there was a record high number of strandings in the IRLES (n=61) (Stolen *et al.* 2007). A UME was declared when 34 of these dolphins stranded in a relatively short time period (7 May – 25 August 2001) and were confined to a relatively small geographic area in central Brevard County (Stolen *et al.* 2007). The cause of this UME was undetermined; however, saxitoxin, a biotoxin produced by the algae *Pyrodinium bahamense*, was suspected to be a factor. The IRLES experienced another UME in 2008. From May to August a total of 47 bottlenose dolphins were recovered from the northern IRLES. One dolphin from the Central Florida Coastal Stock was also considered part of this UME (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 13 September 2012). Infectious disease is suspected as a possible cause of this event. During January to December 2013, another UME occurred within the IRLES. Elevated strandings occurred in the northern and central IRLES in Brevard County. The investigation and analyses are ongoing. Finally, a UME was declared in the summer of 2013 for the mid-Atlantic coast from New York to Brevard County, Florida. Beginning in July 2013, bottlenose dolphins have been stranding at elevated rates. The total number of stranded bottlenose dolphins from New York through North Florida (Brevard County) as of mid-October 2014 (1 July 2013 - 19 October 2014) was ~1546. Morbillivirus has been determined to be the cause of the event. Most strandings and morbillivirus positive animals have been recovered from the ocean side beaches rather than from within the estuaries, suggesting that at least so far coastal stocks have been more impacted by this UME than estuarine stocks. However, several confirmed morbillivirus positive animals have been recovered from within the IRLES Stock area. The UME is still ongoing as of December 2014 when this report was drafted, and work continues to determine the effect of this event on all bottlenose dolphin stocks in the Atlantic.

Feeding or provisioning of wild bottlenose dolphins has been documented in Florida, particularly in areas of the Indian River Lagoon. Feeding wild dolphins is defined under the MMPA's implementing regulations as a form of "take" because it can alter the dolphins' natural behavior and increase their risk of injury or death. There are emerging questions regarding potential linkages between provisioning wild dolphins, dolphin depredation of recreational fishing gear, and associated entanglement and ingestions of gear, which is increasing through much of Florida.

Impacts of motorized vessels on bottlenose dolphins in the IRLES were investigated using photo-ID data collected from September 1996 to October 2006 (Bechdel *et al.* 2009). Six percent of distinctly marked individuals had injuries associated with vessel impact. Two counties, Martin and St. Lucie Counties, had the highest rate (9.9%) of boat-injured dolphins as well as the largest number of registered boaters per km^2 (237 boats/km^2). During sightings with less than 5 vessels within 100 m of the dolphin group, changes in the frequency of feeding decreased and traveling increased. Resting behavior was the least observed activity (< 1% of observations) during the 10-year study. Bechdel *et al.* (2009) suggest that continual vessel avoidance, lack of rest, and projected increases in anthropogenic impacts may result in chronic stress for dolphins inhabiting the IRLES.

Table 2. Bottlenose dolphin strandings by county within the Indian River Lagoon System from 2009 to 2013, as well as number of strandings for which evidence of human interaction was detected and number of strandings for which it could not be determined (CBD) if there was evidence of human interaction. Data are from the NOAA National Marine Mammal Health and Stranding Response Database (accessed 11 June 2014). Please note human interaction does not necessarily mean the interaction caused the animal's death.

COUNTY		**2009**	**2010**	**2011**	**2012**	**2013**	**TOTAL**
Volusia	**Total Stranded**	**2**	**1**	**6**	**5**	**8**	**22**
	Human Interaction						
	---Yes	1	1	2	1	1	6
	---No	0	0	1	0	1	2
	---CBD	1	0	3	4	6	14
Seminole	**Total Stranded**	**1**	**0**	**0**	**0**	**0**	**1**
	Human Interaction						
	---Yes	1	0	0	0	0	1
	---No	0	0	0	0	0	0
	---CBD	0	0	0	0	0	0
Brevard	**Total Stranded**	**25**	**32**	**18**	**38**	**70**	**183**
	Human Interaction						
	---Yes	3	5	1	8	7	24
	---No	4	6	3	9	13	35
	---CBD	18	21	14	21	50	124
Indian							

River	**Total Stranded**	**1**	**2**	**1**	**3**	**4**	**11**
	Human Interaction						
	---Yes	0	0	0	1	0	1
	---No	0	0	0	0	2	2
	---CBD	1	2	1	2	2	8
St. Lucie	**Total Stranded**	**1**	**0**	**5**	**0**	**0**	**6**
	Human Interaction						
	---Yes	0	0	4	0	0	4
	---No	1	0	1	0	0	2
	---CBD	0	0	0	0	0	0
Martin	**Total Stranded**	**1**	**1**	**2**	**0**	**0**	**4**
	Human Interaction						
	---Yes	0	0	0	0	0	0
	---No	0	0	1	0	0	1
	---CBD	1	1	1	0	0	3
TOTAL	Total Stranded	**31**	**36**	**32**	**46**	**82**	**227**
	Human Interaction						
	---Yes	5	6	7	10	8	36
	---No	5	6	6	9	16	42
	---CBD	21	24	19	27	58	149

HABITAT ISSUES

The IRLES is a shallow water estuary with little tidal influx, which limits water exchange with the Atlantic Ocean. This allows for accumulation of land-based effluents and contaminants in the estuary, as well as fresh-water dilution from run-off and rivers. A large portion of Florida's agriculture also drains into the IRLES, including all of the sugarcane, approximately 38% of citrus and 42% of other vegetable crops (Miles and Pleuffer 1997). Dolphins in the IRLES were found to have concentrations of contaminants at levels of possible toxicological concern. Hansen *et al.* (2004) suggested that polychlorinated biphenyl (PCBs) concentrations in blubber samples collected from remote biopsy of IRLES dolphins were sufficiently high to warrant additional sampling. Fair *et al.* (2010) found potentially harmful levels of several different chemical contaminants, including some that may act as endocrine disruptors. However, there have been no reports of mortalities in the IRLES resulting solely from contaminant concentrations.

Durden *et al.* (2007) found mean mercury concentrations in IRLES dolphins were positively correlated with age and length and tended to be slightly higher than dolphins from the Gulf of Mexico and South Carolina coasts. In the same study, 5 animals were found to have mercury concentrations exceeding 100ppm, which may be associated with toxic effects in marine mammals (Durden *et al.* 2007). Stavros *et al.* (2007, 2008) reported that blood and skin samples obtained from IRLES dolphins had concentrations of total mercury among the highest reported in free-living marine mammals worldwide and approximately 4 to 5 times the concentrations found in dolphins from Charleston, South Carolina. Concentrations of total mercury in IRLES dolphins were associated with lower levels of total thyroxine, triiodothyronine, lymphocytes, eosinophils and platelets and increases in blood urea nitrogen and gamma-glutamyl transferase (Schaefer *et al.* 2011). A further study of IRLES dolphins indicated that 33% of the stranded and 15% of the free-ranging dolphins from Florida exceeded the minimum 100 lg g_1 wet weight (ww) Hg threshold for hepatic damage previously published for marine mammals (Stavros *et al.* 2011).

Recent studies of IRLES dolphins have shown evidence of infection with the cetacean morbillivirus. Positive morbillivirus titers were found in 12 of 122 (9.8%) IRLES dolphins sampled between 2003 and 2007 (Bossart *et al.* 2010). In addition, approximately 10% of bottlenose dolphins had lacaziosis (lobomycosis), a chronic mycotic disease of the skin caused by *Lacazia loboi* (Reif *et al.* 2006). The prevalence of lacaziosis was also studied through examination of photo-ID data between 1996 and 2006 and was estimated to be 6.8% (Murdoch *et al.* 2008). There are no published reports of mortalities resulting solely from this disease.

STATUS OF STOCK

Common bottlenose dolphins in the western North Atlantic are not listed as threatened or endangered under the

Endangered Species Act. However, because the abundance of the IRLES Stock is currently unknown, but likely small, and relatively few mortalities and serious injuries would exceed PBR, NMFS considers this to be a strategic stock under the Marine Mammal Protection Act. The documented mean annual human-caused mortality for this stock for 2009 – 2013 was 4.4. However, there are several commercial fisheries operating within this stock's boundaries and these fisheries have little to no observer coverage. In particular, the impact of crab trap/pot fisheries on estuarine bottlenose dolphins is currently unknown, but has been shown previously to be considerable in the similar Charleston Estuarine System Stock area (Burdett and McFee 2004). Therefore, any documented mortalities must be considered minimum estimates of total fishery-related mortality. There is insufficient information available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching a zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine the population trends for this stock.

Documented human-caused mortalities from hook and line gear and crab pot gear entanglements as well as repeated UMEs reinforce concern for this stock. The removal of dolphins in live-capture fisheries in the 1970's and 1980's is also cause for concern; however, the effects of the permanent removals and the mortality events on stock abundance have not yet been completely determined. Stolen and Barlow (2003) concluded that the population's growth rate was stable or increasing from a model life table that was based on stranding data collected from 1978 to 1997 and incorporated the live capture removals. The limited ranging behavior of potentially 3 or more discrete dolphin communities and the geographic localization of previous UMEs suggest that mortality impacts may be more significant when analyzed on a smaller spatial scale.

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HARBOR PORPOISE (*Phocoena phocoena phocoena*): Gulf of Maine/Bay of Fundy Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

This stock is found in U.S. and Canadian Atlantic waters. The distribution of harbor porpoises has been documented by sighting surveys, strandings and takes reported by NMFS observers in the Sea Sampling Programs. During summer (July to September), harbor porpoises are concentrated in the northern Gulf of Maine and southern Bay of Fundy region, generally in waters less than 150 m deep (Gaskin 1977; Kraus *et al.* 1983; Palka 1995a, 1995b), with a few sightings in the upper Bay of Fundy and on Georges Bank (Palka 2000). During fall (October–December) and spring (April–June), harbor porpoises are widely dispersed from New Jersey to Maine, with lower densities farther north and south. They are seen from the coastline to deep waters (>1800 m; Westgate *et al.* 1998), although the majority of the population is found over the continental shelf. During winter (January to March), intermediate densities of harbor porpoises can be found in waters off New Jersey to North Carolina, and lower densities are found in waters off New York to New Brunswick, Canada. There does not appear to be a temporally coordinated migration or a specific migratory route to and from the Bay of Fundy region. However, during the fall, several satellite-tagged harbor porpoises did favor the waters around the 92-m isobath, which is consistent with observations of high rates of incidental catches in this depth range (Read and Westgate 1997). There were two stranding records from Florida during the 1980s (Smithsonian strandings database) and one in 2003 (NE Regional Office/NMFS strandings and entanglement database).

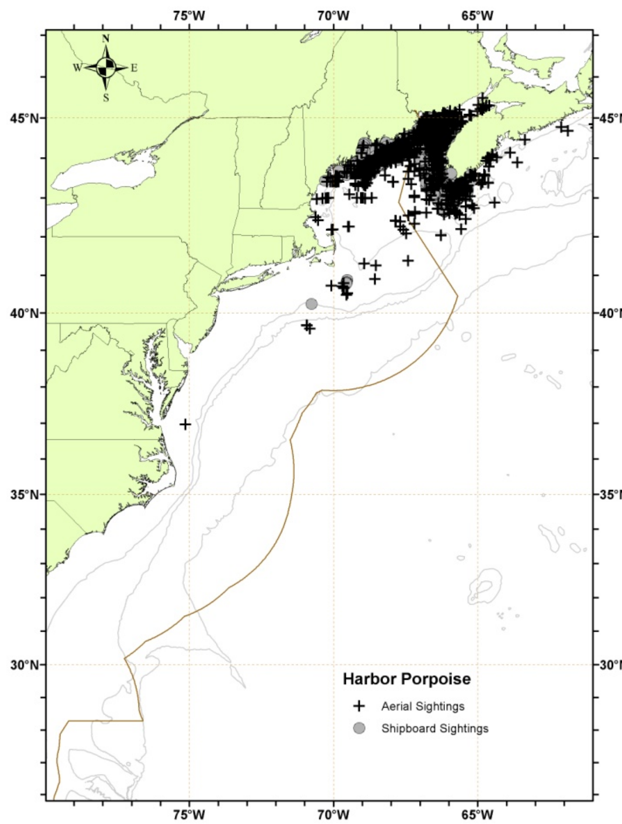

Figure 1. *Distribution of harbor porpoises from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1995, 1998, 1999, 2002, 2004, 2006, 2007, 2008, 2010, and 2011 and DFO's 2007 TNASS survey. Isobaths are the 100-m, 1000-m, and 4000-m depth contours.*

Gaskin (1984, 1992) proposed that there were four separate populations in the western North Atlantic: the Gulf of Maine/Bay of Fundy, Gulf of St. Lawrence, Newfoundland, and Greenland populations. Analyses involving mtDNA (Wang *et al.* 1996; Rosel *et al.* 1999a; 1999b), organochlorine contaminants (Westgate *et al.* 1997; Westgate and Tolley 1999), heavy metals (Johnston 1995), and life history parameters (Read and Hohn 1995) support Gaskin's proposal. Genetic studies using mitochondrial DNA (Rosel *et al.* 1999a) and contaminant studies using total PCBs (Westgate and Tolley 1999) indicate that the Gulf of Maine/Bay of Fundy females were distinct from females from the other populations in the Northwest Atlantic. Gulf of Maine/Bay of Fundy males were distinct from Newfoundland and Greenland males, but not from Gulf of St. Lawrence males according to studies comparing mtDNA (Palka *et al.* 1996; Rosel *et al.* 1999a) and CHLORs, DDTs, PCBs and CHBs (Westgate and Tolley 1999). Nuclear microsatellite markers have also been applied to samples from these four populations, but this analysis failed to detect significant population sub-division in either sex (Rosel *et al.* 1999a). These patterns may be indicative of female philopatry coupled with dispersal of males. Both mitochondrial DNA and microsatellite analyses indicate that the Gulf of Maine/Bay of Fundy stock is not the sole contributor to the aggregation of porpoises found off the mid-Atlantic states during winter (Rosel *et al.* 1999a; Hiltunen 2006). Mixed-stock analyses using twelve microsatellite loci in both Bayesian and likelihood frameworks indicate that the Gulf of Maine/Bay of Fundy is the largest contributor (~60%), followed by Newfoundland (~25%) and then the Gulf of St. Lawrence (~12%), with Greenland making a small contribution (<3%). For Greenland, the lower confidence interval of the likelihood analysis includes zero. For the Bayesian analysis, the lower 2.5% posterior quantiles include zero for both Greenland and the Gulf of St. Lawrence. Intervals that reach zero provide the possibility that these populations contribute no animals to the mid-Atlantic aggregation. This report follows Gaskin's hypothesis on harbor porpoise stock structure in the western North Atlantic, where the Gulf of Maine and Bay of Fundy harbor porpoises are recognized as a single management stock separate from harbor porpoise populations in the Gulf of St. Lawrence, Newfoundland, and Greenland.

POPULATION SIZE

The best current abundance estimate of the Gulf of Maine/Bay of Fundy harbor porpoise stock is from the 2011 survey: 79,883 (CV=0.32).

Earlier abundance estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions. As recommended in the GAMMS II Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable for the determination of the current PBR.

Recent surveys and abundance estimates

An abundance estimate of 12,732 (CV=0.61) harbor porpoises on the Scotian Shelf and in the Gulf of St. Lawrence was generated from the Canadian Trans-North Atlantic Sighting Survey in July–August 2007 (and see Lawson and Gosselin 2009). The total estimate of harbor porpoises from the Gulf of Maine/Bay of Fundy, Gulf of St. Lawrence, and Newfoundland stocks was 16,058 (CV=0.50). This aerial survey covered waters from northern Labrador to the Scotian Shelf, providing full coverage of the Atlantic Canadian coast. The abundance estimates from this survey have been corrected for perception and availability bias, when possible. In general, this involved correcting for perception bias using mark-recapture distance sampling (MCDS), and correcting for availability bias using dive/surface times, as reported in the literature, and the Laake et al. (1997) analysis method (Lawson and Gosselin 2011).

An abundance estimate of 79,883 (CV=0.32) harbor porpoises was generated from a shipboard and aerial survey conducted during June–August 2011 (Palka 2012). The aerial portion that contributed to the abundance estimate covered 5,313 km of tracklines that were over waters north of New Jersey from the coastline to the 100-m depth contour through the U.S. and Canadian Gulf of Maine and up to and including the lower Bay of Fundy. The shipboard portion covered 3,107 km of tracklines that were in waters offshore of central Virginia to Massachusetts (waters that were deeper than the 100-m depth contour out to beyond the U.S. EEZ). Both sighting platforms used a double-platform team data-collection procedure, which allows estimation of abundance corrected for perception bias of the detected species (Laake and Borchers 2004). Estimation of the abundance was based on the independent-observer approach assuming point independence (Laake and Borchers 2004) and calculated using the mark-recapture distance sampling option in the computer program Distance (version 6.0, release 2, Thomas *et al.* 2009).

No harbor porpoises were detected in an abundance survey that was conducted concurrently (June-August 2011) in waters between central Virginia and central Florida. This shipboard survey included shelf-break and inner continental slope waters deeper than the 50-m depth contour within the U.S. EEZ. The survey employed the double-platform methodology searching with 25x150 “bigeye” binoculars. A total of 4,445 km of tracklines was surveyed, yielding 290 cetacean sightings.

Table 1. Summary of recent abundance estimates for the Gulf of Maine/Bay of Fundy harbor porpoise (*Phocoena phocoena phocoena*) by month, year, and area covered during each abundance survey and the resulting abundance estimate (N_{best}) and coefficient of variation (CV).			
Month/Year	**Area**	N_{best}	**CV**
Jul-Aug 2007[a]	Scotian Shelf and Gulf of St. Lawrence	12,732	0.61
Jul-Aug 2011	Central Virginia to lower Bay of Fundy	79,883	0.32
a. A portion of this survey covered habitat of the Gulf of Maine/Bay of Fundy stock. The estimate also includes animals from the Gulf of St. Lawrence and Newfoundland stocks.			

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for harbor porpoises is 79,883 (CV=0.32). The minimum population estimate for the Gulf of Maine/Bay of Fundy harbor porpoise is 61,415.

Current Population Trend

A trend analysis has not been conducted for this stock. The statistical power to detect a trend in abundance for this stock is poor due to the relatively imprecise abundance estimates and long survey interval. For example, the power to detect a precipitous decline in abundance (i.e., 50% decrease in 15 years) with estimates of low precision (e.g., CV > 0.30) remains below 80% (alpha = 0.30) unless surveys are conducted on an annual basis (Taylor *et al.* 2007).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Several attempts have been made to estimate potential population growth rates. Barlow and Boveng (1991), who used a re-scaled human life table, estimated the upper bound of the annual potential growth rate to be 9.4%. Woodley and Read (1991) used a re-scaled Himalayan tahr life table to estimate a likely annual growth rate of 4%. In an attempt to estimate a potential population growth rate that incorporates many of the uncertainties in survivorship and reproduction, Caswell *et al.* (1998) used a Monte Carlo method to calculate a probability distribution of growth rates. The median potential annual rate of increase was approximately 10%, with a 90% confidence interval of 3–15%. This analysis underscored the considerable uncertainty that exists regarding the potential rate of increase in this population. Moore and Read (2008) conducted a Bayesian population modeling analysis to estimate the potential population growth of harbor porpoise in the absence of bycatch mortality. Their method used fertility data, in combination with age-at-death data from stranded animals and animals taken in gillnets, and was applied under two scenarios to correct for possible data bias associated with observed bycatch of calves. Demographic parameter estimates were ‘model averaged’ across these scenarios. The Bayesian posterior median estimate for potential natural growth rate was 0.046. This last, most recent, value will be the one used for the purpose of this assessment.

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 61,415. The maximum productivity rate is 0.046. The recovery factoris 0.5 because stock's status relative to OSP is unknown and the CV of the average mortality estimate is less than 0.3 (Wade and Angliss 1997). PBR for the Gulf of Maine/Bay of Fundy harbor porpoise is 706.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual estimated average human-caused mortality is 564 harbor porpoises per year. This is derived from two components: 521 harbor porpoise per year (CV=0.15) from U.S. fisheries using observer and MMAP data, and 43 per year (unknown CV) from Canadian fisheries using observer data.

Fishery Information

Recently, Gulf of Maine/Bay of Fundy harbor porpoise takes have been documented in the U.S. northeast sink gillnet, mid-Atlantic gillnet, and northeast bottom trawl fisheries and in the Canadian herring weir fisheries (Table 2). Detailed U.S. fishery information is reported in Appendix III.

Earlier Interactions

One harbor porpoise was observed taken in the Atlantic pelagic drift gillnet fishery during 1991–1998; the fishery ended in 1998. This observed bycatch was notable because it occurred in continental shelf edge waters adjacent to Cape Hatteras (Read *et al.* 1996). See Appendix V for more information on historical takes.

U.S.

Northeast Sink Gillnet

Harbor porpoise bycatch in the northern Gulf of Maine occurs primarily from June to September, while in the southern Gulf of Maine, bycatch occurs from January to May and September to December. See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

There appeared to be no evidence of differential mortality in U.S. or Canadian gillnet fisheries by age or sex in animals collected before 1994, although there was substantial inter-annual variation in the age and sex composition of the bycatch (Read and Hohn 1995). Using observer data collected during 1990–1998 and a logit regression model, females were 11 times more likely to be caught in the offshore southern Gulf of Maine region, males were more likely to be caught in the south Cape Cod region, and the overall proportion of males and females caught in a gillnet and brought back to land were not significantly different from 1:1 (Lamb 2000).

Scientific experiments that demonstrated the effectiveness of pingers in the Gulf of Maine were conducted during 1992 and 1993 (Kraus *et al.* 1997). After the scientific experiments, experimental fisheries were allowed in the general fishery during 1994 to 1997 in various parts of the Gulf of Maine and south of Cape Cod areas. During these experimental fisheries, bycatch rates of harbor porpoises in pingered nets were less than in non-pingered nets.

A study on the effects of two different hanging ratios in the bottom-set monkfish gillnet fishery on the bycatch of cetaceans and pinnipeds was conducted by NEFSC in 2009 and 2010 with 100% observer coverage which took place in both the Northeast and mid-Atlantic gillnet fisheries. Commercial fishing vessels from Massachusetts and New Jersey were used for the study, which took place south of the Harbor Porpoise Take Reduction Cape Cod South Management Area (south of 40° 40′N) in February–April. Researchers purposely picked an area of historically high bycatch rates in order to have a chance of finding a significant difference. Eight research strings of fourteen nets each were fished and 159 hauls were completed during the course of the 2009–2010 study. Results showed that while a 0.33 mesh performed better at catching commercially important finfish than a 0.50 mesh, there was no statistical difference in cetacean or pinniped bycatch rates between the two hanging ratios. Twelve harbor porpoises were caught in this project in 79 hauls during 2009 and one animal was caught in 72 hauls during the 2010 experiment in the Northeast (A.I.S., Inc. 2010). These animals were included in the observed interactions and added into the total estimates (Table 2), though these animals and the fishing effort from this experiment were not included in the estimation of the bycatch rate that was expanded to the rest of the fishing effort.

Mid-Atlantic Gillnet

See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

In the northeast gillnet fishery section above, see the description of the study on the effects of two different hanging rations in the bottom-set gillnet fishery which took place in both the northeast and mid-Atlantic gillnet fisheries. Ten harbor porpoises were caught in 8 hauls in the mid-Atlantic as part of this experiment (A.I.S., Inc. 2010). Harbor porpoises that were caught in this study were included in the observed interactions and added into the total estimates (Table 2), though these animals and the fishing effort from this experiment were not included in the estimation of the bycatch rate that was expanded to the rest of the fishing effort.

Northeast Bottom Trawl

Since 1989, harbor porpoise mortalities have been observed in the northeast bottom trawl fishery, but many of these were not attributable to this fishery because decomposed animals are presumed to have been dead prior to being taken by the trawl. New serious injury criteria were applied to all observed interactions retroactive back to 2007 (Waring *et al.* 2014, 2015; Wenzel *et al.* 2015). Fishery-related bycatch rates for years since 2008 were estimated using an annual stratified ratio-estimator (Lyssikatos 2015). These estimates replace the 2008–2010 annual estimates reported in the 2013 stock assessment report that were generated using a different method. See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix

V for historical bycatch information

CANADA

Bay of Fundy Sink Gillnet

The earlier estimated annual mortality estimates were 38 for 1998, 32 for 1999, 28 for 2000, and 73 for 2001 (Trippel and Shepherd 2004). Estimates of variance are not available. However, since 2002 there has been no observer program in the Bay of Fundy region, but the fishery is still active. Bycatch for these years is unknown. The annual average of most recent five years with available data (1997–2001) was 43 animals, so this value is used to estimate the annual average for more recent years. In 2011 there was little gillnet effort in New Brunswick waters in the summer; thus the Canadian porpoise by-catch estimates could have been near zero. The fishermen that sought groundfish went into the mid-Bay of Fundy where traditionally bycatch levels were extremely low, though current bycatch levels are unknown. Trippel (pers. comm.) estimated that fewer than 10 porpoises were bycaught in the Canadian fisheries in the Bay of Fundy in 2011. Analysis of port catch records might allow estimation of bycatch for more recent times, however, it would be difficult to also accurately account for the changes in the spatial distribution of the harbor porpoises and fisheries.

Herring Weirs

Harbor porpoises are taken in Canadian herring weirs, but there have been no recent efforts to observe takes in the U.S. component of this fishery. Smith *et al.* (1983) estimated that in the 1980s approximately 70 harbor porpoises became trapped annually and, on average, 27 died annually. In 1990, at least 43 harbor porpoises were trapped in Bay of Fundy weirs (Read *et al.* 1994). In 1993, after a cooperative program between fishermen and Canadian biologists was initiated, over 100 harbor porpoises were released alive (Read *et al.* 1994). Between 1992 and 1994, this cooperative program resulted in the live release of 206 of 263 harbor porpoises caught in herring weirs. Mortalities (and releases) were 11 (50) in 1992, 33 (113) in 1993, and 13 (43) in 1994 (Neimanis *et al.* 1995). Since that time, additional harbor porpoises have been documented in Canadian herring weirs: mortalities (releases and unknowns) were 5 (60, 0) in 1995, 2 (4, 0) in 1996, 2 (24, 0) in 1997, 2 (26, 0) in 1998, 3 (89, 0) in 1999, 0 (13, 0) in 2000 (A. Read, pers. comm), 14 (296, 0) in 2001, 3 (46, 4) in 2002, 1 (26, 3) in 2003, 4 (53, 2) in 2004, 0 (19, 5) in 2005, 2 (14, 0) in 2006, 3 (9, 3) in 2007, 0 (8, 6) in 2008, 0 (3,4) in 2009, 1 in 2010 (7, 0), 0 (2, 3) in 2011, 0 (2, 3) in 2012, 0 (2,0) in 2013 and 0 (9, 2) in 2014 (Neimanis *et al.* 2004; H. Koopman and A. Westgate, pers. comm.).

See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information

Table 2. From observer program data, summary of the incidental mortality of Gulf of Maine/Bay of Fundy harbor porpoise (*Phocoena phocoena phocoena*) by commercial fishery including the years sampled, the type of data used, the annual observer coverage, the mortalities and serious injuries recorded by on-board observers, the estimated annual serious injury and mortality, the estimated CV of the annual mortality, and the mean annual combined mortality (CV in parentheses).

Fishery	Years	Data Type [a]	Observer Coverage [b]	Observed Serious Injury[i]	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Combined Serious Injury	Estimated CVs	Mean Annual Combined Mortality
U.S.										
Northeast Sink Gillnet [c, h]	09-13	Obs. Data, Weighout, Trip Logbook	.04, .17, .19, .15, .11	0, 0, 0, 0, 0	45, 50, 66, 34, 20	0, 0, 0, 0, 0	591, 387, 273, 277, 399	591, 387, 273, 277, 399	.23, .27, .20, .59, .33	385.5 (0.14)
Mid-Atlantic Gillnet [h]	09-13	Obs. Data Weighout	.03, .04, .02, .02, .03	0, 0, 0, 0, 0	7, 18, 11, 2, 1	0, 0, 0, 0, 0	201, 259, 123, 63, 19	201, 259, 123, 63, 19	.55, .88, .41, .83, 1.06	133 (0.4)
Northeast bottom	09-13	Obs. Data Weighout	.09, .16, .26, .17,	0, 0, 1, 0, 0	0, 0, 1, 0, 0	0, 0, 2.0, 0, 0	0, 0, 3.9, 0, 7	0, 0, 5.9, 0, 7	0, 0, .71, 0, .98	2.6 (0.62)[g]

trawl [g]			.15							
U.S. TOTAL	2009–2013									521 (0.15)
CANADA										
Bay of Fundy Sink Gillnet [f]	1997-2001	Can. Trips	unk		19, 5, 3, 5, 39		43, 38, 32, 28, 73		unk	43 [f] (unk)
Herring Weir [d,e]	09-13	Coop. Data	unk		0, 1, 0, 0, 0		0, 1, 0, 0, 0		NA	0.2 (unk)
CANADIAN TOTAL	2009–2013									43 (unk)
GRAND TOTAL										564 (unk)

NA = Not available.

a. Observer data (Obs. Data) are used to measure bycatch rates; the U.S. data are collected by the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program and At-Sea Monitoring Program; the Canadian data are collected by DFO. NEFSC collects Weighout (Weighout) landings data that are used as a measure of total effort for the U.S. gillnet fisheries. The Canadian DFO catch and effort statistical system collected the total number of trips fished by the Canadians (Can. Trips), which was the measure of total effort for the Canadian groundfish gillnet fishery. Mandatory vessel trip report (VTR) (Trip Logbook) data are used to determine the spatial distribution of fishing effort in the northeast sink gillnet fishery. Observed mortalities from herring weirs are collected by a cooperative program between fishermen and Canadian biologists (Coop. Data).

b. Observer coverage for the U.S. Northeast and mid-Atlantic coastal gillnet fisheries, is based on tons of fish landed. Northeast bottom trawl fishery coverages are ratios based on trips. Total observer coverage reported for bottom trawl gear and gillnet gear in the year 2010 includes only samples collected from traditional fisheries observer, but not the fishery monitors. Monitor trips were incorporated starting in 2011, the first full year of monitor coverage.

c. Since 2002 in the Northeast gillnet fishery, harbor porpoises were taken on pingered strings within strata that required pingers but that stratum also had observed strings without pingers. For estimates made during 1998 and after, a weighted bycatch rate was applied to effort from both pingered and non-pingered hauls within a stratum. The weighted bycatch rate was:

$$\sum_{i}^{ping,non-ping} \frac{\# porpoise_i}{sslandings_i} \cdot \frac{\# hauls_i}{total \# hauls}$$

There were 10, 33, 44, 0, 11, 0, 2, 8, 6, 2, 26, 2, 4, 12, 2, 9, 6, 11, 23, 11, 30, and 20 observed harbor porpoise takes on pinger trips from 1992 to 2013, respectively, that were included in the observed mortality column. In addition, there were 9, 0, 2, 1,1, 4, 0, 1, 7, 21, 33, 24, 7, 13, 20, 41, 11, 31, and 8 observed harbor porpoise takes in 1995 to 2013, respectively, on trips dedicated to fish sampling versus dedicated to watching for marine mammals; these were also included in the observed mortality column.

d. There were 255 licenses for herring weirs in the Canadian Bay of Fundy region.

e. Data provided by H. Koopman pers. comm.

f. The Canadian gillnet fishery was not observed during 2002 and afterwards, but the fishery is still active; thus, the current bycatch estimate for this fishery is assumed to be the average estimate using last five years that the fishery was observed in (1997-–2001).

g. Fishery related bycatch rates for years 2009–2013 were estimated using an annual stratified ratio-estimator.

h. Thirteen harbor porpoises in the Northeast area and 10 in the mid-Atlantic area were incidentally caught as part of a 2009-2010 NEFSC gillnet hanging ratio study to examine the impact of hanging ratio on

harbor porpoise bycatch in gillnets. These animals were included in the observed interactions and added to the total estimates, though these interactions and their associated fishing effort were not included in the estimation of the bycatch rate that was expanded to the rest of the fishery. i. Serious injuries were evaluated for the 2009–2013 period using new guidelines and include both at-sea monitor and traditional observer data (Waring *et al.* 2014, 2015; Wenzel *et al*. 2015)

Other Mortality
U.S.

There is evidence that harbor porpoises were harvested by natives in Maine and Canada before the 1960s, and the meat was used for human consumption, oil, and fish bait (NMFS 1992). The extent of these past harvests is unknown, though it is believed to have been small. Up until the early 1980s, small kills by native hunters (Passamaquoddy Indians) were reported. In recent years it was believed to have nearly stopped (Polacheck 1989) until media reports in September 1997 depicted a Passamaquoddy tribe member dressing out a harbor porpoise. Further articles describing use of porpoise products for food and other purposes were timed to coincide with ongoing legal action in state court.

During 2009, 65 harbor porpoises were reported stranded on Atlantic U.S. beaches. Of these, three stranding mortalities were reported as having signs of human interaction, all of which were fishery interactions.

During 2010, 82 harbor porpoises were reported stranded on Atlantic U.S. beaches. Of these, six stranding mortalities were reported as having signs of human interaction, three of which were reported to be fishery interactions.

During 2011, 164 harbor porpoises were reported stranded on Atlantic U.S. beaches. Of these, nine stranding mortalities were reported as having signs of human interaction, three of which were reported to be fishery interactions.

During 2012, 45 harbor porpoises were reported stranded on Atlantic U.S. beaches. Of these, four stranding mortalities were reported as having signs of human interaction, one of which was reported to be a fishery interaction.

During 2013, 102 harbor porpoises were reported stranded on Atlantic U.S. beaches. Of these, nine stranding mortalities were reported as having signs of human interaction, three of which were reported to be fishery interactions.

Stranding data probably underestimate the extent of fishery-related mortality and serious injury because all of the marine mammals that die or are seriously injured may not wash ashore, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery-interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interaction.

Table 4. Gulf of Maine/Bay of Fundy harbor porpoise (*Phocoena phocoena phocoena*) reported strandings along the U.S. and Canadian Atlantic coast, 2009–2013 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 20 August 2014).

Area	Year					**Total**
	2009	2010	2011	2012	2013	
Maine[a,e,h]	4	7	15	7	7	**40**
New Hampshire	0	5	1	3	1	**10**
Massachusetts[a,e,f,g,h]	19	28	102	25	40	**214**
Rhode Island[b,f]	1	0	4	0	3	**8**
Connecticut[h]	0	0	0	0	1	**1**
New York[c,f,h]	9	1	11	3	15	**39**
New Jersey[d,e,h]	4	7	1	2	8	**22**
Pennsylvania	1	0	0	0	0	**1**
Delaware	0	2	0	0	2	**4**

Maryland	5	4	0	1	3	**13**
Virginia[d,f]	8	10	2	2	15	**37**
North Carolina[e]	14	18	28	2	7	**69**
TOTAL U.S.	**65**	**82**	**164**	**45**	**102**	**458**
Nova Scotia/Prince Edward Island[i]	6	5	13	6	21	**51**
Newfoundland and New Brunswick[j]	2	1	0	0	3	**6**
GRAND TOTAL	**73**	**88**	**177**	**51**	**126**	**515**

a. In Massachusetts in 2011, 5 animals were released alive and one taken to rehab. One Maine animal taken to rehab in 2012. Three Massachusetts live strandings taken to rehab in 2013 and 1 Maine animal released alive.

b. In Rhode Island in 2011, one animal classified as human interaction due to fluke amputation.

c. One of the 2012 New York strandings classified as human interaction due to interaction with marine debris.

d. In 2009, 3 harbor porpoises were classified as fishery interactions, 2 in VA and a third in NJ.

e. Six total HI cases in 2010; 2 in Massachusetts, 1 in Maine, 1 in North Carolina and 2 in New Jersey. One of the New Jersey records, one of the North Carolina records, and the Maine record were fishery interactions.

f. Nine total HI cases in 2011; 5 in Massachusetts, 1 in Rhode Island, 2 in New York and 1 in Virginia. Two of these Massachusetts animals and the Virginia animal were fishery interactions.

g. Four HI cases in 2012. One of these was a fishery interaction (Massachusetts).

h. Ten total HI cases in 2013 (Massachusetts-3, Maine-2, New York-3, New Jersey-1, Connecticut-1), including one released alive (ME). Three of these were considered fishery interactions, including one entangled in gear in Maine.

i. Data supplied by Nova Scotia Marine Animal Response Society (pers. comm.). One of the 2012 animals trapped in mackerel net.

j. Data supplied from Ledwell and Huntington (2009, 2010, 2011, 2012, 2013).

CANADA

Whales and dolphins stranded on the coast of Nova Scotia are recorded by the Marine Animal Response Society and the Nova Scotia Stranding Network, including 6 harbor porpoises stranded in 2009 (2 released alive), 5 (1 released alive) in 2010, 13 (4 released alive) in 2011, 6 in 2012, and 21 in 2013; Table 3).

Two dead stranded harbor porpoises (one dead entangled and one live release) were reported in 2009 by the Newfoundland and Labrador Whale Release and Strandings Program, 1 in 2010, 0 in 2011 and 2012, and 3 in 2013 (Ledwell and Huntington 2010, 2011, 2012, 2013; Table 3).

U.S. management measures taken to reduce bycatch

A ruling to reduce harbor porpoise bycatch in U.S. Atlantic gillnets was published in the Federal Register (63 FR 66464) on 02 December 1998 and became effective 01 January 1999. This plan was amended in 2010 (75 FR 7383, February 19, 2010) and again in 2013 (78 FR 193, October 4, 2013). For more information on these rules, please see http://www.greateratlantic.fisheries.noaa.gov/protected/porptrp/

STATUS OF STOCK

Harbor porpoise in the Gulf of Maine/Bay of Fundyare not listed as threatened or endangered under the Endangered Species Act, and this stock is not considered strategic under the MMPA. The total U.S. fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. The status of harbor porpoises, relative to OSP, in the U.S. Atlantic EEZ is unknown. Population trends for this species have not been investigated.

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May 2016

HARBOR SEAL (*Phoca vitulina concolor*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The harbor seal (*Phoca vitulina concolor*) is found in all nearshore waters of the North Atlantic and North Pacific Oceans and adjoining seas above about 30ºN (Burns 2009; Desportes *et al.* 2010). In the western North Atlantic, they are distributed from the eastern Canadian Arctic and Greenland south to southern New England and New York, and occasionally to the Carolinas (Mansfield 1967; Boulva and McLaren 1979; Katona *et al.* 1993; Gilbert and Guldager 1998; Baird 2001;Desportes *et al.* 2010). Stanley *et al.* (1996) examined worldwide patterns in harbor seal mitochondrial DNA, which indicate that western and eastern North Atlantic harbor seal populations are highly differentiated. Further, they suggested that harbor seal females are only regionally philopatric, thus population or management units are on the scale of a few hundred kilometers. High philopatry has been reported in other North Atlantic populations (Goodman 1998; Andersen and Olsen 2010). Although the stock structure of the western North Atlantic population is unknown, it is thought that harbor seals found along the eastern U.S. and Canadian coasts represent one population (Temte *et al.* 1991; Andersen and Olsen 2010). In U.S. waters, breeding and pupping normally occur in waters north of the New Hampshire/Maine border, although breeding occurred as far south as Cape Cod in the early part of the twentieth century (Temte *et al.* 1991; Katona *et al.* 1993).

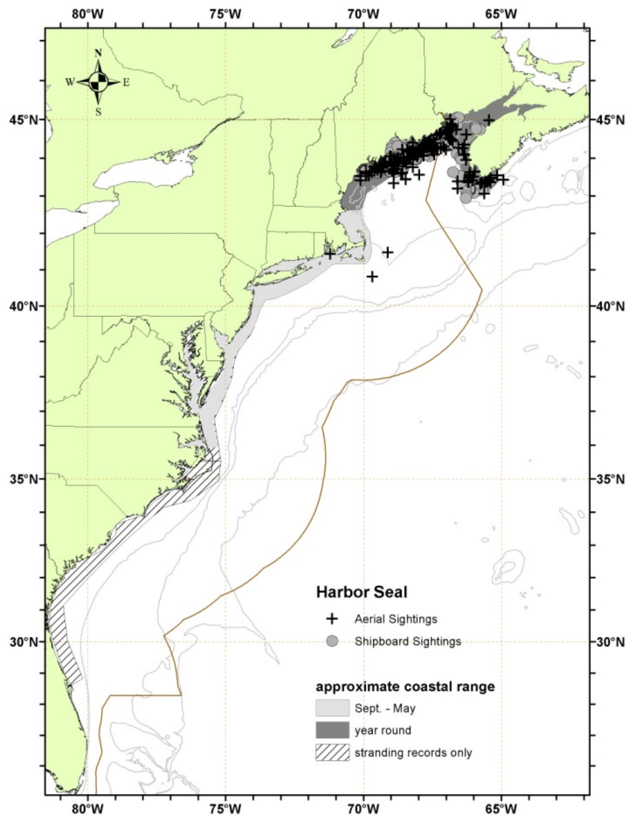

Figure 1. *Approximate coastal range of harbor seals, and distribution of harbor seal sightings from NEFSC and SEFSC shipboard and aerial surveys during the summers of 1995, 1998, 1999, 2002, 2004, 2006, 2007, 2008, 2010, and 2011. Isobaths are the 100-m, 1000-m, and 4000-m depth contours.*

Harbor seals are year-round inhabitants of the coastal waters of eastern Canada and Maine (Katona *et al.* 1993), and occur seasonally along the southern New England to New Jersey coasts from September through late May (Schneider and Payne 1983; Barlas 1999; Schroeder 2000; deHart 2002). In recent years small numbers of seals (<50) have established winter haul-out sites in the Chesapeake Bay and near Oregon Inlet, North Carolina (Todd Pusser, pers. comm. June 2011; Virginia Institute of Marine Science; http://www.vims.edu/bayinfo/faqs/marine_mammal.php, accessed 14 February, 2013). Scattered sightings and strandings have been recorded as far south as Florida (NMFS unpublished data). A general southward movement from the Bay of Fundy to southern New England waters occurs in autumn and early winter (Rosenfeld *et al.* 1988; Whitman and Payne 1990; Barlas 1999; Jacobs and Terhune 2000). A northward movement from southern New England to Maine and eastern Canada occurs prior to the pupping season, which takes place from mid-May through June along the Maine Coast (Richardson 1976; Wilson 1978; Whitman and Payne 1990; Kenney 1994; deHart 2002). Earlier research identified no pupping areas in southern New England (Payne and Schneider 1984; Barlas 1999); however, more recent anecdotal reports suggest that some pupping is occurring at high-use haulout sites off Manomet, Massachusetts and the Isles of Shoals, Maine. The overall geographic range throughout coastal New England has not changed significantly during the last century (Payne and Selzer 1989).

Prior to the spring 2001 live-capture and radio-tagging of adult harbor seals, it was believed that the majority of seals moving into southern New England and mid-Atlantic waters were subadults and juveniles (Whitman and Payne 1990; Katona *et al.* 1993). The 2001 study established that adult animals also made this migration. Seventy-five percent (9/12) of the seals tagged in March in Chatham Harbor were detected at least once during the May/June 2001 abundance survey along the Maine coast (Gilbert *et al.* 2005; Waring *et al.* 2006). Similar findings were made in spring 2011 and 2012 work.

POPULATION SIZE

The best current abundance estimate of harbor seals is 75,834 (CV=0.15) which is from the 2012 survey.

Earlier abundance estimates

Coast-wide aerial surveys along the Maine coast were conducted in May/June 1981, 1986, 1993, 1997, 2001, and 2012 during pupping (Gilbert and Stein 1981; Gilbert and Wynne 1983, 1984; Kenney 1994; Gilbert and Guldager 1998; Gilbert *et al.* 2005; Waring *et al*. 2015a). Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions. As recommended in the GAMMS II Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable for the determination of the current PBR.

Canadian scientists counted 3,500 harbor seals during an August 1992 aerial survey in the Bay of Fundy (Stobo and Fowler 1994), but noted that the survey was not designed to obtain a population estimate. The Sable Island population was the largest in eastern Canada in the late 1980s, however the number drastically declined in the late 1990s (Baird 2001). Similarly, pup production declined on Sable Island from 600 in 1989 to around a dozen pups or fewer by 2002 (Baird 2001; Bowen *et al.* 2003). A decline in the number of juveniles and adults did not occur immediately, but a decline was observed in these age classes as a result of the reduced number of pups recruiting into the older age classes (Bowen *et al*. 2003). Possible reasons for this decline may be increased use of the island by gray seals and increased predation by sharks (Stobo and Lucas 2000; Bowen *et al.* 2003). Helicopter surveys have also been flown to count hauled-out animals along the coast and around small islands in parts of the Gulf of St. Lawrence and the St. Lawrence estuary. In the estuary, surveys were flown in June 1995, 1996, and 1997, and in August 1994, 1995, 1996, and 1997; different portions of the Gulf were surveyed in June 1996 and 2001 (Robillard *et al.* 2005). Changes in counts over time in sectors that were flown under similar conditions were examined at nine sites that were surveyed in June and in August. Although all slopes were positive, only one was significant, indicating numbers are likely stable or increasing slowly. Overall, the June surveys resulted in an average of 469 (SD=60, N=3) hauled-out animals, which is lower than the average count of 621 (SD=41, N=3) hauled-out animals flown under similar conditions in August. Aerial surveys in the Gulf of St. Lawrence resulted in counts of 467 animals in 1996 and 423 animals in 2001 for a different area (Robillard *et al*. 2005). Further, approximately 200 harbor seals breed in the Grand Barachois on the islands of S. Pierre and Miquelon (France) off the southern coast of Newfoundland. This population has been declining since the mid-1980s, when there might have been more than 900 harbor seals there, due to disturbance by tourists and natural alterations of the tidal sand flats of the haul-out area (J. Lawson, pers. comm., DFO, St. Johns, Newfoundland, 21 March 2013).

Recent surveys and abundance estimates

The 2001 survey, conducted in May/June, included replicate surveys and radio-tagged seals to obtain a correction factor for animals not hauled out. The 2012 survey was designed (Waring *et al*. 2015a) to sample bay units using a single aircraft, and it also included a radio-tracking aircraft and obtained a correction factor. The corrected estimates (pups in parenthesis) for 2001 and 2012, respectively, were 99,340 (23,722) and 75,834 (23,830) (Table 1). The 2001 observed count of 38,014 was 28.7% greater than the 1997 count, whereas the 2012 corrected estimate was 24% lower than the 2001 estimate. In addition, the CV of the 2012 estimate is 0.153 compared to 0.091in 2001.

Although the 2012 population estimate was lower than the 2001 estimate, Waring *et al.* (2015a) do not consider the population to be declining because the two estimates are not significantly different and because the actual estimate was lower because some fraction of the population was not in the survey area. Evidence for this is that the 31.4% of the count were pups, a percentage that is biologically unlikely. The estimated number of harbor seal pups did not differ significantly between 2001 and 2012. In 2001, there were an estimated 23,722 (CV=0.096) pups in the study area (Gilbert *et al.* 2005); in 2012 there were an estimated 23,830 (CV=0.159) pups in the study area. Therefore it is likely that there were some non-pups in the population that were not available to be counted because they were not in the study area of Coastal Maine. Some number of seals could have remained farther south in New England, more northerly in Canada, or offshore.

Table 1. Summary of recent abundance estimates for the western North Atlantic harbor seal (*Phoca vitulina concolor*) by month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
May/June 2012	Maine coast	75,834	0.15

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for harbor seals is 75,834 (CV=0.15). The minimum population estimate is 66,884 based on corrected available counts along the Maine coast in 2012.

Current Population Trend

A trend analysis has not been conducted for this stock. The statistical power to detect a trend in abundance for this stock is poor due to the relatively imprecise abundance estimates and long survey interval. For example, the power to detect a precipitous decline in abundance (i.e., 50% decrease in 15 years) with estimates of low precision (e.g., CV > 0.30) remains below 80% (alpha = 0.30) unless surveys are conducted on an annual basis (Taylor *et al.* 2007).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock.. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.12. This value is based on theoretical modeling showing that pinniped populations may not grow at rates much greater than 12% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 66,884 animals. The maximum productivity rate is 0.12, the default value for pinnipeds. The recovery factor (F_R) is 0.5, the default value for stocks of unknown status relative to optimum sustainable population (OSP), and the CV of the average mortality estimate is less than 0.3 (Wade and Angliss 1997). PBR for the western North Atlantic stock of harbor seals is 2,006.

ANNUAL HUMAN-CAUSED SERIOUS INJURY AND MORTALITY

For the period 2009–2013 the total human caused mortality and serious injury to harbor seals is estimated to be 420 per year. The average was derived from two components: 1) 408 (CV=0.11; Table 2) from 2009–2013 observed fisheries; and 2) 12 from average 2009–2013 non-fishery-related, human interaction stranding and direct interaction mortalities (NMFS unpublished data). Analysis of bycatch rates from fisheries observer program records likely underestimates lethal (Lyle and Willcox 2008), and greatly under-represents sub-lethal, fishery interactions.

Fishery Information

Detailed fishery information is given in Appendix III.

U.S.
Northeast Sink Gillnet:

Harbor seal bycatch is observed year round where they are most frequently observed in the summer in groundfish trips occurring between Boston, MA and Maine in the coastal Gulf of Maine waters. Williams (1999) aged 261 harbor seals caught in this fishery from 1991 to 1997, and 93% were juveniles (i.e., less than four years old). There were 6, 8, 5, 9, 6 and 8 unidentified seals observed during 2009–2013, respectively. Since 1997, unidentified seals have not been prorated to a species. This is consistent with the treatment of other unidentified mammals that do not get prorated to a specific species. Revised serious injury guidelines were applied for this period

(Waring *et al.* 2014, 2015; Wenzel *et al*. 2015). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Mid-Atlantic Gillnet

Harbor seal bycatch has been onbserved in this fishery in waters off Massachusetts and New Jersey and rarely further south. A study on the effects of two different hanging ratios in the bottom-set monkfish gillnet fishery on the bycatch of cetaceans and pinnipeds was conducted by NEFSC in 2009 and 2010 with 100% observer coverage. Commercial fishing vessels from Massachusetts and New Jersey were used for the study, which took place south of the Harbor Porpoise Take Reduction Team Cape Cod South Management Area (south of 40° 40′) in February, March and April. Eight research strings of fourteen nets each were fished, and 159 hauls were completed during the course of the study. Results showed that while a 0.33 mesh performed better at catching commercially important finfish than a 0.50 mesh. There was no statistical difference in cetacean or pinniped bycatch rates between the two hanging ratios. Four harbor seals (3 in mid-Atlantic gillnet and 1 in NE gillnet) were caught in this project during 2010 (AIS 2010).

See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Northeast Bottom Trawl

Harbor seal are occasionally observed taken in this fishery See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Mid-Atlantic Bottom Trawl

Harbor seal are rarely observed taken in this fishery. See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information. .

Northeast Mid-water Trawl Fishery (Including Pair Trawl)

One harbor seal mortality was observed in this fishery in 2009, 2 in 2010 and 1 in 2012 (Table 2). The resultant estimated annual fishery-related mortality and serious injury (CV in parentheses) was 1.3 (0.81) in 2009 but an extended bycatch rate has not been calculated for 2010 or 2012. Until this bycatch estimate can be developed, the average annual fishery-related mortality and serious injury for 2009–2013 was calculated as 0.9 animals (3 animals +1.3 animals/5 years). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Mid-Atlantic Mid-water Trawl Fishery (Including Pair Trawl)

A harbor seal mortality was observed in this fishery in 2010. An expanded bycatch estimate has not been generated. Until this bycatch estimate can be developed, the average annual fishery-related mortality and serious injury for 2009–2013 was calculated as 0.2 animals (1 animal/5 years). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Gulf of Maine Atlantic Herring Purse Seine Fishery

The Gulf of Maine Atlantic Herring Purse Seine Fishery is a Category III fishery. This fishery was not observed until 2003. No mortalities have been observed, but 3 harbor seals were captured and released alive in 2011, 1 in 2012, and 1 in 2013. In addition, 8 seals of unknown species were captured and released alive in 2011, and 0 in 2012-2013. One harbor seal and two unknown species in were designated as serious injuries/mortalities in 2011, based on fisheries monitoring logs (Waring *et al*. 2014). An expanded bycatch estimate has not been generated. Until this bycatch estimate can be developed, the average annual fishery-related mortality and serious injury for 2009–2013 was calculated as 0.2 animals (1 animal/5 years). See Table 2 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

CANADA

Currently, scant data are available on bycatch in Atlantic Canada fisheries due to a lack of observer programs (Baird 2001). An unknown number of harbor seals have been taken in Newfoundland, Labrador, Gulf of St. Lawrence and Bay of Fundy groundfish gillnets; Atlantic Canada and Greenland salmon gillnets; Atlantic Canada cod traps; and in Bay of Fundy herring weirs (Read 1994; Cairns *et al.* 2000). Furthermore, some of these mortalities (e.g., seals trapped in herring weirs) are the result of direct shooting under nuisance permits.

Table 2. Summary of the incidental mortality of harbor seals (*Phoca vitulina concolor*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CVs) and the mean annual mortality (CV in parentheses).

Fishery	Years	Data Type [a]	Observer Coverage [b]	Observed Serious Injury[e]	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Estimated CVs	Mean Annual Mortality
Northeast [c] Sink Gillnet	09-13	Obs. Data, Weighout, Logbooks	.04, .17, .19, .15, .11	0, 0, 0, 0, 0	21, 71, 91, 37, 22	0, 0, 0, 0, 0	513, 540, 343, 252, 142	513, 540, 343, 252, 142	.28, .25, .19, .26, .31	358 (0.12)
Mid-Atlantic Gillnet	09-13	Obs. Data, Weighout	.03, .04, .02, .02, .03	0, 0, 0, 0, 0	2, 9, 2, 0	0, 0, 0, 0, 0	47, 89, 21, 0, 0	47, 89, 21, 0, 0	.68, .39, .67, 0, 0	31.4 (0.31)
Northeast Bottom Trawl [d]	09-13	Obs. Data, Weighout	.09, .16, .26, .17, .15	0, 0, 0, 0, 0	0, 0, 3, 1, 1	0, 0, 0, 0, 0	0, 0, 9, 3, 4	0, 0, 9, 3, 4	0, 0, .58, 1, .96	3.2 (.44)
Mid-Atlantic Bottom Trawl	09-13	Obs. Data Dealer	.05, .06, .08, .05, .06	0, 0, 0, 0, 0	0, 1 ,1, 0, 3	0, 0, 0, 0, 0	24, 11, 0, 23, 11	24, 11, 0, 23, 11	.92, 1.1, 0, 1, .96	13.8 (.53)
Northeast Mid-water Trawl - Including Pair Trawl	09-13	Obs. Data Weighout Trip Logbook	.42, .53, .41, .45, .37	0, 0, 0, 0, 0	1, 2, 0, 1, 0	0, 0, 0, 0, 0	1.3, na, 0, na, 0	1.3, na, 0, na, 0	.81, na, 0, na, 0	0.9 (.24)
Mid-Atlantic Mid-water Trawl - Including Pair Trawl	09-13	Obs. Data Weighout Trip Logbook	.13, .25, .41, .21, .07	0, 0, 0, 0, 0	0, 1, 0, 0, 0	0, 0, 0, 0, 0	0, 0, na, 0, 0	0, 0, na, 0, 0	0, 0, na, 0, 0	0.2 (na)[e]
Herring Purse Seine	09-13	Obs. Data	.21, .12 .33, .17, .17	0, 0, 1, 0, 0	0, 0, 0, 0, 0	0, 0, na, 0, 0	0, 0, 0, 0, 0	0, 0, na, 0, 0	0, 0, na, 0, 0	0.2 (na)
TOTAL										408 (0.11)

[a] Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Observer Program. NEFSC collects landings data (Weighout), and total landings are used as a measure of total effort for the sink gillnet fishery. Mandatory logbook (Logbook) data are used to determine the spatial distribution of fishing effort in the northeast sink gillnet fishery.

[b] The observer coverages for the northeast sink gillnet fishery and the mid-Atlantic gillnet fisheries are ratios based on tons of fish landed and coverages for the northeast bottom trawl are ratios based on trips. Total observer coverage reported for bottom trawl gear and gillnet gear in the year 2010–2013 includes samples collected from traditional fisheries observers in addition to fishery monitors through the Northeast Fisheries Observer Program (NEFOP).

[c] Since 1998, takes from pingered and non-pingered nets within a marine mammal time/area closure that required pingers, and takes from pingered and non-pingered nets not within a marine mammal time/area closure were pooled. The pooled bycatch rate was weighted by the total number of

samples taken from the stratum and used to estimate the mortality. In 2009–2013, respectively, 8, 23, 32, 12 and 11 takes were observed in nets with pingers. In 2009–2013, respectively, 13, 48, 59, 25 and 11 takes were observed in nets without known pingers.

[d] Fishery related bycatch rates for years 2009–2013 were estimated using an annual stratified ratio-estimator.

[e] Analyses of bycatch mortality attributed to the mid-water trawl fisheries for 2010 – 2013 have not been generated.

f. Serious injuries were evaluated for the 2009–2013 period using new guidelines and include both at-sea monitor and traditional observer data (Waring *et al.* 2014, 2015b; Wenzel *et al*. 2015.)

Other Mortality

U.S.

Historically, harbor seals were bounty-hunted in New England waters, which may have caused a severe decline of this stock in U.S. waters (Katona *et al*. 1993; Lelli *et al*. 2009). Bounty-hunting ended in the mid-1960s.

Other sources of harbor seal mortality include human interactions, storms, abandonment by the mother, disease (Anthony *et al.* 2012), and predation (Katona *et al.* 1993; Jacobs and Terhune 2000). Mortalities caused by human interactions include boat strikes, fishing gear interactions, oil spill/exposure, harassment, boat strikes, and shooting.

Harbor seals strand each year throughout their migratory range. Stranding data provide insight into some of these sources of mortality. From 2009 to 2013, 1,318 harbor seal stranding mortalities were reported between Maine and Florida (Table 3; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 20 August 2014). Seventy (5.3%) of the dead harbor seals stranded during this five-year period showed signs of human interaction (6 in 2009, 20 in 2010, 20 in 2011, 9 in 2012, and 15 in 2013), with 13 (0.9%) having some sign of fishery interaction (0 in 2009, 6 in 2010, 2 in 2011, 2 in 2012, and 3 in 2013). Two harbor seals during this period were reported as having been shot.

An Unusual Mortality Event (UME) was declared for harbor seals in northern Gulf of Maine waters in 2003 and continued into 2004. No consistent cause of death could be determined. The UME was declared over in spring 2005 (MMC 2006). NMFS declared another UME in the Gulf of Maine in autumn 2006 based on infectious disease. A UME was declared in November of 2011 that involved 567 harbor seal stranding mortalities between June 2011 and October 2012 in Maine, New Hampshire, and Massachusetts. The UME was declared closed in February 2013.

Stobo and Lucas (2000) have documented shark predation as an important source of natural mortality at Sable Island, Nova Scotia. They suggest that shark-inflicted mortality in pups, as a proportion of total production, was less than 10% in 1980-1993, approximately 25% in 1994–1995, and increased to 45% in 1996. Also, shark predation on adults was selective towards mature females. The decline in the Sable Island population appears to result from a combination of shark-inflicted mortality on both pups and adult females and inter-specific competition with the much more abundant gray seal for food resources (Stobo and Lucas 2000; Bowen *et al.* 2003).

CANADA

Aquaculture operations in eastern Canada are licensed to shoot nuisance seals, but the number of seals killed is unknown (Jacobs and Terhune 2000; Baird 2001). Small numbers of harbor seals are taken in subsistence hunting in northern Canada, and Canada also issues personal hunting licenses which allow the holder to take six seals annually (DFO 2008).

Table 3. Harbor seal (*Phoca vitulina concolor*) stranding mortalities along the U.S. Atlantic coast (2009–2013) with subtotals of animals recorded as pups in parentheses[a].

State	2009	2010	2011	2012	2013	Total
Maine[b]	72 (61)	70 (64)	147 (115)	131 (101)	99 (74)	519
New Hamphire[b]	15 (12)	20 (15)	77 (63)	24 (18)	16 (6)	152
Massachusetts[b]	74 (36)	82 (26)	133 (80)	54 (35)	95 (39)	438
Rhode Island	5 (2)	4 (0)	7 (0)	14 (0)	9 (3)	39
Connecticut	0	0	1 (1)	1 (1)	2 (1)	4
New York	14 (1)	15 (0)	17 (0)	14 (1)	11 (2)	71
New Jersey	11 (2)	21 (0)	10 (0)	7 (0)	4 (0)	53
Maryland	2 (0)	0	1 (0)	0	1 (0)	4
Virginia	3	1 (0)	4 (0)	0	5 (0)	13

North Carolina	6 (5)	11 (1)	2 (0)	2 (0)	3 (0)	24
South Carolina	0	1	0	0	0	1
Total	202	225	399	247	245	1318
Unspecified seals (all states)	34	22	63	28	25	172
a. Some of the data reported in this table differ from that reported in previous years. We have reviewed the records and made an effort to standardize reporting. Records of live releases and rehabbed animals have been eliminated. Mortalities include animals found dead and animals that were euthanized, died during handling, or died in the transfer to, or upon arrival at, rehab facilities.						
b. Unusual Mortality event (UME) declared for harbor seals in southern Maine to northern Massachusetts in 2011.						

STATUS OF STOCK

Harbor seals are not listed as threatened or endangered under the Endangered Species Act, and the western North Atlantic stock is not considered strategic under the Marine Mammal Protection Act. The 2009–2013 average annual human-caused mortality and serious injury does not exceed PBR. The status of the western North Atlantic harbor seal stock, relative to OSP, in the U.S. Atlantic EEZ is unknown. Total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate.

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GRAY SEAL (*Halichoerus grypus grypus*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The gray seal (*Halichoerus grypus grypus*) is found on both sides of the North Atlantic, with three major populations: eastern Canada, northwestern Europe and the Baltic Sea (Katona *et al.* 1993). The western North Atlantic stock is equivalent to the eastern Canada population, and ranges from New Jersey to Labrador (Davies 1957; Mansfield 1966; Katona *et al.* 1993; Lesage and Hammill 2001). This stock is separated by geography, differences in the breeding season, and mitochondrial and nuclear DNA variation from the northeastern Atlantic stocks (Bonner 1981; Boskovic *et al.* 1996; Lesage and Hammill 2001; Klimova *et al.* 2014). There are three breeding herds in eastern Canada: Sable Island, Gulf of St. Lawrence, and along the coast of Nova Scotia (Laviguer and Hammill 1993). Outside the breeding period, there is overlap in the distribution of animals from the three colonies (Lavigueur and Hammill 1993; Harvey *et al.* 2008; Breed *et al.* 2006, 2009, Hammill, pers. comm. DFO, Mont-Joli, Quebec, Canada) and they are considered a single population based on genetic similarity (Boskovic *et al.* 1996; Wood *et al.* 2011). In the mid-1980s, small numbers of animals and pupping were observed on several isolated islands along the Maine coast and in Nantucket-Vineyard Sound, Massachusetts (Katona *et al.* 1993; Rough 1995: Gilbert *et al*. 2005). In the late 1990s, a year-round breeding population of approximately 400+ animals was documented on outer Cape Cod and Muskeget Island (D. Murley, pers. comm., Mass. Audubon Society, Wellfleet, MA). In December 2001, NMFS initiated aerial surveys to monitor gray seal pup production on Muskeget Island and adjacent sites in Nantucket Sound, and Green and Seal Islands off the coast of Maine (Wood *et al.* 2007). To assess the stock structure of gray seals in the northwest Atlantic, tissue samples were collected from Canadian and US populations for genetic analyses (Wood et al. 2011). Based on examination of nine highly variable microsatellite loci, all individuals were placed into one population. This provides additional confirmation that recolonization by Canadian gray seals is the source of the U.S. population.

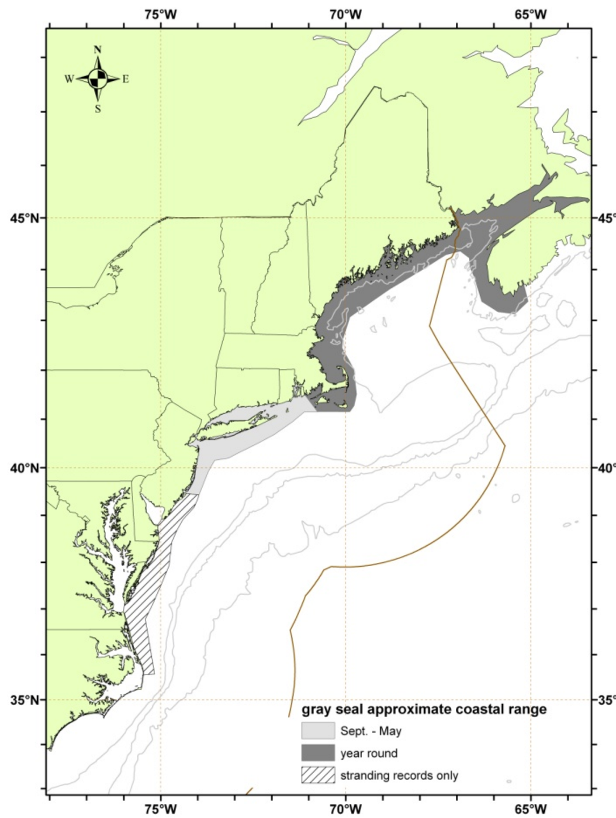

Figure 1. Approximate coastal range of gray seals. Isobaths are the 100-m, 1000-m, and 4000-m depth contours.

POPULATION SIZE

Current estimates of the total western Atlantic gray seal population are not available; although estimates of portions of the stock are available for select time periods. The Canadian gray seal stock assessment (DFO 2014) reports gray seal pup production in 2014 for the three Canadian herds (Gulf of St. Lawrence, Sable Island, and Nova Scotia) as 93,000 (95%CI=48,000-137,000) animals, and total population levels of 505,000 (95%CI=329,000-682,000) animals.

In U.S. waters, gray seals currently pup at four established colonies: Muskeget Island and Monomoy Island in Massachusetts, and Green and, Seal Islands in Maine. Although white-coated pups have stranded on eastern Long Island beaches, no pupping colonies have been detected in that region. Gray seals have been observed using the historic pupping site on Muskeget Island in Massachusetts since 1988. Pupping has taken place on Seal and Green Islands in Maine since at least the mid-- 1990s. Aerial survey data from these sites indicate that pup production is increasing. A minimum of 2,620 pups (Muskeget= 2,095, Green= 59, Seal= 466) were born in the U.S. in 2008 (Wood LaFond 2009). Table 2 summarizes single-day pup counts from three of the U.S. pupping colonies from 2001/2002 to 2007/2008 pupping periods. The decrease in pup counts in some years is an artifact of survey timing and not indicative of true declines in those years. Additionally, minima of 2,750 and 3,037 pups were counted on Muskeget Island in 2013 and 2014, respectively. In recent years NMFS monitoring surveys have detected an increase in pupping, (i.e., from tens to hundreds) on Monomoy. Further, occasional mother/pup (white coats) pairs have been photographed on Nomans Land in Massachusetts. Some of the local breeders have been observed with brands and tags indicating they had been born on Sable Island, Canada (Rough 1995; L. Sette, pers. comm.). The increase in the number of gray seals observed in the U.S. is probably due to both natural increase and immigration.

Gray seals are also observed in New England outside of the pupping season. In April–May 1994 a maximum count of 2,010 was obtained for Muskeget Island and Monomoy combined (Rough 1995). Maine coast-wide surveys conducted during summer revealed 597 and 1,731 gray seals in 1993 and 2001, respectively (Gilbert *et al.* 2005). In March 1999 a maximum count of 5,611 was obtained in the region south of Maine (between Isles of Shoals, Maine and Woods Hole, Massachusetts) (Barlas 1999). In March 2011 a maximum count of 15,756 was obtained in southeastern Massachusetts coastal waters (NMFS unpubl. data). No gray seals were recorded at haul-out sites between Newport, Rhode Island and Montauk Point, New York (Barlas 1999), currently several hundred gray seals have been recorded in surveys conducted off eastern Long Island (R. DiGiovanni, pers. comm).

Table 1. Summary of recent abundance estimates for the western North Atlantic gray seal (*Halichoerus grypus grypus*) by year, and area covered during each abundance survey, resulting total abundance estimate and 95% confidence interval.

Month/Year	**Area**	**N_{best}** [a]	**CI**
2012[b]	Gulf of St Lawrence + Nova Scotia Eastern Shore + Sable Island	331,000	95% CI 263,000-458,000
2014[c]	Gulf of St Lawrence + Nova Scotia Eastern Shore + Sable Island	505,000	95%CI=329,000-682,000

[a]These are model based estimates derived from pup surveys.
[b] DFO 2013
[c] DFO 2014

Table 2. The number of pups observed on Muskeget, Seal, and Green Islands 2002–2008. Data are from aerial surveys[1, 2]. These are single-day counts, not estimates of total pup production (Wood LaFond 2009).

Pupping Season	Muskeget Island	Seal Island	Green Island
2001-2	883	No data	34
2002-3	509	147	No data
2003-4	824	150	26
2004-5	992	365	33
2005-6	868	239	43
2006-7	1704	364	57
2007-8	2095	466	59
2012-13[1]	2750		
2013-14[1]	3037		

1 Survey data for the 2008–9 through 2011–2 seasons have not been counted.

Minimum Population Estimate

Based on modeling, the total Canadian gray seal population was estimated to be 505,000 (95% CI = 329,000-682,000) (DFO 2014) . Present data are insufficient to calculate the minimum population estimate for U.S. waters.

Current Population Trend

Gray seal abundance is likely increasing in the U.S. Atlantic Exclusive Economic Zone (EEZ), but the rate of increase is unknown. The population in eastern Canada was greatly reduced by hunting and bounty programs, and in the 1950s the gray seal was considered rare (Lesage and Hammill 2001). The Sable Island, Nova Scotia, population was less affected and has been increasing for several decades. Pup production on Sable Island increased exponentially at a rate of 12.8% per year between the 1970s and 1997 (Stobo and Zwanenburg 1990; Mohn and Bowen 1996; Bowen *et al.* 2003; Trzcinski *et al.* 2005; Bowen *et al.* 2007; DFO 2011). Recent population modeling indicates that the combined population increased at an annual rate of 5.2% between 2007 and 2010, and since has continued to grow at a rate of 4.5% per year (DFO 2011, 2014). The non-Sable Island population increased from approximately 25,000 in the mid-1980s to a peak of 112,000 in 2014 (Thomas *et al.* 2011; DFO 2014). Modeling estimates of pup production increased from approximately 6,000 in 1985 to 21,500 in 2014 (Thomas *et al.* 2011; DFO 2014). Approximately 75% of the western North Atlantic population is from the Sable Island stock. In the early 1990s pupping was established on Hay Island, off the Cape Breton coast (Lesage and Hammill 2001; Hammill *et al*. 2007, Hamill and Stenson 2010).

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. Recent studies estimated the current annual rate of increase at 4.5% for the combined breeding herds in Canada (DFO 2014),, continuing a decline in the rate of increase (Trzcinski *et al*. 2005; Bowen *et al*. 2007; Thomas *et al*. 2011;DFO 2014). For purposes of this assessment, the maximum net productivity rate was assumed to be 0.12. This value is based on theoretical modeling showing that pinniped populations may not grow at rates much greater than 12% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is unknown. The maximum productivity rate is 0.12, the default value for pinnipeds. The recovery factor (F_R) for this stock is 1.0, the value for stocks of unknown status, but which are known to be increasing. PBR for the western North Atlantic gray seals in U.S. waters is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

For the period 2009–2013, the total estimated human caused mortality and serious injury to gray seals was 5,004 per year. The average was derived from five components: 1) 1193.4 (CV=0.11) (Table 3) from the 2009–2013 U.S. observed fishery; 2) 7.6 from average 2009–2013 non-fishery related, human interaction stranding mortalities (NMFS unpublished data); 3) 172 from average 2009–2013 kill in the Canadian hunt (DFO 2014)*;* 4) 82 from DFO scientific collections (DFO 2011); and 5) 3,549 removals of nuisance animals in Canada (DFO 2014). Analysis of bycatch rates from fisheries observer program records likely greatly under-represents sub-lethal fishery interactions. Photographic analysis of gray seals at haulout sites on Cape Cod, Massachusetts revealed 5-8% of seals exhibited signs of entanglement (Sette *et al.* 2009).

Fishery Information

Detailed fishery information is given in Appendix III.

U.S.

Northeast Sink Gillnet

Gray seal bycatch in the northeast sink gillnet fishery were usually observed in the first half of the year in waters to the east and south of Cape Cod, Massachusetts in 12-inch gillnets fishing for skates and monkfish (Orphanides 2013; Hatch and Orphanides 2014, 2015). There were 8, 7, 9, 1, and 8 unidentified seals observed during 2009–2013, respectively. Since 1997 unidentified seals have not been prorated to a species. This is consistent with the treatment of other unidentified mammals that do not get prorated to a specific species. See Table 3 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Mid-Atlantic Gillnet

Gray seal interactions were first observed in this fishery in 2010, since then, when they are observed, it is usually in waters off New Jersey in gillnets that have mesh sizes ≥ 7 in (Orphanides 2013; Hatch and Orphanides 2014, 2015). See Table 3 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Northeast Mid-Water Trawl

One gray seal mortality was observed in 2012 and one in 2013 in this fishery. An expanded bycatch estimate has not been generated. Until this bycatch estimate can be developed, the average annual fishery-related mortality and serious injury for 2009–2013 is calculated as 0.4 animals (2 animals /5 years). See Table 3 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Mid-Atlantic Mid-Water Trawl

One gray seal mortality was observed in 2010 in this fishery. An expanded bycatch estimate has not been generated. Until this bycatch estimate can be developed, the average annual fishery-related mortality and serious injury for 2009–2013 is calculated as 0.2 animals (1 animal /5 years). See Table 3 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Gulf of Maine Atlantic Herring Purse Seine Fishery

The Gulf of Maine Atlantic Herring Purse Seine Fishery is a Category III fishery. This fishery was not observed until 2003, and was not observed in 2006. No mortalities have been observed, but during this time period 4 gray seals were captured and released alive in 2010, 34 in 2011, 33 in 2012, and 1 in 2013. In addition, during this time period 8 seals of unknown species were captured and released alive in 2011. See Table 3 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Northeast Bottom Trawl

Vessels in the North Atlantic bottom trawl fishery, a Category III fishery under MMPA, were observed in order to meet fishery management, rather than marine mammal management needs. No mortalities were observed prior to 2005, when four mortalities were attributed to this fishery. See Table 3 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

Mid-Atlantic Bottom Trawl

One gray seal mortality was observed in this fishery in 2009, 2 in 2011, 1 in 2012, and 2 in 2013 (Table 2). See Table 3 for bycatch estimates and observed mortality and serious injury for the current 5-year period, and Appendix V for historical bycatch information.

CANADA

Historically, an unknown number of gray seals have been taken in Newfoundland and Labrador, Gulf of St. Lawrence, and Bay of Fundy groundfish gillnets; Atlantic Canada and Greenland salmon gillnets;, Atlantic Canada cod traps, and Bay of Fundy herring weirs (Read 1994). In addition to incidental catches, some mortalities (e.g., seals trapped in herring weirs) were the result of direct shooting, and there were culls of about 1,700 animals annually during the 1970s and early 1980s on Sable Island (Anonymous 1986).

Table 3. Summary of the incidental serious injury and mortality of gray seal (*Halichoerus grypus grypus*) by commercial fishery including the years sampled, the type of data used, the annual observer coverage, the serious injuries and mortalities recorded by on-board observers, the estimated annual mortality, the estimated CV of the annual mortality and the mean annual combined mortality (CV in parentheses).

Fishery	Years	Data Type [a]	Observer Coverage [b]	Observed Serious Injury[e]	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Estimated CVs	Mean Annual Combined Mortality
Northeast Sink Gillnet[c]	09-13	Obs. Data,Weighout, Trip Logbook	.04, .17, .19, .15, .11	0, 0, 0, 0, 0	52, 107, 222, 91, 69	0, 0, 0, 0, 0	1063, 1155, 1491, 542, 982	1063, 1155, 1491, 542, 1,127	.26, .28, .22, .19, .20	1076 (0.11)
Mid-Atlantic Gillnet	09-13	Obs. Data, Trip Logbook, Allocated Dealer Data	.03, .04, .02, .02, .03	0, 0, 0, 0, 0	0, 9, 2, 1 ,0	0, 0, 0, 0, 0	0, 267, 19, 14, 0	0, 267, 19, 14, 0	0, .75, .60, .98, 0	60 (0.67)
Northeast Bottom Trawl [d]	09-13	Obs. Data,Trip Logbook	.09, .16, .26, 17, .15	0, 0, 0, 0, 0	5, 9, 19, 8, 5	0, 0, 0, 0, 0	22, 30, 58, 37, 20	22, 30, 58, 37, 20	.46, .34, .25, .49, .37	33.4 (0.18)
Mid-Atlantic Bottom Trawl	09-13	Obs. Data,Trip Logbook	.05, .06, .08, .05, .06	0, 0, 0, 0, 0	3, 0, 3, 1, 2	0, 0, 0, 0, 0	38, 0, 25, 30, 29	38, 0, 25, 30, 29	.7, 0, .57, 1.1, .67	24.4(0.4)
Northeast Mid-water Trawl - Including Pair Trawl	09-13	Obs. Data, Trip Logbook	.42, .53, .41, .45, .37	0, 0, 0, 0, 0	0, 0, 0, 1, 1	0, 0, 0, 0, 0	0, 0, 0, na, na	0, 0, 0, na, na	0,0, 0, na, na	0.4 (na) [d]
Mid-Atlantic Mid-water Trawl - Including Pair Trawl	09-13	Obs. Data, Trip Logbook	.13, .25, .41, .21, .07	0, 0, 0, 0, 0	0, 1, 0, 0, 0	0, 0, 0, 0, 0	0, na, 0, 0, 0	0, na, 0, 0, 0	0, na, 0, 0, 0	0.2 (na)
TOTAL										1193.4 (0.11)

a. Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Observer Program. The Northeast Fisheries Observer Program collects landings data (Weighout), and total landings are used as a measure of total effort for the sink gillnet fishery. Mandatory logbook (Logbook) data are used to determine the spatial distribution of fishing effort in the Northeast multispecies sink gillnet fishery.

b. The observer coverages for the northeast sink gillnet fishery and the mid-Atlantic gillnet fisheries are ratios based on tons of fish landed. North Atlantic bottom trawl mid-Atlantic bottom trawl, and mid-Atlantic mid-water trawl fishery coverages are ratios based on trips. Total observer coverage reported for bottom trawl gear and gillnet gear in the years 2010–2013 includes traditional fisheries observers in addition to fishery monitors through the Northeast Fisheries Observer Program (NEFOP).

c. Since 1998, takes from pingered and non-pingered nets within a marine mammal time/area closure that required pingers, and takes from pingered and non-pingered nets not within a marine mammal time/area closure were pooled. The pooled bycatch rate was weighted by the total number of samples taken from the stratum and used to estimate the mortality. In 2009–2013, respectively, 13, 17, 125, 54 and 38 takes were observed in nets with pingers. In 2009 -2013, respectively, 27, 39, 90, 97, 10 and 31 takes were observed in nets without pingers.

d. Fishery related bycatch rates for years 2009–2013 were estimated using an annual stratified ratio-estimator. These estimates replace the 2008-2011 annual estimates reported in the 2013 stock assessment report that were generated using a different method.

e. Serious injuries were evaluated for the 2009–2013 period using new guidelines (Waring *et al.* 2014, 2015; Wenzel *et al*. 2015)

Other Mortality
U.S

Gray seals, like harbor seals, were hunted for bounty in New England waters until the late 1960s (Katona *et al.* 1993; Lelli *et al*. 2009). This hunt may have severely depleted this stock in U.S. waters (Rough 1995; Lelli *et al*. 2009). Other sources of mortality include human interactions, storms, abandonment by the mother, disease, and shark predation. Mortalities caused by human interactions include boat strikes, fishing gear interactions, power plant entrainment, oil spill/exposure, harassment, and shooting. Seals entangled in netting have been reported at several major haul-out sites in the Gulf of Maine.

From 2009 to 2013 521 gray seal stranding mortalities were recorded, extending from Maine to North Carolina (Table 4; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 20 August 2014). Most stranding mortalities were in Massachusetts, which is the center of gray seal abundance in U.S. waters. Sixty-seven (13%) of the total stranding mortalities showed signs of human interaction (14 in 2009, 12 in 2010, 20 in 2011, 4 in 2012, and 17 in 2013), 29 of which had some indication of fishery interaction (9 in 2009, 4 in 2010, 5 in 2011, 2 in 2012, and 9 in 2013). Ten gray seals are recorded in the NE stranding database during the 2009 to 2013 period as having been shot—1 in Maine in 2009, 1 in Maine and 2 in Massachusetts in 2010, 6 in Massachusetts in 2011, and none in 2012 or 2013.

CANADA

There is a small commercial harvest of gray seals in the Gulf of St. Lawrence and Nova Scotia. During the 2009–2013 period, commercial harvest statistics were as follows: 263 removals in 2009, 58 in 2010, 215 in 2011, 218 in 2012, and 106 in 2013 (DFO 2014). Further, between 2009 and 2013 the lethal removal of nuisance seals was: 2009 (5,218), 2010 (1,853), 2011 (1,722), 2012 (5,428), and 2013 (3,525) (DFO 2014).

For scientific collections, DFO took 320 animals in 2011 and 90 animals in 2012 (DFO 2014).

Table 4. Gray seal (*Halichoerus grypus grypus*) stranding mortalities [a] along the U.S. Atlantic coast (2009–2013) with subtotals of animals recorded as pups in parentheses.

State	2009	2010	2011	2012	2013	Total
Maine	3	8 (4)	4 (2)	10 (2)	9 (4)	34
New Hamphire	1 (1)	0	8 (1)	1 (1)	1 (0)	11
Massachusetts	52 (7)	43 (5)	89 (14)	38 (21)	82 (8)	303
Rhode Island	10 (2)	8 (3)	14 (2)	13 (5)	11 (2)	56
Connecticut	1(1)	0	2 (0)	0	0	3
New York	16 (7)	10 (7)	22 (6)	5 (3)	18 (5)	71
New Jersey	4 (0)	4 (1)	10 (0)	4 (0)	7 (2)	29
Maryland	1 (0)	1 (0)	4 (2)	0	0	6
Virginia	2 (0)	1 (0)	1 (0)	0	0	4
North Carolina	1 (1)	1 (0)	2 (2)	0	0	4
Total	91 (19)	76 (20)	156 (29)	71 (32)	128 (21)	521
Unspecified seals (all states)	34	22	63	28	25	172

STATUS OF STOCK

Gray seals are not listed as threatened or endangered under the Endangered Species Act, and the western North Atlantic stock is not considered strategic under the Marine Mammal Protection Act. The level of human-caused mortality and serious injury in the U.S. Atlantic EEZ is low relative to the total stock size. The status of the gray seal population relative to OSP in U.S. Atlantic EEZ waters is unknown, but the stock's abundance appears to be increasing in Canadian and U.S. waters. The total U.S. fishery-related mortality and serious injury for this stock is low relative to the stock size in Canadian and U.S. waters and can be considered insignificant and approaching zero mortality and serious injury rate.

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SPERM WHALE (*Physeter macrocephalus*): Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Sperm whales are found throughout the world's oceans in deep waters from the tropics to the edge of the ice at both poles (Leatherwood and Reeves 1983; Rice 1989; Whitehead 2002). Sperm whales were commercially hunted in the Gulf of Mexico by American whalers from sailing vessels until the early 1900s (Townsend 1935). In the northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) systematic aerial and ship surveys indicate that sperm whales inhabit continental slope and oceanic waters where they are widely distributed (Figure 1; Fulling *et al.* 2003; Mullin and Fulling 2004; Mullin *et al.* 2004; Maze-Foley and Mullin 2006; Mullin 2007). Seasonal aerial surveys confirm that sperm whales are present in the northern Gulf of Mexico in all seasons (Mullin *et al.* 1994; Hansen *et al.* 1996; Mullin and Hoggard 2000).

Because there are many confirmed records from Gulf of Mexico waters beyond U.S. boundaries (e.g., Jefferson and Schiro 1997, Ortega Ortiz 2002), sperm whales almost certainly occur throughout the oceanic Gulf of Mexico (Jefferson *et al.* 2008), which is also composed of waters belonging to Mexico and Cuba where there is currently little information on cetacean species abundance and distribution. U.S. waters comprise about 40% of the entire Gulf of Mexico, and 65% of oceanic waters are south of the U.S. Exclusive Economic Zone (EEZ).

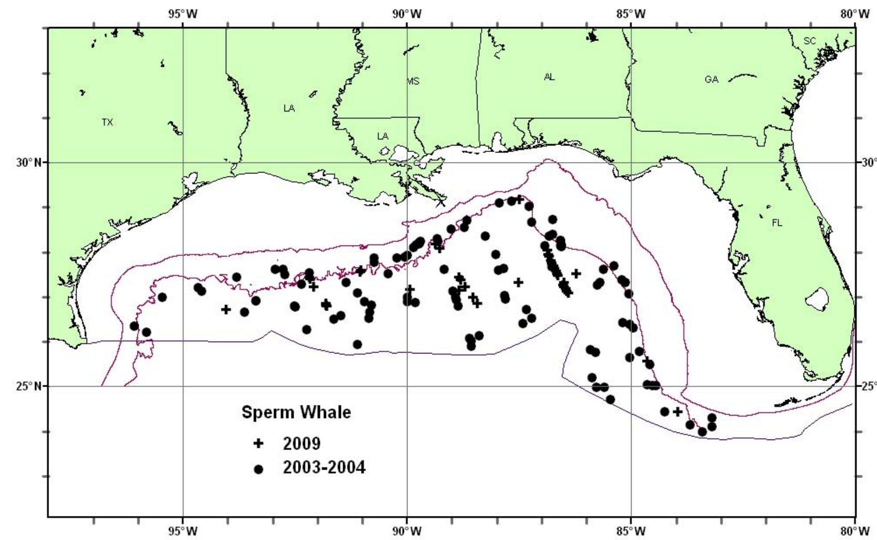

Figure 1. *Distribution of sperm whale sightings from SEFSC vessel surveys during summer 2003 and spring 2004, and during summer 2009. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 100m and 1,000m isobaths and the offshore extent of the U.S. EEZ.*

Sperm whales throughout the world exhibit a geographic social structure where females and juveniles of both sexes occur in mixed groups and inhabit tropical and subtropical waters. Males, as they mature, initially form bachelor groups but eventually become more socially isolated and more wide-ranging, inhabiting temperate and polar waters as well (Whitehead 2003). While this pattern also applies to the Gulf of Mexico, results of multi-disciplinary research conducted in the Gulf since 2000 confirms speculation by Schmidly (1981) and indicates clearly that Gulf of Mexico sperm whales constitute a stock that is distinct from other Atlantic Ocean stocks(s) (Mullin *et al.* 2003; Jaquet 2006; Jochens *et al.* 2008). The following summarizes the most significant stock structure-related findings from the Sperm Whale Seismic Study (Jochens *et al.* 2008) and associated projects. Measurements of the total length of Gulf of Mexico sperm whales indicate that they are 1.5-2.0m smaller on average compared to whales measured in other areas. Female/immature group size in the Gulf is about one-third to one-fourth that found in the Pacific Ocean but more similar to group sizes in the Caribbean (Richter *et al.* 2008; Jaquet and Gendron 2009). Tracks from 39 whales satellite tagged in the northern Gulf were monitored for up to 607 days. No discernable seasonal migrations were made, but Gulf-wide movements primarily along the northern Gulf slope did occur. The tracks showed that whales exhibit a range of movement patterns within the Gulf, including movement into the southern Gulf in a few cases, but that only 1 whale (a male) left the Gulf of Mexico. This animal moved into the North Atlantic and then back into the Gulf after about 2 months. Additionally, no matches were found when 285 individual whales photo-identified from the Gulf and about 2500 from the North Atlantic and Mediterranean Sea were compared. More recently, Gero *et al.* (2007) suggested that movements of sperm whales between the adjacent areas of the Caribbean Sea, Gulf of Mexico and Atlantic may not be common. No matches were made from animals photo-identified in the eastern Caribbean Sea (islands of Dominica, Guadeloupe, Grenada, St. Lucia and Martinique) with either animals from the Sargasso Sea or the Gulf of Mexico. Engelhaupt *et al.* (2009) conducted an analysis of matrilineally inherited mitochondrial DNA and found significant genetic differentiation between animals from the northern Gulf of Mexico and those from the western North Atlantic Ocean, North Sea and Mediterranean Sea. Analysis of biparentally inherited nuclear DNA showed no significant difference between whales sampled in the Gulf and those from the other areas of the North Atlantic, suggesting that while females show strong philopatry to the Gulf, male-mediated gene flow between the Gulf and North Atlantic Ocean may be occurring (Engelhaupt *et al.* 2009).

Sperm whales make vocalizations called "codas" that have distinct patterns and are apparently culturally transmitted (Watkins and Schevill 1977; Whitehead and Weilgart 1991; Rendell and Whitehead 2001), and based on degree of social affiliation, mixed groups of sperm whales (mixed-sex groups of females/immatures) worldwide can be placed in recognizable acoustic clans (Rendell and Whitehead 2003). Recordings from mixed groups in the Gulf of Mexico compared to those from other areas of the Atlantic indicated that Gulf sperm whales constitute a distinct acoustic clan that is rarely encountered outside of the Gulf. It is assumed from this that groups from other clans enter the northern Gulf only infrequently (Gordon *et al.* 2008). Antunes (2009) used additional data to further examine variation in sperm whale coda repertoires in the North Atlantic Ocean, and found that variation in the North Atlantic is mostly geographically structured as coda patterns were unique to certain regions and a significant negative correlation was found between coda repertoire similarities and geographic distance. His work also suggested sperm whale codas differed between the Gulf of Mexico and the North Atlantic.

POPULATION SIZE

The best abundance estimate available for northern Gulf of Mexico sperm whales is 763 (CV=0.38; Table 1). This estimate is from a summer 2009 oceanic survey covering waters from the 200-m isobath to the seaward extent of the U.S. EEZ.

Earlier abundance estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions.

Recent survey and abundance estimate

During summer 2009, a line-transect survey dedicated to estimating the abundance of oceanic cetaceans was conducted in the northern Gulf of Mexico. Survey lines were stratified in relation to depth and the location of the Loop Current. The abundance estimate for sperm whales in oceanic waters during 2009 was 763 (CV=0.38; Table 1).

Table 1. Summary of abundance estimates for northern Gulf of Mexico sperm whales. Month, year and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Apr-Jun 1991-1994	Oceanic waters	530	0.31
Apr-Jun 1996-2001 (excluding 1998)	Oceanic waters	1,349	0.23
Jun-Aug 2003, Apr-Jun 2004	Oceanic waters	1,665	0.20
Jun-Aug 2009	Oceanic waters	763	0.38

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for sperm whales is 763 (CV=0.38). The minimum population estimate for the northern Gulf of Mexico is 560 sperm whales.

Current Population Trend

A trend analysis has not been conducted for this stock. Four point estimates of sperm whale abundance have been made based on data from surveys covering 1991-2009 (Table 1). The estimates vary by a maximum factor of 3.1. To determine whether changes in abundance have occurred over this period, an analysis of all the survey data needs to be conducted which incorporates covariates (e.g., survey conditions, season) that could potentially affect estimates. It should be noted that since this is a transboundary stock and the abundance estimates are for U.S. waters only, it will be difficult to interpret any detected trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one half the maximum net productivity rate and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 560. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.1 because the sperm whale is an endangered species. PBR for the northern Gulf of Mexico sperm whale is 1.1.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total human-caused mortality and serious injury for sperm whales in the northern Gulf of Mexico during 2009–2013 was 0.

New Serious Injury Guidelines

NMFS updated its serious injury designation and reporting process, which uses guidance from previous serious injury workshops, expert opinion, and analysis of historic injury cases to develop new criteria for distinguishing serious from non-serious injury (Angliss and DeMaster 1998; Andersen *et al*. 2008; NOAA 2012). NMFS defines serious injury as an "*injury that is more likely than not to result in mortality*". Injury determinations for stock assessments revised in 2013 or later incorporate the new serious injury guidelines, based on the most recent 5-year period for which data are available.

Fisheries Information

The commercial fishery that interacts with this stock in the Gulf of Mexico is the Atlantic Ocean, Caribbean, Gulf of Mexico large pelagic longline fishery (Appendix III). Pelagic swordfish, tunas and billfish are the targets of the longline fishery operating in the northern Gulf of Mexico. There have been no reports of mortality or serious injury to sperm whales by this fishery in recent years (2009–2013) or historically 1998-2008 (Yeung 1999; 2001; Garrison 2003; Garrison and Richards 2004; Garrison 2005; Fairfield Walsh and Garrison 2006; Fairfield-Walsh and Garrison 2007; Fairfield and Garrison 2008; Garrison *et al.* 2009; Garrison and Stokes 2010; 2012a,b; 2013; 2014). However, in 2008 during quarter 2, there was an entanglement and live release without serious injury of 1 sperm whale (Garrison *et al.* 2009). The whale was entangled in mainline and other gear and was accompanied by a calf. The mainline broke when the whale dove and gear remained on the animal; however, since it was a large whale it was not considered seriously injured (Garrison and Stokes 2008). This was the first observed interaction between a sperm whale and this fishery. During 15 April – 15 June 2008, and also subsequently during the second quarters (15 April – 15 June) of 2009–2013, observer coverage in the Gulf of Mexico pelagic longline fishery was greatly enhanced (approaching 55%) to collect more robust information on the interactions between pelagic longline vessels and spawning bluefin tuna. Therefore, the high annual observer coverage rates during 2008-2013 primarily reflect high coverage rates during the second quarter of each year. During the second quarter, this elevated coverage results in an increased probability that relatively rare interactions will be detected. Species within the oceanic Gulf of Mexico are presumed to be resident year-round; however, it is unknown if the bycatch rate observed during the second quarter is representative of that which occurs throughout the year.

A commercial fishery for sperm whales operated in the Gulf of Mexico in deep waters between the Mississippi River delta and DeSoto Canyon during the late 1700s to the early 1900s (Mullin *et al.* 1991), but the exact number of whales taken is not known (Townsend 1935; Lowery 1974). Townsend (1935) reported many records of sperm whales from April through July in the north-central Gulf (Petersen and Hoggard 1996).

Other Mortality

There were 8 sperm whale strandings in the northern Gulf of Mexico during 2009–2013 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). It could not be determined if there was evidence of human interactions for any of the 8 stranded animals. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury, particularly for offshore species such as sperm whales, because not all of the whales that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

An Unusual Mortality Event (UME) was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010; and, as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see "Habitat Issues" below), during the spill, and after. During 2010-2013, 5 sperm whales from this stock were considered to be part of the UME.

Ship strikes to whales occur world-wide and are a source of injury and mortality. No vessel strikes have been documented in recent years (2009–2013) for sperm whales in the Gulf of Mexico. Historically, 1 possible sperm whale mortality due to a vessel strike has been documented for the Gulf of Mexico. The incident occurred in 1990 in the vicinity of Grande Isle, Louisiana. Deep cuts on the dorsal surface of the whale indicated the ship strike was probably pre-mortem (Jensen and Silber 2004).

HABITAT ISSUES

The *Deepwater Horizon* (DWH) MC252 drilling platform, located approximately 50 miles southeast of the Mississippi River Delta in waters about 1500 m deep, exploded on 20 April 2010. The rig sank, and over 87 days up to ~4.9 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (McNutt *et al.* 2012). During the response effort dispersants were applied extensively at the seafloor and at the sea surface (Lehr *et al.* 2010; OSAT 2010). In-situ burning, or controlled burning of oil at the surface, was also used extensively as a response tool (Lehr *et al.* 2010). The oil, dispersant and burn residue compounds present ecological concerns (Buist *et al.* 1999; NOAA 2011). The magnitude of this oil spill was unprecedented in U.S. history, causing impacts to wildlife, natural habitats and human communities along coastal areas from western Louisiana to the Florida Panhandle (NOAA 2011). It could be years before the entire scope of damage is ascertained (NOAA 2011).

Shortly after the oil spill, the Natural Resource Damage Assessment (NRDA) process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies are being conducted to determine potential impacts of the spill on marine mammals. These studies have focused on identifying the type, magnitude, severity, length and impact of oil exposure to oceanic, continental shelf, coastal and estuarine marine mammals. For continental shelf and oceanic cetaceans, the NOAA-led efforts include: aerial surveys to document the distribution, abundance, species and exposure relative to oil from the DWH spill; and ship surveys to evaluate exposure to oil and other chemicals and to assess changes in animal behavior and distribution relative to oil exposure through visual and acoustic surveys, deployment of passive acoustic monitoring systems, collection of tissue samples, and deployment of satellite tags on sperm and Bryde's whales.

Vessel and aerial surveys documented sperm whales, bottlenose dolphins, Atlantic spotted dolphins, rough-toothed dolphins, spinner dolphins, pantropical spotted dolphins, Risso's dolphins, striped dolphins, dwarf/pygmy sperm whales and a Cuvier's beaked whale swimming in oil or potentially oil-derived substances (e.g., sheen, mousse) in the offshore waters of the northern Gulf of Mexico following the DWH oil spill. The effects of oil exposure on marine mammals depend on a number of factors including the type and mixture of chemicals involved; the amount, frequency and duration of exposure; the route of exposure (inhaled, ingested, absorbed, or external); and biomedical risk factors of the particular animal (Geraci 1990). In general, direct external contact with petroleum compounds or dispersants with skin may cause skin irritation, chemical burns and infections. Inhalation of volatile petroleum compounds or dispersants may irritate or injure the respiratory tract, which could lead to pneumonia or inflammation. Ingestion of petroleum compounds may cause injury to the gastrointestinal tract, which could affect an animal's ability to digest or absorb food. Absorption of petroleum compounds or dispersants may damage kidney, liver and brain function in addition to causing immune suppression and anemia. Long-term chronic effects such as lowered reproductive success and decreased survival may occur (Geraci 1990).

Seismic vessel operations in the Gulf of Mexico (commercial and academic) now operate with marine mammal observers as part of required mitigation measures. There have been no reported seismic-related or industry ship-related mortalities or injuries to sperm whales. However, disturbance by anthropogenic noise may prove to be an important habitat issue in some areas of this population's range, notably in areas of oil and gas activities and/or where shipping activity is high. Results from very limited studies of northern Gulf of Mexico sperm whale responses to seismic exploration indicate that sperm whales do not appear to exhibit horizontal avoidance of seismic survey activities (Miller *et al.* 2009). Data did suggest there may be some decrease in foraging effort during exposure to full-array airgun firing, at least for some individuals. Further study is needed as samples sizes are insufficient at this time (Miller *et al.* 2009).

STATUS OF STOCK

The sperm whale is listed as endangered under the Endangered Species Act, and therefore the northern Gulf of Mexico stock is considered strategic under the MMPA. Total human-caused mortality and serious injury for this stock during 2009–2013 was 0. The total fishery-related mortality and serious injury for this stock is insignificant and approaching zero mortality and serious injury rate. The status of sperm whales in the northern Gulf of Mexico, relative to OSP, is unknown. There are insufficient data to determine the population trends for this stock.

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BRYDE'S WHALE (*Balaenoptera edeni*): Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Bryde's whales are distributed worldwide in tropical and sub-tropical waters, but the taxonomy and number of species and/or subspecies of Bryde’s whales in the world is currently a topic of debate (Kato and Perrin 2009). In the western Atlantic Ocean, Bryde's whales are reported from the southeastern United States including the Gulf of Mexico and the southern West Indies to Cabo Frio, Brazil (Leatherwood and Reeves 1983). Most of the sighting records of Bryde's whales in the northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) occurred in the northeastern Gulf and are from NMFS abundance surveys that were conducted during the spring (Figure 1; Hansen *et al.* 1995, 1996; Mullin and Hoggard 2000; Mullin and Fulling 2004; Maze-Foley and Mullin 2006). However, there are stranding records from throughout the year (Jefferson and Schiro 1997; Würsig *et al.* 2000). Genetic analysis suggests that Bryde’s whales from the northern Gulf of Mexico represent a unique evolutionary lineage distinct from other recognized Bryde’s whale subspecies, including those found in the southern Caribbean and southwestern Atlantic off Brazil (Rosel and Wilcox 2014). The geographic distribution of this Bryde’s whale form has not yet been fully identified. Two strandings from the southeastern U.S. Atlantic coast share the same genetic characteristics with those from the northern Gulf of Mexico but it is unclear whether these are extralimital strays or they indicate the population extends from the northeastern Gulf of Mexico to the Atlantic coast of the southern U.S. (Rosel and Wilcox 2014).

Although there are no confirmed records from Gulf of Mexico waters beyond U.S. boundaries, Bryde's whales may occur in other parts of the Gulf of Mexico (Jefferson *et al.* 2008), which is also composed of waters belonging to Mexico and Cuba where there is currently little information on cetacean species abundance and distribution. U.S. waters comprise about 40% of the entire Gulf of Mexico and 35% of the oceanic (i.e., >200m) Gulf of Mexico. However, there is currently no information on abundance and distribution of Bryde’s whales in these other waters.

POPULATION SIZE

The best abundance estimate available for northern Gulf of Mexico Bryde’s whales is 33 (CV=1.07; Table 1). This estimate is from a summer 2009 oceanic survey covering waters from the 200m isobath to the seaward extent of the U.S. EEZ.

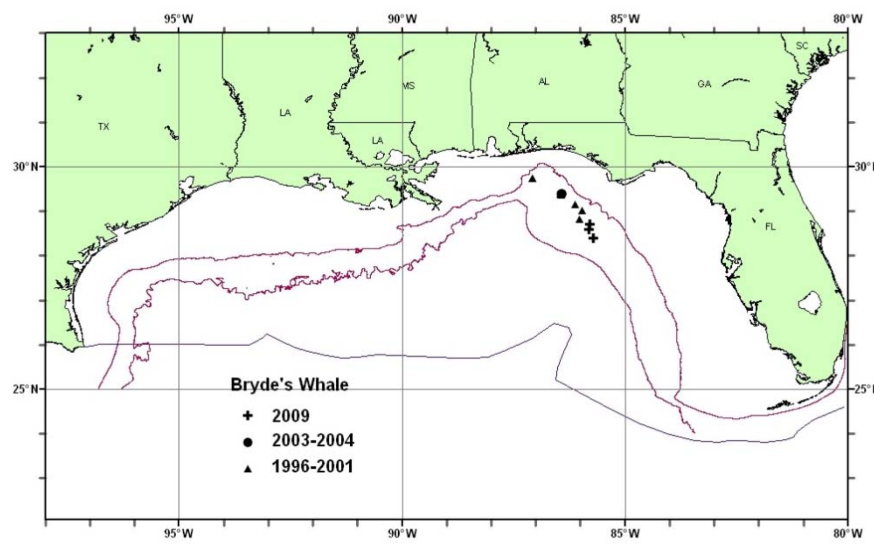

Figure 1. *Distribution of Bryde’s whale sightings from SEFSC vessel surveys during spring 1996-2001, summer 2003 and spring 2004, and summer 2009. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 100m and 1,000m isobaths and the offshore extent of the U.S. EEZ.*

Earlier abundance estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions.

Recent survey and abundance estimate

During summer 2009, a line-transect survey dedicated to estimating the abundance of oceanic cetaceans was conducted in the northern Gulf of Mexico. Survey lines were stratified in relation to depth and the location of the Loop Current. The abundance estimate for Bryde’s whales in oceanic waters during 2009 was 33 (CV=1.07; Table 1).

Table 1. Summary of abundance estimates for northern Gulf of Mexico Bryde's whales. Month, year and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Apr-Jun 1991-1994	Oceanic waters	35	1.10
Apr-Jun 1996-2001 (excluding 1998)	Oceanic waters	40	0.61
Jun-Aug 2003, Apr-Jun 2004	Oceanic waters	15	1.98
Jun-Aug 2009	Oceanic waters	33	1.07

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for Bryde's whales is 33 (CV=1.07). The minimum population estimate for the northern Gulf of Mexico is 16 Bryde's whales.

Current Population Trend

A trend analysis has not been conducted for this stock. Four point estimates of Bryde's whale abundance have been made based on data from line-transect surveys covering 1991-2009 (Table 1). The estimates vary by a maximum factor of nearly three, but the precision of the estimates is very poor. The vast majority of the small number of Bryde's whale sightings from each survey occurred in a very restricted area of the northeastern Gulf (Figure 1) during surveys that uniformly sampled the entire oceanic northern Gulf. Because the population size is small, in order to effectively monitor trends in Bryde's whale abundance in the future, other methods need to be used.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one half the maximum net productivity rate and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 16. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor, is0.1 because the stock is very small, exhibits very low genetic diversity and appears to represent a unique and possibly endemic evolutionary lineage of Bryde's whale. PBR for the northern Gulf of Mexico Bryde's whale is 0.03, equivalent to 1 take every 33 years.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The fishery-related mortality and serious injury for this stock during 2009–2013 for observed fisheries and strandings identified as fishery-caused was 0. Additional mean annual mortality and serious injury during 2009–2013 due to other human-caused actions (ship strike) was 0.2. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 0.2.

New Serious Injury Guidelines

NMFS updated its serious injury designation and reporting process, which uses guidance from previous serious injury workshops, expert opinion, and analysis of historic injury cases to develop new criteria for distinguishing serious from non-serious injury (Angliss and DeMaster 1998; Andersen *et al*. 2008; NOAA 2012). NMFS defines serious injury as an "*injury that is more likely than not to result in mortality*". Injury determinations for stock assessments revised in 2013 or later incorporate the new serious injury guidelines, based on the most recent 5-year period for which data are available.

Fisheries Information

The commercial fishery that potentially could interact with this stock in the Gulf of Mexico is the Atlantic Ocean, Caribbean, Gulf of Mexico large pelagic longline fishery (Appendix III). Pelagic swordfish, tunas and billfish are the targets of the longline fishery operating in the northern Gulf of Mexico. There has been no reported fishing-related mortality or serious injury of a Bryde's whale by this fishery during 1998-2013 (Yeung 1999; Yeung 2001; Garrison 2003; Garrison and Richards 2004; Garrison 2005; Fairfield Walsh and Garrison 2006; Fairfield-Walsh and Garrison 2007; Fairfield and Garrison 2008; Garrison *et al.* 2009; Garrison and Stokes 2010; 2012a,b; 2013, 2014).

Other Mortality

There were 3 reported strandings of Bryde's whales in the Gulf of Mexico during 2009–2013 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). During 2009 a Bryde's whale was found floating in the Port of Tampa (Florida). The whale had evidence of premortem and postmortem blunt trauma, and was determined to have been struck by a ship, draped across the bow and carried into port. The whale was a lactating female and measured 12.65m in length. During 2012, 2 Bryde's whale strandings occurred in Louisiana. It could not be determined if there was evidence of human interaction for these strandings. Both whales were in a state of advanced decomposition when observed. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury, particularly for offshore species such as Bryde's whales, because not all of the whales that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

An Unusual Mortality Event (UME) was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010; and, as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see "Habitat Issues" below), during the spill, and after. The 2 Bryde's whale strandings in 2012 are considered to be part of this UME.

HABITAT ISSUES

The *Deepwater Horizon* (DWH) MC252 drilling platform, located approximately 50 miles southeast of the Mississippi River Delta in waters about 1500 m deep, exploded on 20 April 2010. The rig sank, and over 87 days up to ~4.9 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (McNutt *et al.* 2012). During the response effort dispersants were applied extensively at the seafloor and at the sea surface (Lehr *et al.* 2010; OSAT 2010). In-situ burning, or controlled burning of oil at the surface, was also used extensively as a response tool (Lehr *et al.* 2010). The oil, dispersant and burn residue compounds present ecological concerns (Buist *et al.* 1999; NOAA 2011). The magnitude of this oil spill was unprecedented in U.S. history, causing impacts to wildlife, natural habitats and human communities along coastal areas from western Louisiana to the Florida Panhandle (NOAA 2011). It could be years before the entire scope of damage is ascertained (NOAA 2011).

Shortly after the oil spill, the Natural Resource Damage Assessment (NRDA) process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies are being conducted to determine potential impacts of the spill on marine mammals. These studies have focused on identifying the type, magnitude, severity, length and impact of oil exposure to oceanic, continental shelf, coastal and estuarine marine mammals. For continental shelf and oceanic cetaceans, the NOAA-led efforts include: aerial surveys to document the distribution, abundance, species and exposure relative to oil from the DWH spill; and ship surveys to evaluate exposure to oil and other chemicals and to assess changes in animal behavior and distribution relative to oil exposure through visual and acoustic surveys, deployment of passive acoustic monitoring systems, collection of tissue samples, and deployment of satellite tags on sperm and Bryde's whales.

Vessel and aerial surveys documented bottlenose dolphins, Atlantic spotted dolphins, rough-toothed dolphins, spinner dolphins, pantropical spotted dolphins, Risso's dolphins, striped dolphins, sperm whales, dwarf/pygmy sperm whales and a Cuvier's beaked whale swimming in oil or potentially oil-derived substances (e.g., sheen, mousse) in the offshore waters of the northern Gulf of Mexico following the DWH oil spill. Given the cumulative oiling footprint of the spill compared to historical Bryde's whale sightings, it is likely the Bryde's whale stock was also exposed to oil during the event (ERMA 2014). The effects of oil exposure on marine mammals depend on a number of factors including the type and mixture of chemicals involved, the amount, frequency and duration of exposure, the route of exposure (inhaled, ingested, absorbed, or external) and biomedical risk factors of the particular animal (Geraci 1990). In general, direct external contact with petroleum compounds or dispersants with skin may cause skin irritation, chemical burns and infections. For baleen whales, oil can foul the baleen they use to filter-feed. Inhalation of volatile petroleum compounds or dispersants may irritate or injure the respiratory tract, which could lead to pneumonia or inflammation. Ingestion of petroleum compounds may cause injury to the gastrointestinal tract, which could affect an animal's ability to digest or absorb food. Absorption of petroleum compounds or dispersants may damage kidney, liver and brain function in addition to causing immune suppression and anemia. Long term chronic effects such as lowered reproductive success and decreased survival may occur (Geraci 1990).

STATUS OF STOCK

The Bryde's whale is not listed as threatened or endangered under the Endangered Species Act, but the northern Gulf of Mexico stock is considered strategic under the MMPA because the mean annual human-caused mortality and serious injury exceeds PBR. The status of Bryde's whales in the northern Gulf of Mexico, relative to OSP, is unknown. There are insufficient data to determine the population trends for this stock.

In April 2015 NMFS made a positive 90-day finding on a petition to list the Gulf of Mexico Bryde's whale as an endangered distinct population segment under the ESA. NMFS is currently conducting a status review of the Gulf of Mexico Bryde's whale to determine if the petitioned action is warranted.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Northern Gulf of Mexico Continental Shelf Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) Continental Shelf Stock of common bottlenose dolphins inhabits waters from 20 to 200 m deep in the northern Gulf from the U.S.-Mexican border to the Florida Keys (Figure 1). Genetically distinct "coastal" and "offshore" ecotypes of bottlenose dolphins (Hoelzel *et al.* 1998; Vollmer 2011) occur in the Gulf of Mexico, and the Continental Shelf Stock, while predominantly of the coastal ecotype, may also include dolphins of the offshore ecotype (Vollmer 2011). The Continental Shelf Stock range may extend into Mexican and Cuban territorial waters; for example, a stranded dolphin from the Florida Panhandle was rehabilitated and released over the shelf off western Florida and traveled into the Atlantic Ocean (Wells *et al.* 1999). However, there are no available estimates of either abundance or mortality from Mexico or Cuba to incorporate in this assessment.

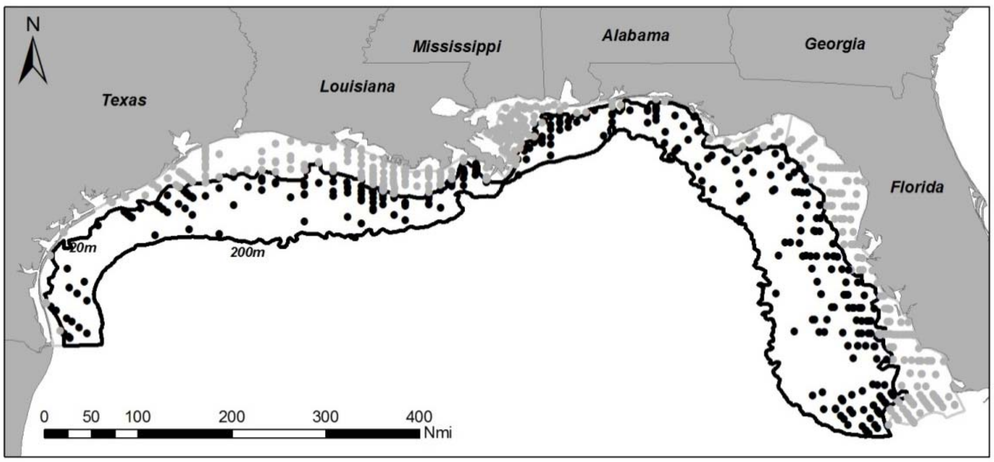

Figure 1. *Locations (circles) of common bottlenose dolphin groups sighted in coastal and continental shelf waters during aerial surveys conducted in spring, summer and fall of 2011 and in winter of 2012. Dark circles indicate groups within the boundaries of the Continental Shelf Stock. The 20-m and 200-m isobaths are shown.*

This stock's boundaries abut other bottlenose dolphin stocks, namely the Oceanic Stock and the three coastal stocks. While individuals from different stocks may occasionally overlap, the degree of overlap is unknown and it is not thought that significant mixing or interbreeding occurs between them. Genetic studies have shown significant differentiation between inshore stocks and the adjacent coastal stock (Sellas *et al.* 2005) and among dolphins living in coastal and shelf waters (Vollmer 2011). These results suggest that if there is spatial overlap there may be mechanisms reducing interbreeding between the stocks. Overall, stock structure of bottlenose dolphins in the northern Gulf of Mexico is complex and has not been fully examined. Continued studies are necessary to examine the current stock boundaries delineated in coastal, shelf and oceanic waters. As research is completed, it may be necessary to revise stocks of bottlenose dolphins in the northern Gulf of Mexico.

POPULATION SIZE

The best abundance estimate available for the northern Gulf of Mexico Continental Shelf Stock of bottlenose dolphins is 51,192 (CV=0.10; Table 1). This estimate is from an inverse-variance weighted average of seasonal abundance estimates from aerial surveys conducted during spring 2011, summer 2011, fall 2011 and winter 2012.

Earlier abundance estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions.

Recent survey and abundance estimate

The Southeast Fisheries Science Center conducted aerial surveys of continental shelf waters (shoreline to 200 m depth) along the U.S. Gulf of Mexico coast from the Florida Keys to the Texas/Mexico border during spring

(March-April) 2011, summer (July-August) 2011, fall (October-November) 2011 and winter (January-February) 2012. The surveys were conducted along tracklines oriented perpendicular to the shoreline and spaced 20-30 km apart. The total survey effort varied during each survey due to weather conditions, but ranged between 13,500 – 15,600 km. Each survey incorporated a two-team approach to develop estimates of visibility bias using the independent observer approach with Distance analysis (Laake and Borchers 2004). A model for the probability of detection on the trackline as a function of sighting conditions (seas state, glare, water color, etc.) was developed using data across all four surveys. This model was then applied to detection probability functions specific to each survey to account for the probability of detection as a function of distance from the trackline and additional environmental covariates. A bootstrap resampling approach was used to estimate the variance of the estimates. The survey data were post-stratified into spatial boundaries corresponding to the defined boundaries of bottlenose dolphin stocks within the surveyed area. The abundance estimates for the Continental Shelf Stock of bottlenose dolphins were based upon tracklines and sightings in waters from the 20-m to the 200-m isobaths and between the Texas-Mexico border and the Florida Keys. The seasonal abundance estimates for this stock were: spring – 45,171 (CV=0.22), summer – 64,583 (CV=0.16), fall – 34,181 (CV=0.20) and winter – 58,561 (CV=0.25). Due to the uncertainty in stock movements and apparent seasonal variability in the abundance of the stock, a weighted average of these seasonal estimates was taken where the weighting was the inverse of the CV. This approach weights estimates with higher precision more heavily in the final weighted mean. The resulting weighted mean and best estimate of abundance for the Continental Shelf Stock of common bottlenose dolphins was 51,192 (CV=0.10).

Table 1. Summary of recent abundance estimates for the northern Gulf of Mexico Continental Shelf Stock of common bottlenose dolphins. Month, year and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Season/Year	Area	N_{best}	CV
Spring, summer and fall 2011, winter 2012	Continental Shelf waters, 20-200 m	51,192	0.10

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for bottlenose dolphins is 51,192 (CV=0.10). The minimum population estimate for the northern Gulf of Mexico is 46,926.

Current Population Trend

A trend analysis has not been conducted for this stock. There are 2 abundance estimates from 1998-2001 fall surveys and year-round, seasonal 2011-2012 surveys. Methodological differences between the estimates need to be evaluated to quantify trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one half the maximum net productivity rate and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 46,926. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because the stock is of unknown status. PBR for the Gulf of Mexico Continental Shelf Stock of common bottlenose dolphins is 469.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the Continental Shelf Stock of common bottlenose dolphins during 2009–2013 is unknown because this stock is known to interact with unobserved fisheries (see below), and also because the most current observer data for the shrimp trawl fishery are for 2007-2011. The mean annual fishery-related mortality and serious injury during 2009–2013 for observed fisheries and strandings identified as fishery-caused was 0.6. Additional mean annual mortality and serious injury during 2009–2013 due to other human-caused actions (oil platform removal operations) was 0.2. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 0.8. This does not include an estimate for the commercial shrimp trawl fishery. The 5-year unweighted mean annual mortality estimate for 2007-2011 for the commercial shrimp trawl fishery was 56 (CV=0.42) (see Shrimp and Butterfish Trawl section below).

Fisheries Information

This stock interacts with the Category II Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl commercial fishery. This stock also interacts, or has the potential to interact, with 4 Category III commercial fisheries: Southeastern U.S. Atlantic, Gulf of Mexico shark bottom longline/hook-and-line; Southeastern U.S. Atlantic, Gulf of Mexico, Caribbean snapper-grouper and other reef fish; Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line); and Gulf of Mexico butterfish trawl (Appendix III).

Shrimp and Butterfish Trawl

Between 1997 and 2011, 5 common bottlenose dolphins and 7 unidentified dolphins, which could have been either common bottlenose dolphins or Atlantic spotted dolphins, became entangled in the lazy line, turtle excluder device or tickler chain gear in the commercial shrimp trawl fishery in the Gulf of Mexico. All dolphin bycatch interactions resulted in mortalities except for 1 unidentified dolphin that was released alive in 2009. Soldevilla *et al.* (2015) provide mortality estimates calculated from analysis of shrimp fishery effort data and NMFS's Observer Program bycatch data. Annual mortality estimates were calculated for the years 1997-2011 from stratified annual fishery effort and bycatch rates, and a 5-year unweighted mean mortality estimate for 2007-2011 was calculated for Gulf of Mexico dolphin stocks. The 4-area (TX, LA, MS/AL, FL) stratification method was chosen because it best approximates how fisheries operate (Soldevilla *et al.* 2015). The mean annual mortality estimate for the continental shelf bottlenose dolphin stock is 56 (CV=0.42). Limitations and biases of annual bycatch mortality estimates are described in detail in Soldevilla *et al.* (2015). However, this estimate is not included in the total annual human-caused mortality and serious injury for this stock because estimates for 2012 and 2013 are not available.

In addition, during 2012, 1 bottlenose dolphin was observed entangled and released alive in the commercial shrimp trawl fishery, and it could not be determined if this animal was seriously injured (Maze-Foley and Garrison, in prep b). Also, during 2013, 1 bottlenose dolphin mortality was observed during commercial shrimp trawl fishing. Both of these animals likely belonged to the Continental Shelf Stock.

A trawl fishery for butterfish was monitored by NMFS observers for a short period in the 1980's with no records of incidental take of marine mammals (Burn and Scott 1988; NMFS unpublished data), although an experimental set by NMFS resulted in the death of 2 common bottlenose dolphins (Burn and Scott 1988). There are no other data available.

Shark Bottom Longline

No interactions between common bottlenose dolphins and this fishery were observed during 2004-2013 (Hale and Carlson 2007; Hale *et al.* 2007; Richards 2007; Hale *et al.* 2009; 2010; 2011; 2012; Gulak *et al.* 2013; 2014). The shark bottom longline fishery has been observed since 1994, and 3 interactions with bottlenose dolphins have been recorded, 2 of which likely involved the Continental Shelf Stock: 1 mortality (2003) and 1 hooked animal that escaped at the vessel (2002; Burgess and Morgan 2003). For the shark bottom longline fishery in the Gulf of Mexico, Richards (2007) estimated common bottlenose dolphin mortalities of 58 (CV=0.99), 0 and 0 for 2003, 2004 and 2005, respectively.

Reef Fish

During 2009–2013, 1 mortality and 1 serious injury were observed in the snapper-grouper and other reef fish fishery. During 2012 a mortality occurred when a dolphin was entangled in the mainline of bottom longline gear. During 2010 a serious injury occurred in which a common bottlenose dolphin was hooked in the rostrum and line was wrapped around the rostrum (Maze-Foley and Garrison in prep a). Both animals were likely from the Continental Shelf Stock, and both incidents occurred off Florida's west coast. In July 2006 NMFS implemented a mandatory observer program for this commercial fishery operating within the U.S. Gulf of Mexico (Scott-Denton *et al.* 2011).

Hook and Line

During 2009–2013, there was 1 at-sea observation in 2010 in the Continental Shelf Stock area of a common bottlenose dolphin entangled in monofilament line and hooks, and this dolphin was considered seriously injured

(Maze-Foley and Garrison in prep a,b,c). It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Other Mortality

The use of explosives to remove oil rigs in portions of the continental shelf in the western Gulf of Mexico has the potential to cause serious injury or mortality to marine mammals. These activities have been closely monitored by NMFS observers since 1987 (Gitschlag and Herczeg 1994). There had been no reports of either serious injury or mortality to common bottlenose dolphins until 2010 (NMFS unpublished data). One mortality occurred during 2010 when a bottlenose dolphin became entangled in a diver's guide line during platform removal operations. A diver discovered the dolphin at a depth of 25.9m and reported it to be motionless and unresponsive with both tail flukes caught in poly guide line, which was being used to transfer equipment to the sea floor. No explosives were involved in this incident.

A total of 1,878 bottlenose dolphins were found stranded in the northern Gulf of Mexico from 2009 through 2013 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). Of these, 187 showed evidence of human interactions (e.g., gear entanglement, mutilation, gunshot wounds). Bottlenose dolphins are known to become entangled in, or ingest recreational and commercial fishing gear (Wells and Scott 1994; Wells *et al.* 1998; Gorzelany 1998), and some are struck by vessels (Wells and Scott 1997; Wells *et al.* 2008). The vast majority of stranded bottlenose dolphins are assumed to come from stocks that live nearest to land, namely the bay, sound and estuary stocks and the three coastal stocks. Nevertheless, it is possible that some of the stranded bottlenose dolphins belonged to the Continental Shelf or Oceanic Stocks and that they were among those strandings with evidence of human interactions. (Strandings do occur for other cetacean species whose primary range in the Gulf of Mexico is outer continental shelf or oceanic waters.)

An Unusual Mortality Event (UME) was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010; and, as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see "Habitat Issues" below), during the spill, and after. During 2010-2013, 928 bottlenose dolphins were considered to be part of the UME. The vast majority of stranded bottlenose dolphins are assumed to belong to one of the coastal stocks or to bay, sound and estuary stocks. Nevertheless, it is possible that some of the stranded bottlenose dolphins considered part of the UME belonged to the Continental Shelf Stock.

HABITAT ISSUES

The *Deepwater Horizon* (DWH) MC252 drilling platform, located approximately 50 miles southeast of the Mississippi River Delta in waters about 1500 m deep, exploded on 20 April 2010. The rig sank, and over 87 days up to ~4.9 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (McNutt *et al.* 2012). During the response effort dispersants were applied extensively at the seafloor and at the sea surface (Lehr *et al.* 2010; OSAT 2010). In-situ burning, or controlled burning of oil at the surface, was also used extensively as a response tool (Lehr *et al.* 2010). The oil, dispersant and burn residue compounds present ecological concerns (Buist *et al.* 1999; NOAA 2011). The magnitude of this oil spill was unprecedented in U.S. history, causing impacts to wildlife, natural habitats and human communities along coastal areas from western Louisiana to the Florida Panhandle (NOAA 2011). It could be years before the entire scope of damage is ascertained (NOAA 2011).

Shortly after the oil spill, the Natural Resource Damage Assessment (NRDA) process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies are being conducted to determine potential impacts of the spill on marine mammals. These studies have focused on identifying the type, magnitude, severity, length and impact of oil exposure to oceanic, continental shelf, coastal and estuarine marine mammals. For continental shelf and oceanic cetaceans, the NOAA-led efforts include: aerial surveys to document the distribution, abundance, species and exposure relative to oil from the DWH spill; and ship surveys to evaluate exposure to oil and other chemicals and to assess changes in animal behavior and distribution relative to oil exposure through visual and acoustic surveys, deployment of passive acoustic monitoring systems, collection of tissue samples, and deployment of satellite tags on sperm and Bryde's whales.

Vessel and aerial surveys documented common bottlenose dolphins, Atlantic spotted dolphins, rough-toothed dolphins, spinner dolphins, pantropical spotted dolphins, Risso's dolphins, striped dolphins, sperm whales, dwarf/pygmy sperm whales and a Cuvier's beaked whale swimming in oil or potentially oil-derived substances (e.g., sheen, mousse) in offshore waters of the northern Gulf of Mexico following the DWH oil spill. Given the location of the well head and the trajectory of the surface oil during the spill, it is likely the Continental Shelf Stock of bottlenose dolphins was exposed to oil during the event. The effects of oil exposure on marine mammals depend on a number of factors including the type and mixture of chemicals involved, the amount, frequency and duration of exposure, the route of exposure (inhaled, ingested, absorbed, or external) and biomedical risk factors of the particular animal (Geraci 1990). In general, direct external contact with petroleum compounds or dispersants with skin may cause skin irritation, chemical burns and infections. Inhalation of volatile petroleum compounds or dispersants may irritate or injure the respiratory tract, which could lead to pneumonia or inflammation. Ingestion of petroleum compounds may cause injury to the gastrointestinal tract, which could affect an animal's ability to digest or absorb food. Absorption of petroleum compounds or dispersants may damage kidney, liver and brain function in addition to causing immune suppression and anemia. Long term chronic effects such as lowered reproductive success and decreased survival may occur (Geraci 1990).

STATUS OF STOCK

Common bottlenose dolphins are not listed as threatened or endangered under the Endangered Species Act, and the northern Gulf of Mexico Continental Shelf Stock is not considered strategic under the MMPA. Total U.S. fishery-related mortality and serious injury for this stock is not known, but at a minimum is greater than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. The status of bottlenose dolphins, relative to OSP, in the northern Gulf of Mexico continental shelf waters is unknown. There are insufficient data to determine population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Gulf of Mexico Eastern Coastal Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Common bottlenose dolphins inhabit coastal waters throughout the northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) (Mullin *et al.* 1990). As a working hypothesis, it is assumed that the dolphins occupying habitats with dissimilar climatic, coastal and oceanographic characteristics might be restricted in their movements between habitats, and thus constitute separate stocks. Therefore, northern Gulf of Mexico coastal waters have been divided for management purposes into 3 stock areas: eastern, northern and western, with coastal waters defined as waters between the shore, barrier islands or presumed outer bay boundaries out to the 20-m isobath (Figure 1). The 20-m depth seaward boundary corresponds to survey strata (Scott 1990; Blaylock and Hoggard 1994; Fulling *et al.* 2003), and thus represents a management boundary rather than an ecological boundary. The Eastern Coastal bottlenose dolphin stock area extends from 84^{o}W longitude to Key West, Florida. The region is temperate to subtropical in climate, is bordered by a mixture of coastal marshes, sand beaches, marsh and mangrove islands, and has an intermediate level of freshwater input. It is bordered on the north by an extensive area of coastal marsh and marsh islands typical of Florida's Apalachee Bay. Dolphins belonging to this stock are all expected to be of the coastal ecotype (Vollmer 2011).

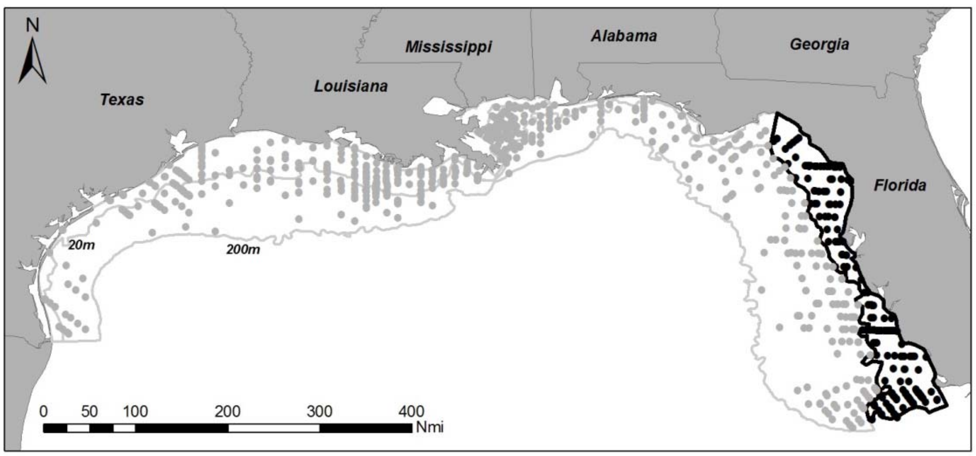

Figure 1. *Locations (circles) of common bottlenose dolphin groups sighted in coastal and continental shelf waters during aerial surveys conducted in spring, summer and fall of 2011 and in winter of 2012. Dark circles indicate groups within the boundaries of the Eastern Coastal Stock. The 20-m and 200-m isobaths are shown.*

This stock's boundaries abut other bottlenose dolphin stocks, namely the Continental Shelf Stock, the Northern Coastal Stock and several bay, sound and estuary stocks, and while individuals from different stocks may occasionally overlap, it is not thought that significant mixing or interbreeding occurs between them. Fazioli *et al.* (2006) conducted photo-identification surveys of coastal waters off Tampa Bay, Sarasota Bay and Lemon Bay, Florida, over 14 months. They found both 'inshore' and 'Gulf' dolphins inhabited coastal waters but the 2 types used coastal waters differently. Dolphins from the inshore communities were observed occasionally in Gulf near-shore waters adjacent to their inshore range, whereas 'Gulf' dolphins were found primarily in open Gulf of Mexico waters with some displaying seasonal variations in their use of the study area. The 'Gulf' dolphins did not show a preference for waters near passes as was seen for 'inshore' dolphins, but moved throughout the study area and made greater use of waters offshore of waters used by 'inshore' dolphins. During winter months abundance of 'Gulf' groups decreased while abundance for 'inshore' groups increased. These findings support an earlier report by Irvine *et al.* (1981) of increased use of pass and coastal waters by Sarasota Bay dolphins in winter. Seasonal movements of identified individuals and abundance indices suggested that part of the 'Gulf" dolphin community moved out of the study area during winter, but their destination is unknown (Fazioli *et al.* 2006). In a follow-up study, Sellas *et al.* (2005) examined genetic population subdivision in the study area of Fazioli *et al.* (2006), and found evidence of significant population structure among all areas on the basis of both mitochondrial DNA control region sequence data and 9 nuclear microsatellite loci. The Sellas *et al.* (2005) findings support the separate identification of bay, sound and estuary stocks from those occurring in adjacent Gulf coastal waters, as suggested by Wells (1986).

Off Galveston, Texas, Beier (2001) reported an open population of individual dolphins in coastal waters, but several individual dolphins had been sighted previously by other researchers over a 10-year period. Some coastal animals may move relatively long distances alongshore. Two bottlenose dolphins previously seen in the South Padre Island area in Texas were seen in Matagorda Bay, 285km north, in May 1992 and May 1993 (Lynn and Würsig 2002).

POPULATION SIZE

The best abundance estimate available for the northern Gulf of Mexico Eastern Coastal Stock of common bottlenose dolphins is 12,388 (CV=0.13; Table 1). This estimate is from an inverse-variance weighted average of seasonal abundance estimates from aerial surveys conducted during spring 2011, summer 2011, fall 2011 and winter 2012.

Earlier abundance estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions.

Recent surveys and abundance estimates

The Southeast Fisheries Science Center conducted aerial surveys of continental shelf waters (shoreline to 200 m depth) along the U.S. Gulf of Mexico coast from the Florida Keys to the Texas/Mexico border during spring (March-April) 2011, summer (July-August) 2011, fall (October-November) 2011 and winter (January-February) 2012. The surveys were conducted along tracklines oriented perpendicular to the shoreline and spaced 20-30 km apart. The total survey effort varied during each survey due to weather conditions, but ranged between 13,500 – 15,600 km. Each of these surveys was conducted using a two-team approach to develop estimates of visibility bias using the independent observer approach with Distance analysis (Laake and Borchers 2004). A model for the probability of detection on the trackline as a function of sighting conditions (sea state, glare, water color, etc.) was developed using data across all 4 surveys. This model was then applied to detection probability functions specific to each survey to account for the probability of detection as a function of distance from the trackline and additional environmental covariates. A bootstrap resampling approach was used to estimate the variance of the estimates. The survey data were post-stratified into spatial boundaries corresponding to the defined boundaries of common bottlenose dolphin stocks within the surveyed area. The abundance estimates for the Eastern Coastal Stock of bottlenose dolphins were based upon tracklines and sightings in waters from the shoreline to the 20-m isobath and between 84°W longitude and the Florida Keys. The seasonal abundance estimates for this stock were: spring – 13,770 (CV=0.22), summer – 8,458 (CV=0.23), fall – 10,019 (CV=0.36) and winter – 16,669 (CV=0.25). Due to the uncertainty in stock movements and apparent seasonal variability in the abundance of the stock, a weighted average of these seasonal estimates was taken where the weighting was the inverse of the CV. This approach weights estimates with higher precision more heavily in the final weighted mean. The resulting weighted mean and best estimate of abundance for the Eastern Coastal Stock of common bottlenose dolphins was 12,388 (CV=0.13).

Previous abundance estimates for the Northern and Eastern Coastal Stocks were derived from aerial surveys conducted during 17 July to 8 August 2007. Survey effort covered waters from the shoreline to 200 m depth and was stratified such that the majority of effort was expended in the 0-20m depth range of the coastal stocks. The survey team consisted of an observer stationed at each of two forward bubble windows and a third observer stationed at a belly window that monitored the trackline. Surveys were typically flown during favorable sighting conditions at Beaufort sea state less than or equal to 3 (surface winds <10 knots). Abundance estimates were derived using distance analysis including environmental covariates that had a significant influence on sighting probability (Buckland *et al.* 2001), but these estimates were not corrected for *g(0)* and are thus negatively biased. The resulting abundance estimate for the Eastern Coastal Stock was 7,702 animals (CV=0.19).

Table 1. Summary of recent abundance estimates for the Eastern Coastal Stock of common bottlenose dolphins. Month, year and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).			
Month/Year	Area	N_{best}	CV
July-Aug 2007	shoreline to 20 m, Eastern Coastal Stock waters (84°W longitude to Florida Keys)	7,702	0.19
Spring, summer and fall 2011, winter 2012	shoreline to 20 m, Eastern Coastal Stock waters (84°W longitude to Florida Keys)	12,388	0.13

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for the Eastern Coastal Stock of common bottlenose dolphins is 12,388 (CV=0.13). The minimum population estimate for the northern Gulf of Mexico Eastern Coastal Stock is 11,110 common bottlenose dolphins.

Current Population Trend

A trend analysis has not been conducted for this stock. There are 3 abundance estimates from: 1) fall 1994 (9,912; CV=0.12); 2) summer 2007 (7,702; CV=0.19); and 3) year-round, seasonal 2011-2012 (12,388; CV=0.13). Methodological differences among the estimates need to be evaluated to quantify trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known for this stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate and a recovery factor (Wade and Angliss 1997). The minimum population size is 11,110. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because the stock is of unknown status. PBR for the northern Gulf of Mexico Eastern Coastal Stock of common bottlenose dolphins is 111.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the Eastern Coastal Stock of common bottlenose dolphins during 2009–2013 is unknown because this stock is known to interact with unobserved fisheries (see below), and also because the most current observer data for the shrimp trawl fishery are for 2007-2011. The mean annual fishery-related mortality and serious injury during 2009–2013 for strandings and at-sea observations identified as fishery-caused was 1.6. No additional mortality or serious injury was documented from other human-caused actions. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 1.6. This does not include an estimate for the commercial shrimp trawl fishery. The 5-year unweighted mean annual mortality estimate for 2007-2011 for the commercial shrimp trawl fishery was 2.3 (CV=0.99) (see Shrimp Trawl section below).

Fisheries Information

This stock interacts with 2 Category II commercial fisheries: Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl and Southeastern U.S. Atlantic, Gulf of Mexico stone crab trap/pot. This stock also interacts, or has the potential to interact, with 5 Category III commercial fisheries: Southeastern U.S. Atlantic, Gulf of Mexico shark bottom longline/hook-and-line; FL spiny lobster trap/pot; Gulf of Mexico blue crab trap/pot; FL West Coast sardine purse seine; and Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) (Appendix III). There have been no documented interactions between common bottlenose dolphins of the Eastern Coastal Stock and the FL West Coast sardine purse seine fishery; however, it should be noted there is no observer coverage of the sardine purse seine fishery.

Shrimp Trawl

Between 1997 and 2011, 5 common bottlenose dolphins and 7 unidentified dolphins, which could have been either common bottlenose dolphins or Atlantic spotted dolphins, became entangled in the lazy line, turtle excluder device or tickler chain gear in the commercial shrimp trawl fishery in the Gulf of Mexico. All dolphin bycatch interactions resulted in mortalities except for 1 unidentified dolphin that was released alive in 2009. Soldevilla *et al.* (2015) provide mortality estimates calculated from analysis of shrimp fishery effort data and NMFS's Observer Program bycatch data. Annual mortality estimates were calculated for the years 1997-2011 from stratified annual fishery effort and bycatch rates, and a 5-year unweighted mean mortality estimate for 2007-2011 was calculated for Gulf of Mexico dolphin stocks. The 4-area (TX, LA, MS/AL, FL) stratification method was chosen because it best approximates how fisheries operate (Soldevilla *et al.* 2015). The mean annual mortality estimate for the Eastern Coastal Stock of common bottlenose dolphins is 2.3 (CV=0.99). Limitations and biases of annual bycatch mortality estimates are described in detail in Soldevilla *et al.* (2015). However, this estimate is not included in the annual human-caused mortality and serious injury for this stock because estimates for 2012 and 2013 are not available.

Blue Crab, Stone Crab and Spiny Lobster Trap/Pot

During 2009–2013, 5 entanglements associated with trap/pot fisheries were documented for the Eastern Coastal Stock: 2 mortalities, 1 live release with serious injury, 1 live release without serious injury, and 1 live release in unknown condition. In 2013, 1 animal was disentangled from trap/pot gear and released alive, considered seriously injured (Maze-Foley and Garrison in prep c). In 2012, 1 mortality was documented in which an animal was entangled in stone crab trap/pot gear. In 2010, 2 dolphins were disentangled and released alive. One animal was entangled in stone crab trap/pot gear and its condition upon release could not be determined (Maze-Foley and Garrison in prep a). The second animal was entangled in commercial stone crab trap/pot gear and was released alive without serious injury (Maze-Foley and Garrison in prep a). Also during 2010, 1 mortality was documented in which an animal was entangled in unidentified commercial trap/pot gear. The mortalities and live entanglements were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and are included in the stranding totals presented in Table 2. Since there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab traps/pots.

Shark Bottom Longline

During 2009–2013, no interactions between common bottlenose dolphins and this fishery were observed. The shark bottom longline fishery has been observed since 1994, and 3 interactions with bottlenose dolphins have been recorded, 1 of which likely involved the Eastern Coastal Stock: in 1999, a hooked dolphin escaped at the vessel (Burgess and Morgan 2003). No interactions were observed during 2004-2013 (Hale and Carlson 2007; Hale *et al.* 2007; Richards 2007; Hale *et al.* 2009; 2010; 2011; 2012; Gulak *et al.* 2013; 2014). For the shark bottom longline fishery in the Gulf of Mexico, Richards (2007) estimated bottlenose dolphin mortalities of 58 (CV=0.99), 0 and 0 for 2003, 2004 and 2005, respectively.

Hook and Line

During 2009–2013, 2 mortalities and 1 serious injury involving hook and line gear entanglement or ingestion were documented. The mortalities occurred in 2009 and 2011. During 2010 an attempt was made to disentangle 1 live animal from hook and line gear and an anchor line, and this animal was considered seriously injured (Maze-Foley and Garrison in prep a). The mortality and live entanglement were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and are included in the stranding totals presented in Table 2. It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Strandings

A total of 63 common bottlenose dolphins were found stranded in Eastern Coastal waters of the northern Gulf of Mexico from 2009 through 2013 (Table 2; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). It could not be determined if there was evidence of human interaction for 45 of these strandings. For 9 dolphins, no evidence of human interaction was detected. Evidence of human interactions was detected for the remaining 9 dolphins, and included entanglement interactions with trap/pot and hook and line fishing gear (see Table 2). Bottlenose dolphins are known to become entangled in, or ingest recreational and commercial fishing gear (Wells and Scott 1994; Gorzelany 1998; Wells *et al.* 1998; Wells *et al.* 2008), and some are struck by vessels (Wells and Scott 1997; Wells *et al.* 2008).

There are a number of difficulties associated with the interpretation of stranding data. It is possible that some or all of the stranded dolphins may have been from a nearby bay, sound and estuary stock; however, the proportion of stranded dolphins belonging to another stock cannot be determined because of the difficulty of determining from where the stranded carcass originated. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

Since 1990, there have been 13 bottlenose dolphin die-offs or Unusual Mortality Events (UMEs) in the northern Gulf of Mexico, and 3 of these have occurred within the boundaries of the Eastern Coastal Stock and may have affected the stock. 1) From January through May 1990, a total of 344 bottlenose dolphins stranded in the northern Gulf of Mexico. Overall this represented a two-fold increase in the prior maximum recorded strandings for the same period, but in some locations (i.e., Alabama) strandings were 10 times the average number. The cause of the 1990 mortality event could not be determined (Hansen 1992), however, morbillivirus may have contributed to this event (Litz *et al.* 2014). 2) An unusual mortality event was declared for Sarasota Bay, Florida, in 1991involving 31 bottlenose dolphins. The cause was not determined, but it is believed biotoxins may have contributed to this event (Litz *et al.* 2014). 3) In 2005, a particularly destructive red tide (*K. brevis*) bloom occurred off of central west Florida. Manatee, sea turtle, bird and fish mortalities were reported in the area in early 2005 and a manatee UME had been declared. Dolphin mortalities began to rise above the historical averages by late July 2005, continued to increase through October 2005, and were then declared to be part of a multi-species UME. The multi-species UME extended into 2006, and ended in November 2006. A total of 190 dolphins were involved, primarily bottlenose dolphins (plus strandings of 1 Atlantic spotted dolphin, *S. frontalis*, and 23 unidentified dolphins). The evidence suggests the effects of a red tide bloom contributed to the cause of this event (Litz *et al.* 2014).

A UME was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010; and, as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see "Habitat Issues" below), during the spill, and after. However, no animals from the Eastern Coastal Stock that stranded during 2010-2013 were considered to be part of this UME.

Table 2. Common bottlenose dolphin strandings occurring in Eastern Coastal Stock waters of the northern Gulf of Mexico from 2009 to 2013, as well as number of strandings for which evidence of human interaction (HI) was detected and number of strandings for which it could not be determined (CBD) if there was evidence of HI. Data are from the NOAA National Marine Mammal Health and Stranding Response Database (unpublished data, accessed 11 June 2014). Please note human interaction does not necessarily mean the interaction caused the animal's death.

Stock	**Category**	**2009**	**2010**	**2011**	**2012**	**2013**	**Total**
Eastern Coastal Stock	Total Stranded	13	11	16	13	10	63
	Human Interaction						
	---Yes	1[a]	4[b]	1[c]	1[d]	2[e]	9
	---No	5	1	1	1	1	9
	---CBD	7	6	14	11	7	45

[a] This was an entanglement interaction with hook and line gear (mortality).
[b] This total includes 3 entanglement interactions with trap/pot gear (1 mortality and 2 animals released alive, 1 without serious injury and 1 that could not be determined if seriously injured or not) and 1 entanglement interaction with hook and line gear (released alive seriously injured).
[c] This was an entanglement interaction with hook and line gear (mortality).
[d] This includes 1 entanglement interaction with stone crab trap/pot gear (mortality)
[e] This includes 1 entanglement interaction with trap/pot gear (released alive seriously injured).

Other Mortality

In addition to animals included in the stranding database, during 2009–2013 in the Eastern Coastal Stock area, there was 1 at-sea observation in 2011 of a common bottlenose dolphin entangled in crab-pot type line, and this dolphin was considered seriously injured (Maze-Foley and Garrison in prep a,b). There were also 3 at-sea observations in 2013 of bottlenose dolphins entangled by a rope/buoy (considered seriously injured), and unidentified gear (2 animals, could not be determined if seriously injured or not) (Maze-Foley and Garrison in prep c).

The problem of dolphin depredation of fishing gear is increasing in the Gulf of Mexico. To date, there are no records of depredation for this stock area however.

Feeding or provisioning of wild bottlenose dolphins has been documented in Florida, particularly near Panama City Beach in the Panhandle (Samuels and Bejder 2004) and south of Sarasota Bay (Cunningham-Smith *et al.* 2006; Powell and Wells 2011), and also in Texas near Corpus Christi (Bryant 1994). Feeding wild dolphins is defined under the MMPA as a form of 'take' because it can alter their natural behavior and increase their risk of injury or death. There are emerging questions regarding potential linkages between provisioning and depredation of recreational fishing gear and associated entanglement and ingestion of gear, which is increasing through much of Florida. During 2006, an estimated 2% of the long-term resident dolphins of Sarasota Bay, immediately inshore of the Eastern Coastal Stock, died from ingestion of recreational fishing gear (Powell and Wells 2011).

Swimming with wild bottlenose dolphins has also been documented in Florida, including Key West (Samuels and Engleby 2007) and Panama City Beach (Samuels and Bejder 2004), but to date, there are no records for this stock area.

HABITAT ISSUES

The *Deepwater Horizon* (DWH) MC252 drilling platform, located approximately 50 miles southeast of the Mississippi River Delta in waters about 1500 m deep, exploded on 20 April 2010. The rig sank, and over 87 days up to ~4.9 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (McNutt *et al.* 2012). During the response effort dispersants were applied extensively at the seafloor and at the sea surface (Lehr *et al.* 2010; OSAT 2010). In-situ burning, or controlled burning of oil at the surface, was also used extensively as a response tool (Lehr *et al.* 2010). The oil, dispersant and burn residue compounds present ecological concerns (Buist *et al.* 1999; NOAA 2011). The magnitude of this oil spill was unprecedented in U.S. history, causing impacts to wildlife, natural habitats and human communities along coastal areas from western Louisiana to the Florida Panhandle (NOAA 2011). It could be years before the entire scope of damage is ascertained (NOAA 2011). Because the range of the Eastern Coastal Stock of common bottlenose dolphins does not extend west of 84°W longitude, this stock is not thought to have experienced oil exposure due to the DWH event.

The nearshore habitat occupied by the 3 coastal stocks is adjacent to areas of high human population and in some areas, such as Tampa Bay, Florida, Galveston, Texas, and Mobile, Alabama, is highly industrialized. Concentrations of anthropogenic chemicals such PCBs and DDT and its metabolites vary from site to site, and can reach levels of concern for bottlenose dolphin health and reproduction in the southeastern U.S. (Schwacke *et al.* 2002). PCB concentrations in 3 stranded dolphins sampled from the Eastern Coastal Stock area ranged from 16-46µg/g wet weight. Two stranded dolphins from the Northern Coastal Stock area had the highest levels of DDT derivatives of any of the bottlenose dolphin liver samples analyzed in conjunction with a 1990 mortality investigation conducted by NMFS (Varanasi *et al.* 1992). The significance of these findings is unclear, but there is some evidence that increased exposure to anthropogenic compounds may reduce immune function in bottlenose dolphins (Lahvis *et al.* 1995), or impact reproduction through increased first-born calf mortality (Wells *et al.* 2005). Concentrations of chlorinated hydrocarbons and metals were relatively low in most of the bottlenose dolphins examined in conjunction with an anomalous mortality event in Texas bays in 1990; however, some had concentrations at levels of possible toxicological concern (Varanasi *et al.* 1992). Agricultural runoff following periods of high rainfall in 1992 was implicated in a high level of bottlenose dolphin mortalities in Matagorda Bay, which is adjacent to the Western Coastal Stock area (NMFS unpublished data).

STATUS OF STOCK

The common bottlenose dolphin is not listed as threatened or endangered under the Endangered Species Act, and the Eastern Coastal Stock is not considered strategic under the MMPA. Total U.S. fishery-related mortality and serious injury for this stock is not known and there is insufficient information available to determine whether the total fishery-related mortality and serious injury is insignificant and approaching the zero mortality and serious injury rate. However, this is not a strategic stock because it is assumed that the mean annual human-caused mortality and serious injury does not exceed PBR. The status of this stock relative to OSP in the Gulf of Mexico EEZ is unknown. There are insufficient data to determine the population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Gulf of Mexico Northern Coastal Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Common bottlenose dolphins inhabit coastal waters throughout the northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) (Mullin *et al.* 1990). As a working hypothesis, it is assumed that the dolphins occupying habitats with dissimilar climatic, coastal and oceanographic characteristics might be restricted in their movements between habitats, and thus constitute separate stocks. Therefore, northern Gulf of Mexico coastal waters have been divided for management purposes into 3 stock areas: eastern, northern and western, with coastal waters defined as waters between the shore, barrier islands or presumed outer bay boundaries out to the 20-m isobath (Figure 1). The 20-m depth seaward boundary corresponds to survey strata (Scott 1990; Blaylock and Hoggard 1994; Fulling *et al.* 2003), and thus represents a management boundary rather than an ecological boundary. The Northern Coastal bottlenose dolphin stock area extends from 84°W longitude to the Mississippi River Delta. This region is characterized by a temperate climate, barrier islands, sand beaches, coastal marshes and marsh islands, and has a relatively high level of freshwater input. It is bordered on the east by an extensive area of coastal marsh and marsh islands typical of Florida's Apalachee Bay. Dolphins belonging to this stock are all expected to be of the coastal ecotype (Vollmer 2011).

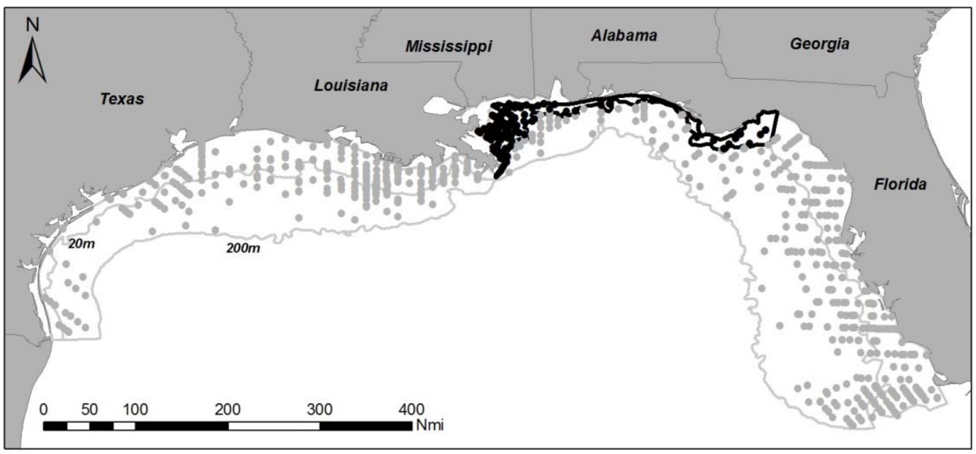

Figure 1. *Locations (circles) of common bottlenose dolphin groups sighted in coastal and continental shelf waters during aerial surveys conducted in spring, summer and fall of 2011 and in winter of 2012. Dark circles indicate groups within the boundaries of the Northern Coastal Stock. The 20-m and 200-m isobaths are shown.*

This stock's boundaries abut other bottlenose dolphin stocks, namely the Continental Shelf Stock, the Eastern and Western Coastal Stocks, and several bay, sound and estuary stocks in Louisiana, Mississippi, Alabama and Florida, and while individuals from different stocks may occasionally overlap, it is not thought that significant mixing or interbreeding occurs between them. Fazioli *et al.* (2006) conducted photo-identification surveys of coastal waters off Tampa Bay, Sarasota Bay and Lemon Bay, Florida, over 14 months. They found both 'inshore' and 'Gulf' dolphins inhabited coastal waters but the 2 types used coastal waters differently. Dolphins from the inshore communities were observed occasionally in Gulf near-shore waters adjacent to their inshore range, whereas 'Gulf' dolphins were found primarily in open Gulf of Mexico waters with some displaying seasonal variations in their use of the study area. The 'Gulf' dolphins did not show a preference for waters near passes as was seen for 'inshore' dolphins, but moved throughout the study area and made greater use of waters offshore of waters used by 'inshore' dolphins. During winter months abundance of 'Gulf' groups decreased while abundance for 'inshore' groups increased. These findings support an earlier report by Irvine *et al.* (1981) of increased use of pass and coastal waters by Sarasota Bay dolphins in winter. Seasonal movements of identified individuals and abundance indices suggested that part of the 'Gulf' dolphin community moved out of the study area during winter, but their destination is unknown (Fazioli *et al.* 2006). In a follow-up study, Sellas *et al.* (2005) examined genetic population subdivision in the study area of Fazioli *et al.* (2006), and found evidence of significant population structure among all areas on the basis of both mitochondrial DNA control region sequence data and 9 nuclear microsatellite loci. The Sellas *et al.* (2005) findings support the separate identification of bay, sound and estuary stocks from those occurring in adjacent Gulf coastal waters, as suggested by Wells (1986).

Off Galveston, Texas, Beier (2001) reported an open population of individual dolphins in coastal waters, but several individual dolphins had been sighted previously by other researchers over a 10-year period. Some coastal animals may move relatively long distances alongshore. Two bottlenose dolphins previously seen in the South Padre Island area in Texas were seen in Matagorda Bay, 285 km north, in May 1992 and May 1993 (Lynn and Würsig 2002).

POPULATION SIZE

The best abundance estimate available for the northern Gulf of Mexico Northern Coastal Stock of common bottlenose dolphins is 7,185 (CV=0.21; Table 1). This estimate is from an inverse-variance weighted average of seasonal abundance estimates from aerial surveys conducted during spring 2011, summer 2011, fall 2011 and winter 2012.

Earlier abundance estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions.

Recent surveys and abundance estimates

The Southeast Fisheries Science Center conducted aerial surveys of continental shelf waters (shoreline to 200 m depth) along the U.S. Gulf of Mexico coast from the Florida Keys to the Texas/Mexico border during spring (March-April) 2011, summer (July-August) 2011, fall (October-November) 2011 and winter (January-February) 2012. The surveys were conducted along tracklines oriented perpendicular to the shoreline and spaced 20-30 km apart. The total survey effort varied during each survey due to weather conditions, but ranged between 13,500 – 15,600 km. Each of these surveys was conducted using a two-team approach to develop estimates of visibility bias using the independent observer approach with Distance analysis (Laake and Borchers 2004). A model for the probability of detection on the trackline as a function of sighting conditions (sea state, glare, water color, etc.) was developed using data across all 4 surveys. This model was then applied to detection probability functions specific to each survey to account for the probability of detection as a function of distance from the trackline and additional environmental covariates. A bootstrap resampling approach was used to estimate the variance of the estimates. The survey data were post-stratified into spatial boundaries corresponding to the defined boundaries of common bottlenose dolphin stocks within the surveyed area. The abundance estimates for the Northern Coastal Stock of bottlenose dolphins were based upon tracklines and sightings in waters from the shoreline to the 20-m isobath and between the Mississippi River Delta and 84°W longitude, including waters of northern Chandeleur Sound. The seasonal abundance estimates for this stock were: spring – 15,831 (CV=0.38), summer – 6,792 (CV=0.28), fall – 4,960 (CV=0.38) and winter – 2,384 (CV=0.31). Due to the uncertainty in stock movements and apparent seasonal variability in the abundance of the stock, a weighted average of these seasonal estimates was taken where the weighting was the inverse of the CV. This approach weights estimates with higher precision more heavily in the final weighted mean. The resulting weighted mean and best estimate of abundance for the Northern Coastal Stock of common bottlenose dolphins was 7,185 (CV=0.21).

Previous abundance estimates for the Northern and Eastern Coastal Stocks were derived from aerial surveys conducted during 17 July to 8 August 2007. Survey effort covered waters from the shoreline to 200m depth and was stratified such that the majority of effort was expended in the 0-20m depth range of the coastal stocks. The survey team consisted of an observer stationed at each of two forward bubble windows and a third observer stationed at a belly window that monitored the trackline. Surveys were typically flown during favorable sighting conditions at Beaufort sea state less than or equal to 3 (surface winds <10 knots). Abundance estimates were derived using Distance analysis including environmental covariates that had a significant influence on sighting probability (Buckland *et al.* 2001), but these estimates were not corrected for *g(0)* and are thus negatively biased. The resulting abundance estimate for the Northern Coastal Stock was 2,473 (CV=0.25).

Table 1. Summary of recent abundance estimates for the Northern Coastal Stock of common bottlenose dolphins. Month, year and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
July-Aug 2007	shoreline to 20 m, Northern Coastal Stock waters (Mississippi River Delta to 84°W longitude)	2,473	0.25
Spring, summer and fall 2011, winter 2012	shoreline to 20 m, Northern Coastal Stock waters (Mississippi River Delta to 84°W longitude)	7,185	0.21

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for the Northern Coastal Stock of common bottlenose dolphins is 7,185 (CV=0.21). The minimum population estimate for the Northern Coastal Stock is 6,044 common bottlenose dolphins.

Current Population Trend

A trend analysis has not been conducted for this stock. There are 3 abundance estimates from: 1) fall 1993 (4,191; CV=0.21); 2) summer 2007 (2,473; CV=0.25) and 3) year-round, seasonal 2011-2012 (7,185; CV=0.21). Methodological differences among the estimates need to be evaluated to quantify trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known for this stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate and a recovery factor (Wade and Angliss 1997). The minimum population size is 6,044. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because the stock is of unknown status. PBR for the northern Gulf of Mexico Northern Coastal Stock of common bottlenose dolphins is 60.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the Northern Coastal Stock of common bottlenose dolphins during 2009–2013 is unknown because this stock is known to interact with an unobserved fishery (see below), and also because the most current observer data for the shrimp trawl fishery are for 2007-2011. The mean annual fishery-related mortality and serious injury during 2009–2013 for strandings identified as fishery-caused was 0.4. No additional mortality or serious injury was documented from other human-caused actions. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 0.4. This does not include an estimate for the commercial shrimp trawl fishery. The 5-year unweighted mean annual mortality estimate for 2007-2011 for the commercial shrimp trawl fishery was 21 (CV=0.66) (see Shrimp Trawl section below).

Fisheries Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category II Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl; Southeastern U.S. Atlantic, Gulf of Mexico stone crab trap/pot; Gulf of Mexico menhaden purse seine; and Gulf of Mexico gillnet fisheries; and the Category III Gulf of Mexico blue crab trap/pot; and Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fisheries (Appendix III).

Shrimp Trawl

Between 1997 and 2011, 5 common bottlenose dolphins and 7 unidentified dolphins, which could have been either common bottlenose dolphins or Atlantic spotted dolphins, became entangled in the lazy line, turtle excluder device or tickler chain gear in the commercial shrimp trawl fishery in the Gulf of Mexico. All dolphin bycatch interactions resulted in mortalities except for 1 unidentified dolphin that was released alive in 2009. Soldevilla *et al.* (2015) provide mortality estimates calculated from analysis of shrimp fishery effort data and NMFS's Observer Program bycatch data. Annual mortality estimates were calculated for the years 1997-2011 from stratified annual fishery effort and bycatch rates, and a 5-year unweighted mean mortality estimate for 2007-2011 was calculated for Gulf of Mexico dolphin stocks. The 4-area (TX, LA, MS/AL, FL) stratification method was chosen because it best approximates how fisheries operate (Soldevilla *et al.* 2015). The mean annual mortality estimate for the Northern Coastal Stock of common bottlenose dolphins is 21 (CV=0.66). Limitations and biases of annual bycatch mortality estimates are described in detail in Soldevilla *et al.* (2015). However, this estimate is not included in the annual human-caused mortality and serious injury for this stock because estimates for 2012 and 2013 are not available.

Blue and Stone Crab Trap/Pot

There have been no reported mortalities or serious injuries involving trap/pot gear for the Northern Coastal Stock to date. However, mortalities and serious injuries have been reported for the Eastern Coastal Stock, Western Coastal Stock, and bay, sound and estuary stocks. Since there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab traps/pots.

Menhaden Purse Seine

During 2009–2013, no interactions between the Northern Coastal Stock and the menhaden purse seine fishery were documented. There is currently no observer program for the Gulf of Mexico menhaden purse seine fishery; however, recent interactions with common bottlenose dolphins have been reported via two sources. First, during 2011, a pilot observer program operated from May through September, and observers documented 3 dolphins trapped within purse seine nets (within waters of the Western Coastal Stock and Mississippi Sound, Lake Borgne, Bay Boudreau Stock). All 3 were released alive without serious injury (Maze-Foley and Garrison in prep). Second, through the Marine Mammal Authorization Program (MMAP), there have been 13 self-reported incidental takes (all mortalities) of bottlenose dolphins in northern Gulf of Mexico coastal and estuarine waters by the menhaden purse seine fishery during 2000-2013. These takes likely affected the following stocks: Western Coastal Stock; Northern Coastal Stock; Mississippi Sound, Lake Borgne, Bay Boudreau Stock; and Mississippi River Delta Stock. Specific self-reported takes under the MMAP that might be attributed to the Northern Coastal Stock are as follows: one take of a single bottlenose dolphin was reported in Louisiana waters during 2001 that likely belonged to Mississippi River Delta Stock or Northern Coastal Stock; and during 2000, there was one reported take of a single bottlenose dolphin in Louisiana waters that likely belonged to Mississippi River Delta Stock or Northern Coastal Stock.

The menhaden purse seine fishery was observed to take 9 bottlenose dolphins (3 fatally) between 1992 and 1995 (NMFS unpublished data). During that period, there were 1,366 sets observed out of 26,097 total sets, which if extrapolated for all years suggests that as many as 172 bottlenose dolphins could have been taken in this fishery with up to 57 animals killed.

Without an ongoing observer program it is not possible to obtain statistically reliable information for this fishery on the number of sets annually, the incidental take and mortality rates, and the communities from which bottlenose dolphins are being taken.

Gillnet

No marine mammal mortalities associated with U.S. gillnet fisheries have been reported or observed for the Northern Coastal Stock, but stranding data suggest that gillnet and marine mammal interactions do occur, causing mortality and serious injury. There has been no observer coverage of this fishery in federal waters. Beginning in November 2012, NMFS began placing observers on commercial vessels in the coastal waters of Alabama, Mississippi and Louisiana (state waters only). No takes have been observed to date (J. Carlson, pers. comm.).

Hook and Line

During 2009–2013, 2 mortalities involving hook and line gear entanglement or ingestion were documented for the Northern Coastal Stock. The mortalities occurred in 2011 and 2012. The mortalities were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and are included in the stranding totals presented in Table 2. It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Strandings

A total of 103 common bottlenose dolphins were found stranded in Northern Coastal Stock waters of the Gulf of Mexico from 2009 through 2013 (Table 2; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). It could not be determined if there was evidence of human interaction for 78 of these strandings. For 18 dolphins, no evidence of human interaction was detected. Evidence of human interactions was detected for 7 of these dolphins (see Table 2). Bottlenose dolphins are known to become entangled in, or ingest recreational and commercial fishing gear (Wells and Scott 1994; Gorzelany 1998; Wells *et al.* 1998; Wells *et al.* 2008), and some are struck by vessels (Wells and Scott 1997; Wells *et al.* 2008).

There are a number of difficulties associated with the interpretation of stranding data. It is possible that some or all of the stranded dolphins may have been from a nearby bay, sound and estuary stock; however, the proportion of stranded dolphins belonging to another stock cannot be determined because of the difficulty of determining from where the stranded carcass originated. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

Since 1990, there have been 13 bottlenose dolphin die-offs or Unusual Mortality Events (UMEs) in the northern Gulf of Mexico, and 7 of these have occurred within the boundaries of the Northern Coastal Stock and may have affected the stock. 1) From January through May 1990, a total of 344 bottlenose dolphins stranded in the northern Gulf of Mexico. Overall this represented a two-fold increase in the prior maximum recorded strandings for the same period, but in some locations (i.e., Alabama) strandings were 10 times the average number. The cause of the 1990 mortality event could not be determined (Hansen 1992), however, morbillivirus may have contributed to this event (Litz *et al.* 2014). 2) In 1993-1994 a UME of bottlenose dolphins caused by morbillivirus started in the Florida Panhandle and spread west with most of the mortalities occurring in Texas (Lipscomb 1993; Lipscomb *et al.* 1994; Litz *et al.* 2014). From February through April 1994, 236 bottlenose dolphins were found dead on Texas beaches, of which 67 occurred in a single 10-day period. 3) In 1996 a UME was declared for bottlenose dolphins in Mississippi when 31 bottlenose dolphins stranded during November and December. The cause was not determined, but a *Karenia brevis* (red tide) bloom was suspected to be responsible. 4) Between August 1999 and May 2000, 150 bottlenose dolphins died coincident with *K. brevis* blooms and fish kills in the Florida Panhandle (additional strandings included 3 Atlantic spotted dolphins, *Stenella frontalis*, 1 Risso's dolphin, *Grampus griseus*, 2 Blainville's beaked whales, *Mesoplodon densirostris*, and 4 unidentified dolphins). Brevetoxin was determined to be the cause of this event (Twiner *et al.* 2012; Litz *et al.* 2014). 5) In March and April 2004, in another Florida Panhandle UME attributed to *K. brevis* blooms, 105 bottlenose dolphins and 2 unidentified dolphins stranded dead (Litz *et al.* 2014). Although there was no indication of a *K. brevis* bloom at the time, high levels of brevetoxin were found in the stomach contents of the stranded dolphins (Flewelling *et al.* 2005; Twiner *et al.* 2012). 6) A separate UME was declared in the Florida Panhandle after elevated numbers of dolphin strandings occurred in association with a *K. brevis* bloom in September 2005. Dolphin strandings remained elevated through the spring of 2006 and brevetoxin was again detected in the tissues of most of the stranded dolphins and determined to be the cause of the event (Twiner *et al.* 2012; Litz *et al.* 2014). Between September 2005 and April 2006 when the event was officially declared over, a total of 88 bottlenose dolphin strandings occurred (plus strandings of 5 unidentified dolphins). 7) A UME was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010; and, as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see "Habitat Issues" below), during the spill, and after. During 2010-2013, all strandings but 1 for the Northern Coastal Stock were considered to be part of this UME (see Table 2).

Table 2. Common bottlenose dolphin strandings occurring in Northern Coastal Stock waters of the northern Gulf of Mexico from 2009 to 2013, as well as number of strandings for which evidence of human interaction (HI) was detected and number of strandings for which it could not be determined (CBD) if there was evidence of HI. Data are from the NOAA National Marine Mammal Health and Stranding Response Database (unpublished data, accessed 11 June 2014). Please note HI does not necessarily mean the interaction caused the animal's death.

Stock	Category	2009	2010	2011	2012	2013	Total
Northern Coastal Stock	Total Stranded	8	18[a]	40[b]	17[b]	20[b]	103
	Human Interaction						
	---Yes	1	1[c]	1[d]	2[e]	2[f]	7
	---No	3	3	4	3	5	18
	---CBD	4	14	35	12	13	78

[a] This total includes 17 strandings that are part of the ongoing UME in the northern Gulf of Mexico.
[b] All strandings were part of the ongoing UME in the northern Gulf of Mexico.
[c] Fishery interaction (mortality).
[d] This was an entanglement interaction (mortality) with hook and line gear.
[e] Includes 1 entanglement interaction (mortality) with hook and line gear.
[f] Includes 1 fishery interaction (mortality).

Other Mortality

The problem of dolphin depredation of fishing gear is increasing in the Gulf of Mexico. There have been 4 recent and historical documented cases of fishermen illegally "taking" dolphins due to dolphin depredation of recreational and commercial fishing gear. One recent case of a shrimp fisherman illegally "taking" a dolphin in Mississippi Sound occurred during summer 2012. In December 2013 the fisherman was convicted under the MMPA for knowingly shooting a dolphin with a shotgun while shrimping. A commercial fisherman was indicted in November 2008 for throwing pipe bombs at dolphins off Panama City, Florida, and charged in March 2009 for "taking" dolphins with an explosive device. In 2006 a charter boat fishing captain was charged under the MMPA for shooting at a dolphin that was swimming around his catch in the Gulf of Mexico, off Panama City, Florida. In 2007 a second charter fishing boat captain was fined under the MMPA for shooting at a common bottlenose dolphin that was attempting to remove a fish from his line in the Gulf of Mexico, off Orange Beach, Alabama.

Feeding or provisioning of wild bottlenose dolphins has been documented in Florida, particularly near Panama City Beach in the Panhandle (Samuels and Bejder 2004) and south of Sarasota Bay (Cunningham-Smith *et al.* 2006; Powell and Wells 2011), and also in Texas near Corpus Christi (Bryant 1994). Feeding wild dolphins is defined under the MMPA as a form of 'take' because it can alter their natural behavior and increase their risk of injury or death. Nevertheless, a high rate of provisioning was observed near Panama City Beach in 1998 (Samuels and Bejder 2004), and provisioning has been observed south of Sarasota Bay since 1990 (Cunningham-Smith *et al.* 2006; Powell and Wells 2011). There are emerging questions regarding potential linkages between provisioning and depredation of recreational fishing gear and associated entanglement and ingestion of gear, which is increasing through much of Florida. During 2006, an estimated 2% of the long-term resident dolphins of Sarasota Bay died from ingestion of recreational fishing gear (Powell and Wells 2011).

Swimming with wild bottlenose dolphins has also been documented in Florida in Key West (Samuels and Engleby 2007) and near Panama City Beach (Samuels and Bejder 2004). Near Panama City Beach, Samuels and Bejder (2004) concluded that dolphins were amenable to swimmers due to illegal provisioning. Swimming with wild dolphins may cause harassment, and harassment is illegal under the MMPA.

HABITAT ISSUES

The *Deepwater Horizon* (DWH) MC252 drilling platform, located approximately 50 miles southeast of the Mississippi River Delta in waters about 1500 m deep, exploded on 20 April 2010. The rig sank, and over 87 days up to ~4.9 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (McNutt *et al.* 2012). During the response effort dispersants were applied extensively at the seafloor and at the sea surface (Lehr *et al.* 2010; OSAT 2010). In-situ burning, or controlled burning of oil at the surface, was also used extensively as a response tool (Lehr *et al.* 2010). The oil, dispersant and burn residue compounds present ecological concerns (Buist *et al.* 1999; NOAA 2011). The magnitude of this oil spill was unprecedented in U.S. history, causing impacts to wildlife, natural habitats and human communities along coastal areas from western Louisiana to the Florida

Panhandle (NOAA 2011). It could be years before the entire scope of damage is ascertained (NOAA 2011).

Given the trajectory of the surface oil during the spill and the documented oiling of shoreline (Michel *et al.* 2013), it is likely the Northern Coastal Stock of common bottlenose dolphins was exposed to oil during the event. A substantial number of beaches and wetlands along the Louisiana coast experienced heavy or moderate oiling (OSAT-2 2011; Michel *et al.* 2013). The heaviest oiling in Louisiana occurred west of the Mississippi River on the Mississippi Delta and in Barataria and Terrebonne Bays, and to the east of the river on the Chandeleur Islands. Some heavy to moderate oiling occurred on Alabama and Florida beaches, with the heaviest stretch occurring from Dauphin Island, Alabama, to Gulf Breeze, Florida. Light to trace oil was reported along the majority of Mississippi's mainland coast, from Gulf Breeze to Panama City, Florida, and outside of Atchafalaya and Vermilion Bays in western Louisiana. Heavy to light oiling occurred on Mississippi's barrier islands (Michel *et al.* 2013).

Shortly after the oil spill, the Natural Resource Damage Assessment (NRDA) process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies are being conducted to determine potential impacts of the spill on marine mammals. These studies have focused on identifying the type, magnitude, severity, length and impact of oil exposure to oceanic, continental shelf, coastal and estuarine marine mammals. The research is ongoing. For coastal and estuarine dolphins, the NOAA-led efforts include: active surveillance to detect stranded animals in remote locations; aerial surveys to document the distribution, abundance, species and exposure relative to oil from the DWH spill; assessment of sublethal and chronic health impacts on coastal and estuarine bottlenose dolphins in Barataria Bay, Louisiana, Mississippi Sound, and a reference site in Sarasota Bay, Florida; and assessment of injuries to dolphin stocks in Barataria Bay and Chandeleur Sound, Louisiana, Mississippi Sound, and as a reference site, St. Joseph Bay, Florida.

Dolphins were observed with tar balls attached to them and seen swimming through oil slicks close to shore and inland bays. The effects of oil exposure on marine mammals depend on a number of factors including the type and mixture of chemicals involved, the amount, frequency and duration of exposure, the route of exposure (inhaled, ingested, absorbed, or external) and biomedical risk factors of the particular animal (Geraci 1990). In general, direct external contact with petroleum compounds or dispersants with skin may cause skin irritation, chemical burns and infections. Inhalation of volatile petroleum compounds or dispersants may irritate or injure the respiratory tract, which could lead to pneumonia or inflammation. Ingestion of petroleum compounds may cause injury to the gastrointestinal tract, which could affect an animal's ability to digest or absorb food. Absorption of petroleum compounds or dispersants may damage kidney, liver and brain function in addition to causing immune suppression and anemia. Long term chronic effects such as lowered reproductive success and decreased survival may occur (Geraci 1990).

The nearshore habitat occupied by the 3 coastal stocks is adjacent to areas of high human population and in some areas, such as Tampa Bay, Florida, Galveston, Texas, and Mobile, Alabama, is highly industrialized. Concentrations of anthropogenic chemicals such PCBs and DDT and its metabolites vary from site to site, and can reach levels of concern for bottlenose dolphin health and reproduction in the southeastern U.S. (Schwacke *et al.* 2002). PCB concentrations in 3 stranded dolphins sampled from the Eastern Coastal Stock area ranged from 16-46μg/g wet weight. Two stranded dolphins from the Northern Coastal Stock area had the highest levels of DDT derivatives of any of the bottlenose dolphin liver samples analyzed in conjunction with a 1990 mortality investigation conducted by NMFS (Varanasi *et al.* 1992). The significance of these findings is unclear, but there is some evidence that increased exposure to anthropogenic compounds may reduce immune function in bottlenose dolphins (Lahvis *et al.* 1995), or impact reproduction through increased first-born calf mortality (Wells *et al.* 2005). Concentrations of chlorinated hydrocarbons and metals were relatively low in most of the bottlenose dolphins examined in conjunction with an anomalous mortality event in Texas bays in 1990; however, some had concentrations at levels of possible toxicological concern (Varanasi *et al.* 1992). Agricultural runoff following periods of high rainfall in 1992 was implicated in a high level of bottlenose dolphin mortalities in Matagorda Bay, which is adjacent to the Western Coastal Stock area (NMFS unpublished data).

The Mississippi River, which drains about two-thirds of the continental U.S., flows into the north-central Gulf of Mexico and deposits its nutrient load which is linked to the formation of one of the world's largest areas of seasonal hypoxia (Rabalais *et al.* 1999). This area is located in Louisiana coastal waters west of the Mississippi River delta. How it affects bottlenose dolphins is not known.

STATUS OF STOCK

The common bottlenose dolphin is not listed as threatened or endangered under the Endangered Species Act, and the Gulf of Mexico northern coastal stock is not considered strategic under the Marine Mammal Protection Act. However, the occurrence of a UME of unprecedented size and duration (began 1 February 2010 and is ongoing) has impacted the Northern Coastal Stock area and is a cause for concern. Total U.S. fishery-related mortality and serious injury for this stock is not known, but at a minimum is greater than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. The status of this stock relative to OSP in the Gulf of Mexico EEZ is unknown. There are insufficient data to determine the population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Gulf of Mexico Western Coastal Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Common bottlenose dolphins inhabit coastal waters throughout the northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) (Mullin *et al.* 1990). As a working hypothesis, it is assumed that the dolphins occupying habitats with dissimilar climatic, coastal and/or oceanographic characteristics might be restricted in their movements between habitats, and thus constitute separate stocks. Therefore, northern Gulf of Mexico coastal waters have been divided for management purposes into 3 stock areas: eastern, northern and western, with coastal waters defined as waters between the shore, barrier islands or presumed outer bay boundaries out to the 20-m isobath (Figure 1). The 20-m depth seaward boundary corresponds to survey strata (Scott 1990; Blaylock and Hoggard 1994; Fulling *et al.* 2003) and thus represents a management boundary rather than an ecological boundary. The Western Coastal bottlenose dolphin stock area extends from the Mississippi River Delta to the Texas-Mexico border. This region is characterized by an arid to temperate climate, sand beaches in southern Texas, extensive coastal marshes in northern Texas and Louisiana, and varying amounts of freshwater input. Dolphins belonging to this stock are all expected to be of the coastal ecotype (Vollmer 2011). The Western Coastal Stock is trans-boundary with Mexico; however, there is no information available for abundance estimation, nor for estimating fishery-related mortality in Mexican waters.

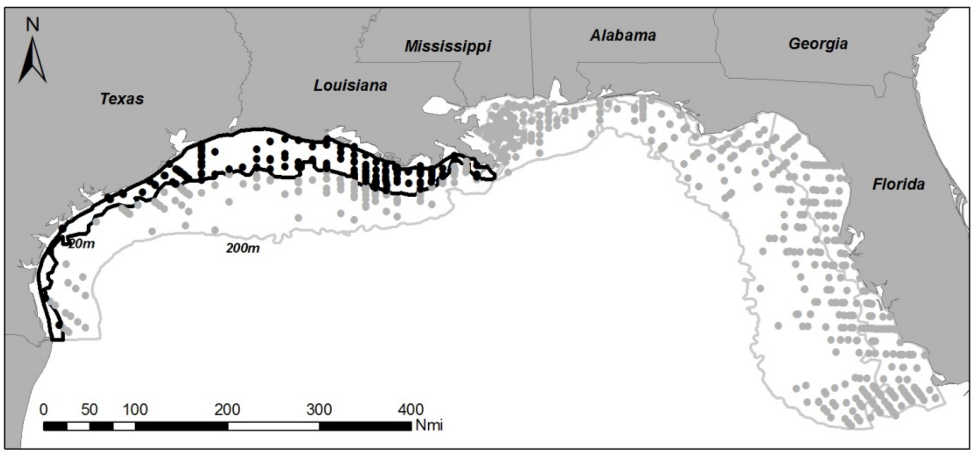

Figure 1. *Locations (circles) of common bottlenose dolphin groups sighted in coastal and continental shelf waters during aerial surveys conducted in spring, summer and fall of 2011 and in winter of 2012. Dark circles indicate groups within the boundaries of the Western Coastal Stock. The 20-m and 200-m isobaths are shown.*

This stock's boundaries abut other bottlenose dolphin stocks, namely the Northern Coastal Stock, Continental Shelf Stock and several bay, sound and estuary stocks in Texas and Louisiana, and while individuals from different stocks may occasionally overlap, it is not thought that significant mixing or interbreeding occurs between them. Fazioli *et al.* (2006) conducted photo-identification surveys of coastal waters off Tampa Bay, Sarasota Bay and Lemon Bay, Florida, over 14 months. They found both 'inshore' and 'Gulf' dolphins inhabited coastal waters but the 2 types used coastal waters differently. Dolphins from the inshore communities were observed occasionally in Gulf near-shore waters adjacent to their inshore range, whereas 'Gulf' dolphins were found primarily in open Gulf of Mexico waters with some displaying seasonal variations in their use of the study area. The 'Gulf' dolphins did not show a preference for waters near passes as was seen for 'inshore' dolphins, but moved throughout the study area and made greater use of waters offshore of waters used by 'inshore' dolphins. During winter months abundance of 'Gulf' groups decreased while abundance for 'inshore' groups increased. These findings support an earlier report by Irvine *et al.* (1981) of increased use of pass and coastal waters by Sarasota Bay dolphins in winter. Seasonal movements of identified individuals and abundance indices suggested that part of the 'Gulf' dolphin community moved out of the study area during winter, but their destination is unknown (Fazioli *et al.* 2006). In a follow-up study, Sellas *et al.* (2005) examined genetic population subdivision in the study area of Fazioli *et al.* (2006), and found evidence of significant population structure among all areas on the basis of both mitochondrial DNA control region sequence data and 9 nuclear microsatellite loci. The Sellas *et al.* (2005) findings support the separate identification of bay, sound and estuary stocks from those occurring in adjacent

Gulf coastal waters, as suggested by Wells (1986).

Off Galveston, Texas, Beier (2001) reported an open population of individual dolphins in coastal waters, but several individual dolphins had been sighted previously by other researchers over a 10-year period. Some coastal animals may move relatively long distances alongshore. Two bottlenose dolphins previously seen in the South Padre Island area in Texas were seen in Matagorda Bay, 285km north, in May 1992 and May 1993 (Lynn and Würsig 2002).

POPULATION SIZE

The best abundance estimate available for the northern Gulf of Mexico Western Coastal Stock of common bottlenose dolphins is 20,161 (CV=0.17; Table 1). This estimate is from an inverse-variance weighted average of seasonal abundance estimates from aerial surveys conducted during spring 2011, summer 2011, fall 2011 and winter 2012.

Earlier abundance estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions.

Recent surveys and abundance estimates

The Southeast Fisheries Science Center conducted aerial surveys of continental shelf waters (shoreline to 200 m depth) along the U.S. Gulf of Mexico coast from the Florida Keys to the Texas/Mexico border during spring (March-April) 2011, summer (July-August) 2011, fall (October-November) 2011 and winter (January-February) 2012. The surveys were conducted along tracklines oriented perpendicular to the shoreline and spaced 20-30 km apart. The total survey effort varied during each survey due to weather conditions, but ranged between 13,500 – 15,600 km. Each of these surveys was conducted using a two-team approach to develop estimates of visibility bias using the independent observer approach with Distance analysis (Laake and Borchers 2004). A model for the probability of detection on the trackline as a function of sighting conditions (sea state, glare, water color, etc.) was developed using data across all 4 surveys. This model was then applied to detection probability functions specific to each survey to account for the probability of detection as a function of distance from the trackline and additional environmental covariates. A bootstrap resampling approach was used to estimate the variance of the estimates. The survey data were post-stratified into spatial boundaries corresponding to the defined boundaries of common bottlenose dolphin stocks within the surveyed area. The abundance estimates for the Western Coastal Stock of bottlenose dolphins were based upon tracklines and sightings in waters from the shoreline to the 20-m isobath and between the Texas-Mexico border and the Mississippi River Delta. The seasonal abundance estimates for this stock were: spring – 6,047 (CV=0.60), summer – 32,987 (CV=0.28), fall – 12,150 (CV=0.23) and winter – 24,139 (CV=0.33). Due to the uncertainty in stock movements and apparent seasonal variability in the abundance of the stock, a weighted average of these seasonal estimates was taken where the weighting was the inverse of the CV. This approach weights estimates with higher precision more heavily in the final weighted mean. The resulting weighted mean and best estimate of abundance for the Western Coastal Stock of common bottlenose dolphins was 20,161 (CV=0.17).

Table 1. Summary of recent abundance estimates for the Western Coastal Stock of common bottlenose dolphins. Month, year and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Spring, summer and fall 2011, winter 2012	shoreline to 20 m, Western Coastal Stock waters (Texas/Mexico border to Mississippi River Delta)	20,161	0.17

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for the Western Coastal Stock of common bottlenose dolphins is 20,161 (CV=0.17). Therefore, the minimum population estimate for the northern Gulf of Mexico Western Coastal Stock is 17,491.

Current Population Trend

A trend analysis has not been conducted for this stock. There are 2 abundance estimates from: 1) fall 1992 (3,499; CV=0.21); and 2) year-round, seasonal 2011-2012 (20,161; CV=0.17). Methodological differences between the estimates need to be evaluated to quantify trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known for this stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate and a recovery factor (Wade and Angliss 1997). The minimum population size is 17,491. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because the stock is of unknown status. PBR for the northern Gulf of Mexico Western Coastal Stock of common bottlenose dolphins is 175.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the Western Coastal Stock of common bottlenose dolphins during 2009–2013 is unknown because this stock is known to interact with unobserved fisheries (see below), and also because the most current observer data for the shrimp trawl fishery are for 2007-2011. The mean annual fishery-related mortality and serious injury during 2009–2013 for strandings identified as fishery-caused was 0.6. No additional mortality or serious injury was documented from other human-caused actions. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 0.6. This does not include an estimate for the commercial shrimp trawl fishery. The 5-year unweighted mean annual mortality estimate for 2007-2011 for the commercial shrimp trawl fishery was 68 (CV=0.85) (see Shrimp Trawl section below).

Fisheries Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category II Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl; Gulf of Mexico menhaden purse seine; and Gulf of Mexico gillnet fisheries; and the Category III Gulf of Mexico blue crab trap/pot; and Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fisheries (Appendix III).

Shrimp Trawl

Between 1997 and 2011, 5 common bottlenose dolphins and 7 unidentified dolphins, which could have been either common bottlenose dolphins or Atlantic spotted dolphins, became entangled in the lazy line, turtle excluder device or tickler chain gear in the commercial shrimp trawl fishery in the Gulf of Mexico. All dolphin bycatch interactions resulted in mortalities except for 1 unidentified dolphin that was released alive in 2009. Soldevilla *et al.* (2015) provide mortality estimates calculated from analysis of shrimp fishery effort data and NMFS's Observer Program bycatch data. Annual mortality estimates were calculated for the years 1997-2011 from stratified annual fishery effort and bycatch rates, and a 5-year unweighted mean mortality estimate for 2007-2011 was calculated for Gulf of Mexico dolphin stocks. The 4-area (TX, LA, MS/AL, FL) stratification method was chosen because it best approximates how fisheries operate (Soldevilla *et al.* 2015). The mean annual mortality estimate for the Western Coastal Stock of common bottlenose dolphins is 68 (CV=0.85). Limitations and biases of annual bycatch mortality estimates are described in detail in Soldevilla *et al.* (2015). However, this estimate is not included in the annual human-caused mortality and serious injury for this stock because estimates for 2012 and 2013 are not available.

In addition, chaffing gear from a commercial shrimp trawl was recovered wrapped around the tongue and in the mouth of a dolphin carcass that stranded during 2013. It is believed the animal ingested the gear while removing gilled fish that were caught in the trawl net. This animal was included in the stranding database.

Menhaden Purse Seine

During 2009–2013, 2 live releases without serious injury were documented for the Western Coastal Stock and the menhaden purse seine fishery.

There is currently no observer program for the Gulf of Mexico menhaden purse seine fishery; however, recent interactions with common bottlenose dolphins have been reported via two sources. First, during 2011, a pilot observer program operated from May through September, and observers documented 3 dolphins trapped within purse seine nets. All 3 were released alive without serious injury (Maze-Foley and Garrison in prep). Two of the 3 dolphins were trapped within a single purse seine within waters of the Western Coastal Stock. The third animal was trapped in waters of the Mississippi Sound, Lake Borgne, Bay Boudreau Stock. Second, through the Marine Mammal Authorization Program (MMAP), there have been 13 self-reported incidental takes (all mortalities) of bottlenose dolphins in northern Gulf of Mexico coastal and estuarine waters by the menhaden purse seine fishery during 2000-2013. These takes likely affected the following stocks: Western Coastal Stock; Northern Coastal Stock; Mississippi Sound, Lake Borgne, Bay Boudreau Stock; and Mississippi River Delta Stock. Specific self-reported takes under the MMAP likely involving the Western Coastal Stock are as follows: two takes of single bottlenose dolphins were reported in Louisiana waters during 2005 (1 of the animals may have been dead prior to capture); and during 2000, one take of a single bottlenose dolphin was reported in Louisiana waters.

The menhaden purse seine fishery was observed to take 9 bottlenose dolphins (3 fatally) between 1992 and 1995 (NMFS unpublished data). During that period, there were 1,366 sets observed out of 26,097 total sets, which if extrapolated for all years suggests that as many as 172 bottlenose dolphins could have been taken in this fishery with up to 57 animals killed.

Without an ongoing observer program it is not possible to obtain statistically reliable information for this fishery on the number of sets annually, the incidental take and mortality rates, and the communities from which bottlenose dolphins are being taken.

Gillnet

No marine mammal mortalities associated with U.S. gillnet fisheries have been reported or observed for the Western Coastal Stock, but stranding data suggest that gillnet and marine mammal interactions do occur, causing mortality and serious injury. During 2011 enforcement officers found a dead common bottlenose dolphin entangled in a Mexican gillnet that had been illegally set in U.S. waters. This mortality, attributed to the Western Coastal Stock, was included in the stranding data in Table 2 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014).

There has been no observer coverage of this fishery in federal waters. Beginning in November 2012, NMFS began placing observers on commercial vessels in the coastal waters of Alabama, Mississippi and Louisiana (state waters only). No takes have been observed to date (J. Carlson, pers. comm.).

Blue Crab Trap/Pot

During 2009–2013, no interactions were documented for the Western Coastal Stock with crab trap/pot fisheries. An earlier interaction was documented for this stock. During 2008 an animal was disentangled from trap/pot gear and released alive without serious injury (Maze-Foley and Garrison in prep). Since there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab traps/pots.

Hook and Line

During 2009–2013, 3 mortalities involving hook and line gear entanglement or ingestion were documented for the Western Coastal Stock. The mortalities occurred in 2010, 2011 and 2012. The mortalities were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and are included in the stranding totals presented in Table 2. It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Strandings

A total of 724 common bottlenose dolphins were found stranded in Western Coastal Stock waters of the northern Gulf of Mexico from 2009 through 2013 (Table 2; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). It could not be determined if there was evidence of human interaction for 626 of these strandings. For 61 dolphins, no evidence of human interaction was detected. Evidence of human interactions was detected for 37 of these stranded dolphins. Human interactions were from numerous sources, including 14 animals that stranded with visible, external oil (in Louisiana), 3 entanglement interactions with hook and line fishing gear and 1 illegal gillnet take in foreign fishing gear (see Table 2 for details). Bottlenose dolphins are known to become entangled in, or ingest recreational and commercial fishing gear (Wells and Scott 1994; Gorzelany 1998; Wells *et al.* 1998; Wells *et al.* 2008), and some are struck by vessels (Wells and Scott 1997; Wells *et al.* 2008).

There are a number of difficulties associated with the interpretation of stranding data. It is possible that some or all of the stranded dolphins may have been from a nearby bay, sound and estuary stock; however, the proportion of stranded dolphins belonging to another stock cannot be determined because of the difficulty of determining from where the stranded carcass originated. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

Since 1990, there have been 13 bottlenose dolphin die-offs or Unusual Mortality Events (UMEs) in the northern Gulf of Mexico, and 7 of these have occurred within the boundaries of the Western Coastal Stock and may have affected the stock. 1) From January through May 1990, a total of 344 bottlenose dolphins stranded in the northern Gulf of Mexico. Overall this represented a two-fold increase in the prior maximum recorded strandings for the same period, but in some locations (i.e., Alabama) strandings were 10 times the average number. The cause of the 1990 mortality event could not be determined (Hansen 1992), however, morbillivirus may have contributed to this event (Litz *et al.* 2014). 2) In March and April 1992, 119 bottlenose dolphins stranded in Texas, about 9 times the average number. The cause of this event was not determined, but low salinity due to record rainfall combined with pesticide runoff and exposure to morbillivirus were suggested as potential contributing factors (Duignan *et al.* 1996; Colbert *et al.* 1999; Litz *et al.* 2014). 3) In 1993-1994 a UME of bottlenose dolphins likely caused by morbillivirus started in the Florida Panhandle and spread west with most of the mortalities occurring in Texas (Lipscomb 1993; Lipscomb *et al.* 1994; Litz *et al.* 2014). From February through April 1994, 236 bottlenose dolphins were found dead on Texas beaches, of which 67 occurred in a single 10-day period. 4) During February and March of 2007 an event was declared for northeast Texas and western Louisiana involving 64 bottlenose dolphins and 2 unidentified dolphins. Decomposition prevented conclusive analyses on most carcasses. 5) During February and March of 2008 an additional event was declared in Texas involving 111 bottlenose dolphin strandings (plus strandings of 1 unidentified dolphin and 1 melon-headed whale). Most of the animals recovered were in a decomposed state. The event has been closed, however, the investigation is ongoing. 6) A UME was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010; and, as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see "Habitat Issues" below), during the spill, and after. During 2010, 46 animals from this stock were considered to be part of the UME, during 2011, 93 animals, during 2012, 52 animals, and during 2013, 63 animals. 7) A UME occurred from November 2011 to March 2012 across 5 Texas counties including 126 bottlenose dolphin strandings. Ninety-six animals from this stock were considered to be part of the UME. The strandings were coincident with a harmful algal bloom of *K. brevis*, but researchers have not determined that was the cause of the event.

Table 2. Common bottlenose dolphin strandings occurring in Western Coastal Stock waters of the northern Gulf of Mexico from 2009 to 2013, as well as number of strandings for which evidence of human interaction (HI) was detected and number of strandings for which it could not be determined (CBD) if there was evidence of HI. Data are from the NOAA National Marine Mammal Health and Stranding Response Database (unpublished data, accessed 11 June 2014). Please note HI does not necessarily mean the interaction caused the animal's death.

Stock	**Category**	**2009**	**2010**	**2011**	**2012**	**2013**	**Total**
Western Coastal Stock	Total Stranded	100	136[a]	193[b]	147[c]	148[d]	724
	Human Interaction						
	---Yes	3	9[e]	12[f]	6[g]	7[h]	37
	---No	5	17	12	10	17	61
	---CBD	92	110	169	131	124	626

[a] This total includes 46 strandings that are part of the ongoing UME in the northern Gulf of Mexico.
[b] This total includes 93 strandings that are part of the ongoing UME in the northern Gulf of Mexico and 18 strandings that were part of the 2011-2012 Texas UME.
[c] This total includes 52 strandings that are part of the ongoing UME in the northern Gulf of Mexico and 78 strandings that were part of the 2011-2012 Texas UME.
[d] This total includes 63 strandings that are part of the ongoing UME in the northern Gulf of Mexico.
[e] This total includes 1 live animal visibly oiled and the following mortalities: 3 animals visibly oiled and 1 entanglement interaction with hook and line gear.
[f] This total includes the following mortalities: 1 illegal gillnet take in foreign fishing gear, 8 animals visibly

oiled and 1 interaction with hook and line gear.
[g] This total includes the following mortalities: 2 animals visibly oiled and 1 entanglement interaction with hook and line gear.
[h] This total includes 1 mortality with ingested chaffing gear from a commercial shrimp trawl.

Other Mortality

As part of its annual coastal dredging program, the Army Corps of Engineers conducts sea turtle relocation trawling during hopper dredging as a protective measure for marine turtles. No interactions have been documented during the most recent 5 years, 2009–2013, except for 1 interaction within the boundaries of the Mississippi Sound, Lake Borgne, Bay Boudreau Stock (please see that SAR for details). However, in earlier years, 5 incidents were documented in the Gulf of Mexico involving common bottlenose dolphins and relocation trawling activities. Four of the incidents were mortalities, and 1 occurred during each of the following years: 2003, 2005, 2006 and 2007. It is likely that 2 of these animals belonged to the Western Coastal Stock (2005, 2007) and 2 animals belonged to bay, sound and estuary stocks (2003, 2006). An additional incident occurred during 2006 in which the dolphin became free during net retrieval and was observed swimming away normally. It is likely this animal belonged to a bay, sound and estuary stock.

The problem of dolphin depredation of fishing gear is increasing in the Gulf of Mexico. To date, there are no records of depredation for this stock area, however.

Feeding or provisioning of wild bottlenose dolphins has been documented in Florida, particularly near Panama City Beach in the Panhandle (Samuels and Bejder 2004) and south of Sarasota Bay (Cunningham-Smith *et al.* 2006; Powell and Wells 2011), and also in Texas near Corpus Christi (Bryant 1994). Feeding wild dolphins is defined under the MMPA as a form of 'take' because it can alter their natural behavior and increase their risk of injury or death. There are emerging questions regarding potential linkages between provisioning and depredation of recreational fishing gear and associated entanglement and ingestion of gear, which is increasing through much of Florida. During 2006, an estimated 2% of the long-term resident dolphins of Sarasota Bay died from ingestion of recreational fishing gear (Powell and Wells 2011).

HABITAT ISSUES

The *Deepwater Horizon* (DWH) MC252 drilling platform, located approximately 50 miles southeast of the Mississippi River Delta in waters about 1500 m deep, exploded on 20 April 2010. The rig sank, and over 87 days up to ~4.9 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (McNutt *et al.* 2012). During the response effort dispersants were applied extensively at the seafloor and at the sea surface (Lehr *et al.* 2010; OSAT 2010). In-situ burning, or controlled burning of oil at the surface, was also used extensively as a response tool (Lehr *et al.* 2010). The oil, dispersant and burn residue compounds present ecological concerns (Buist *et al.* 1999; NOAA 2011). The magnitude of this oil spill was unprecedented in U.S. history, causing impacts to wildlife, natural habitats and human communities along coastal areas from western Louisiana to the Florida Panhandle (NOAA 2011). It could be years before the entire scope of damage is ascertained (NOAA 2011).

Given the trajectory of the surface oil during the spill and the documented oiling of shoreline and marshes west of the Mississippi River (Michel *et al.* 2013), it is likely the Western Coastal Stock of common bottlenose dolphins was exposed to oil during the event. A substantial number of beaches and wetlands along the Louisiana coast experienced heavy or moderate oiling (OSAT-2 2011; Michel *et al.* 2013). The heaviest oiling in Louisiana occurred west of the Mississippi River on the Mississippi Delta and in Barataria and Terrebonne Bays, and to the east of the river on the Chandeleur Islands. Some heavy to moderate oiling occurred on Alabama and Florida beaches, with the heaviest stretch occurring from Dauphin Island, Alabama, to Gulf Breeze, Florida. Light to trace oil was reported along the majority of Mississippi's mainland coast, from Gulf Breeze to Panama City, Florida, and outside of Atchafalaya and Vermilion Bays in western Louisiana. Heavy to light oiling occurred on Mississippi's barrier islands (Michel *et al.* 2013).

Shortly after the oil spill, the Natural Resource Damage Assessment (NRDA) process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies are being conducted to determine potential impacts of the spill on marine mammals. These studies have focused on identifying the type, magnitude, severity, length and impact of oil exposure to oceanic, continental shelf, coastal and estuarine marine mammals. The research is ongoing. For coastal and estuarine dolphins, the NOAA-led efforts include: active surveillance to detect stranded animals in remote locations; aerial surveys to document the distribution, abundance, species and exposure relative to oil from the DWH spill; assessment of sublethal and chronic health impacts on coastal and estuarine bottlenose dolphins in Barataria Bay, Louisiana, Mississippi Sound, and a reference site in Sarasota Bay, Florida; and assessment of injuries to dolphin stocks in Barataria Bay and Chandeleur Sound, Louisiana, Mississippi Sound, and as a reference site, St. Joseph Bay, Florida.

Dolphins were observed with tar balls attached to them and seen swimming through oil slicks close to shore and inland bays. The effects of oil exposure on marine mammals depend on a number of factors including the type and mixture of chemicals involved, the amount, frequency and duration of exposure, the route of exposure (inhaled, ingested, absorbed, or external) and biomedical risk factors of the particular animal (Geraci 1990). In general, direct external contact with petroleum compounds or dispersants with skin may cause skin irritation, chemical burns and infections. Inhalation of volatile petroleum compounds or dispersants may irritate or injure the respiratory tract, which could lead to pneumonia or inflammation. Ingestion of petroleum compounds may cause injury to the gastrointestinal tract, which could affect an animal's ability to digest or absorb food. Absorption of petroleum compounds or dispersants may damage kidney, liver and brain function in addition to causing immune suppression and anemia. Long term chronic effects such as lowered reproductive success and decreased survival may occur (Geraci 1990).

The nearshore habitat occupied by the 3 coastal stocks is adjacent to areas of high human population and in some areas, such as Tampa Bay, Florida, Galveston, Texas, and Mobile, Alabama, is highly industrialized. Concentrations of anthropogenic chemicals such PCBs and DDT and its metabolites vary from site to site, and can reach levels of concern for bottlenose dolphin health and reproduction in the southeastern U.S. (Schwacke *et al.* 2002). PCB concentrations in 3 stranded dolphins sampled from the Eastern Coastal Stock area ranged from 16-46µg/g wet weight. Two stranded dolphins from the Northern Coastal Stock area had the highest levels of DDT derivatives of any of the bottlenose dolphin liver samples analyzed in conjunction with a 1990 mortality investigation conducted by NMFS (Varanasi *et al.* 1992). The significance of these findings is unclear, but there is some evidence that increased exposure to anthropogenic compounds may reduce immune function in bottlenose dolphins (Lahvis *et al.* 1995), or impact reproduction through increased first-born calf mortality (Wells *et al.* 2005). Concentrations of chlorinated hydrocarbons and metals were relatively low in most of the bottlenose dolphins examined in conjunction with an anomalous mortality event in Texas bays in 1990; however, some had concentrations at levels of possible toxicological concern (Varanasi *et al.* 1992). Agricultural runoff following periods of high rainfall in 1992 was implicated in a high level of bottlenose dolphin mortalities in Matagorda Bay, which is adjacent to the Western Coastal Stock area (NMFS unpublished data).

The Mississippi River, which drains about two-thirds of the continental U.S., flows into the north-central Gulf of Mexico and deposits its nutrient load which is linked to the formation of one of the world's largest areas of seasonal hypoxia (Rabalais *et al.* 1999). This area is located in Louisiana coastal waters west of the Mississippi River delta. How it affects bottlenose dolphins is not known.

STATUS OF STOCK

The common bottlenose dolphin is not listed as threatened or endangered under the Endangered Species Act, and the Gulf of Mexico western coastal stock is not considered strategic under the Marine Mammal Protection Act. However, the occurrence of a UME of unprecedented size and duration (began 1 February 2010 and is ongoing) has impacted the Western Coastal Stock area and is cause for concern. Total U.S. fishery-related mortality and serious injury for this stock is not known, but at a minimum is greater than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. The status of this stock relative to OSP in the Gulf of Mexico EEZ is unknown. There are insufficient data to determine the population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Northern Gulf of Mexico Bay, Sound, and Estuary Stocks

NOTE – NMFS is in the process of writing individual stock assessment reports for each of the 31 bay, sound and estuary stocks of common bottlenose dolphins that are included in this report. Until this effort is completed and this report is replaced by 31 individual reports, basic information for all individual bay, sound and estuary stocks will remain in this report: "Northern Gulf of Mexico Bay, Sound and Estuary Stocks". Twenty-seven stocks are assessed in this report.

STOCK DEFINITION AND GEOGRAPHIC RANGE

Common bottlenose dolphins are distributed throughout the bays, sound and estuaries of the Gulf of Mexico (Mullin 1988). The identification of biologically-meaningful "stocks" of bottlenose dolphins in these waters is complicated by the high degree of behavioral variability exhibited by this species (Shane *et al.* 1986; Wells and Scott 1999; Wells 2003), and by the lack of requisite information for much of the region.

Distinct stocks are delineated in each of 31 areas of contiguous, enclosed or semi-enclosed bodies of water adjacent to the northern Gulf of Mexico (i.e., U.S. Gulf of Mexico; Table 1; Figure 1). The genesis of the delineation of these stocks was work initiated in the 1970s in Sarasota Bay, Florida (Irvine *et al.* 1981), and in bays in Texas (Shane 1977; Gruber 1981). These studies documented year-round residency of individual bottlenose dolphins in estuarine waters. As a result, the expectation of year-round resident populations was extended to bay, sound and estuary (BSE) waters across the northern Gulf of Mexico when the first stock assessment reports were established in 1995. Since these early studies, long-term (year-round, multi-year) residency has been reported from nearly every site where photographic identification (photo-ID) or tagging studies have been conducted in the Gulf of Mexico. In Texas, long-term resident dolphins have been reported in the Matagorda-Espiritu Santo Bay area (Gruber 1981; Lynn and Würsig 2002), Aransas Pass (Shane 1977; Weller 1998), San Luis Pass (Maze and Würsig 1999; Irwin and Würsig 2004), and Galveston Bay (Bräger 1993; Bräger *et al.* 1994; Fertl 1994). In Louisiana, Miller (2003) concluded the bottlenose dolphin population in the Barataria Basin was relatively closed. Hubard *et al.* (2004) reported sightings of dolphins in Mississippi Sound that were known from tagging efforts there 12-15 years prior. In Florida, long-term residency has been reported from Choctawhatchee Bay (1989-1993; F. Townsend, unpublished data), Tampa Bay (Wells 1986; Wells *et al.* 1996b; Urian *et al.* 2009), Sarasota Bay (Irvine and Wells 1972; Irvine *et al.* 1981; Wells 1986, 1991, 2003; Wells *et al.* 1987; Scott *et al.* 1990; Wells 1991; 2003), Lemon Bay (Wells *et al.* 1996a; Bassos-Hull *et al.* 2013), Charlotte Harbor/Pine Island Sound (Shane 1990; Wells *et al.* 1996a; Wells *et al.* 1997; Shane 2004; Bassos-Hull *et al.* 2013) and Gasparilla Sound (Bassos-Hull *et al.* 2013). In Sarasota Bay, which has the longest research history, at least 5 concurrent generations of identifiable residents have been identified, including some of those first identified in 1970. Maximum immigration and emigration rates of about 2-3% have been estimated (Wells and Scott 1990).

Genetic data also support the concept of relatively discrete BSE stocks. Analyses of mitochondrial DNA haplotype distributions indicate the existence of clinal variations along the Gulf of Mexico coastline (Duffield and Wells 2002). Differences in reproductive seasonality from site to site also suggest genetic-based distinctions between communities (Urian *et al.* 1996). Mitochondrial DNA analyses suggest finer-scale structural levels as well. For example, dolphins in Matagorda Bay, Texas, appear to be a localized population, and differences in haplotype frequencies distinguish among adjacent communities in Tampa Bay, Sarasota Bay and Charlotte Harbor/Pine Island Sound, along the central west coast of Florida (Duffield and Wells 1991; 2002). Additionally, Sellas *et al.* (2005) examined population subdivision among dolphins sampled in Sarasota Bay, Tampa Bay, Charlotte Harbor, Matagorda Bay, and the coastal Gulf of Mexico (1 – 12 km offshore) from just outside Tampa Bay to the southern end of Lemon Bay, and found evidence of significant population structure among all areas on the basis of both mitochondrial DNA control region sequence data and 9 nuclear microsatellite loci. The Sellas *et al.* (2005) findings support the separate identification of BSE populations from those occurring in adjacent Gulf coastal waters.

In many cases, residents occur primarily in BSE waters, with limited movements through passes to the Gulf of Mexico (Shane 1977; 1990; Gruber 1981; Irvine *et al.* 1981; Maze and Würsig 1999; Lynn and Würsig 2002; Fazioli *et al.* 2006). These habitat use patterns are reflected in the ecology of the dolphins in some areas; for example, residents of Sarasota Bay, Florida, lacked squid in their diet, unlike non-resident dolphins stranded on nearby Gulf beaches (Barros and Wells 1998). However, in some areas year-round residents may co-occur with non-resident dolphins. For example, about 14-17% of group sightings involving resident Sarasota Bay dolphins include at least 1 non-resident as well (Wells *et al.* 1987; Fazioli *et al.* 2006). Mixing of inshore residents and non-residents has been seen at San Luis Pass, Texas (Maze and Würsig 1999), Cedar Keys, Florida (Quintana-Rizzo and Wells 2001), and Pine Island Sound, Florida (Shane 2004). Non-residents exhibit a variety of movement patterns, ranging from apparent nomadism recorded as transience to a given area, to apparent seasonal or non-seasonal migrations. Passes, especially the mouths of the larger estuaries, serve as mixing areas. For example, dolphins from several different areas were documented at the mouth of Tampa Bay, Florida (Wells 1986), and most of the dolphins identified in the mouths of Galveston Bay and Aransas Pass, Texas, were considered transients (Henningsen 1991; Bräger 1993; Weller 1998).

Seasonal movements of dolphins into and out of some of the bays, sounds and estuaries have also been documented. In Sarasota Bay, Florida, and San Luis Pass, Texas, residents have been documented moving into Gulf coastal waters in fall/winter, and returning inshore in spring/summer (Irvine *et al.* 1981; Maze and Würsig 1999). Fall/winter increases in abundance have been noted for Tampa Bay (Scott *et al.* 1989) and are thought to occur in Matagorda Bay (Gruber 1981; Lynn and Würsig 2002) and Aransas Pass (Shane 1977; Weller 1998). Spring/summer increases in abundance occur in Mississippi Sound (Hubard *et al.* 2004) and are thought to occur in Galveston Bay (Henningsen 1991; Bräger 1993; Fertl 1994).

Spring and fall increases in abundance have been reported for St. Joseph Bay, Florida. Mark-recapture abundance estimates were highest in spring and fall and lowest in summer and winter (Table 1; Balmer *et al.* 2008). Individuals with low site-fidelity indices were sighted more often in spring and fall, whereas individuals sighted during summer and winter displayed higher site-fidelity indices. In conjunction with health assessments, 23 dolphins were radio tagged during April 2005 and July 2006. Dolphins tagged in spring 2005 displayed variable utilization areas and variable site fidelity patterns. In contrast, during summer 2006 the majority of radio tagged individuals displayed similar utilization areas and moderate to high site-fidelity patterns. The results of the studies suggest that during summer and winter St. Joseph Bay hosts dolphins that spend most of their time within this region, and these may represent a resident community. In spring and fall, St. Joseph Bay is visited by dolphins that range outside of this area (Balmer *et al.* 2008).

The current BSE stocks are delineated as described in Table 1. There are some estuarine areas that are not currently part of any stock's range. Many of these are areas that dolphins cannot readily access. For example, the marshlands between Galveston Bay and Sabine Lake and between Sabine Lake and Calcasieu Lake are fronted by long, sandy beaches that prohibit dolphins from entering the marshes. The region between the Calcasieu Lake and Vermilion Bay/Atchafalaya Bay stocks has some access, but these marshes are predominantly freshwater rather than saltwater marshes, making them unsuitable for long-term survival of a viable population of bottlenose dolphins. In other regions, there is insufficient estuarine habitat to harbor a demographically independent population, for instance between the Matagorda Bay and West Bay Stocks in Texas, and/or sufficient isolation of the estuarine habitat from coastal waters. The regions between the south end of the Estero Bay Stock area to just south of Naples and between Little Sarasota Bay and Lemon Bay are highly developed and contain little appropriate habitat. South of Naples to San Marco Island and Gullivan Bay is also not currently covered in a stock boundary. This region may reasonably contain bottlenose dolphins, but the relationship of any dolphins in this region to other BSE stocks is unknown. They may be members of the Gullivan to Chokoloskee Bay stock as there is passage behind San Marco Island that would allow dolphins to move north. The regions between Apalachee Bay and Cedar Key/Waccasassa Bay, between Crystal Bay and St. Joseph Sound and between Chokoloskee Bay and Whitewater Bay are comprised of thin strips of marshland with no barriers to adjacent coastal waters. Further work is necessary to determine whether year-round resident dolphins use these thin marshes or whether dolphins in these areas are members of the coastal stock that use the fringing marshland as well. Finally, the region between the eastern border of the Barataria Bay Stock and the Mississippi Delta Stock to the east may harbor dolphins, but the area is small and work is necessary to determine whether any dolphins utilizing this habitat come from an adjacent BSE stock.

As more information becomes available, combination or division of these stocks, or alterations to stock boundaries, may be warranted. For example, unpublished research suggests B36, Caloosahatchee River, can be considered a part of Pine Island Sound. Recent research based on photo-ID data collected by Bassos-Hull *et al.* (2013) recommended combining B21, Lemon Bay, with B22-23, Gasparilla Sound, Charlotte Harbor, Pine Island Sound. Therefore, these stocks have been combined (see Table 1). However, it should be noted this change was made in the absence of genetic data and could be revised again in the future when genetic data are available. Additionally, a number of geographically and socially distinct subgroupings of dolphins in regions such as Tampa Bay, Charlotte Harbor, Pine Island Sound, Aransas Pass and Matagorda Bay have been identified, but the importance of these distinctions to stock designations remains undetermined (Shane 1977; Gruber 1981; Wells *et al.* 1996a; 1996b; 1997; Lynn and Würsig 2002; Urian 2002). For Tampa Bay, Urian *et al.* (2009) described 5 discrete communities (including the adjacent Sarasota Bay community) that differed in their social interactions and ranging patterns. Structure was found despite a lack of physiographic barriers to movement within this large, open embayment. Urian *et al.* (2009) further suggested that fine-scale structure may be a common element among bottlenose dolphins in the southeastern U.S. and recommended that management should account for fine-scale structure that exists within current stock designations.

Table 1. Most recent common bottlenose dolphin abundance (N_{BEST}), coefficient of variation (CV) and minimum population estimate (N_{MIN}) in northern Gulf of Mexico bays, sounds and estuaries. Because they are based on data collected more than 8 years ago, most estimates are considered unknown or undetermined for management purposes. Blocks refer to aerial survey blocks illustrated in Figure 1. PBR – Potential Biological Removal; UNK – unknown; UND – undetermined.

Blocks	Gulf of Mexico Estuary	N_{BEST}	CV	N_{MIN}	PBR	Year	Reference
B51	Laguna Madre	80	1.57	UNK	UND	1992	A
B52	Nueces Bay, Corpus Christi Bay	58	0.61	UNK	UND	1992	A
B50	Copano Bay, Aransas Bay, San Antonio Bay, Redfish Bay, Espiritu Santo Bay	55	0.82	UNK	UND	1992	A
B54	Matagorda Bay, Tres Palacios Bay, Lavaca Bay	61	0.45	UNK	UND	1992	A
B55	West Bay	32	0.15	UNK	UND	2000	E
B56	Galveston Bay, East Bay, Trinity Bay	152	0.43	UNK	UND	1992	A
B57	Sabine Lake	0[a]	-		UND	1992	A
B58	Calcasieu Lake	0[a]	-		UND	1992	A
B59	Vermilion Bay, West Cote Blanche Bay, Atchafalaya Bay	0[a]	-		UND	1992	A
B60	Terrebonne Bay, Timbalier Bay	100	0.53	UNK	UND	1993	A
B61	Barataria Bay	138	0.08	UNK	UND	2001	D
B30	Mississippi River Delta	332	0.93	170	1.7	2011-12	J
B02-05, 29, 31	Mississippi Sound, Lake Borgne, Bay Boudreau	901	0.63	551	5.6	2012	J
B06	Mobile Bay, Bonsecour Bay	122	0.34	UNK	UND	1993	A
B07	Perdido Bay	0[a]	-		UND	1993	A
B08	Pensacola Bay, East Bay	33	0.80	UNK	UND	1993	A
B09	Choctawhatchee Bay	179	0.04	173	1.7	2007	H
B10	St. Andrew Bay	124	0.57	UNK	UND	1993	A
B11	St. Joseph Bay	152	0.08	142	1.4	2007	F
B12-13	St. Vincent Sound, Apalachicola Bay, St. George Sound	439	0.14	390	3.9	2007-08	G
B14-15	Apalachee Bay	491	0.39	UNK	UND	1993	A
B16	Waccasassa Bay, Withlacoochee Bay, Crystal Bay	100	0.85	UNK	UND	1994	A
B17	St. Joseph Sound, Clearwater Harbor	37	1.06	UNK	UND	1994	A
B32-34	Tampa Bay	559	0.24	UNK	UND	1994	A
B20, 35	Sarasota Bay, Little Sarasota Bay	160	na[c]	160	1.6	2007	B
B21-23	Pine Island Sound, Charlotte Harbor, Gasparilla Sound, Lemon Bay	826	0.09	UNK	UND	2006	I
B36	Caloosahatchee River	0[a,b]	-		UND	1985	C
B24	Estero Bay	104	0.67	UNK	UND	1994	A
B25	Chokoloskee Bay, Ten Thousand Islands, Gullivan Bay	208	0.46	UNK	UND	1994	A
B27	Whitewater Bay	242	0.37	UNK	UND	1994	A
B28	Florida Keys (Bahia Honda to Key West)	29	1.00	UNK	UND	1994	A

References: A – Blaylock and Hoggard 1994; B – Wells 2009; C – Scott *et al.* 1989; D – Miller 2003; E – Irwin and Würsig 2004; F – Balmer *et al.* 2008; G – Tyson *et al.* 2011; H – Conn *et al.* 2011; I - Bassos-Hull *et al.*

2013; J - NMFS unpublished data
Notes:
[a] During earlier surveys (Scott *et al.* 1989), the range of seasonal abundances was as follows: B57, 0-2 (CV=0.38); B58, 0-6 (0.34); B59, 0-0; B30, 0-182 (0.14); B07, 0-0; B21, 0-15 (0.43); and B36, 0-0.
[b] Block not surveyed during surveys reported in Blaylock and Hoggard (1994).
[c] No CV because N_{BEST} was a direct count of known individuals.

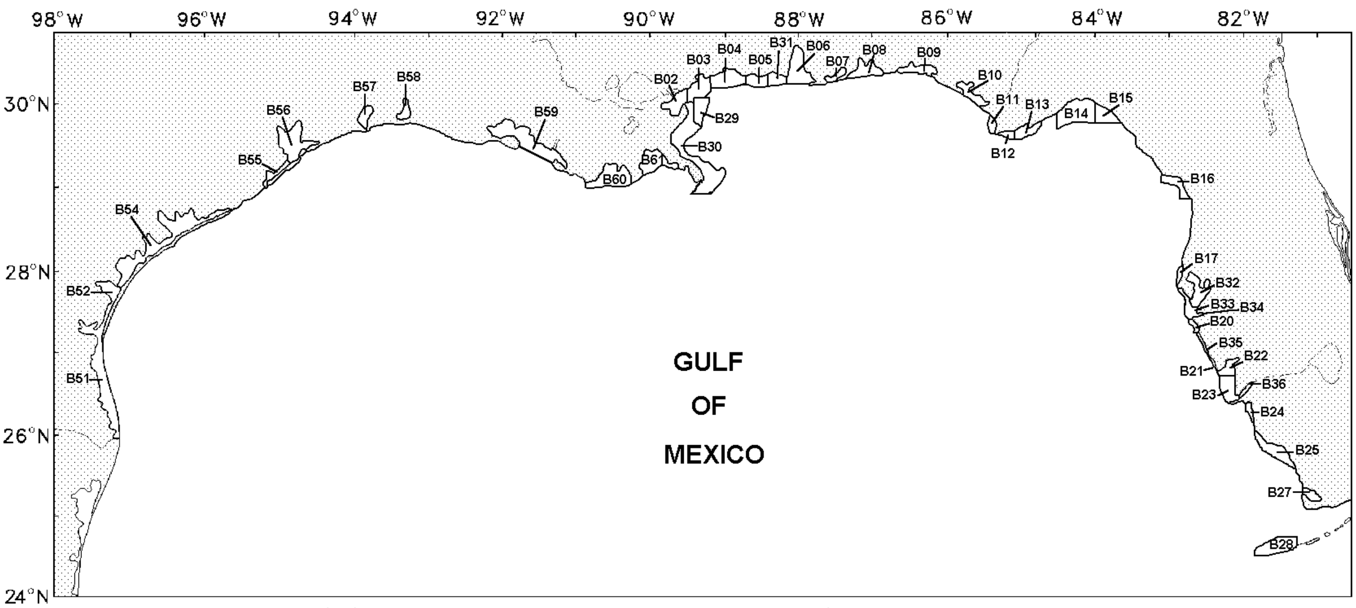

Figure 1. *Northern Gulf of Mexico bays, sounds and estuaries. Each of the alpha-numerically designated blocks corresponds to one of the NMFS Southeast Fisheries Science Center logistical aerial survey areas listed in Table 1. The common bottlenose dolphins inhabiting each bay, sound or estuary are considered to comprise a unique stock for purposes of this assessment.*

POPULATION SIZE

Population size estimates for most of the stocks are greater than 8 years old and therefore the current population sizes for all but 6 of these stocks are considered unknown (Wade and Angliss 1997). However, recent mark-recapture population size estimates are available for Choctawhatchee Bay; St. Joseph Bay; and St. Vincent Sound, Apalachicola Bay, St. George Sound. A direct count is available for Sarasota Bay. Recent aerial survey line-transect population size estimates are available for Mississippi River Delta and Mississippi Sound, Lake Borgne, Bay Boudreau (Table 1). Population size estimates for the remaining stocks (Table 1) were generated from preliminary analyses of line-transect data collected during aerial surveys conducted in September-October 1992 in Texas and Louisiana; in September-October 1993 in Louisiana, Mississippi, Alabama and the Florida Panhandle (Blaylock and Hoggard 1994); and in September-November 1994 along the west coast of Florida (NMFS unpublished data). Standard line-transect perpendicular sighting distance analytical methods (Buckland *et al.* 1993) and the computer program DISTANCE (Laake *et al.* 1993) were used.

Minimum Population Estimate

The population sizes for all but 6 stocks are currently unknown and the minimum population estimates are given for those 6 stocks in Table 1. In most cases, the minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The minimum population estimate was calculated for each block from the estimated population size and its associated coefficient of variation. Where the population size resulted from a direct count of known individuals, the minimum population size was identical to the estimated population size.

Current Population Trend

The data are insufficient to determine population trends for most of the Gulf of Mexico BSE common bottlenose dolphin stocks.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known for these stocks. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate and a recovery factor (Wade and Angliss 1997). The recovery factor is 0.5 because these stocks are of unknown status. PBR is undetermined for all but 6 stocks because the population size estimate is more than 8 years old. PBR for those stocks with population size estimates less than 8 years old is given in Table 1.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for these stocks during 2009–2013 is unknown because these stocks interact with unobserved fisheries (see below). Five-year unweighted mean mortality estimates for 2007-2011 for the commercial shrimp trawl fishery were calculated at the state level (see Shrimp Trawl section below).

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with these stocks in the Gulf of Mexico are the Category II Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl; Gulf of Mexico menhaden purse seine; Southeastern U.S. Atlantic, Gulf of Mexico stone crab trap/pot; and Gulf of Mexico gillnet fisheries; and the Category III Gulf of Mexico blue crab trap/pot; Florida spiny lobster trap/pot; and Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fisheries (Appendix III).

Shrimp Trawl

Between 1997 and 2011, 5 common bottlenose dolphins and 7 unidentified dolphins, which could have been either common bottlenose dolphins or Atlantic spotted dolphins, became entangled in the lazy line, turtle excluder device or tickler chain gear in the commercial shrimp trawl fishery in the Gulf of Mexico. All dolphin bycatch interactions resulted in mortalities except for 1 unidentified dolphin that was released alive in 2009. Soldevilla *et al.* (2015) provide mortality estimates calculated from analysis of shrimp fishery effort data and NMFS's Observer Program bycatch data. Observer program coverage does not extend into BSE waters; time-area stratified bycatch rates were extrapolated into inshore waters to estimate bycatch mortalities from inshore fishing effort. Annual mortality estimates were calculated for the years 1997-2011 from stratified annual fishery effort and bycatch rates, and a 5-year unweighted mean mortality estimate for 2007-2011 was calculated for Gulf of Mexico dolphin stocks. The 4-area (Texas, Louisiana, Mississippi/Alabama, Florida) stratification method was chosen because it best approximates how fisheries operate (Soldevilla *et al.* 2015). The BSE stock mortality estimates were aggregated at the state level as this was the spatial resolution at which fishery effort is modeled (e.g., Nance *et al.* 2008). The mean annual mortality estimates for the BSE stocks are as follows: Texas BSE (from Galveston Bay, East Bay, Trinity Bay south to Laguna Madre): 0; Louisiana BSE (from Sabine Lake east to Barataria Bay): 88 (CV=1.01); Mississippi/Alabama BSE (from Mississippi River Delta east to Mobile Bay, Bonsecour Bay): 41 (CV=0.67); and Florida BSE (from Perdido Bay east and south to the Florida Keys): 3.4 (CV=0.99). These estimates do not include skimmer trawl effort, which may represent up to 50% of shrimp fishery effort in Louisiana, Alabama, and Mississippi inshore waters, because Observer Program coverage of skimmer trawls is limited. Limitations and biases of annual bycatch mortality estimates are described in detail in Soldevilla *et al.* (2015).

One mortality (2009) and 1 live release without serious injury (2012) occurred in Alabama bays during non-commercial shrimp trawling (see "Other Mortality" below for details).

Menhaden Purse Seine

During 2009–2013, there were 2 mortalities and 1 animal released alive without serious injury documented within BSE waters involving the menhaden purse seine fishery. All 3 interactions occurred within the waters of the Mississippi Sound, Lake Borgne, Bay Boudreau Stock (also reported in that SAR).

There is currently no observer program for the Gulf of Mexico menhaden purse seine fishery; however, recent incidental takes have been reported via two sources. First, during 2011, a pilot observer program operated from May through September, and observers documented 3 dolphins trapped within purse seine nets. All 3 were released alive without serious injury (Maze-Foley and Garrison in prep a). Two of the 3 dolphins were trapped within a single purse seine within waters of the Western Coastal Stock. The third animal was trapped in waters of the Mississippi Sound, Lake Borgne, Bay Boudreau Stock. Second, through the Marine Mammal Authorization Program (MMAP), there have been 13 self-reported incidental takes (all mortalities) of common bottlenose dolphins in northern Gulf of Mexico coastal and estuarine waters by the menhaden purse seine fishery during 2000-2013. These takes likely affected the following stocks: Western Coastal Stock; Northern Coastal Stock; Mississippi Sound, Lake Borgne, Bay Boudreau Stock; and Mississippi River Delta Stock. Specific self-reported takes under the MMAP likely involving BSE stocks are as follows: 2 dolphins were reported taken in a single purse seine during 2012 in Mississippi Sound (Mississippi Sound, Lake Borgne, Bay Boudreau Stock); 1 take of a single bottlenose dolphin was reported in Louisiana waters during 2004 that likely belonged to the Mississippi River Delta Stock; 1 take of a single unidentified dolphin reported during 2002 likely belonged to the Mississippi Sound, Lake Borgne, Bay Boudreau Stock; 1 take of a single bottlenose dolphin was reported in Louisiana waters during 2001 that likely belonged to Mississippi River Delta Stock or Northern Coastal Stock; during 2000, 1 take of a single bottlenose dolphin was reported in Louisiana waters that likely belonged to Mississippi River Delta Stock or Northern Coastal Stock; and also in 2000, 3 bottlenose dolphins were reported taken in a single purse seine in Mississippi waters that likely belonged to Mississippi Sound, Lake Borgne, Bay Boudreau Stock.

The menhaden purse seine fishery was observed to take 9 bottlenose dolphins (3 fatally) between 1992 and 1995 (NMFS unpublished data). During that period, there were 1,366 sets observed out of 26,097 total sets, which if extrapolated for all years suggests that as many as 172 bottlenose dolphins could have been taken in this fishery with up to 57 animals killed.

Without an ongoing observer program, it is not possible to obtain statistically reliable information for this fishery on the number of sets annually, the incidental take and mortality rates, and the stocks from which bottlenose dolphins are being taken.

Blue Crab, Stone Crab and Florida Spiny Lobster Trap/Pot

During 2009–2013 there were 4 documented interactions with trap/pot fisheries and BSE stocks. During 2013, 1 animal was disentangled and released alive from Florida spiny lobster trap/pot gear (it could not be determined if the animal was seriously injured [Maze-Foley and Garrison in prep c]). This animal likely belonged to the Florida Keys Stock. During 2011, 1 mortality occurred and 1 live animal was disentangled and released (it could not be determined if the animal was seriously injured [Maze-Foley and Garrison in prep a]). The BSE stocks involved were likely Waccasassa Bay, Withlacoochee Bay, Crystal Bay and Galveston Bay, East Bay, Trinity Bay, respectively. In 2010, a calf likely belonging to the Copano Bay, Aransas Bay, San Antonio Bay, Redfish Bay, Espiritu Santo Bay Stock was disentangled by stranding network personnel from a crab trap line wrapped around its peduncle. The animal swam away with no obvious injuries, but was considered seriously injured because it is unknown whether it was reunited with its mother (Maze-Foley and Garrison in prep a). The specific fishery could not be identified for the trap/pot gear involved in the 2011 and 2010 interactions. All mortalities and animals released alive were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and are included in the stranding totals in Table 1. Because there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab traps/pots.

Gillnet

No marine mammal mortalities associated with gillnet fisheries have been reported or observed in recent years, but stranding data suggest that gillnet and marine mammal interactions do occur, causing mortality and serious injury. During 2009–2013, a total of 12 entanglements in research-related gillnets were reported in BSE stocks: 8 dolphins in Texas, 2 in Louisiana and 2 in Florida. Three of the 12 entanglements resulted in mortalities, and 1 in a serious injury (see “Other Mortality” below for details on recent and historical research-related entanglements).

There has been no observer coverage of this fishery in federal waters. Beginning in November 2012, NMFS began placing observers on commercial vessels in the coastal waters of Alabama, Mississippi and Louisiana (state waters only). No takes have been observed to date (J. Carlson, pers. comm.). In 1995, a Florida state constitutional amendment banned gillnets and large nets from bays, sounds, estuaries and other inshore waters.

Hook and Line

During 2009–2013 there were 18 mortalities for which hook and line gear entanglement or ingestion were documented, and attempts were made to disentangle 10 live animals from hook and line gear. During 2009 there were 2 mortalities, and 2 live animals were disentangled from hook and line gear and were considered not seriously injured (Maze-Foley and Garrison in prep a). During 2010 there were 3 mortalities, and 1 live animal was disentangled and released, considered seriously injured (Maze-Foley and Garrison in prep a). During 2011, there were 2 mortalities, and 2 live animals were disentangled from hook and line gear. One of the live animals was considered seriously injured, and 1 was not seriously injured (Maze-Foley and Garrison in prep a). During 2012 there were 8 mortalities, and 2 live animals were disentangled from hook and line gear (1 considered not seriously injured, 1 could not be determined if it was seriously injured or not) (Maze-Foley and Garrison in prep b). Finally, during 2013 there were 3 mortalities and 3 live animals disentangled from hook and line gear. One of the live animals was considered not seriously injured and for the other 2, it could not be determined whether they were seriously injured or not (Maze-Foley and Garrison in prep c). The interactions likely involved animals from the following BSE stocks: Waccasassa Bay, Withlacoochee Bay, Crystal Bay; Tampa Bay; Sarasota Bay, Little Sarasota Bay; Pine Island Sound, Charlotte Harbor, Gasparilla Sound, Lemon Bay; Caloosahatchee River; Estero Bay; Chokoloskee Bay, Ten Thousand Islands, Gullivan Bay; Galveston Bay, East Bay, Trinity Bay; Copano Bay, Aransas Bay, San Antonio Bay, Redfish Bay, Espiritu Santo Bay; Neuces Bay, Corpus Christi Bay; and Laguna Madre. All mortalities and live entanglements were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and are included in the stranding totals presented in Table 1.

It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Strandings

A total of 526 common bottlenose dolphins were found stranded within bays, sounds and estuaries of the northern Gulf of Mexico from 2009 through 2013 (Table 2; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). It could not be determined if there was evidence of human interaction for 406 of these strandings. For 29 dolphins, no evidence of human interaction was detected. Evidence of human interactions was detected for 91 of these dolphins. Human interactions were from numerous sources, including 28 entanglements with hook and line gear, 4 entanglements with trap/pot gear, 12 incidental takes in research gillnet gear, 1 stabbing with a screwdriver, 2 entanglements in non-commercial shrimp trawls, 1 entanglement in research longline gear, 2 strandings with visible, external oil, and 1 entrapment between oil booms (see Table 1). Strandings with evidence of fishery related interactions are reported above in the respective gear sections. Bottlenose dolphins are known to become entangled in, or ingest recreational and commercial fishing gear (Wells and Scott 1994; Gorzelany 1998; Wells *et al.* 1998, 2008), and some are struck by vessels (Wells and Scott 1997; Wells *et al.* 2008).

There are a number of difficulties associated with the interpretation of stranding data. Except in rare cases, such as Sarasota Bay, Florida, where residency can be determined, it is possible that some or all of the stranded dolphins may have been from a nearby coastal stock. However, the proportion of stranded dolphins belonging to another stock cannot be determined because of the difficulty of determining from where the stranded carcasses originated. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

Since 1990, there have been 13 bottlenose dolphin die-offs or Unusual Mortality Events (UMEs) in the northern Gulf of Mexico. 1) From January through May 1990, a total of 344 bottlenose dolphins stranded in the northern Gulf of Mexico. Overall this represented a two-fold increase in the prior maximum recorded number of strandings for the same period, but in some locations (i.e., Alabama) strandings were 10 times the average number. The cause of the 1990 mortality event could not be determined (Hansen 1992), however, morbillivirus may have contributed to this event (Litz *et al.* 2014). 2) A UME was declared for Sarasota Bay, Florida, in 1991 involving 31 bottlenose dolphins. The cause was not determined, but it is believed biotoxins may have contributed to this event (Litz *et al.* 2014). 3) In March and April 1992, 119 bottlenose dolphins stranded in Texas - about 9 times the average number. The cause of this event was not determined, but low salinity due to record rainfall combined with pesticide runoff and exposure to morbillivirus were suggested as potential contributing factors (Duignan *et al.* 1996; Colbert *et al.*

1999; Litz *et al.* 2014). 4) In 1993-1994 a UME of bottlenose dolphins caused by morbillivirus started in the Florida Panhandle and spread west with most of the mortalities occurring in Texas (Lipscomb 1993; Lipscomb *et al.* 1994; Litz *et al.* 2014). From February through April 1994, 236 bottlenose dolphins were found dead on Texas beaches, of which 67 occurred in a single 10-day period. 5) In 1996 a UME was declared for bottlenose dolphins in Mississippi when 31 bottlenose dolphins stranded during November and December. The cause was not determined, but a *Karenia brevis* (red tide) bloom was suspected to be responsible. 6) Between August 1999 and May 2000, 150 bottlenose dolphins died coincident with *K. brevis* blooms and fish kills in the Florida Panhandle (additional strandings included 3 Atlantic spotted dolphins, *Stenella frontalis*, 1 Risso's dolphin, *Grampus griseus*, 2 Blainville's beaked whales, *Mesoplodon densirostris*, and 4 unidentified dolphins. Brevetoxin was determined to be the cause of this event (Twiner *et al.* 2012; Litz *et al.* 2014). 7) In March and April 2004, in another Florida Panhandle UME attributed to *K. brevis* blooms, 105 bottlenose dolphins and 2 unidentified dolphins stranded dead (Litz *et al.* 2014). Although there was no indication of a *K. brevis* bloom at the time, high levels of brevetoxin were found in the stomach contents of the stranded dolphins (Flewelling *et al.* 2005; Twiner *et al.* 2012). 8) In 2005, a particularly destructive red tide (*K. brevis*) bloom occurred off central west Florida. Manatee, sea turtle, bird and fish mortalities were reported in the area in early 2005 and a manatee UME had been declared. Dolphin mortalities began to rise above the historical averages by late July 2005, continued to increase through October 2005, and were then declared to be part of a multi-species UME. The multi-species UME extended into 2006, and ended in November 2006. A total of 190 dolphins were involved, primarily bottlenose dolphins (plus strandings of 1 Atlantic spotted dolphin, *S. frontalis*, and 23 unidentified dolphins). The evidence suggests the effects of a red tide bloom contributed to the cause of this event (Litz *et al.* 2014). 9) A separate UME was declared in the Florida Panhandle after elevated numbers of dolphin strandings occurred in association with a *K. brevis* bloom in September 2005. Dolphin strandings remained elevated through the spring of 2006 and brevetoxin was again detected in the tissues of most of the stranded dolphins and determined to be the cause of the event (Twiner *et al.* 2012; Litz *et al.* 2014). Between September 2005 and April 2006 when the event was officially declared over, a total of 88 bottlenose dolphin strandings occurred (plus strandings of 5 unidentified dolphins). 10) During February and March of 2007 an event was declared for northeast Texas and western Louisiana involving 64 bottlenose dolphins and 2 unidentified dolphins. Decomposition prevented conclusive analyses on most carcasses. 11) During February and March of 2008 an additional event was declared in Texas involving 111 bottlenose dolphin strandings (plus strandings of 1 unidentified dolphin and 1 melon-headed whale, *Peponocephala electra*). Most of the animals recovered were in a decomposed state. The investigation is closed and a direct cause could not be identified. However, there were numerous, co-occurring harmful algal bloom toxins detected during the time period of this UME which may have contributed to the mortalities (Fire *et al.* 2011). 12) A UME was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010; and, as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see "Habitat Issues" below), during the spill, and after. During 2010, 43 animals from BSE stocks were considered to be part of the UME; during 2011, 46 animals; during 2012, 28 animals; and during 2013, 39 animals (these totals do not include strandings from Barataria Bay Estuarine System; Mississippi Sound, Lake Borgne, Bay Boudreau; Choctawhatchee Bay; or St. Joseph Bay Stocks). 13) A UME occurred from November 2011 to March 2012 across 5 Texas counties and included 126 bottlenose dolphin strandings. The strandings were coincident with a harmful algal bloom of *K. brevis*, but researchers have not determined that was the cause of the event.

Table 2. Common bottlenose dolphin strandings occurring in bays, sounds and estuaries in the northern Gulf of Mexico from 2009 to 2013, as well as number of strandings for which evidence of human interaction was detected and number of strandings for which it could not be determined (CBD) if there was evidence of human interaction. Data are from the NOAA National Marine Mammal Health and Stranding Response Database (unpublished data, accessed 11 June 2014). Please note human interaction does not necessarily mean the interaction caused the animal's death. Please also note that this table does not include strandings from Barataria Bay Estuarine System; Mississippi Sound, Lake Borgne, Bay Boudreau; Choctawhatchee Bay; or St. Joseph Bay.

Stock	Category	2009	2010	2011	2012	2013	Total
Bay, Sound and Estuary	Total Stranded	72[a]	94[b]	106[c]	124[d]	130[e]	526
	Human Interaction						
	---Yes	18[f]	15[g]	13[h]	23[i]	22[j]	91
	---No	6	7	6	6	4	29
	---CBD	48	72	87	95	104	406

[a] This total includes a mass stranding of 6 animals in Louisiana in June 2009.

[b] This total includes 43 animals that are part of the ongoing UME in the northern Gulf of Mexico.
[c] This total includes 46 animals that are part of the ongoing UME in the northern Gulf of Mexico, and 7 animals that were part of the 2011-2012 UME in Texas.
[d] This total includes 28 animals that are part of the ongoing UME in the northern Gulf of Mexico, and 23 animals that were part of the 2011-2012 UME in Texas.
[e] This total includes 39 animals that are part of the ongoing UME in the northern Gulf of Mexico
[f] Includes 4 entanglement interactions with hook and line gear (2 mortalities and 2 animals released alive without serious injuries) and 1 entanglement in a research trawl (mortality).
[g] Includes 4 entanglement interactions with hook and line gear (3 mortalities and 1 animal released alive seriously injured); 1 entanglement interaction with unidentified trap/pot gear (released alive seriously injured); 2 entanglement interactions with research gillnet gear (1 released alive without serious injury, 1 released alive that could not be determined if seriously injured or not); 1 live release without serious injury following entrapment between oil booms; and 1 animal visibly oiled (mortality).
[h] Includes 4 entanglement interactions with hook and line gear (2 mortalities, 1 animal released alive seriously injured, 1 released alive without serious injury); 2 entanglement interactions with research gillnet gear (1 mortality, 1 released alive without serious injury); 2 entanglement interactions with trap/pot gear (1 mortality, 1 released alive that could not be determined if seriously injured or not); and 1 animal visibly oiled (mortality).
[i] Includes 10 entanglement interactions with hook and line gear (8 mortalities, 2 animals released alive without serious injuries); 4 entanglement interactions with research gillnet gear (1 released alive seriously injured, 3 released alive without serious injury); 1 entanglement in a non-commercial shrimp trawl net (released alive without serious injury); and 1 stabbing (serious injury).
[j] Includes 6 entanglement interactions with hook and line gear (3 mortalities, 1 animal released alive without serious injury, 2 animals released alive that could not be determined if seriously injured or not); 4 entanglement interactions with research gillnet gear (2 mortalities, 1 animal released alive without serious injury, 1 released alive that could not be determined if seriously injured or not); 1 interaction with probable lobster trap/pot gear (released alive, could not be determined if seriously injured or not); and 1 interaction with research longline gear (released alive, seriously injured).

Other Mortality

In addition to animals included in the stranding database, during 2009–2013, there were 22 at-sea observations in BSE stock areas of common bottlenose dolphins entangled in fishing gear or unidentified gear (hook and line, crab trap/pot and unidentified gear/line/rope). During 2009, there were 5 observations (3 seriously injured, 1 not seriously injured, 1 CBD); during 2010, 2 observations (1 seriously injured, 1 CBD); during 2011, 3 observations (2 seriously injured, 1 CBD); during 2012, 5 observations (2 seriously injured, 3 CBD); and during 2013, 7 observations (2 seriously injured, 1 not seriously injured, 4 CBD) (Maze-Foley and Garrison in prep a,b,c).

During 2013 in Alabama (Mobile Bay, Bonsecour Bay Stock), a dolphin was caught by a circle hook during a longline research survey. The animal broke free from the gear, but the hook and ~2 m of trailing line remained attached, and the animal was considered seriously injured (Maze-Foley and Garrison in prep c). During 2012 in Alabama (Perdido Bay Stock), a dolphin was disentangled from a shrimp trawling net being used in a local ecotour. The animal was considered not seriously injured (Maze-Foley and Garrison in prep b). During 2009 in Mobile Bay, Alabama, near the entrance to the Gulf of Mexico, a bottlenose dolphin mortality resulted from an entanglement in the lazy line of a trawl net during an educational trawling cruise operated by a marine science education and research laboratory. This animal likely belonged to the Mobile Bay, Bonsecour Bay Stock. All of these animals were included in the stranding database.

During 2009–2013, 12 dolphins were entangled in research-related gillnets—in Texas (8), Louisiana (2) and Florida (2). During 2013, 2 dolphins were entangled in research-related gillnets in Louisiana (Mississippi River Delta Stock area) and 2 were entangled in Florida (Pine Island Sound, Charlotte Harbor, Gasparilla Sound, Lemon Bay Stock area). Two entanglements resulted in mortalities, 1 animal was released alive not seriously injured, and 1 was released alive but its condition could not be determined (Maze-Foley and Garrison in prep c). During 2012, 4 live animals were entangled and released from research-related gillnets in Texas. One of these animals was seriously injured (in Copano Bay, Aransas Bay, San Antonio Bay, Redfish Bay, Espiritu Santo Bay Stock area), and the other 3 were not seriously injured (1 in Neuces Bay, Corpus Christi Bay Stock area, 1 in Copano Bay, Aransas Bay, San Antonio Bay, Redfish Bay, Espiritu Santo Bay Stock area, 1 in Laguna Madre Stock area [Maze-Foley and Garrison in prep b]). During 2011, 1 research-related gillnet mortality occurred, and 1 live animal was entangled and released without serious injury (Maze-Foley and Garrison in prep a). Both of these interactions occurred in the Copano Bay, Aransas Bay, San Antonio Bay, Redfish Bay, Espiritu Santo Bay Stock area. During 2010, 2 animals were entangled and released from research-related gillnets in Texas. One of these animals was not seriously injured and for the other, it could not be determined if the animal was seriously injured (Maze-Foley and Garrison in prep a). Both of these interactions occurred in the Copano Bay, Aransas Bay, San Antonio Bay, Redfish Bay, Espiritu Santo Bay Stock area. All of these interactions were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). Historically, during 2008, 1 live animal was entangled and released without serious injuries from a research-related gillnet in the Matagorda Bay, Tres Palacios Bay, Lavaca Bay Stock area (not included in stranding database). Four mortalities resulted from gillnet entanglements in research gear off Texas and Louisiana during 2003, 2004, 2006 and 2007. Three of the mortalities were a result of fisheries sampling and research in Texas, and 1 mortality (2006) occurred during a gulf sturgeon research project in Louisiana. These 4 animals likely belonged to the following BSE stocks: Copano Bay, Aransas Bay, San Antonio Bay, Redfish Bay, Espiritu Santo Bay Stock (2003, 2004 mortalities); Mississippi River Delta Stock (2006 mortality); and Matagorda Bay, Tres Palacios Bay, Lavaca Bay Stock (2007 mortality). These 4 mortalities were included in the stranding database.

The problem of dolphin depredation of fishing gear is increasing in Gulf of Mexico coastal and estuary waters. There have been 4 recent cases of fishermen illegally taking dolphins due to dolphin depredation of recreational and commercial fishing gear. One recent case of a shrimp fisherman illegally taking a dolphin in Mississippi Sound occurred during summer 2012. In December 2013 the fisherman was convicted under the MMPA for knowingly shooting a dolphin with a shotgun while shrimping. A commercial fisherman was indicted in November 2008 for throwing pipe bombs at dolphins off Panama City, Florida, and charged in March 2009 for taking dolphins with an explosive device. In 2006 a charter boat fishing captain was charged under the MMPA for shooting at a dolphin that was swimming around his catch in the Gulf of Mexico, off Panama City, Florida. In 2007 a second charter fishing boat captain was fined under the MMPA for shooting at a bottlenose dolphin that was attempting to remove a fish from his line in the Gulf of Mexico, off Orange Beach, Alabama.

During 2012 a dolphin was observed swimming in Perdido Bay with a screwdriver protruding from its melon and was found dead the next day. This stabbing was included in the stranding database.

Illegal feeding or provisioning of wild bottlenose dolphins has been documented in Florida, particularly near Panama City Beach in the Panhandle (Samuels and Bejder 2004) and in and near Sarasota Bay (Cunningham-Smith *et al.* 2006; Powell and Wells 2011), and also in Texas near Corpus Christi (Bryant 1994). Feeding wild dolphins is defined under the MMPA as a form of 'take' because it can alter their natural behavior and increase their risk of injury or death. Nevertheless, a high rate of provisioning was observed near Panama City Beach in 1998 (Samuels and Bejder 2004), and provisioning has been observed south of Sarasota Bay since 1990 (Cunningham-Smith *et al.* 2006; Powell and Wells 2011). There are emerging questions regarding potential linkages between provisioning and depredation of recreational fishing gear and associated entanglement and ingestion of gear, which is increasing through much of Florida. During 2006, at least 2% of the long-term resident dolphins of Sarasota Bay died from ingestion of recreational fishing gear (Powell and Wells 2011).

Swimming with wild bottlenose dolphins has also been documented in Florida in Key West (Samuels and Engleby 2007) and near Panama City Beach (Samuels and Bejder 2004). Near Panama City Beach, Samuels and Bejder (2004) concluded that dolphins were amenable to swimmers due to illegal provisioning. Swimming with wild dolphins may cause harassment, and harassment is illegal under the MMPA.

As noted previously, bottlenose dolphins are known to be struck by vessels (Wells and Scott 1997; Wells *et al.* 2008). During 2009–2013, 23 stranded bottlenose dolphins (of 525 total strandings) showed signs of a boat collision (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). It is possible some of the instances were post-mortem collisions. In addition to vessel collisions, the presence of vessels may also impact bottlenose dolphin behavior in bays, sounds and estuaries. Nowacek *et al.* (2001) reported that boats pass within 100m of each bottlenose dolphin in Sarasota Bay once every 6 minutes on average, leading to changes in dive patterns and group cohesion. Buckstaff (2004) noted changes in communication patterns of Sarasota Bay dolphins when boats approached. Miller *et al.* (2008) investigated the immediate responses of bottlenose dolphins to "high-speed personal watercraft" (i.e., boats) in Mississippi Sound. They found an immediate impact on dolphin behavior demonstrated by an increase in traveling behavior and dive duration, and a decrease in feeding behavior for non-traveling groups. The findings suggested dolphins attempted to avoid high-speed personal watercraft. It is unclear whether repeated short-term effects will result in long-term consequences like reduced health and viability of dolphins. Further studies are needed to determine the impacts throughout the Gulf of Mexico.

As part of its annual coastal dredging program, the Army Corps of Engineers conducts sea turtle relocation trawling during hopper dredging as a protective measure for marine turtles. No interactions have been documented during the most recent 5 years, 2009–2013, except for 1 interaction within the boundaries of the Mississippi Sound, Lake Borgne, Bay Boudreau Stock (please see that SAR for details). However, in earlier years, 5 incidents were documented in the Gulf of Mexico involving bottlenose dolphins and relocation trawling activities. Four of the incidents were mortalities, and 1 occurred during each of the following years: 2003, 2005, 2006 and 2007. It is likely that 2 of these animals belonged to the Western Coastal Stock (2005, 2007) and 2 animals belonged to BSE stocks (2003, 2006). An additional incident occurred during 2006 in which the dolphin became free during net retrieval and was observed swimming away normally. It is likely this animal belonged to a BSE stock.

Two dolphin research-related mortalities have occurred during health-assessment projects in past years. During November 2002 in Sarasota Bay, Florida, a 35-year-old male died during a health assessment research project. The histopathology report stated that drowning was the cause of death. However, the necropsy revealed that the animal was in poor condition as follows: anemic, thin (ribs evident, blubber thin and grossly lacking lipid), no food in the stomach and little evidence of recent feeding in the digestive tract, vertebral fractures with muscle atrophy, and with additional conditions present. This has been the only such loss during capture/release research conducted over a 43-year period on Florida's central west coast. Another research-related mortality occurred during July 2006 in St. Joseph Bay, in the Florida Panhandle, during a NMFS health assessment research project to investigate a series of UMEs in the region. The animal became entangled deep in the capture net and was found dead during extrication of other animals from the net. The cause of death was determined to be asphyxiation.

Some of the BSE communities were the focus of a live-capture fishery for bottlenose dolphins which supplied dolphins to the U.S. Navy and to oceanaria for research and public display for more than 2 decades ending in 1989 (NMFS unpublished data). During the period 1972-1989, 490 bottlenose dolphins, an average of 29 dolphins annually, were removed from a few locations in the Gulf of Mexico, including the Florida Keys, Charlotte Harbor, Tampa Bay and elsewhere. Mississippi Sound sustained the highest level of removals with 202 dolphins taken from this stock during this period, representing 41% of the total and an annual average of 12 dolphins (compared to a previous PBR of 13). The annual average number of removals never exceeded previous PBR levels, but it may be biologically significant that 73% of the dolphins removed during 1982-1988 were females. The impact of these removals on the stocks is unknown.

HABITAT ISSUES

The *Deepwater Horizon* (DWH) MC252 drilling platform, located approximately 50 miles southeast of the Mississippi River Delta in waters about 1500 m deep, exploded on 20 April 2010. The rig sank, and over 87 days up to ~4.9 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (McNutt *et al.* 2012). During the response effort dispersants were applied extensively at the seafloor and at the sea surface (Lehr *et al.* 2010; OSAT 2010). In-situ burning, or controlled burning of oil at the surface, was also used extensively as a response tool (Lehr *et al.* 2010). The oil, dispersant and burn residue compounds present ecological concerns (Buist *et al.* 1999; NOAA 2011). The magnitude of this oil spill was unprecedented in U.S. history, causing impacts to wildlife, natural habitats and human communities along coastal areas from western Louisiana to the Florida Panhandle (NOAA 2011). It could be years before the entire scope of damage is ascertained (NOAA 2011).

A substantial number of beaches and wetlands along the Louisiana coast experienced heavy or moderate oiling (OSAT-2 2011; Michel *et al.* 2013). The heaviest oiling in Louisiana occurred west of the Mississippi River on the Mississippi Delta and in Barataria and Terrebonne Bays, and to the east of the river on the Chandeleur Islands. Some heavy to moderate oiling occurred on Alabama and Florida beaches, with the heaviest stretch occurring from Dauphin Island, Alabama, to Gulf Breeze, Florida. Light to trace oil was reported along the majority of Mississippi's mainland coast, from Gulf Breeze to Panama City, Florida, and outside of Atchafalaya and Vermilion Bays in western Louisiana. Heavy to light oiling occurred on Mississippi's barrier islands (Michel *et al.* 2013). Thus, it is likely that some BSE stocks were exposed to oil. Dolphins were observed with tar balls attached to them and seen swimming through oil slicks close to shore and inland bays. The effects of oil exposure on marine mammals depend on a number of factors including the type and mixture of chemicals involved, the amount, frequency and duration of exposure, the route of exposure (inhaled, ingested, absorbed, or external) and biomedical risk factors of the particular animal (Geraci 1990). In general, direct external contact with petroleum compounds or dispersants with skin may cause skin irritation, chemical burns and infections. Inhalation of volatile petroleum compounds or dispersants may irritate or injure the respiratory tract, which could lead to pneumonia or inflammation. Ingestion of petroleum compounds may cause injury to the gastrointestinal tract, which could affect an animal's ability to digest or absorb food. Absorption of petroleum compounds or dispersants may damage kidney, liver and brain function in addition to causing immune suppression and anemia. Long term chronic effects such as lowered reproductive success and decreased survival may occur (Geraci 1990).

Shortly after the oil spill, the Natural Resource Damage Assessment (NRDA) process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies are being conducted to determine potential impacts of the spill on marine mammals. These studies have focused on identifying the type, magnitude, severity, length and impact of oil exposure to oceanic, continental shelf, coastal and estuarine marine mammals. The research is ongoing. For coastal and estuarine dolphins, the NOAA-led efforts include: active surveillance to detect stranded animals in remote locations; aerial surveys to document the distribution, abundance, species and exposure relative to oil from the DWH spill; assessment of sublethal and chronic health impacts on coastal and estuarine bottlenose dolphins in Barataria Bay, Louisiana, Mississippi Sound, and a reference site in Sarasota Bay, Florida; and assessment of injuries to dolphin stocks in Barataria Bay and Chandeleur Sound, Louisiana, Mississippi Sound, and as a reference site, St. Joseph Bay, Florida.

The nearshore habitat occupied by many of these stocks is adjacent to areas of high human population, and in some bays, such as Mobile Bay in Alabama and Galveston Bay in Texas, is highly industrialized. The area surrounding Galveston Bay, for example, has a coastal population of over 3 million people. More than 50% of all chemical products manufactured in the U.S. are produced there, and 17% of the oil produced in the Gulf of Mexico is refined there (Henningsen and Würsig 1991). Many of the enclosed bays in Texas are surrounded by agricultural lands which receive periodic pesticide applications.

Concentrations of chlorinated hydrocarbons and metals were examined in conjunction with an anomalous mortality event of bottlenose dolphins in Texas bays in 1990 and found to be relatively low in most; however, some had concentrations at levels of possible toxicological concern (Varanasi *et al.* 1992). No studies to date have determined the amount, if any, of indirect human-induced mortality resulting from pollution or habitat degradation.

Analyses of organochlorine concentrations in the tissues of bottlenose dolphins in Sarasota Bay, Florida, have found that the concentrations in male dolphins exceeded toxic threshold values that may result in adverse effects on health or reproductive rates (Schwacke *et al.* 2002). Studies of contaminant concentrations relative to life history parameters showed higher levels of mortality in first-born offspring, and higher contaminant concentrations in these calves and in primiparous females (Wells *et al.* 2005). While there are no direct measurements of adverse effects of pollutants on estuary dolphins, the exposure to environmental pollutants and subsequent effects on population health are areas of concern and active research.

STATUS OF STOCKS

The status of these stocks relative to OSP is unknown and this species is not listed as threatened or endangered under the Endangered Species Act. The occurrence of 13 Unusual Mortality Events (UMEs) among common bottlenose dolphins along the northern Gulf of Mexico coast since 1990 (Litz *et al.* 2014; NMFS unpublished data) is cause for concern. Notably, stock areas in Louisiana, Mississippi, Alabama and the western Florida panhandle have been impacted by a UME of unprecedented size and duration (began 1 February 2010, and as of September 2014, is still ongoing). However, the effects of the mortality events on stock abundance have not yet been determined, in large part because it has not been possible to assign mortalities to specific stocks due to a lack of empirical information on stock identification.

The relatively high number of bottlenose dolphin deaths that occurred during the mortality events since 1990 suggests that some of these stocks may be stressed. Human-caused mortality and serious injury for each of these stocks is not known. Considering the evidence from stranding data (Table 2) and the low PBRs for stocks with recent abundance estimates, the total fishery-related mortality and serious injury likely exceeds 10% of the total known PBR or previous PBR, and therefore, it is probably not insignificant and not approaching the zero mortality and serious injury rate. NMFS considers each of these stocks to be strategic because most of the stock sizes are currently unknown, but likely small and relatively few mortalities and serious injuries would exceed PBR.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*)
Barataria Bay Estuarine System Stock

NOTE – NMFS is in the process of writing individual stock assessment reports for each of the 31 bay, sound and estuary stocks of common bottlenose dolphins in the Gulf of Mexico. Until this effort is completed and 31 individual reports are available, some of the basic information presented in this report will also be included in the report: "Northern Gulf of Mexico Bay, Sound and Estuary Stocks".

STOCK DEFINITION AND GEOGRAPHIC RANGE

Common bottlenose dolphins are distributed throughout the bays, sounds and estuaries of the Gulf of Mexico (Mullin 1988). Long-term (year-round, multi-year) residency by at least some individuals has been reported from nearly every site where photographic identification (photo-ID) or tagging studies have been conducted in the Gulf of Mexico (e.g., Irvine and Wells 1972; Shane 1977; Gruber 1981; Irvine *et al.* 1981; Wells 1986; Wells *et al.* 1987; Scott *et al.* 1990; Shane 1990; Wells 1991; Bräger 1993; Bräger *et al.* 1994; Fertl 1994; Wells *et al.* 1996a,b; Wells *et al.* 1997; Weller 1998; Maze and Würsig 1999; Lynn and Würsig 2002; Wells 2003; Hubard *et al.* 2004; Irwin and Würsig 2004; Shane 2004; Balmer *et al.* 2008; Urian *et al.* 2009; Bassos-Hull *et al.* 2013). In many cases, residents occur predominantly within estuarine waters, with limited movements through passes to the Gulf of Mexico (Shane 1977; Shane 1990; Gruber 1981; Irvine *et al.* 1981; Shane 1990; Maze and Würsig 1999; Lynn and Würsig 2002; Fazioli *et al.* 2006; Bassos-Hull *et al.* 2013). Early studies indicating year-round residency in bays in both the eastern and western Gulf of Mexico led to the delineation of 33 bay, sound and estuary (BSE) stocks, including Barataria Bay, with the first stock assessment reports published in 1995.

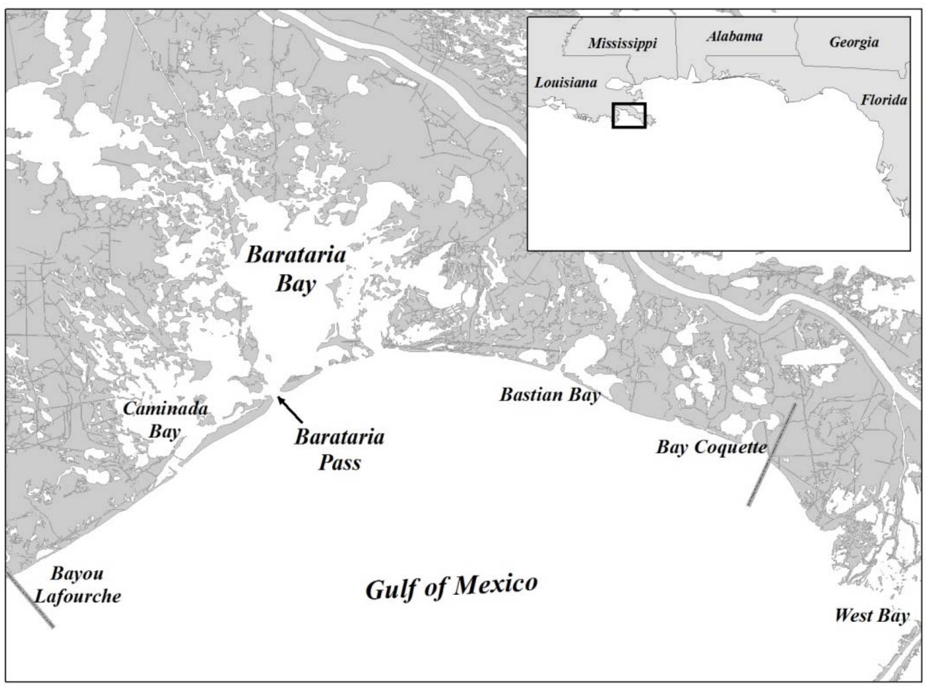

Figure 1. *Geographic extent of the Barataria Bay Estuarine System (BBES) Stock, located on the coast of Louisiana. The borders are denoted by solid lines.*

More recently, genetic data also support the concept of relatively discrete BSE stocks (Duffield and Wells 2002; Sellas *et al.* 2005). Sellas *et al.* (2005) examined population subdivision among dolphins sampled in Sarasota Bay, Tampa Bay, and Charlotte Harbor, Florida; Matagorda Bay, Texas; and the coastal Gulf of Mexico (1-12 km offshore) from just outside Tampa Bay to the south end of Lemon Bay, and found evidence of significant population differentiation among all areas on the basis of both mitochondrial DNA control region sequence data and 9 nuclear microsatellite loci. The Sellas *et al.* (2005) findings support the identification of BSE populations distinct from those occurring in adjacent Gulf coastal waters. Differences in reproductive seasonality from site to site also suggest genetic-based distinctions among areas (Urian *et al.* 1996). Photo-ID and genetic data from several inshore areas of the southeastern United States also support the existence of resident estuarine animals and a differentiation between animals biopsied along the Atlantic coast and those biopsied within estuarine systems at the same latitude (Caldwell 2001; Gubbins 2002; Zolman 2002; Mazzoil *et al.* 2005; Litz 2007; Rosel *et al*. 2009; NMFS unpublished).

Barataria Bay is a shallow (mean depth=2 m) estuarine system located in central Louisiana. It is bounded in the west by Bayou Lafourche, in the east by the Mississippi River delta and in the south by the Grand Terre barrier islands. Barataria Bay is approximately 110 km in length and 50 km in width at its widest point where it opens into the Gulf of Mexico (Conner and Day 1987). This estuarine system is connected to the Gulf of Mexico by a series of passes: Caminada Pass, Barataria Pass, Pass Abel and Quatre Bayou Pass. The margins of Barataria Bay include marshes, canals, small embayments and channels. Bay waters are turbid, and salinity varies widely from south to north with the more saline, tidally influenced portions in the south and freshwater lakes in the north (U.S. EPA 1999; Moretzsohn *et al*. 2010). Miller and Baltz (2009) reported salinity varied seasonally and averaged 22.77 psu (practical salinity unit) in lower Barataria and Caminada Bays (data collected during dolphin sightings). Barataria Bay, together with the Timbalier-Terrebonne Bay system (referred to as the Barataria-Terrebonne National Estuary Program), has been selected as an estuary of national significance by the Environmental Protection Agency National Estuary Program (see http://www.btnep.org/BTNEP/home.aspx). The marshes and swamp forests which characterize Barataria Bay supply breeding and nursery grounds for an assortment of commercial and recreational species of consequence, such as finfish, shellfish, alligators, songbirds, geese and ducks (U.S. EPA 1999; Moretzsohn *et al*. 2010). The Barataria basin also produces a significant part of U.S. petroleum resources and is an important commercial harbor (Conner and Day 1987). High industrial and commercial use of the area and human alteration have resulted in environmental degradation and habitat loss. The most serious environmental issues facing the estuarine system include loss of coastal wetlands, eutrophication, barrier island erosion, saltwater intrusion and introduction of toxic substances (Conner and Day 1987; Barras *et al*. 2003).

The Barataria Bay Estuarine System (BBES) Stock area includes Caminada Bay, Barataria Bay, Bastian Bay and Bay Coquette (Figure 1). During June 1999 – May 2002, Miller (2003) conducted 44 boat-based, photo-ID surveys in lower Barataria and Caminada Bays. Dolphins were present year-round, and 133 individual dolphins were identified. One individual was sighted 6 times, but most individuals, 58%, were sighted only once. Using a fine-scale microhabitat approach, Miller and Baltz (2009) described foraging habitat of bottlenose dolphins in Barataria Bay. Significant differences in temperature, group size, season and turbidity differentiated foraging sites from non-foraging sites. Foraging was more often observed in waters 200-500 m from shore in 4-6 m depth and at salinity values of approximately 20 psu. Additional study is needed to further describe the population of bottlenose dolphins inhabiting the BBES. The current stock boundary does not include any coastal waters outside of the barrier islands. Further research is needed to determine the degree to which dolphins of this stock utilize nearshore coastal waters outside Barataria Bay. This stock boundary is subject to change upon further study of dolphin residency patterns in estuarine waters of Louisiana. Information on the use of coastal waters will be important when considering exposure to coastal fisheries as estuarine animals that make use of nearshore coastal waters would be at risk of entanglement in fishing gear while moving along the coast. Ongoing NOAA photo-ID surveys initiated in 2010, as well as data from tracking of 44 bottlenose dolphins tagged with satellite-linked transmitters in and around Barataria Bay in August 2011, June 2013 and June 2014 will address some of these issues as the data become available.

Dolphins residing in the estuaries southeast of this stock between BBES and the Mississippi River mouth (West Bay) are not currently covered in any stock assessment report. There are insufficient data to determine whether animals in this region exhibit affiliation to the BBES stock or should be delineated as their own stock. Further research is needed to establish affinities of dolphins in this region. It should be noted that in this region during 2009–2013, no bottlenose dolphins were reported stranded.

POPULATION SIZE

The total number of common bottlenose dolphins residing within the BBES Stock is unknown. Miller (2003) conducted boat-based, photo-ID surveys in lower Barataria and Caminada Bays from June 1999 to May 2002. Miller (2003) identified 133 individual dolphins, and using closed-population unequal catchability models in the program CAPTURE, produced an abundance estimate of 138-238 (128-297, 95% CI). Miller's (2003) estimate covered only a portion of the area of the BBES stock and did not include a correction for the unmarked portion of the population. Therefore, the estimate is considered negatively biased. Also, this estimate is considered outdated due to being more than 8 years old.

Minimum Population Estimate

Published data are insufficient to calculate a minimum population estimate for the BBES Stock of common bottlenose dolphins.

Current Population Trend

One abundance estimate is available for this stock, and therefore there are insufficient data to assess population trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of the BBES Stock of common bottlenose dolphins is unknown. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is of unknown status. PBR for this stock of bottlenose dolphins is undetermined.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the BBES Stock of common bottlenose dolphins during 2009–2013 is unknown because this stock is known to interact with unobserved fisheries (see below), and also because the most current observer data for the shrimp trawl fishery are for 2007-2011 and mortality rates were calculated at the state level (see Shrimp Trawl section below). The mean annual fishery-related mortality and serious injury during 2009–2013 for strandings and at-sea observations identified as fishery-caused was 0.8. No additional mortality or serious injury was documented from other human-caused actions. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 0.8. This does not include an estimate for the commercial shrimp trawl fishery.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category II Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl; and Gulf of Mexico menhaden purse seine fisheries; and the Category III Gulf of Mexico blue crab trap/pot; and Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fisheries (Appendix III). Brown shrimp, white shrimp, blue crab and menhaden fisheries are all important commercial fisheries in the Barataria Bay region. The menhaden purse seine fishery is an important fishery in Gulf of Mexico coastal waters just outside the barrier islands of Barataria Bay. It has the potential to interact with dolphins of this stock that use nearshore coastal waters.

Shrimp Trawl

Between 1997 and 2011, 5 common bottlenose dolphins and 7 unidentified dolphins, which could have been either common bottlenose dolphins or Atlantic spotted dolphins, became entangled in the lazy line, turtle excluder device or tickler chain gear in the commercial shrimp trawl fishery in the Gulf of Mexico. All dolphin bycatch interactions resulted in mortalities except for 1 unidentified dolphin that was released alive in 2009. Soldevilla *et al.* (2015) provide mortality estimates calculated from analysis of shrimp fishery effort data and NMFS's Observer Program bycatch data. Observer program coverage does not extend into BSE waters; time-area stratified bycatch rates were extrapolated into inshore waters to estimate bycatch mortalities from inshore fishing effort. Annual mortality estimates were calculated for the years 1997-2011 from stratified annual fishery effort and bycatch rates, and a 5-year unweighted mean mortality estimate for 2007-2011 was calculated for Gulf of Mexico dolphin stocks. The 4-area (Texas, Louisiana, Mississippi/Alabama, Florida) stratification method was chosen because it best approximates how fisheries operate (Soldevilla *et al.* 2015). The BSE stock mortality estimates were aggregated at the state level as this was the spatial resolution at which fishery effort is modeled (e.g., Nance *et al.* 2008). The mean annual mortality estimate for Louisiana BSE stocks (from Sabine Lake east to Barataria Bay) was 88 (CV=1.01). This estimate does not include skimmer trawl effort, which may represent up to 50% of shrimp fishery effort in Louisiana, Alabama, and Mississippi inshore waters, because Observer Program coverage of skimmer trawls is limited. Limitations and biases of annual bycatch mortality estimates are described in detail in Soldevilla *et al.* (2015).

Blue Crab Trap/Pot

During 2009–2013 there were 2 documented interactions in trap/pot gear. There was 1 documented mortality (in 2011) of a common bottlenose dolphin in commercial blue crab trap/pot gear, and 1 live animal (in 2012) was disentangled from commercial blue crab trap/pot gear and released, considered not seriously injured (Maze-Foley and Garrison in prep b). Both the mortality and live release were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and in the totals presented in Table 1. There is no systematic observer coverage of crab trap/pot fisheries, so it is not possible to quantify total mortality.

Hook and Line

During 2009–2013, there were 4 documented interactions with hook and line gear in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014; Table 1). In 2011, hook and line gear entanglement or ingestion were documented for 1 mortality and 1 animal released alive without serious injury (Maze-Foley and Garrison in prep a). In 2013, 2 live releases without serious injury involved dolphins found with hook and line gear on them during a live-capture-release health assessment (Maze-Foley and Garrison in prep c).

In addition to animals included in the stranding database, during 2009–2013, there were 2 at-sea observations in Barataria Bay of dolphins entangled in fishing gear (monofilament line). The observations occurred during 2011 and 2012, and both dolphins were considered seriously injured (Maze-Foley and Garrison in prep a,b).

It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Other Mortality

From 2009 to 2013, 92 common bottlenose dolphins were reported stranded within the BBES (Table 1; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). It could not be determined if there was evidence of human interaction for 65 of these strandings. For 10 dolphins, no evidence of human interaction was detected. Evidence of human interactions was detected for 17 stranded dolphins, 8 of which stranded visibly oiled. In addition, there were 2 entanglements with commercial blue crab trap/pot gear, 4 entanglements with hook and line gear, and 1 gunshot wound (see Table 1). Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al.* 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

In addition to animals included in the stranding database, during 2009–2013, there was 1 at-sea observation during 2013 in Barataria Bay of a dolphin entangled around the head in a plastic packing strap that was constricting, and this animal was considered seriously injured (Maze-Foley and Garrison in prep c).

An Unusual Mortality Event (UME) was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010; and, as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see "Habitat Issues" below), during the spill, and after. During 2010-2013, all 92 stranded dolphins from this stock were considered to be part of the UME. One earlier mortality event that occurred from January through May 1990 and included 344 bottlenose dolphin strandings in the northern Gulf of Mexico may have affected the BBES Stock as well. Strandings were reported in the Barataria Bay area during the time of the 1990 mortality event, but there is little information available on the impact of the event on the BBES Stock. The cause of the 1990 mortality event could not be determined (Hansen 1992), however, morbillivirus may have contributed to this event (Litz *et al.* 2014).

The problem of dolphin depredation of fishing gear is increasing in Gulf of Mexico coastal and estuary waters and illegal feeding or provisioning of wild bottlenose dolphins has been documented in Florida and Texas (Bryant 1994; Samuels and Bejder 2004; Cunningham-Smith *et al.* 2006; Powell and Wells 2011). There are emerging questions regarding potential linkages between provisioning and depredation of recreational fishing gear and associated entanglement and ingestion of gear. To date there are no records of depredation or provisioning for this stock area however.

Table 1. Common bottlenose dolphin strandings occurring in the Barataria Bay Estuarine System Stock area from 2009 to 2013, as well as number of strandings for which evidence of human interaction (HI) was detected and number of strandings for which it could not be determined (CBD) if there was evidence of human interaction. Data are from the NOAA National Marine Mammal Health and Stranding Response Database (unpublished data, accessed 11 June 2014). Please note human interaction does not necessarily mean the interaction caused the animal's death.

Stock	Category	2009	2010	2011	2012	2013	Total
Barataria Bay Estuarine System Stock	Total Stranded	0	22[a]	36[a]	17[a]	17[a]	92
	Human Interaction						
	---Yes	0	1[b]	11[c]	2[d]	3[e]	17
	---No	0	2	6	2	0	10
	---CBD	0	19	19	13	14	65

[a] All strandings were part of the ongoing UME event in the northern Gulf of Mexico.
[b] This animal stranded visibly oiled (mortality).
[c] Includes six animals stranded visibly oiled (mortalities), 1entanglement in commercial blue crab pot gear (mortality), and 2 entanglement interactions with hook and line gear (1 mortality and 1 animal released alive without serious injury).
[d] Includes 1 animal that stranded visibly oiled and also had a gunshot wound (mortality), and 1 entanglement interaction with commercial blue crab trap/pot gear (released alive without serious injury).
[e] Includes 2 entanglement interactions with hook and line gear (both were released alive without serious injury).

HABITAT ISSUES

The *Deepwater Horizon* (DWH) MC252 drilling platform, located approximately 50 miles southeast of the Mississippi River Delta in waters about 1500 m deep, exploded on 20 April 2010. The rig sank, and over 87 days up to ~4.9 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (McNutt *et al.* 2012). During the response effort dispersants were applied extensively at the seafloor and at the sea surface (Lehr *et al*. 2010; OSAT 2010). In-situ burning, or controlled burning of oil at the surface, was also used extensively as a response tool (Lehr *et al*. 2010). The oil, dispersant and burn residue compounds present ecological concerns (Buist *et al.* 1999; NOAA 2011). The magnitude of this oil spill was unprecedented in U.S. history, causing impacts to wildlife, natural habitats and human communities along coastal areas from western Louisiana to the Florida Panhandle (NOAA 2011). It could be years before the entire scope of damage is ascertained (NOAA 2011).

A substantial number of beaches and wetlands along the Louisiana coast experienced heavy or moderate oiling (OSAT-2 2011; Michel *et al.* 2013). The heaviest oiling in Louisiana occurred west of the Mississippi River on the Mississippi Delta and in Barataria and Terrebonne Bays, and to the east of the river on the Chandeleur Islands. Some heavy to moderate oiling occurred on Alabama and Florida beaches, with the heaviest stretch occurring from Dauphin Island, Alabama, to Gulf Breeze, Florida. Light to trace oil was reported along the majority of Mississippi's mainland coast, from Gulf Breeze to Panama City, Florida, and outside of Atchafalaya and Vermilion Bays in western Louisiana. Heavy to light oiling occurred on Mississippi's barrier islands (Michel *et al.* 2013).

Shortly after the oil spill, the Natural Resource Damage Assessment (NRDA) process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies are being conducted to determine potential impacts of the spill on marine mammals. These studies have focused on identifying the type, magnitude, severity, length and impact of oil exposure to oceanic, continental shelf, coastal and estuarine marine mammals. The research is ongoing. For coastal and estuarine dolphins, the NOAA-led efforts include: active surveillance to detect stranded animals in remote locations; aerial surveys to document the distribution, abundance, species and exposure relative to oil from the DWH spill; assessment of sublethal and chronic health impacts on coastal and estuarine common bottlenose dolphins in Barataria Bay, Louisiana, Mississippi Sound, and a reference site in Sarasota Bay, Florida; and assessment of injuries to dolphin stocks in Barataria Bay and Chandeleur Sound, Louisiana, Mississippi Sound, and as a reference site, St. Joseph Bay, Florida.

During August 2011, a capture-and-release health assessment was conducted on bottlenose dolphins in Barataria Bay and a reference site (Sarasota Bay). Preliminary findings from the NRDA health assessment indicate the health of many of the dolphins is compromised (Schwacke *et al.* 2014). Barataria Bay dolphins were 5 times more likely to have moderate-severe lung disease and many showed evidence of compromised adrenal function. Based on the observed disease conditions, 17% of the dolphins sampled in Barataria Bay were given a poor prognosis, indicating that they would likely not survive. The disease conditions in Barataria Bay dolphins were greater in prevalence and severity as compared to the reference site, as well as compared to disease previously reported in other wild populations (Schwacke *et al.* 2014).

The effects of oil exposure on marine mammals depend on a number of factors including the type and mixture of chemicals involved, the amount, frequency and duration of exposure, the route of exposure (inhaled, ingested, absorbed, or external) and biomedical risk factors of the particular animal (Geraci 1990). In general, direct external contact with petroleum compounds or dispersants with skin may cause skin irritation, chemical burns and infections. Inhalation of volatile petroleum compounds or dispersants may irritate or injure the respiratory tract, which could lead to pneumonia or inflammation. Ingestion of petroleum compounds may cause injury to the gastrointestinal tract, which could affect an animal's ability to digest or absorb food. Absorption of petroleum compounds or dispersants may damage kidney, liver and brain function in addition to causing immune suppression and anemia. Long term chronic effects such as lowered reproductive success and decreased survival may occur (Geraci 1990).

Besides oil exposure, another habitat concern for BBES Stock dolphins is the degradation and loss of wetland habitat within the Barataria Bay Estuarine System. Wetland loss can be attributed to both natural processes and human activities (Committee on the Future of Coastal Louisiana 2002; Louisiana Coastal Wetlands Conservation and Restoration Task Force 2012). Natural erosional processes include herbivory, subsidence, sea-level rise, storms, winds and tides, and human activities include levee construction, channelization (navigational channels and oil and gas canals) and development. Critical problems contributing to wetland loss are considered to be the loss of freshwater and sediment input from the Mississippi River due to levee construction, and barrier island erosion. These problems result in land loss, changes in vegetation and increased salinity in lower Barataria Bay. As wetlands disappear, productivity and biodiversity of the Barataria Bay Estuarine System decrease (Committee on the Future of Coastal Louisiana 2002; Louisiana Coastal Wetlands Conservation and Restoration Task Force 2012).

STATUS OF STOCK

Common bottlenose dolphins are not listed as threatened or endangered under the Endangered Species Act. Because the stock size is currently unknown, but likely small and relatively few mortalities and serious injuries would exceed PBR, NMFS considers this a strategic stock. Additionally, because a UME of unprecedented size and duration (began 1 February 2010 and is ongoing) has impacted the northern Gulf of Mexico, including Barataria Bay, and because the health assessment findings of Schwacke *et al.* (2014) indicate compromised health of dolphins sampled within Barataria Bay, NMFS finds cause for concern about this stock. The total human-caused mortality and serious injury for this stock is unknown and there is insufficient information available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching zero mortality and serious injury rate. The status of the BBES stock relative to OSP is unknown. There are insufficient data to determine population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*) Mississippi Sound, Lake Borgne, Bay Boudreau Stock

NOTE – NMFS is in the process of writing individual stock assessment reports for each of the 31 bay, sound and estuary stocks of common bottlenose dolphins in the Gulf of Mexico. Until this effort is completed and 31 individual reports are available, some of the basic information presented in this report will also be included in the report: "Northern Gulf of Mexico Bay, Sound and Estuary Stocks".

STOCK DEFINITION AND GEOGRAPHIC RANGE

Common bottlenose dolphins are distributed throughout the bays, sounds and estuaries of the northern Gulf of Mexico (Mullin 1988). Long-term (year-round, multi-year) residency by at least some individuals has been reported from nearly every site where photographic identification (photo-ID) or tagging studies have been conducted in the Gulf of Mexico (e.g., Irvine and Wells 1972; Shane 1977; Gruber 1981; Irvine *et al.* 1981; Wells 1986; Wells *et al.* 1987; Scott *et al.* 1990; Shane 1990; Wells 1991; Bräger 1993; Bräger *et al.* 1994; Fertl 1994; Wells *et al.* 1996a,b; Wells *et al.* 1997; Weller 1998; Maze and Würsig 1999; Lynn and Würsig 2002; Wells 2003; Hubard *et al.* 2004; Irwin and Würsig 2004; Shane 2004; Balmer *et al.* 2008; Urian *et al.* 2009; Bassos-Hull *et al.* 2013). In many cases, residents occur predominantly within estuarine waters, with limited movements through passes to the Gulf of Mexico (Shane 1977; Shane 1990; Gruber 1981; Irvine *et al.* 1981; Shane 1990; Maze and Würsig 1999; Lynn and Würsig 2002; Fazioli *et al.* 2006; Bassos-Hull *et al.* 2013). Early studies indicating year-round residency in bays in both the eastern and western Gulf of Mexico led to the delineation of 33 bay, sound and estuary (BSE) stocks, including Mississippi Sound, Lake Borgne, Bay Boudreau, with the first stock assessment reports published in 1995.

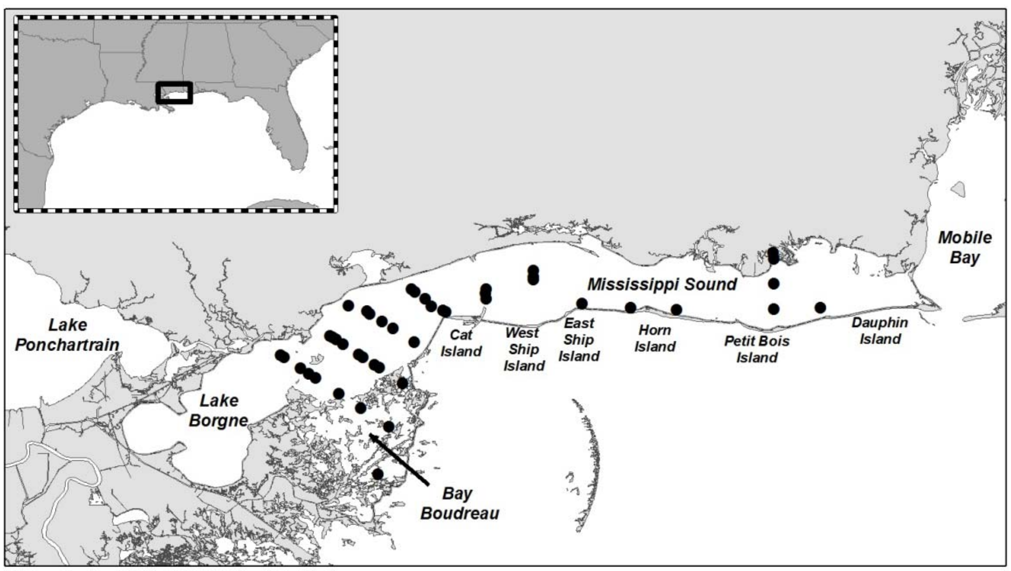

Figure 1. *Geographic extent of the Mississippi Sound, Lake Borgne, Bay Boudreau Stock, located on the coasts of Alabama, Mississippi and Louisiana. Dark circles indicate sightings of common bottlenose dolphins during aerial surveys conducted in spring, summer and fall of 2011 and in winter of 2012.*

More recently, genetic data also support the concept of relatively discrete, demographically independent BSE stocks (Duffield and Wells 2002; Sellas *et al.* 2005). Sellas *et al.* (2005) examined population subdivision among Sarasota Bay, Tampa Bay, and Charlotte Harbor, Florida; Matagorda Bay, Texas; and the coastal Gulf of Mexico (1-12 km offshore) from just outside Tampa Bay to the south end of Lemon Bay, and found evidence of significant population structure among all areas on the basis of both mitochondrial DNA control region sequence data and 9 nuclear microsatellite loci. The Sellas *et al.* (2005) findings support the identification of BSE populations distinct from those occurring in adjacent Gulf coastal waters. Differences in reproductive seasonality from site to site also suggest genetic-based distinctions among areas (Urian *et al.* 1996). Photo-ID and genetic data from several inshore areas of the southeastern United States also support the existence of resident estuarine animals and a differentiation between animals biopsied along the Atlantic coast and those biopsied within estuarine systems at the same latitude (Caldwell 2001; Gubbins 2002; Zolman 2002; Mazzoil *et al.* 2005; Litz 2007; Rosel *et al*. 2009; NMFS unpublished).

The Mississippi Sound, Lake Borgne, Bay Boudreau Stock area (Figure 1) is complex with an estimated surface area of 3,711 km^2 (Scott *et al*. 1989). Mississippi Sound itself has a surface area of about 2,100 km^2 (Eleuterius 1978a,b) and is bounded by Mobile Bay in the east, Lake Borgne in the west, and the opening to Bay Boudreau in the southwest. It is bordered to the north by the mainlands of Louisiana, Mississippi and Alabama and to the south by six barrier islands: Cat, West Ship, East Ship, Horn, Petit Bois and Dauphin Islands (Eleuterius 1978b), and in the extreme west, Louisiana marshes. Mississippi Sound is an open embayment with large passes between the barrier islands allowing broad access to the Gulf of Mexico, including two dredged shipping channels. Average depth at mean low water is 2.98 m, and tides are diurnal with an average range of 0.57 m (Eleuterius 1978b). Sea surface temperature ranges seasonally from 9˚C to 32˚C and salinity from 0 to 33 ppt from winter to summer, respectively (Christmas 1973). The bottom type is soft substrate consisting of mud and/or sand (Moncreiff 2007). Lake Borgne and Bay Boudreau are part of the Pontchartrain Basin and are remnants of the Saint Bernard lobe of Mississippi River Delta that existed until about 2000 years ago when the Mississippi River changed course (Roberts 1997; Penland *et al.* 2013). Lake Borgne has an average depth of 3 m and an average salinity of 7 ppt (USEPA 1999). Bay Boudreau is a large shallow complex in the Saint Bernard marshes and consists of marshes, bayou, shallow bays and points (Penland *et al*. 2013).

The Mississippi Sound, Lake Borgne, Bay Boudreau Stock area (“MS Sound Region”) configuration is in part a result of the management of the live-capture fishery for bottlenose dolphins (Scott 1990). Mississippi Sound was once the site of the largest live-capture fishery of bottlenose dolphins in North America (Reeves and Leatherwood 1984). Between 1973 and 1988, of the 533 bottlenose dolphins removed from Southeastern U.S. waters, 202 were removed from Mississippi Sound and adjacent waters (Scott 1990). In 1989, the Alliance of Marine Mammal Parks and Aquariums declared a self-imposed moratorium on the capture of bottlenose dolphins in the Gulf of Mexico (Corkeron 2009).

Passage of the Marine Mammal Protection Act in 1972 and the concomitant need to manage the live-capture fishery for bottlenose dolphins was the impetus for much of the earliest bottlenose dolphin research in the MS Sound Region. This work focused on estimating the abundance of bottlenose dolphins (see below) and, to a lesser extent, on stock structure research primarily to provide live-capture quota recommendations (Scott 1990). To gather baseline biological data and study dolphin ranging patterns, 57 bottlenose dolphins were captured from Mississippi Sound, freeze-branded and released during 1982-1983 (Solangi and Dukes 1983; Lohoefener *et al*. 1990*a*). Re-sighting efforts for these dolphins conducted from 1982-1985 by Lohoefener *et al.* (1990a) suggested at least some individual dolphins exhibited fidelity for specific areas within Mississippi Sound.

The first dedicated photo-ID effort in the area undertaken by Hubard *et al.* (2004) during 1995-1996 established a working photo-ID catalog for Mississippi Sound. Photo-ID data suggested that some individual dolphins, seen multiple times, displayed spatial and temporal patterns of site fidelity, and some dolphins showed preferences to different habitats, particularly barrier islands, channels or mainland coasts (Hubard *et al.* 2004). Some individuals were seen in the same seasons both years, while others were seen in multiple seasons with a gap during winter months (Hubard *et al.* 2004). During photo-ID/line transect surveys in 1995 and 1996, several animals photographed in 1991 (Mullin and Hoggard 1992a,b) were re-sighted (Hubard *et al.* 2004). Also, two dolphins freeze branded during the live capture performed by Solangi and Dukes (1983) were re-sighted by Hubard *et al.* (2004).

Mackey (2010) also examined site fidelity as well as residency patterns of bottlenose dolphins in a portion of Mississippi Sound using photo-ID data. During 2004-2007, Mackey (2010) primarily followed dolphins near and on both the Gulf and sound sides the barrier islands and along the Gulfport Shipping Channel and identified three different residency patterns. Of the 687 dolphins identified in those surveys, 71 (10%) were classified as year-round residents, 109 (16%) as seasonal residents, and 498 (73.5%) as transients. These patterns may not be representative of the MS Sound Region. Dolphins sighted near the barrier islands adjacent to or within the range of the Northern Coastal Stock of bottlenose dolphins may have a higher probability of being transient. Outside of the ship channel, a small proportion of the dolphins sighted by Mackey (2010) were from the interior two-thirds of Mississippi Sound (adjacent to the mainland) where dolphins may have quite different residency patterns. Mackey (2010) also identified two animals that were freeze-branded during the live captures 20 years earlier (Solangi and Dukes 1983). Both Mackey (2010) and Hubard *et al.* (2004) noted low re-sighting rates of dolphins with a high percentage of dolphins seen only on one occasion. Both studies also suggested dolphins move out of the Sound into deeper Gulf of Mexico waters during winter months (Hubard *et al.* 2004; Mackey 2010). Definitive conclusions on bottlenose dolphin site fidelity and residency patterns in the MS Sound Region are difficult to make based on available research. Establishing residency patterns in the MS Sound Region using photo-ID studies that cover large study areas (e.g., Hubard *et al*. 2004) will be difficult because of the large number of dolphins that inhabit the area and its open geography. Nevertheless, studies to date indicate that, similar to other Gulf of Mexico areas, some individuals are long-term inhabitants of the MS Sound Region. The current stock boundary does not include any coastal waters outside of the barrier islands. Further research is needed to determine the degree to which dolphins of this stock utilize nearshore coastal waters outside the MS Sound Region. The stock boundaries are subject to change upon further study of dolphin residency patterns in estuarine waters of Alabama, Mississippi and Louisiana. Information on the use of coastal waters will be important when considering exposure to coastal fisheries as estuarine animals that make use of nearshore coastal waters would be at risk of entanglement in fishing gear while moving along the coast. Ongoing NOAA photo-ID surveys initiated in 2010, as well as data from tracking of 19 bottlenose dolphins tagged with satellite-linked transmitters in and around Mississippi Sound in July 2013, will address some of these issues as the data become available.

POPULATION SIZE

The best available abundance estimate for the Mississippi Sound, Lake Borgne, Bay Boudreau Stock of common bottlenose dolphins is 901 (CV=0.63) based on a winter 2012 aerial survey.

Earlier abundance estimates

Aerial and small boat surveys conducted in the MS Sound Region covered different portions of the region and yielded a wide range of abundance estimates for common bottlenose dolphins. Because of the differences in techniques and areas surveyed, it is very difficult to compare results. Aerial strip transect surveys conducted by Leatherwood *et al.* (1978) compared aerial survey techniques for bottlenose dolphins, but the study also produced population estimates for common bottlenose dolphins in Mississippi Sound and the adjacent Gulf of Mexico (to about 10 km south of the barrier islands) of 1,342±847 in 1974 and 879±368 in 1975. Thompson (1982) surveyed central Mississippi Sound ("off Pascagoula") in 1980 using aerial line-transect sampling methods, and abundance estimates ranged from 93 dolphins (SE=22) in December 1980 to 140 dolphins (SE=86) in September 1980. While line-transect is a rigorous and repeatable survey method, this study produced negatively biased estimates of density and abundance (Thompson 1982) due to the fact that the strip of transect directly under the aircraft was not observed. Scott *et al.* (1989) attempted to correct this bias by utilizing an aircraft with a glass bubble nose and placing an observer in it to observe the track-line at all times. Their estimates for the MS Sound Region ranged from 205 in winter to 858 in summer. (Abundances for Mississippi Sound only ranged from 136 dolphins in winter to 719 dolphins in summer.) Boat-based mark-recapture surveys using dolphins freeze-branded during a previous live-capture study were performed by Lohoefener *et al.* (1990a) to assess the impacts of removing 30 dolphins from the population for captivity. The pre-removal estimate was 2,392 dolphins, and the post-removal estimate was 7,052 dolphins (Lohoefener *et al.* 1990a), but these were probably not accurate estimates, as too many assumptions of mark-recapture analysis were likely violated in this study (Lohoefener *et al.* 1990a). Boat-based line-transect abundance surveys of Mississippi Sound (about 55% of the MS Sound Region) were carried out by Lohoefener *et al*. (1990b) in 1984 and 1985, yielding much higher abundance estimates than aerial strip- or line-transect surveys and suggesting a seasonal shift in bottlenose dolphin abundance. For the entire Sound, abundance estimates were 2,400 and 500 dolphins for summer and winter, respectively. Another series of line-transect aerial surveys were performed in fall of 1992 by Blaylock and Hoggard (1994), where the abundance was reported as 1,401 for the MS Sound Region. The two most recent abundance estimates from Mississippi Sound were boat-based line-transect surveys and only covered a portion of Mississippi Sound. Hubard *et al.* (2004) surveyed an area bounded by the western end of Horn Island and the eastern end of Petit Bois Island that was roughly one-quarter the size of the entire Sound. Again, abundances were found to fluctuate seasonally with higher abundances observed in summer months in 1995 (584 dolphins) and 1996 (555 dolphins) versus winter 1995-1996 months (268 dolphins). Miller *et al.* (2013) reported abundance estimates for a study area in eastern Mississippi Sound roughly 2,104 km^2 in size that included areas up to 15 km south of the barrier islands. Abundance estimates were 2,255 dolphins in summer 2007 and 1,413 dolphins in winter 2007-2008 (Miller *et al.* 2013).

Recent surveys and abundance estimates

The Southeast Fisheries Science Center conducted aerial surveys of continental shelf waters (shoreline to 200 m depth) along the U.S. Gulf of Mexico coast from the Florida Keys to the Texas/Mexico border during spring (March-April) 2011, summer (July-August) 2011, fall (October-November) 2011 and winter (January-February) 2012. The surveys were conducted along tracklines oriented perpendicular to the shoreline and spaced 20-30 km apart. The total survey effort varied during each survey due to weather conditions, but ranged between 13,500 – 15,600 km. Each of these surveys was conducted using a two-team approach to develop estimates of visibility bias using the independent observer approach with Distance analysis (Laake and Borchers 2004). A model for the probability of detection on the trackline as a function of sighting conditions (seas state, glare, water color, etc.) was developed using data across all four surveys. This model was then applied to detection probability functions specific to each survey to account for the probability of detection as a function of distance from the trackline and additional environmental covariates. A bootstrap resampling approach was used to estimate the variance of the estimates. The survey data were post-stratified into spatial boundaries corresponding to the defined boundaries of common bottlenose dolphin stocks within the surveyed area. The abundance estimates for the Mississippi Sound, Lake Borgne, Bay Boudreau Stock of bottlenose dolphins were based upon tracklines and sightings in waters along the Alabama, Mississippi and Louisiana coasts inside of the barrier islands. The surveys did not include tracklines in Lake Borgne, but the estimated density was extrapolated to include the entire stock area. The seasonal abundance estimates for this stock were: spring – 2,395 (CV=0.42), summer – 1,709 (CV= 0.59), fall – 1,140 (CV=0.41) and winter – 900 (CV=0.63). As with other BSE stocks, it is possible that there is movement of transient animals from coastal waters into the MS Sound Region on a seasonal basis. In order to assure that the abundance estimate for the stock reflects primarily resident animals, the lowest seasonal estimate (winter) was used to determine N_{best} for this stock. The resulting best estimate of abundance for the Mississippi Sound, Lake Borgne, Bay Boudreau Stock of common bottlenose dolphins was 900 (CV=0.63).

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for this stock of common bottlenose dolphins is 901 (CV=0.63). The minimum population estimate for the MS Sound Region is 551 common bottlenose dolphins.

Current Population Trend

There are insufficient data to determine the population trends for this stock because of significant methodological differences in the surveys over time.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of common bottlenose dolphins in the MS Sound Region is 551. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is of unknown status. PBR for the Mississippi Sound, Lake Borgne, Bay Boudreau Stock of common bottlenose dolphins is 5.6.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the Mississippi Sound, Lake Borgne, Bay Boudreau Stock during 2009–2013 is unknown because this stock is known to interact with unobserved fisheries (see below), and also because the most current observer data for the shrimp trawl fishery are for 2007-2011 and mortality rates were calculated at the state level (see Shrimp Trawl section below). The mean annual fishery-related mortality and serious injury during 2009–2013 for observed fisheries and strandings identified as fishery-caused was 1.6. Additional mean annual mortality and serious injury during 2009–2013 due to other human-caused actions (fishery research and sea turtle relocation trawling) was 0.6. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 2.2. This does not include an estimate for the commercial shrimp trawl fishery.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category II Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl; and Gulf of Mexico menhaden purse seine fisheries; and the Category III Gulf of Mexico blue crab trap/pot; and Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fisheries (Appendix III).

Shrimp Trawl

Between 1997 and 2011, 5 common bottlenose dolphins and 7 unidentified dolphins, which could have been either common bottlenose dolphins or Atlantic spotted dolphins, became entangled in the lazy line, turtle excluder device or tickler chain gear in the commercial shrimp trawl fishery in the Gulf of Mexico. All dolphin bycatch interactions resulted in mortalities except for 1 unidentified dolphin that was released alive in 2009. Soldevilla *et al.* (2015) provide mortality estimates calculated from analysis of shrimp fishery effort data and NMFS's Observer Program bycatch data. Observer program coverage does not extend into BSE waters; time-area stratified bycatch rates were extrapolated into inshore waters to estimate bycatch mortalities from inshore fishing effort. Annual mortality estimates were calculated for the years 1997-2011 from stratified annual fishery effort and bycatch rates, and a 5-year unweighted mean mortality estimate for 2007-2011 was calculated for Gulf of Mexico dolphin stocks. The 4-area (Texas, Louisiana, Mississippi/Alabama, Florida) stratification method was chosen because it best approximates how fisheries operate (Soldevilla *et al.* 2015). The BSE stock mortality estimates were aggregated at the state level as this was the spatial resolution at which fishery effort is modeled (e.g., Nance *et al.* 2008). The mean annual mortality estimate for Mississippi/Alabama BSE stocks (from Mississippi River Delta east to Mobile Bay, Bonsecour Bay) was 41 (CV=0.67). This estimate does not include skimmer trawl effort, which may represent up to 50% of shrimp fishery effort in Louisiana, Alabama, and Mississippi inshore waters, because Observer Program coverage of skimmer trawls is limited. Limitations and biases of annual bycatch mortality estimates are described in detail in Soldevilla *et al.* (2015).

Menhaden Purse Seine

During 2009–2013, there were 2 mortalities and 1 animal released alive without serious injury documented within waters of the MS Sound Region involving the menhaden purse seine fishery.

There is currently no observer program for the Gulf of Mexico menhaden purse seine fishery; however, recent incidental takes have been reported via two sources. First, during 2011, a pilot observer program operated from May through September, and observers documented 3 dolphins trapped within purse seine nets. All 3 were released alive without serious injury (Maze-Foley and Garrison in prep a). Two of the 3 dolphins were trapped within a single purse seine within waters of the Western Coastal Stock, and the third animal was trapped in waters of the MS Sound Region. Second, through the Marine Mammal Authorization Program (MMAP), there have been 13 self-reported incidental takes (all mortalities) of common bottlenose dolphins in northern Gulf of Mexico coastal and estuarine waters by the menhaden purse seine fishery. These takes likely affected the following stocks: Western Coastal Stock; Northern Coastal Stock; Mississippi Sound, Lake Borgne, Bay Boudreau Stock; and Mississippi River Delta Stock. Specific self-reported takes under the MMAP likely involving the MS Sound Region are as follows: two dolphins were reported taken in a single purse seine during 2012 in waters of Mississippi Sound; one take of a single unidentified dolphin was reported during 2002 in waters of Mississippi Sound; and during 2000, 3 bottlenose dolphins were reported taken in a single purse seine in waters of Mississippi Sound.

Without an ongoing observer program it is not possible to obtain statistically reliable information for this fishery on the number of sets annually, the incidental take and mortality rates, and the communities from which bottlenose dolphins are being taken.

Blue Crab Trap/Pot

During 2009–2013 there was 1 documented mortality of a common bottlenose dolphin in commercial blue crab trap/pot gear. The mortality occurred during 2011 and was included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and in the totals presented in Table 1. There is no systematic observer coverage of crab trap/pot fisheries, so it is not possible to quantify total mortality.

Hook and Line

During 2009–2013 there were 5 mortalities for which hook and line gear entanglement or ingestion were documented. Three mortalities occurred during 2011, 1 during 2012, and 1 during 2013 (in Lake Pontchartrain). These mortalities were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and in the totals presented in Table 1. It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Other Mortality

From 2009 to 2013, 353 common bottlenose dolphins were reported stranded within the MS Sound Region (Table 1; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, 11 June 2014). Of those 353, 49 dolphins stranded within Lake Pontchartrain. It is likely the stranded animals in Lake Pontchartrain originated from the MS Sound Region. It could not be determined if there was evidence of human interaction for 317 of these strandings. For 14 dolphins, no evidence of human interaction was detected. Evidence of human interactions was detected for 22 stranded dolphins. Human interactions were from numerous sources, including 5 entanglements with hook and line gear, 1 entanglement with commercial blue crab trap/pot gear, 1 incidental take in a research gillnet, 1 incidental take during turtle relocation trawling, 1 animal entrapped during research skimmer trawling and 2 animals that were visibly oiled (see Table 1). Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

The MS Sound Region has been affected by several bottlenose dolphin die-offs or Unusual Mortality Events (UMEs). From January through May 1990, a total of 344 bottlenose dolphins stranded in the northern Gulf of Mexico including Mississippi. Overall this represented a two-fold increase in the prior maximum recorded number of strandings for the same period, but in some locations (i.e., Alabama) strandings were 10 times the average number. The cause of the 1990 mortality event could not be determined (Hansen 1992), however, morbillivirus may have contributed to this event (Litz *et al.* 2014). In 1996 a UME was declared for bottlenose dolphins in Mississippi when 31 bottlenose dolphins stranded during November and December. The cause was not determined, but a *Karenia brevis* (red tide) bloom was suspected to be responsible (Litz *et al.* 2014). A UME was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010; and, as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see "Habitat Issues" below), during the spill, and after. During 2010-2013, nearly all stranded dolphins from this stock were considered to be part of the UME (see Table 1).

During 2013, 1 animal was entrapped during research skimmer trawl operations within the MS Sound Region. It could not be determined if the animal was seriously injured (Maze-Foley and Garrison in prep b). One mortality was documented in 2011 in the MS Sound Region as a result of an entanglement in a research gillnet. Both interactions were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and in the totals presented in Table 1.

As part of its annual coastal dredging program, the Army Corps of Engineers conducts sea turtle relocation trawling during hopper dredging as a protective measure for marine turtles. One bottlenose dolphin mortality was documented during 2011 in MS Sound Region incidental to relocation trawling activities. This mortality was included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and in the totals presented in Table 1.

The problem of dolphin depredation of fishing gear is increasing in Gulf of Mexico coastal and estuary waters and illegal feeding or provisioning of wild bottlenose dolphins has been documented in Florida and Texas (Bryant 1994; Samuels and Bejder 2004; Cunningham-Smith *et al.* 2006; Powell and Wells 2011). There are emerging questions regarding potential linkages between provisioning and depredation of recreational fishing gear and associated entanglement and ingestion of gear. To date there are no records of provisioning for this stock area. However, one recent case of a shrimp fisherman illegally "taking" a dolphin in Mississippi Sound occurred during summer 2012. In December 2013 the fisherman was convicted under the MMPA for knowingly shooting a dolphin with a shotgun while shrimping.

Table 1. Common bottlenose dolphin strandings occurring in the Mississippi Sound, Lake Borgne, Bay Boudreau Stock area from 2009 to 2013, as well as number of strandings for which evidence of human interaction was detected and number of strandings for which it could not be determined (CBD) if there was evidence of human interaction (HI). Data are from the NOAA National Marine Mammal Health and Stranding Response Database (unpublished data, accessed 11 June 2014). Please note human interaction does not necessarily mean the interaction caused the animal's death.

Stock	Category	2009	2010	2011	2012	2013	Total
Mississippi Sound, Lake Borgne, Bay Boudreau Stock	Total Stranded	36	94[a]	114[b]	47[b]	62[c]	353
	Human Interaction						
	---Yes	1	7[d]	8[e]	3[f]	3[g]	22
	---No	3	1	7	3	0	14
	---CBD	32	86	99	41	59	317

[a] 93 strandings were part of the ongoing UME event in the northern Gulf of Mexico.
[b] All strandings were part of the ongoing UME event in the northern Gulf of Mexico.
[c] 61 strandings were part of the ongoing UME event in the northern Gulf of Mexico
[d] Includes 2 strandings that were visibly oiled.
[e] Includes 3 entanglement interactions (mortalities) with hook and line fishing gear, 1 entanglement interaction (mortality) with commercial blue crab trap/pot gear, 1 mortality incidental to sea turtle relocation trawling, and 1 entanglement interaction (mortality) with a research gillnet.
[f] Includes 1entanglement interaction (mortality) with hook and line fishing gear.
[g] Includes 1 entanglement interaction (mortality, Lake Pontchartrain) with hook and line fishing gear and 1 interaction with a research skimmer trawl (CBD if seriously injured).

HABITAT ISSUES

The *Deepwater Horizon* (DWH) MC252 drilling platform, located approximately 50 miles southeast of the Mississippi River Delta in waters about 1500 m deep, exploded on 20 April 2010. The rig sank, and over 87 days up to ~4.9 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (McNutt *et al.* 2012). During the response effort dispersants were applied extensively at the seafloor and at the sea surface (Lehr *et al.* 2010; OSAT 2010). In-situ burning, or controlled burning of oil at the surface, was also used extensively as a response tool (Lehr *et al.* 2010). The oil, dispersant and burn residue compounds present ecological concerns (Buist *et al.* 1999; NOAA 2011). The magnitude of this oil spill was unprecedented in U.S. history, causing impacts to wildlife, natural habitats and human communities along coastal areas from western Louisiana to the Florida Panhandle (NOAA 2011). It could be years before the entire scope of damage is ascertained (NOAA 2011).

Given the trajectory of the surface oil during the spill and the documented oiling of shoreline (Michel *et al.* 2013), it is likely the Mississippi Sound, Lake Borgne, Bay Boudreau Stock of common bottlenose dolphins was exposed to oil during the event. Light to trace oil was reported along the majority of Mississippi's mainland coast, from Gulf Breeze to Panama City, Florida, and outside of Atchafalaya and Vermilion Bays in western Louisiana. Heavy to light oiling occurred on Mississippi's barrier islands (Michel *et al.* 2013). A substantial number of beaches and wetlands along the Louisiana coast experienced heavy or moderate oiling (OSAT-2 2011; Michel *et al.* 2013). The heaviest oiling in Louisiana occurred west of the Mississippi River on the Mississippi Delta and in Barataria and Terrebonne Bays, and to the east of the river on the Chandeleur Islands. Some heavy to moderate oiling occurred on Alabama and Florida beaches, with the heaviest stretch occurring from Dauphin Island, Alabama, to Gulf Breeze, Florida.

Shortly after the oil spill, the Natural Resource Damage Assessment (NRDA) process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies are being conducted to determine potential impacts of the spill on marine mammals. These studies have focused on identifying the type, magnitude, severity, length and impact of oil exposure to oceanic, continental shelf, coastal and estuarine marine mammals. The research is ongoing. For coastal and estuarine dolphins, the NOAA-led efforts include: active surveillance to detect stranded animals in remote locations; aerial surveys to document the distribution, abundance, species and exposure relative to oil from the DWH spill; assessment of sublethal and chronic health impacts on coastal and estuarine bottlenose dolphins in Barataria Bay, Louisiana, Mississippi Sound, and a reference site in Sarasota Bay, Florida; and assessment of injuries to dolphin stocks in Barataria Bay and Chandeleur Sound, Louisiana, Mississippi Sound, and as a reference site, St. Joseph Bay, Florida.

Coastal dolphins have been observed with tar balls attached to them and seen swimming through oil slicks close to shore and inland bays. The effects of oil exposure on marine mammals depend on a number of factors including the type and mixture of chemicals involved, the amount, frequency and duration of exposure, the route of exposure (inhaled, ingested, absorbed, or external) and biomedical risk factors of the particular animal (Geraci 1990). In general, direct external contact with petroleum compounds or dispersants with skin may cause skin irritation, chemical burns and infections. Inhalation of volatile petroleum compounds or dispersants may irritate or injure the respiratory tract, which could lead to pneumonia or inflammation. Ingestion of petroleum compounds may cause injury to the gastrointestinal tract, which could affect an animal's ability to digest or absorb food. Absorption of petroleum compounds or dispersants may damage kidney, liver and brain function in addition to causing immune suppression and anemia. Long term chronic effects such as lowered reproductive success and decreased survival may occur (Geraci 1990).

Besides oil exposure, another habitat concern for the MS Sound Region is environmental contaminants. Persistent organic pollutant (PCBs, chlordanes, mirex, DDTs, HCB and dieldrin) and polybrominated diphenyl ether concentrations were determined from bottlenose dolphin blubber samples from 14 locations, including Mississippi Sound, along the U.S. Atlantic and Gulf coasts and Bermuda (Kucklick *et al.* 2011). Dolphins from both rural and urban estuarine and coastal waters were sampled. Dolphins sampled from Mississippi Sound had relatively high concentrations of some pollutants, like PBDEs, HCB, mirex and DDTs, and more intermediate concentrations of dieldrin, PCBs and chlordanes, when compared to dolphins sampled from the other 13 locations (Kucklick *et al.* 2011).

The presence of vessels may impact bottlenose dolphin behavior in bays, sounds and estuaries. Miller *et al.* (2008) investigated the immediate responses of bottlenose dolphins to "high-speed personal watercraft" (i.e., boats) in Mississippi Sound. They found an immediate impact on dolphin behavior demonstrated by an increase in traveling behavior and dive duration, and a decrease in feeding behavior for non-traveling groups. The findings suggested dolphins attempted to avoid high-speed personal watercraft. It is unclear whether repeated short-term effects will result in long-term consequences like reduced health and viability of dolphins. Further studies are needed to determine the impacts throughout the Gulf of Mexico.

STATUS OF STOCK

Common bottlenose dolphins are not listed as threatened or endangered under the Endangered Species Act. Because the stock size is small and relatively few mortalities and serious injuries would exceed PBR, NMFS considers this a strategic stock. Additionally,, because a UME of unprecedented size and duration (began 1 February 2010 and is ongoing) has impacted the northern Gulf of Mexico, including the Mississippi Sound, Lake Borgne, Bay Boudreau Stock, NMFS finds cause for concern about this stock. Total fishery-related mortality and serious injury for this stock is not known, but at a minimum is greater than 10% of the calculated PBR and, therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*)
St. Joseph Bay Stock

NOTE – NMFS is in the process of writing individual stock assessment reports for each of the 31 bay, sound and estuary stocks of common bottlenose dolphins in the Gulf of Mexico. Until this effort is completed and 31 individual reports are available, some of the basic information presented in this report will also be included in the report: "Northern Gulf of Mexico Bay, Sound and Estuary Stocks".

STOCK DEFINITION AND GEOGRAPHIC RANGE

Common bottlenose dolphins are distributed throughout the bays, sounds and estuaries of the Gulf of Mexico (Mullin 1988). Long-term (year-round, multi-year) residency by at least some individuals has been reported from nearly every site where photographic identification (photo-ID) or tagging studies have been conducted in the Gulf of Mexico (e.g., Irvine and Wells 1972; Shane 1977; Gruber 1981; Irvine *et al.* 1981; Wells 1986a; Wells *et al.* 1987; Scott *et al.* 1990; Shane 1990; Wells 1991; Bräger 1993; Bräger *et al.* 1994; Fertl 1994; Wells *et al.* 1996a,b; Wells *et al.* 1997; Weller 1998; Maze and Würsig 1999; Lynn and Würsig 2002; Wells 2003; Hubard *et al.* 2004; Irwin and Würsig 2004; Shane 2004; Balmer *et al.* 2008; Urian *et al.* 2009; Bassos-Hull *et al.* 2013). In many cases, residents occur predominantly within estuarine waters, with limited movements through passes to the Gulf of Mexico (Shane 1977; Shane 1990; Gruber 1981; Irvine *et al.* 1981; Shane 1990; Maze and Würsig 1999; Lynn and Würsig 2002; Fazioli *et al.* 2006; Bassos-Hull *et al.* 2013). Early studies indicating year-round residency in bays in both the eastern and western Gulf of Mexico led to the delineation of 33 bay, sound and estuary (BSE) stocks, including St. Joseph Bay, with the first stock assessment reports published in 1995.

More recently, genetic data also support the concept of relatively discrete BSE stocks (Duffield and Wells 2002; Sellas *et al.* 2005). Sellas *et al.* (2005) examined population subdivision among dolphins sampled in Sarasota Bay, Tampa Bay, Charlotte Harbor, Matagorda Bay, Texas, and the coastal Gulf of Mexico (1-12 km offshore) from just outside Tampa Bay to the south end of Lemon Bay, and found evidence of significant population differentiation among all areas on the basis of both mitochondrial DNA control region sequence data and 9 nuclear microsatellite loci. The Sellas *et al.* (2005) findings support the identification of BSE populations distinct from those occurring in adjacent Gulf coastal waters. Differences in reproductive seasonality from site to site also suggest genetic-based distinctions among areas (Urian *et al.* 1996). Photo-ID and genetic data from several inshore areas of the southeastern United States also support the existence of resident estuarine animals and a differentiation between animals biopsied along the Atlantic coast and those biopsied within estuarine

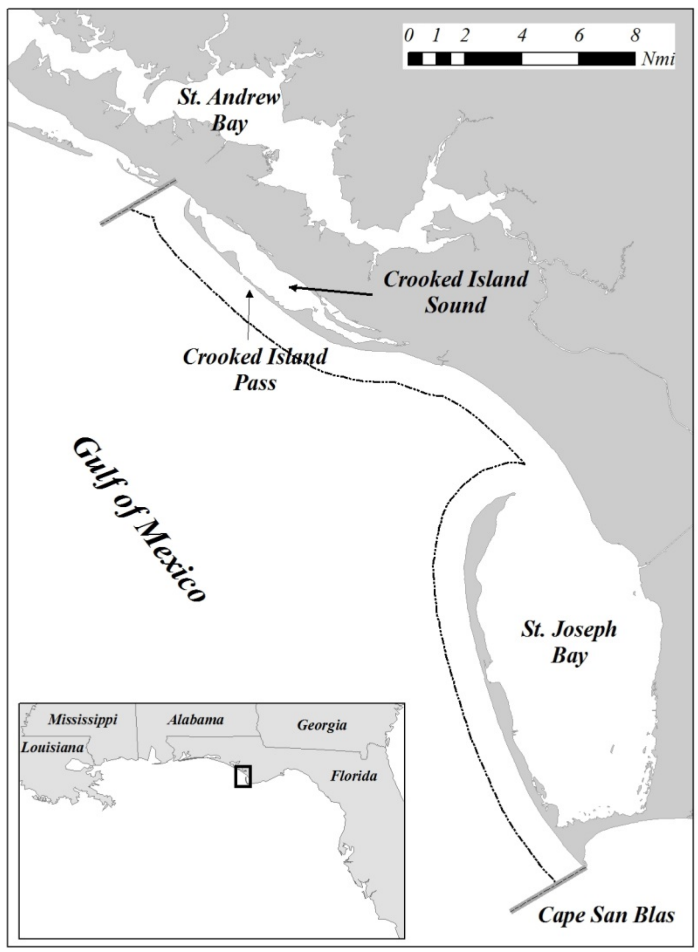

Figure 1. *Geographic extent of the St. Joseph Bay Stock, located in the Florida panhandle. The stock boundaries are denoted by dashed and solid lines.*

systems at the same latitude (Caldwell 2001; Gubbins 2002; Zolman 2002; Mazzoil *et al.* 2005; Litz 2007; Rosel *et al*. 2009; NMFS unpublished).

St. Joseph Bay is a relatively small embayment of 170km^2 in area, located just west of Apalachicola in the central panhandle of Florida (Figure 1). The bay is bounded in the south by Cape San Blas, in the west by the St. Joseph Peninsula and opens in the north to the Gulf of Mexico. St. Joseph Bay extends 21km in length and 10km in width at its widest point, and is characterized by extensive seagrass beds and salt marshes. The southern quarter of the bay is 1m or less deep whereas the deepest portions are in the northwest region at ~10m deep. Most of St. Joseph Bay has been designated as an aquatic preserve by the state of Florida. There is minimal freshwater inflow into the bay (U.S. EPA 1999; Balmer 2007; Moretzsohn *et al.* 2010). To the northwest of St. Joseph Bay, Crooked Island Sound (also known as St. Andrew Sound) extends 12km in length and 2km in width at its widest point. It varies in depth from 1m around the margins of the sound to 6-7m at the sound's entrance (Balmer 2007). The greatest environmental concerns for this area are declining water quality (mainly due to eutrophication), coastal development, loss of seagrass and saltmarsh habitats and beach erosion (Florida Department of Environmental Protection 2008).

In response to 3 unusual mortality events along the Florida panhandle which all impacted the St. Joseph Bay area, Balmer *et al.* (2008) conducted photo-ID surveys from April 2004 to July 2007 to examine seasonal abundance, distribution patterns and site fidelity of bottlenose dolphins in St. Joseph Bay and along the coast northwest to and inside Crooked Island Sound. In addition, during April 2005 and July 2006, NOAA and the Sarasota Dolphin Research Program along with other partners, conducted health assessments of bottlenose dolphins in the St. Joseph Bay area. Photo-ID data strongly suggested a movement of dolphins into the St. Joseph Bay region during spring and fall with lower abundance during winter and summer. Dolphins sighted in winter and summer displayed higher site fidelity, whereas the majority of dolphins sighted during spring and fall displayed the lowest site fidelity (Balmer *et al.* 2008). Radio-tracking results supported these findings, with animals tagged in spring 2005 (April) ranging the farthest of all dolphins tagged, extending outside the St. Joseph Bay Stock region. Overall, Balmer *et al.* (2008) found abundance to vary seasonally in the St. Joseph Bay area, and suggested the St. Joseph Bay area supports a resident community of bottlenose dolphins as well as seasonal visitors during spring and fall seasons.

The St. Joseph Bay Stock area includes St. Joseph Bay, Crooked Island Sound and coastal waters out to 2km from shore in between St. Joseph Bay and Crooked Island Sound, and coastal waters out to 2km from shore from Cape San Blas along St. Joseph Peninsula and along Crooked Island (Figure 1). The boundaries of this stock are based on photo-ID and radio-tracking studies conducted during 2004-2007 (Balmer 2007; Balmer *et al.* 2008), which support the inclusion of nearshore coastal waters within the boundaries for this particular stock. The boundaries are subject to change as additional research is conducted. There is strong support from the findings of Balmer *et al.* (2008) to include Crooked Island Sound in the St. Joseph Bay Stock. However, animals from nearby St. Andrew Bay, located to the northwest of St. Joseph Bay (see Figure 1) and surrounding Panama City, have also been sighted in Crooked Island Sound, suggesting Crooked Island Sound is an area of overlap for dolphins inhabiting both St. Joseph Bay and St. Andrew Bay. An example of overlap with St. Andrew Bay is given by Balmer *et al.* (2010), who show the sightings for a particular animal, tracked simultaneously via satellite-linked transmitter and VHF radio transmitter, sighted in both Crooked Island Sound and St. Andrew Bay as well as adjacent coastal waters.

POPULATION SIZE

In order to estimate seasonal abundance, Balmer *et al.* (2008) conducted photo-ID mark-recapture surveys across multiple seasons from February 2005 through July 2007 in St. Joseph Bay and along the coast to the northwest including Crooked Island Sound (St. Andrew Sound). Line and contour transects were used to cover the study area, and each survey was only conducted if Beaufort Sea State was 3 or less. Balmer *et al.* (2008) also calculated a distinctiveness rate, which was the proportion of distinctive (marked) dolphins to non-distinctive (un-marked) dolphins, for each survey season. Mark-recapture estimates factored in the distinctiveness rate and included animals with distinctive and non-distinctive fins. Seasonal abundance estimates using the robust 'Markovian Emigration' model ranged from 122 dolphins (CV=0.09) for winter 2006 to 340 dolphins (CV=0.09) for fall 2006. Summer and winter estimates provide the best estimate of the resident population as spring and fall estimates also include transient animals. The 2005 and 2006 estimates are considered outdated due to being more than 8 years old. Therefore, the best available abundance estimate for the St. Joseph Bay Stock is the summer 2007 estimate, which is 152 dolphins (CV=0.08).

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate for the St. Joseph Bay Stock is 152 (CV=0.08). The resulting minimum population estimate is 142.

Current Population Trend

There are insufficient data to determine the population trends for this stock. Balmer *et al.* (2008) provided abundance estimates from 2005 to 2007 but did not evaluate an interannual trend.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of the St. Joseph Bay Stock of common bottlenose dolphins is 142. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is of unknown status. PBR for this stock of bottlenose dolphins is 1.4.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury to the St. Joseph Bay Stock of common bottlenose dolphins during 2009–2013 is unknown because this stock may interact with unobserved fisheries (see below), and also because the most current observer data for the commercial shrimp trawl fishery are for 2007-2011 and mortality rates were calculated at the state level (see Shrimp Trawl section below).

New Serious Injury Guidelines

NMFS updated its serious injury designation and reporting process, which uses guidance from previous serious injury workshops, expert opinion, and analysis of historic injury cases to develop new criteria for distinguishing serious from non-serious injury (Angliss and DeMaster 1998; Andersen *et al*. 2008; NOAA 2012). NMFS defines serious injury as an "*injury that is more likely than not to result in mortality*". Injury determinations for stock assessments revised in 2013 or later incorporate the new serious injury guidelines, based on the most recent 5-year period for which data are available.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category II Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl; Gulf of Mexico menhaden purse seine; and Southeastern U.S. Atlantic, Gulf of Mexico stone crab trap/pot fisheries; and the Category III Gulf of Mexico blue crab trap/pot; and Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fisheries (Appendix III). There are no recent observer program data for the Gulf of Mexico menhaden purse seine fishery. The menhaden fishery in this area was very limited during 2009–2013 in Gulf County, Florida. Number of menhaden fishing trips/year for Gulf County was as follows: 3 in 2009; 2 in 2010; 22 in 2011; 15 in 2012; and 9 in 2013 (Florida Fish and Wildlife Conservation Commission 2013). There have been no documented mortalities of St. Joseph Bay bottlenose dolphins in crab trap/pot fisheries. There have been no documented interactions between St. Joseph Bay common bottlenose dolphins and hook and line fisheries. There is no systematic observer coverage of crab trap/pot fisheries nor hook and line fisheries; therefore, it is not possible to quantify total mortality.

Shrimp Trawl

Between 1997 and 2011, 5 common bottlenose dolphins and 7 unidentified dolphins, which could have been either common bottlenose dolphins or Atlantic spotted dolphins, became entangled in the lazy line, turtle excluder device or tickler chain gear in the commercial shrimp trawl fishery in the Gulf of Mexico. All dolphin bycatch interactions resulted in mortalities except for 1 unidentified dolphin that was released alive in 2009. Soldevilla *et al.* (2015) provide mortality estimates calculated from analysis of shrimp fishery effort data and NMFS's Observer Program bycatch data. Observer program coverage does not extend into BSE waters; time-area stratified bycatch rates were extrapolated into inshore waters to estimate bycatch mortalities from inshore fishing effort. Annual mortality estimates were calculated for the years 1997-2011 from stratified annual fishery effort and bycatch rates, and a 5-year unweighted mean mortality estimate for 2007-2011 was calculated for Gulf of Mexico dolphin stocks. The 4-area (Texas, Louisiana, Mississippi/Alabama, Florida) stratification method was chosen because it best approximates how fisheries operate (Soldevilla *et al.* 2015). The BSE stock mortality estimates were aggregated at the state level as this was the spatial resolution at which fishery effort is modeled (e.g., Nance *et al.* 2008). The BSE stock mortality estimates were aggregated at the state level as this was the finest spatial resolution available for fishery effort. The mean annual mortality estimate for Florida BSE stocks (from Perdido Bay east and south to the Florida Keys) was 3.4 (CV=0.99). This estimate does not include skimmer trawl effort, which may represent up to 50% of shrimp fishery effort in Louisiana, Alabama, and Mississippi inshore waters, because Observer Program coverage of skimmer trawls is limited. Limitations and biases of annual bycatch mortality estimates are described in detail in Soldevilla *et al.* (2015).

Other Mortality

From 2009 to 2013, 4 common bottlenose dolphins were reported stranded within the St. Joseph Bay Stock area (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). This particular BSE stock includes nearshore coastal waters within its boundaries, and hence strandings that occurred along the coast within the bounds of this stock are also included in the total. However, because much of the stock area is contiguous, without physical barriers, with the Northern Coastal Stock of bottlenose dolphins, the stock of origin for animals that strand within the St. Joseph Bay Stock area is uncertain. It could not be determined if there was evidence of human interaction for 1 of these strandings. For 1 dolphin, no evidence of human interaction was detected, and for the remaining 2 strandings, evidence of human interactions was found. Both strandings with evidence of human interactions were determined to have lesions/scarring due to fishery interactions, but the fisheries could not be positively identified. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al.* 2012; Wells *et al.* 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al.* 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

St. Joseph Bay has been affected by 4 recent unusual mortality events (UMEs) and was the geographic focus of a UME in 2004. First, between August 1999 and May 2000, 150 bottlenose dolphins died coincident with *K. brevis* blooms and fish kills in the Florida Panhandle. This UME started in St. Joseph Bay and was concurrent spatially and temporally with a *K. brevis* bloom that spread east to west. There were 43 bottlenose dolphin strandings within the St. Joseph Bay Stock area during this event, which accounted for about 29% of the total bottlenose dolphin strandings for the 1999-2000 UME. Brevetoxin was determined to be the cause of this event (Twiner *et al.* 2012; Litz *et al.* 2014). Second, in March and April 2004, in another Florida Panhandle UME attributed to *K. brevis* blooms, 105 bottlenose dolphins and 2 unidentified dolphins stranded dead (Litz *et al.* 2014). This event also started in St. Joseph Bay, and 81 (76%) bottlenose dolphins stranded in the St. Joseph Bay Stock area. Although there was no indication of a *K. brevis* bloom at the time, high levels of brevetoxin were found in the stomach contents of the stranded dolphins (Flewelling *et al.* 2005; Twiner *et al.* 2012). Third, a separate UME was declared in the Florida Panhandle after elevated numbers of dolphin strandings occurred in association with a *K. brevis* bloom in September 2005. Dolphin strandings remained elevated through the spring of 2006 and brevetoxin was again detected in the tissues of most of the stranded dolphins. Between September 2005 and April 2006 when the event was officially declared over, a total of 88 bottlenose dolphin strandings occurred (plus strandings of 5 unidentified dolphins), with 12 (13%) occurring within the St. Joseph Bay Stock area. Brevetoxin was determined to be the cause of this event (Twiner *et al.* 2012; Litz *et al.* 2014). Health assessments of dolphins in the stock area found an eosinophilia syndrome, which could over the long-term produce organ damage and alter immunological status and thereby increase vulnerability to other challenges (Schwacke *et al.* 2010). However, the significance of the high prevalence of the syndrome to the observed mortality events in the St. Joseph Bay area is unclear. Finally, a UME was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010; and, as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see “Habitat Issues” below), during the spill, and after. All 4 strandings during 2009–2013 from this stock area occurred during 2011 and 2012 and were considered to be part of the UME.

The problem of dolphin depredation of fishing gear is increasing in Gulf of Mexico coastal and estuary waters and illegal feeding or provisioning of wild bottlenose dolphins has been documented in Florida and Texas (Bryant 1994; Samuels and Bejder 2004; Cunningham-Smith *et al.* 2006; Powell and Wells 2011). There are emerging questions regarding potential linkages between provisioning and depredation of recreational fishing gear and associated entanglement and ingestion of gear. Dolphins within the boundaries of this stock, primarily within Crooked Island Sound, have been observed to approach vessels in the area and beg for food (Balmer 2007; Balmer, pers. comm.). Begging behaviors are a result of being illegally fed. It is believed that the animals observed begging within Crooked Island Sound are members of the St. Andrew Bay Stock (the St. Andrew Bay Stock encompasses Panama City, an area where illegal feeding has been documented [Samuels and Bejder 2004]). Three dolphins, which were captured in Crooked Island Sound during the April 2005 health assessment, were observed begging during the 3 months of subsequent radio tracking (Balmer 2007; Balmer, pers. comm.). Two of these individuals, a mom/calf pair, were sighted exclusively within the boundaries of the St. Andrew Bay Stock during all radio tracking surveys. Both of these individuals were found stranded within 2 days of each other on 1 November and 3 November 2005 near Panama City and Panama City Beach. The other individual, an adult male, which was documented in Balmer *et al.* (2010), was sighted frequently in the waters from St. Andrew Bay to Crooked Island Sound and in association with individuals from both the St. Andrew Bay and St. Joseph Bay Stocks. Thus, the begging behaviors and overlap by individuals of the St. Andrew Bay Stock are likely affecting the behavior of individuals in the St. Joseph Bay Stock.

HABITAT ISSUES

The *Deepwater Horizon* (DWH) MC252 drilling platform, located approximately 50 miles southeast of the Mississippi River Delta in waters about 1500 m deep, exploded on 20 April 2010. The rig sank, and over 87 days up to ~4.9 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (McNutt *et al.* 2012). During the response effort dispersants were applied extensively at the seafloor and at the sea surface (Lehr *et al.* 2010; OSAT 2010). In-situ burning, or controlled burning of oil at the surface, was also used extensively as a response tool (Lehr *et al.* 2010). The oil, dispersant and burn residue compounds present ecological concerns (Buist *et al.* 1999; NOAA 2011). The magnitude of this oil spill was unprecedented in U.S. history, causing impacts to wildlife, natural habitats and human communities along coastal areas from western Louisiana to the Florida Panhandle (NOAA 2011). It could be years before the entire scope of damage is ascertained (NOAA 2011).

Some heavy to moderate oiling occurred on Alabama and Florida beaches, with the heaviest stretch occurring from Dauphin Island, Alabama, to Gulf Breeze, Florida. Light to trace oil was reported along the majority of Mississippi barrier islands, from Gulf Breeze to Panama City, Florida, and outside of Atchafalaya and Vermilion Bays in western Louisiana (OSAT-2 2011). A substantial number of beaches and wetlands along the Louisiana coast experienced heavy or moderate oiling (OSAT-2 2011). The heaviest oiling in Louisiana occurred west of the Mississippi River on the Mississippi Delta and in Barataria and Terrebonne Bays, and to the east of the river on the Chandeleur Islands.

Shortly after the oil spill, the Natural Resource Damage Assessment (NRDA) process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies are being conducted to determine potential impacts of the spill on marine mammals. These studies have focused on identifying the type, magnitude, severity, length and impact of oil exposure to oceanic, continental shelf, coastal and estuarine marine mammals. The research is ongoing. For coastal and estuarine dolphins, the NOAA-led efforts include: active surveillance to detect stranded animals in remote locations; aerial surveys to document the distribution, abundance, species and exposure relative to oil from the DWH spill; assessment of sublethal and chronic health impacts on coastal and estuarine bottlenose dolphins in Barataria Bay, Louisiana, Mississippi Sound, and a reference site in Sarasota Bay, Florida; and assessment of injuries to dolphin stocks in Barataria Bay and Chandeleur Sound, Louisiana, Mississippi Sound, and as a reference site, St. Joseph Bay, Florida.

The effects of oil exposure on marine mammals depend on a number of factors including the type and mixture of chemicals involved, the amount, frequency and duration of exposure, the route of exposure (inhaled, ingested, absorbed, or external) and biomedical risk factors of the particular animal (Geraci 1990). In general, direct external contact with petroleum compounds or dispersants with skin may cause skin irritation, chemical burns and infections. Inhalation of volatile petroleum compounds or dispersants may irritate or injure the respiratory tract, which could lead to pneumonia or inflammation. Ingestion of petroleum compounds may cause injury to the gastrointestinal tract, which could affect an animal's ability to digest or absorb food. Absorption of petroleum compounds or dispersants may damage kidney, liver and brain function in addition to causing immune suppression and anemia. Long term chronic effects such as lowered reproductive success and decreased survival may occur (Geraci 1990).

STATUS OF STOCK

Common bottlenose dolphins are not listed as threatened or endangered under the Endangered Species Act. Because the stock size is small and relatively few mortalities and serious injuries would exceed PBR, NMFS considers this a strategic stock. Additionally, because a UME of unprecedented size and duration (began 1 February 2010 and is ongoing) has impacted the northern Gulf of Mexico, including the St. Joseph Bay Stock area, and the high number of bottlenose dolphin deaths associated with UMEs in the Florida panhandle since 1999 suggests that this stock may be stressed, NMFS finds cause for concern about this stock. The total human-caused mortality and serious injury for this stock is unknown and there is insufficient information available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine population trends for this stock.

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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*) Choctawhatchee Bay Stock

NOTE – NMFS is in the process of writing individual stock assessment reports for each of the 31 bay, sound and estuary stocks of common bottlenose dolphins in the Gulf of Mexico. Until this effort is completed and 31 individual reports are available, some of the basic information presented in this report will also be included in the report: "Northern Gulf of Mexico Bay, Sound and Estuary Stocks".

STOCK DEFINITION AND GEOGRAPHIC RANGE

Common bottlenose dolphins are distributed throughout the bays, sounds and estuaries of the Gulf of Mexico (Mullin 1988). Long-term (year-round, multi-year) residency by at least some individuals has been reported from nearly every site where photographic identification (photo-ID) or tagging studies have been conducted in the Gulf of Mexico (e.g., Irvine and Wells 1972; Shane 1977; Gruber 1981; Irvine *et al.* 1981; Wells 1986a; Wells *et al.* 1987; Scott *et al.* 1990; Shane 1990; Wells 1991; Bräger 1993; Bräger *et al.* 1994; Fertl 1994; Wells *et al.* 1996a,b; Wells *et al.* 1997; Weller 1998; Maze and Würsig 1999; Lynn and Würsig 2002; Wells 2003; Hubard *et al.* 2004; Irwin and Würsig 2004; Shane 2004; Balmer *et al.* 2008; Urian *et al.* 2009; Bassos-Hull *et al.* 2013). In many cases, residents occur predominantly within estuarine waters, with limited movements through passes to the Gulf of Mexico (Shane 1977; Shane 1990; Gruber 1981; Irvine *et al.* 1981; Shane 1990; Maze and Würsig 1999; Lynn and Würsig 2002; Fazioli *et al.* 2006; Bassos-Hull *et al.* 2013). Early studies indicating year-round residency in bays in both the eastern and western Gulf of Mexico led to the delineation of 33 bay, sound and estuary (BSE) stocks, including Choctawhatchee Bay, with the first stock assessment reports published in 1995.

More recently, genetic data also support the concept of relatively discrete BSE stocks (Duffield and Wells 2002; Sellas *et al.* 2005). Sellas *et al.* (2005) examined population subdivision among dolphins sampled in Sarasota Bay, Tampa Bay, and Charlotte Harbor, Florida; Matagorda Bay, Texas; and the coastal Gulf of Mexico (1-12 km offshore) from just outside Tampa Bay to the south end of Lemon Bay, and found evidence of significant population differentiation among all areas on the basis of both mitochondrial DNA control region sequence data and 9 nuclear microsatellite loci. The Sellas *et al.* (2005) findings support the identification of BSE populations distinct from those occurring in adjacent Gulf coastal waters. Differences in reproductive seasonality from site to site also suggest genetic-based distinctions among areas (Urian *et al.* 1996). Additionally, photo-ID and genetic data from several

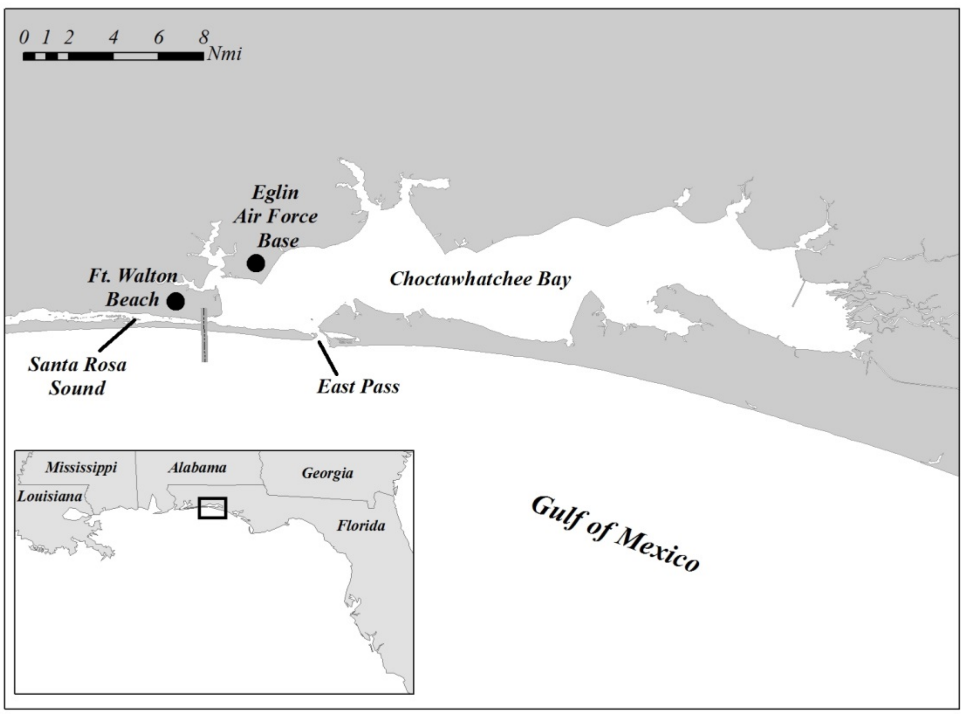

Figure 1. *Geographic extent of the Choctawhatchee Bay Stock, located in the Florida panhandle. The western border (with Santa Rosa Sound) is denoted by a solid line.*

inshore areas of the southeastern United States also support the existence of resident estuarine animals and a differentiation between animals biopsied along the Atlantic coast and those biopsied within estuarine systems at the same latitude (Caldwell 2001; Gubbins 2002; Zolman 2002; Mazzoil *et al.* 2005; Litz 2007; Rosel *et al*. 2009; NMFS unpublished).

Choctawhatchee Bay is located in the Florida panhandle and connected to the Gulf of Mexico by a single pass, East Pass (Figure 1). The bay is approximately 348km^2 in surface area, 43km in length and 2-10km in width (Florida Department of Environmental Protection 2010; Conn *et al.* 2011). The bay is relatively shallow with steep slopes. Water depth averages 8m in western portions and 3m in eastern portions, with an overall mean depth of 3.8m. Fresh water flows into Choctawhatchee Bay from the Choctawhatchee River primarily (90% of freshwater input), and from numerous small creeks and bayous as well. Salinity varies from 0 to 34ppt on an east to west basis from the river delta in the east to East Pass in the west. Choctawhatchee Bay is bordered by forested wetlands and marshes (Florida Department of Environmental Protection 2010). To the north and east, development is limited, partly due to the presence of Eglin Air Force Base. To the south and west are well-developed tourist areas (Conn *et al.* 2011). Both commercial and recreational fishing, as well as oyster harvesting, occur in Choctawhatchee Bay. Environmental concerns for this area include eutrophication and its associated problems (e.g., harmful algal blooms, hypoxia) and loss of seagrass beds and tidal marshes (Florida Department of Environmental Protection 2010).

Bottlenose dolphins utilizing Choctawhatchee Bay are of particular concern due to the potential impacts of recent Unusual Mortality Events (UMEs) on the population (Conn *et al.* 2011; see 'Other Mortality' section). Partly as a result of elevated stranding levels in recent years, Choctawhatchee Bay was chosen by NMFS as the first in a series of north-central Gulf of Mexico BSE stocks to produce abundance estimates for bottlenose dolphins. Photo-ID surveys were conducted during July-August 2007 and mark-recapture models were used to generate abundance estimates for residents and for residents plus transients (Conn *et al.* 2011).

The boundaries of this stock include waters of Choctawhatchee Bay from Point Washington and Jolly Bay in the east to Fort Walton Beach in the west as this is the area surveyed during the most recent mark-recapture photo-ID abundance surveys. The boundaries are likely to change as additional research is conducted. Some animals sighted multiple times in Choctawhatchee Bay have also been sighted in Santa Rosa Sound and/or Pensacola Bay to the west (Shippee 2010), suggesting the geographic area encompassing this stock may have to be expanded westward to include some or all of these areas as well. Further research is needed to fully determine the degree of overlap between dolphins inhabiting primarily Choctawhatchee Bay and those inhabiting primarily Pensacola Bay and waters in between, and the degree of genetic exchange between dolphins in these areas. Dolphins have been observed leaving Choctawhatchee Bay through the pass and entering nearshore coastal waters (Shippee 2010). Further information is needed to determine how often this stock utilizes these waters. Information on the use of nearshore waters will be important when considering exposure to coastal fisheries as estuarine animals that make use of nearshore coastal waters would be at risk of entanglement in fishing gear while moving along the coast.

POPULATION SIZE

In order to estimate abundance of residents and of residents plus transients, photo-ID mark-recapture surveys were conducted during July-August 2007 in Choctawhatchee Bay using "racetrack" (sampling the perimeter of the bay, taking about 3 days to complete) and "zigzag" (sampling open waters and sections of the racetrack, taking about 4 days to complete) tracklines (Conn *et al.* 2011). Each survey was conducted in Beaufort Sea State 3 or less, in good weather, at a survey speed of 12-14kts. Twenty-one percent of dolphins photographed had non-distinctive dorsal fins, and 188 individuals were identified overall. Conn *et al.* (2011), averaging over all fitted models, estimated resident abundance as 179 (CV=0.04) and resident plus transient abundance as 232 (CV=0.06). Therefore, the best available abundance estimate of the resident Choctawhatchee Bay Stock is 179 (CV=0.04). Because this estimate does not account for the proportion of the population with unmarked fins, it is negatively biased. A reanalysis of the data using a method that accounts for unmarked fins is required for a less negatively biased estimate.

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate for the Choctawhatchee Bay Stock is 179 (CV=0.04). The resulting minimum population estimate is 173.

Current Population Trend

One abundance estimate is available for this stock, and therefore there are insufficient data to assess population trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of the Choctawhatchee Bay Stock of common bottlenose dolphins is 173. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is of unknown status. PBR for this stock of common bottlenose dolphins is 1.7.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury of the Choctawhatchee Bay Stock of common bottlenose dolphins during 2009–2013 is unknown because this stock may interact with unobserved fisheries (see below), and also because the most current observer data for the shrimp trawl fishery are for 2007-2011 and mortality rates were calculated at the state level (see Shrimp Trawl section below). The mean annual fishery-related mortality and serious injury during 2009–2013 is unknown. Additional mean annual mortality and serious injury during 2009–2013 due to other human-caused actions (fishery research) was 0.4. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 0.4. This does not include an estimate for the commercial shrimp trawl fishery.

New Serious Injury Guidelines

NMFS updated its serious injury designation and reporting process, which uses guidance from previous serious injury workshops, expert opinion, and analysis of historic injury cases to develop new criteria for distinguishing serious from non-serious injury (Angliss and DeMaster 1998; Andersen *et al*. 2008; NOAA 2012). NMFS defines serious injury as an "*injury that is more likely than not to result in mortality*". Injury determinations for stock assessments revised in 2013 or later incorporate the new serious injury guidelines, based on the most recent 5-year period for which data are available.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category II Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl; Gulf of Mexico menhaden purse seine; and Southeastern U.S. Atlantic, Gulf of Mexico stone crab trap/pot fisheries; and the Category III Gulf of Mexico blue crab trap/pot; and Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fisheries (Appendix III). There have been no documented mortalities of Choctawhatchee Bay common bottlenose dolphins in crab trap/pot fisheries. There is no systematic observer coverage of crab trap/pot fisheries; therefore, it is not possible to quantify total mortality. There are no recent observer program data for the Gulf of Mexico menhaden purse seine fishery. The menhaden fishery in this area is very limited. During 2010, there was only 1 fishing trip for Walton County, Florida, and none for Okaloosa County, Florida. During 2009 and 2011-2013, there were no fishing trips for either county (Florida Fish and Wildlife Conservation Commission 2013). There were no documented interactions with hook and line fisheries in Choctawhatchee Bay during 2009–2013. There is no observer coverage of hook and line fisheries.

Shrimp Trawl

Between 1997 and 2011, 5 common bottlenose dolphins and 7 unidentified dolphins, which could have been either common bottlenose dolphins or Atlantic spotted dolphins, became entangled in the lazy line, turtle excluder device or tickler chain gear in the commercial shrimp trawl fishery in the Gulf of Mexico. All dolphin bycatch interactions resulted in mortalities except for 1 unidentified dolphin that was released alive in 2009. Soldevilla *et al.* (2015) provide mortality estimates calculated from analysis of shrimp fishery effort data and NMFS's Observer Program bycatch data. Observer program coverage does not extend into BSE waters; time-area stratified bycatch rates were extrapolated into inshore waters to estimate bycatch mortalities from inshore fishing effort. Annual mortality estimates were calculated for the years 1997-2011 from stratified annual fishery effort and bycatch rates, and a 5-year unweighted mean mortality estimate for 2007-2011 was calculated for Gulf of Mexico dolphin stocks. The 4-area (Texas, Louisiana, Mississippi/Alabama, Florida) stratification method was chosen because it best approximates how fisheries operate (Soldevilla *et al.* 2015). The BSE stock mortality estimates were aggregated at the state level as this was the spatial resolution at which fishery effort is modeled (e.g., Nance *et al.* 2008). The mean annual mortality estimate for Florida BSE stocks (from Perdido Bay east and south to the Florida Keys) was 3.4 (CV=0.99). This estimate does not include skimmer trawl effort, which may represent up to 50% of shrimp fishery effort in Louisiana, Alabama, and Mississippi inshore waters, because Observer Program coverage of skimmer trawls is limited. Limitations and biases of annual bycatch mortality estimates are described in detail in Soldevilla *et al.* (2015).

Other Mortality

During 2009–2013, 2 dolphin mortalities occurred due to entanglement in a research gillnet in Choctawhatchee Bay. The mortalities occurred during 2011, and were included in the stranding database.

From 2009 to 2013, 13 common bottlenose dolphins were reported stranded within the Choctawhatchee Bay Stock area (Table 1; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). It could not be determined if there was evidence of human interaction for 10 of these strandings. For 1 dolphin, no evidence of human interaction was detected. For the remaining 2 dolphins, evidence of human interactions was found (both animals were entangled in research gillnet gear as mentioned above). Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

Choctawhatchee Bay has been affected by 4 recent unusual mortality events (UMEs). First, between August 1999 and May 2000, 150 bottlenose dolphins died coincident with *Karenia brevis* blooms and fish kills in the Florida Panhandle. This UME started in St. Joseph Bay, Florida, and was concurrent spatially and temporally with a *K. brevis* bloom that spread east to west. There were 62 bottlenose dolphin strandings within Choctawhatchee Bay during this event, which accounted for about 41% of the total bottlenose dolphin strandings associated with this UME. Brevetoxin was determined to be the cause of this event (Twiner *et al.* 2012; Litz *et al.* 2014). Second, in March and April 2004, in another Florida Panhandle UME attributed to *K. brevis* blooms, 105 bottlenose dolphins and 2 unidentified dolphins stranded dead (Litz *et al.* 2014). This event also started in St. Joseph Bay, and the majority (76%) of animals stranded in the St. Joseph Bay Stock area with only 2 strandings within Choctawhatchee Bay. Although there was no indication of a *K. brevis* bloom at the time, high levels of brevetoxin were found in the stomach contents of the stranded dolphins (Flewelling *et al.* 2005; Twiner *et al.* 2012). Third, a separate UME was declared in the Florida Panhandle after elevated numbers of dolphin strandings occurred in association with a *K. brevis* bloom in September 2005. Dolphin strandings remained elevated through the spring of 2006 and brevetoxin was again detected in the tissues of most of the stranded dolphins. Between September 2005 and April 2006 when the event was officially declared over, a total of 88 bottlenose dolphin strandings occurred (plus strandings of 5 unidentified dolphins), with 44 (50%) occurring within Choctawhatchee Bay. Brevetoxin was determined to be the cause of this event (Twiner *et al.* 2012; Litz *et al.* 2014). Finally, a UME was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010; and, as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see "Habitat Issues" below), during the spill, and after. During 2010-2013, all 12 stranded animals from this stock were considered to be part of the UME.

The problem of dolphin depredation of fishing gear is increasing in Gulf of Mexico coastal and estuary waters and illegal feeding or provisioning of wild bottlenose dolphins has been documented in Florida and Texas (Bryant 1994; Samuels and Bejder 2004; Cunningham-Smith *et al.* 2006; Powell and Wells 2011). There are emerging questions regarding potential linkages between provisioning and depredation of recreational fishing gear and associated entanglement and ingestion of gear. To date there are no records of depredation or provisioning for this stock area however.

Table 1. Common bottlenose dolphin strandings occurring in the Choctawhatchee Bay Stock area from 2009 to 2013, as well as number of strandings for which evidence of human interaction was detected and number of strandings for which it could not be determined (CBD) if there was evidence of human interaction. Data are from the NOAA National Marine Mammal Health and Stranding Response Database (unpublished data, accessed 11 June 2014). Please note human interaction does not necessarily mean the interaction caused the animal's death.

Stock	Category	2009	2010	2011	2012	2013	Total
Choctawhatchee Bay Stock	Total Stranded	1	2[a]	4[a]	2[a]	4[a]	13
	Human Interaction						
	---Yes	0	0	2[b]	0	0	2
	---No	1	0	0	0	0	1
	---CBD	0	2	2	2	4	10

[a] All strandings were part of the ongoing UME event in the northern Gulf of Mexico.
[b] Two entanglement interactions with research gillnet gear (mortalities).

HABITAT ISSUES

The *Deepwater Horizon* (DWH) MC252 drilling platform, located approximately 50 miles southeast of the Mississippi River Delta in waters about 1500 m deep, exploded on 20 April 2010. The rig sank, and over 87 days up to ~4.9 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (McNutt *et al.* 2012). During the response effort dispersants were applied extensively at the seafloor and at the sea surface (Lehr *et al.* 2010; OSAT 2010). In-situ burning, or controlled burning of oil at the surface, was also used extensively as a response tool (Lehr *et al.* 2010). The oil, dispersant and burn residue compounds present ecological concerns (Buist *et al.* 1999; NOAA 2011). The magnitude of this oil spill was unprecedented in U.S. history, causing impacts to wildlife, natural habitats and human communities along coastal areas from western Louisiana to the Florida Panhandle (NOAA 2011). It could be years before the entire scope of damage is ascertained (NOAA 2011).

Given the trajectory of the surface oil during the spill and the documented oiling of shoreline (Michel *et al.* 2013), it is likely the Choctawhatchee Bay Stock of common bottlenose dolphins was exposed to oil during the event. Some heavy to moderate oiling occurred on Alabama and Florida beaches, with the heaviest stretch occurring from Dauphin Island, Alabama, to Gulf Breeze, Florida. Light to trace oil was reported along the majority of Mississippi barrier islands, from Gulf Breeze to Panama City, Florida, and outside of Atchafalaya and Vermilion Bays in western Louisiana (OSAT-2 2011). A substantial number of beaches and wetlands along the Louisiana coast experienced heavy or moderate oiling (OSAT-2 2011). The heaviest oiling in Louisiana occurred west of the Mississippi River on the Mississippi Delta and in Barataria and Terrebonne Bays, and to the east of the river on the Chandeleur Islands.

Shortly after the oil spill, the Natural Resource Damage Assessment (NRDA) process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies are being conducted to determine potential impacts of the spill on marine mammals. These studies have focused on identifying the type, magnitude, severity, length and impact of oil exposure to oceanic, continental shelf, coastal and estuarine marine mammals. The research is ongoing. For coastal and estuarine dolphins, the NOAA-led efforts include: active surveillance to detect stranded animals in remote locations; aerial surveys to document the distribution, abundance, species and exposure relative to oil from the DWH spill; assessment of sublethal and chronic health impacts on coastal and estuarine bottlenose dolphins in Barataria Bay, Louisiana, Mississippi Sound, and a reference site in Sarasota Bay, Florida; and assessment of injuries to dolphin stocks in Barataria Bay and Chandeleur Sound, Louisiana, Mississippi Sound, and as a reference site, St. Joseph Bay, Florida.

The effects of oil exposure on marine mammals depend on a number of factors including the type and mixture of chemicals involved, the amount, frequency and duration of exposure, the route of exposure (inhaled, ingested, absorbed, or external) and biomedical risk factors of the particular animal (Geraci 1990). In general, direct external contact with petroleum compounds or dispersants with skin may cause skin irritation, chemical burns and infections. Inhalation of volatile petroleum compounds or dispersants may irritate or injure the respiratory tract, which could lead to pneumonia or inflammation. Ingestion of petroleum compounds may cause injury to the gastrointestinal tract, which could affect an animal's ability to digest or absorb food. Absorption of petroleum compounds or dispersants may damage kidney, liver and brain function in addition to causing immune suppression and anemia. Long term chronic effects such as lowered reproductive success and decreased survival may occur (Geraci 1990).

STATUS OF STOCK

Common bottlenose dolphins are not listed as threatened or endangered under the Endangered Species Act. Because the stock size is small and relatively few mortalities and serious injuries would exceed PBR, NMFS considers this a strategic stock. Additionally, because a UME of unprecedented size and duration (began 1 February 2010 and is ongoing) has impacted the northern Gulf of Mexico, including the Choctawhatchee Bay Stock, and because the high number of bottlenose dolphin deaths associated with UMEs in the Florida panhandle since 1999 suggests that this stock may be stressed, finds cause for concern about this stock. The total human-caused mortality and serious injury for this stock is unknown and there is insufficient information available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching zero mortality and serious injury rate. The status of this stock relative to OSP is unknown. There are insufficient data to determine population trends for this stock.

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ATLANTIC SPOTTED DOLPHIN (*Stenella frontalis*): Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are 2 species of spotted dolphins in the Atlantic Ocean, the Atlantic spotted dolphin (*Stenella frontalis*) and the pantropical spotted dolphin (*S. attenuata*) (Perrin *et al.* 1987). The Atlantic spotted dolphin occurs in 2 forms which may be distinct sub-species (Perrin *et al*. 1987, 1994; Rice 1998; Viricel and Rosel 2014): the large, heavily spotted form which inhabits the continental shelf and is usually found inside or near the 200m isobath; and the smaller, less spotted island and offshore form which occurs in the Atlantic Ocean but is not known to occur in the Gulf of Mexico (Fulling *et al.* 2003; Mullin and Fulling 2003; Mullin and Fulling 2004; Viricel and Rosel 2014). Where they co-occur, the offshore form of the Atlantic spotted dolphin and the pantropical spotted dolphin can be difficult to differentiate at sea.

The Atlantic spotted dolphin is endemic to the Atlantic Ocean in temperate to tropical waters (Perrin *et al.* 1987, 1994). In the Gulf of Mexico, Atlantic spotted dolphins occur primarily from continental shelf waters 10-200m deep to slope waters <500m deep (Figure 1; Fulling *et al.* 2003; Mullin and Fulling 2004; Maze-Foley and Mullin 2006). Atlantic spotted dolphins were seen in all seasons during GulfCet aerial surveys of the northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) from 1992 to 1998 (Hansen *et al.* 1996; Mullin and Hoggard 2000). It has been suggested that this species may move inshore seasonally during spring, but data supporting this hypothesis are limited (Caldwell and Caldwell 1966; Fritts *et al.* 1983). Because there are confirmed records from the southern Gulf of Mexico beyond U.S. boundaries (e.g., Jefferson and Schiro 1997, Ortega Ortiz 2002), this may be a transboundary stock.

Genetic analysis of Atlantic spotted dolphins in the Gulf of Mexico and western North Atlantic revealed significant differentiation for both nuclear and mitochondrial DNA markers (Adams and Rosel 2005; Viricel and Rosel 2014). Estimates of immigration rates between the western North Atlantic shelf population and the Gulf of Mexico were less than 1% per year (Viricel and Rosel 2014), which is well below the 10% per year threshold for demographic independence (Hastings 1993), thereby supporting separate stocks for Gulf of Mexico and western North Atlantic shelf populations. Viricel and Rosel (2014) also found support for 2 demographically independent populations within the northern Gulf of Mexico. One population primarily occupied shelf waters from the Texas-Mexico border eastward to Cape San Blas, Florida while the second population was concentrated over the Florida shelf in the eastern Gulf of Mexico and stretched westward to the Florida panhandle. Thus, the two populations appear to overlap in shelf waters between approximately Mobile Bay and Cape San Blas. Additional work is necessary to identify a boundary between them.

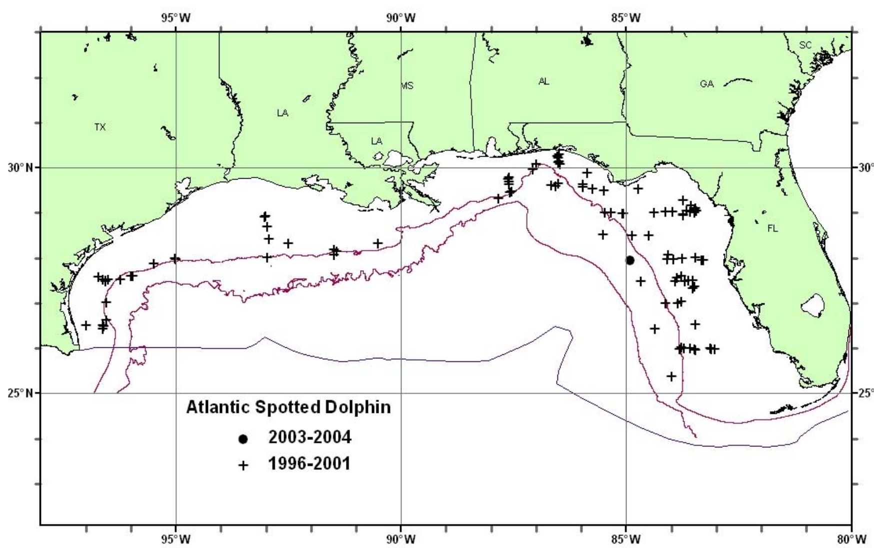

Figure 1. *Distribution of Atlantic spotted dolphin sightings from SEFSC spring and fall vessel surveys during 1996-2001 and from summer 2003 and spring 2004 surveys. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 100m and 1,000m isobaths and the offshore extent of the U.S. EEZ.*

POPULATION SIZE

The current population size for the Atlantic spotted dolphin in the northern Gulf of Mexico is unknown because the most recent survey data are more than 8 years old (Wade and Angliss 1997).

Abundance Estimates

All estimates of abundance were derived through the application of distance sampling analysis (Buckland *et al.* 2001) and the computer program DISTANCE (Thomas *et al.* 1998) to line-transect survey data collected from ships in the northern Gulf of Mexico and are summarized in Appendix IV.

From 1991 through 1994, and from 1996 through 2001 (excluding 1998), annual surveys were conducted during spring in oceanic waters (i.e., 200m isobath to seaward extent of the U.S. EEZ) along a fixed plankton sampling trackline. Due to limited survey effort in any given year, the survey effort-weighted estimated average abundance of Atlantic spotted dolphins for all surveys combined was estimated. For 1991 to 1994, the estimate was 3,213 (CV=0.44; Hansen *et al.* 1995), and for 1996 to 2001, 175 (CV=0.84; Mullin and Fulling 2004). These were underestimates because the continental shelf was not covered during these surveys.

Data were also collected from 1998 to 2001 during fall plankton surveys. Tracklines, which were perpendicular to the bathymetry, covered shelf waters from the 20m to the 200m isobaths. The estimated abundance of Atlantic spotted dolphins, pooled from 2000 through 2001, for the fall outer continental shelf surveys was 37,611 (CV=0.28) (Table 1; see Fulling *et al.* 2003).

During summer 2003 and spring 2004, surveys dedicated to estimating cetacean abundance were conducted in oceanic waters along a grid of uniformly-spaced transect lines from a random start. The abundance estimate for Atlantic spotted dolphins in oceanic waters, pooled from 2003 to 2004, was 0 (Mullin 2007).

The most recent best abundance estimate for the Atlantic spotted dolphin in the northern Gulf of Mexico was the combined estimate of abundance for both the outer continental shelf (fall surveys, 2000-2001) and oceanic waters (spring and summer surveys, 2003-2004), which was 37,611 (CV=0.28; Table 1). Because these data are more than 8 years old, the current best population estimate is unknown.

Table 1. Most recent abundance estimates (N_{best}) and coefficient of variation (CV) of Atlantic spotted dolphins in the northern Gulf of Mexico outer continental shelf (OCS) (waters 20-200m deep) during fall 2000-2001 and oceanic waters (200m to the offshore extent of the EEZ) during spring/summer 2003-2004.

Month/Year	Area	N_{best}	CV
Fall 2000-2001	Outer Continental Shelf	37,611	0.28
Spring/Summer 2003-2004	Oceanic	0	-
Fall & Spring/Summer	**OCS & Oceanic**	**37,611**	**0.28**

Minimum Population Estimate

The current minimum population estimate is unknown. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997).

Current Population Trend

One abundance estimate is available covering this stock's entire range, and therefore there are insufficient data to assess population trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is currently undetermined. PBR is the product of the minimum population size, one half the maximum net productivity rate and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of this stock is unknown. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because the stock is of unknown status.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The estimated mean annual fishery-related mortality and serious injury for this stock during 2007-2011 was 42 Atlantic spotted dolphins (CV=0.45) based on observer data for the commercial shrimp trawl fishery (see Fisheries

Information section below). More recent observer data for 2012 and 2013 for the shrimp trawl fishery are not available.

New Serious Injury Guidelines

NMFS updated its serious injury designation and reporting process, which uses guidance from previous serious injury workshops, expert opinion, and analysis of historic injury cases to develop new criteria for distinguishing serious from non-serious injury (Angliss and DeMaster 1998; Andersen *et al*. 2008; NOAA 2012). NMFS defines serious injury as an "*injury that is more likely than not to result in mortality*". Injury determinations for stock assessments revised in 2013 or later incorporate the new serious injury guidelines, based on the most recent 5-year period for which data are available.

Fisheries Information

The commercial fisheries that interact, or that potentially could interact, with this stock in the Gulf of Mexico are the Atlantic Ocean, Caribbean, Gulf of Mexico large pelagic longline fishery and the Southeastern U.S. Atlantic/Gulf of Mexico shrimp trawl fishery (Appendix III).

Pelagic swordfish, tunas and billfish are the targets of the longline fishery operating in the northern Gulf of Mexico. There has been no reported mortality or serious injury of an Atlantic spotted dolphin in the pelagic longline fishery during 1998-2013 (Yeung 1999; Yeung 2001; Garrison 2003; Garrison and Richards 2004; Garrison 2005; Fairfield Walsh and Garrison 2006; Fairfield-Walsh and Garrison 2007; Fairfield and Garrison 2008; Garrison *et al.* 2009; Garrison and Stokes 2010; 2012a,b; 2013; 2014).

Between 1997 and 2011, 5 common bottlenose dolphins and 7 unidentified dolphins, which could have been either common bottlenose dolphins or Atlantic spotted dolphins, became entangled in the lazy line, turtle excluder device or tickler chain gear in the commercial shrimp trawl fishery in the Gulf of Mexico. All dolphin bycatch interactions resulted in mortalities except for 1 unidentified dolphin that was released alive in 2009. Soldevilla *et al.* (2015) provide mortality estimates calculated from analysis of shrimp fishery effort data and NMFS's Observer Program bycatch data. Annual mortality estimates were calculated for the years 1997-2011 from stratified annual fishery effort and bycatch rates, and a 5-year unweighted mean mortality estimate for 2007-2011 was calculated for Gulf of Mexico dolphin stocks. The 4-area (TX, LA, MS/AL, FL) stratification method was chosen because it best approximates how fisheries operate (Soldevilla *et al.* 2015). The mean annual mortality estimate for the Atlantic spotted dolphin stock is 42 (CV=0.45). Limitations and biases of annual bycatch mortality estimates are described in detail in Soldevilla *et al.* (2015).

Other Mortality

A total of 16 Atlantic spotted dolphins were reported stranded in the Gulf of Mexico during 2009–2013 (Table 1; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). Evidence of human interaction was detected for 1 stranded animal, which had ingested a plastic sandwich bag. No evidence of human interaction was detected for 3 animals, and for the remaining 12 animals, it could not be determined if there was evidence of human interaction. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

Since 1990, there have been 13 common bottlenose dolphin die-offs or Unusual Mortality Events (UMEs) in the northern Gulf of Mexico, and 3 of these included Atlantic spotted dolphins. 1) Between August 1999 and May 2000, 150 common bottlenose dolphins died coincident with *Karenia brevis* blooms and fish kills in the Florida Panhandle. Additional strandings included 3 Atlantic spotted dolphins, 1 Risso's dolphin, *Grampus griseus*, 2 Blainville's beaked whales, *Mesoplodon densirostris*, and 4 unidentified dolphins. Brevetoxin was determined to be the cause of this event (Twiner *et al.* 2012; Litz *et al.* 2014). 2) In 2005, a particularly destructive red tide (*K. brevis*) bloom occurred off of central west Florida. Manatee, sea turtle, bird and fish mortalities were reported in the area in early 2005 and a manatee UME had been declared. Common bottlenose dolphin mortalities began to rise above the historical averages by late July 2005, continued to increase through October 2005, and were then declared to be part of a multi-species UME. The multi-species UME extended into 2006, and ended in November 2006. A total of 190 dolphins were involved, primarily common bottlenose dolphins plus strandings of 1 Atlantic spotted dolphin and 23 unidentified dolphins. The evidence suggests the effects of a red tide bloom contributed to the cause of this event (Litz *et al.* 2014). 3) A UME was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010;

and, as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see "Habitat Issues" below), during the spill, and after. During 2010-2013, 12 animals from this stock were considered to be part of the UME.

Table 1. Atlantic spotted dolphin (*Stenella frontalis*) strandings along the northern Gulf of Mexico coast, 2009–2013.

STATE	**2009**	**2010**	**2011**	**2012**	**2013**	**TOTAL**
Alabama	0	0	0	0	1*	1
Florida	4	3*	1*	6*	1*	15
Louisiana	0	0	0	0	0	0
Mississippi	0	0	0	0	0	0
Texas	0	0	0	0	0	0
TOTAL	4	3	1	6	2	16

*These strandings are included in the Northern Gulf of Mexico UME

HABITAT ISSUES

The *Deepwater Horizon* (DWH) MC252 drilling platform, located approximately 50 miles southeast of the Mississippi River Delta in waters about 1500 m deep, exploded on 20 April 2010. The rig sank, and over 87 days up to ~4.9 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (McNutt *et al.* 2012). During the response effort dispersants were applied extensively at the seafloor and at the sea surface (Lehr *et al.* 2010; OSAT 2010). In-situ burning, or controlled burning of oil at the surface, was also used extensively as a response tool (Lehr *et al.* 2010). The oil, dispersant and burn residue compounds present ecological concerns (Buist *et al.* 1999; NOAA 2011). The magnitude of this oil spill was unprecedented in U.S. history, causing impacts to wildlife, natural habitats and human communities along coastal areas from western Louisiana to the Florida Panhandle (NOAA 2011). It could be years before the entire scope of damage is ascertained (NOAA 2011).

Shortly after the oil spill, the Natural Resource Damage Assessment (NRDA) process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies are being conducted to determine potential impacts of the spill on marine mammals. These studies have focused on identifying the type, magnitude, severity, length and impact of oil exposure to oceanic, continental shelf, coastal and estuarine marine mammals. For continental shelf and oceanic cetaceans, the NOAA-led efforts include: aerial surveys to document the distribution, abundance, species and exposure relative to oil from the DWH spill; and ship surveys to evaluate exposure to oil and other chemicals and to assess changes in animal behavior and distribution relative to oil exposure through visual and acoustic surveys, deployment of passive acoustic monitoring systems, collection of tissue samples, and deployment of satellite tags on sperm and Bryde's whales.

Vessel and aerial surveys documented common bottlenose dolphins, Atlantic spotted dolphins, rough-toothed dolphins, spinner dolphins, pantropical spotted dolphins, Risso's dolphins, striped dolphins, sperm whales, dwarf/pygmy sperm whales and a Cuvier's beaked whale swimming in oil or potentially oil-derived substances (e.g., sheen, mousse) in offshore waters of the northern Gulf of Mexico following the DWH oil spill. The effects of oil exposure on marine mammals depend on a number of factors including the type and mixture of chemicals involved, the amount, frequency and duration of exposure, the route of exposure (inhaled, ingested, absorbed, or external) and biomedical risk factors of the particular animal (Geraci 1990). In general, direct external contact with petroleum compounds or dispersants with skin may cause skin irritation, chemical burns and infections. Inhalation of volatile petroleum compounds or dispersants may irritate or injure the respiratory tract, which could lead to pneumonia or inflammation. Ingestion of petroleum compounds may cause injury to the gastrointestinal tract, which could affect an animal's ability to digest or absorb food. Absorption of petroleum compounds or dispersants may damage kidney, liver and brain function in addition to causing immune suppression and anemia. Long term chronic effects such as lowered reproductive success and decreased survival may occur (Geraci 1990).

STATUS OF STOCK

Atlantic spotted dolphins are not listed as threatened or endangered under the Endangered Species Act, and the northern Gulf of Mexico stock is not considered strategic under the MMPA. Despite an undetermined PBR and unknown population size, this is not a strategic stock because previous estimates of population size have been large compared to the number of cases of documented human-caused mortality and serious injury. There is insufficient information available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching zero mortality and serious injury rate. The status of Atlantic spotted dolphins in the northern Gulf of Mexico, relative to OSP, is unknown. There are insufficient data to determine the population trends for this stock.

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PANTROPICAL SPOTTED DOLPHIN (*Stenella attenuata attenuata*): Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are two species of spotted dolphin in the Atlantic Ocean, the Atlantic spotted dolphin (*Stenella frontalis*) and the pantropical spotted dolphin (*S. attenuata*) (Perrin *et al.* 1987). The Atlantic spotted dolphin occurs in two forms which may be distinct sub-species (Perrin *et al*. 1987, 1994; Rice 1998; Viricel and Rosel 2014): the large, heavily spotted form which inhabits the continental shelf and is usually found inside or near the 200m isobath; and the smaller, less spotted island and offshore form which occurs in the Atlantic Ocean but is not known to occur in the Gulf of Mexico (Fulling *et al.* 2003; Mullin and Fulling 2003; Mullin and Fulling 2004; Viricel and Rosel 2014). Where they co-occur, the offshore form of the Atlantic spotted dolphin and the pantropical spotted dolphin can be difficult to differentiate at sea.

The pantropical spotted dolphin is distributed worldwide in tropical and some sub-tropical oceans (Perrin *et al.* 1987; Perrin and Hohn 1994). Sightings of this species occur in oceanic waters of the northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) (Figure 1; Mullin and Fulling 2004; Maze-Foley and Mullin 2006). Pantropical spotted dolphins were seen in all seasons during GulfCet aerial surveys of the northern Gulf of Mexico between 1992 and 1998 (Hansen *et al.* 1996; Mullin and Hoggard 2000). Because there are many confirmed records from Gulf of Mexico waters beyond U.S. boundaries (e.g., Jefferson and Schiro 1997, Ortega Ortiz 2002), pantropical spotted dolphins almost certainly occur throughout the oceanic Gulf of Mexico (Jefferson *et al.* 2008), which is also composed of waters belonging to Mexico and Cuba where there is currently little information on cetacean species abundance and distribution. U.S. waters comprise about 40% of the entire Gulf of Mexico and 35% of the oceanic (i.e., >200 m) Gulf of Mexico.

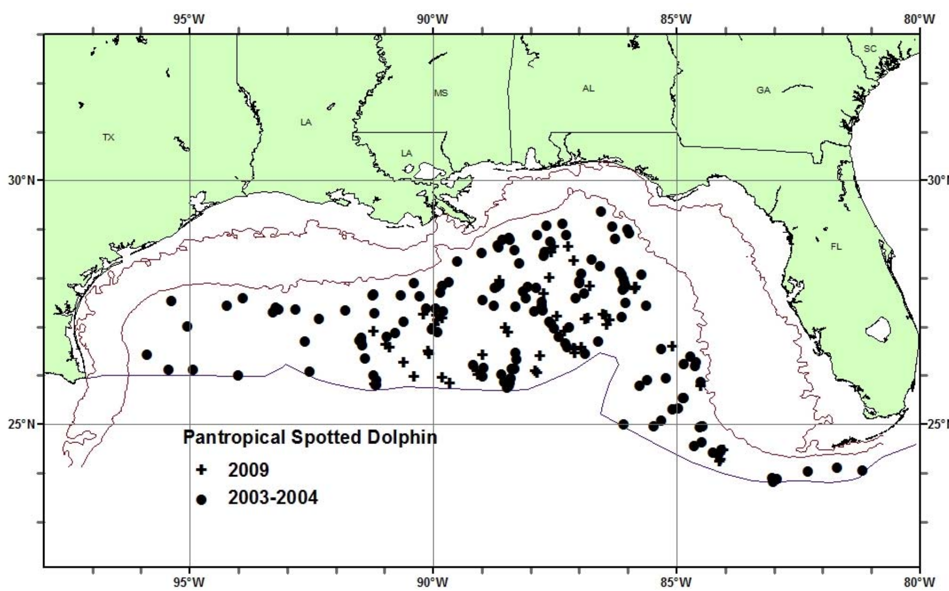

Figure 1. *Distribution of pantropical spotted dolphin sightings from SEFSC vessel surveys during summer 2003 and spring 2004, and during summer 2009. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 20 m and 200 m isobaths and the offshore extent of the U.S. EEZ.*

Some of the Pacific Ocean populations have been divided into different geographic stocks based on morphological characteristics (Perrin *et al.* 1987; Perrin and Hohn 1994). The Gulf of Mexico population is being considered a separate stock for management purposes, although there is currently no information to differentiate this stock from the Atlantic Ocean stock(s). Additional morphological, genetic and/or behavioral data are needed to provide further information on stock delineation.

POPULATION SIZE

The best abundance estimate available for northern Gulf of Mexico pantropical spotted dolphins is 50,880 (CV=0.27; Table 1). This estimate is from a summer 2009 oceanic survey covering waters from the 200m isobath to the seaward extent of the U.S. EEZ from Texas to Florida.

Earlier abundance estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions.

Recent survey and abundance estimate

During summer 2009, a vessel-based line-transect survey dedicated to estimating the abundance of oceanic cetaceans was conducted in the northern Gulf of Mexico. Survey lines were stratified in relation to depth and the location of the Loop Current. The abundance estimate for pantropical spotted dolphins in oceanic waters during 2009 was 50,880 (CV=0.27; Table 1).

Table 1. Summary of abundance estimates for northern Gulf of Mexico pantropical spotted dolphins. Month, year and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Apr-Jun 1991-1994	Oceanic waters	31,320	0.20
Apr-Jun 1996-2001 (excluding 1998)	Oceanic waters	91,321	0.16
Jun-Aug 2003, Apr-Jun 2004 (pooled)	Oceanic waters	34,067	0.18
Jun-Aug 2009	Oceanic waters	50,880	0.27

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for pantropical spotted dolphins is 50,880 (CV=0.27). The minimum population estimate for the northern Gulf of Mexico is 40,699 pantropical spotted dolphins.

Current Population Trend

A trend analysis has not been conducted for this stock. Four point estimates of pantropical spotted dolphin abundance have been made based on data from surveys covering 1991-2009 (Table 1). The estimates vary by a maximum factor of nearly three. To determine whether changes in abundance have occurred over this period, an analysis of all the survey data needs to be conducted which incorporates covariates (e.g., survey conditions, season) that could potentially affect estimates. It should be noted that since this is a transboundary stock and the abundance estimates are for U.S. waters only, it will be difficult to interpret any detected trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one half the maximum net productivity rate, and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 40,699. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because the stock is of unknown status. PBR for the northern Gulf of Mexico pantropical spotted dolphin stock is 407.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The estimated mean annual fishery-related mortality and serious injury for this stock during 2009–2013 was 3.8 pantropical spotted dolphins (CV=0.59; Table 2) due to interactions with the pelagic longline fishery. Additional mean annual mortality and serious injury due to other human-caused actions (fishery research) was 0.6. The total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 4.4.

Fisheries Information

The commercial fisheries that interact, or that potentially could interact, with this stock in the Gulf of Mexico are the Category I Atlantic Highly Migratory Species (high seas longline) fishery and the Atlantic Ocean, Caribbean, Gulf of Mexico large pelagic longline fishery (Appendix III). There is very little effort within the Gulf of Mexico by the high seas longline fishery, and no takes of pantropical spotted dolphins within high seas waters of the Gulf of Mexico have been observed or reported thus far. Pelagic swordfish, tunas and billfish are the targets of the large pelagic longline fishery operating in the northern Gulf of Mexico. The average annual serious injury and mortality in the Gulf of Mexico pelagic longline fishery for the 5-year period from 2009 to 2013 is 3.8 (CV=0.59; Table 2). There were no reports of mortality or serious injury to pantropical spotted dolphins by this fishery during 1998-2008 (Yeung 1999; Yeung 2001; Garrison 2003; Garrison and Richards 2004; Garrison 2005; Fairfield Walsh and Garrison 2006; Fairfield-Walsh and Garrison 2007; Fairfield and Garrison 2008; Garrison *et al.* 2009). However, during 2009, 4 pantropical spotted dolphins were observed to be seriously injured (3 during quarter 2 and 1 during quarter 4) and 1 pantropical spotted dolphin was released alive with no presumed serious injury after entanglement interactions with the pelagic longline fishery (Garrison and Stokes 2010). During 2010, 2 pantropical spotted dolphins were released alive with no presumed serious injuries after entanglement interactions with the pelagic longline fishery (Garrison and Stokes 2012a). One of the entanglements occurred during experimental fishing to test the effectiveness of “weak” hooks as a potential bycatch mitigation tool. There was 100% observer coverage of all experimental sets. During 2011 there were no reports of mortality or serious injury to pantropical spotted dolphins (Garrison and Stokes 2012b). During 2012, 1 mortality of a pantropical spotted dolphin occurred during an experimental set (during quarter 2; Garrison and Stokes 2013). During 2013, 1 pantropical spotted dolphin was observed to be seriously injured (during quarter 2), and 2 additional dolphins were released alive with no presumed serious injuries (Garrison and Stokes 2014). During the second quarters (15 April – 15 June) of 2009–2013, observer coverage in the Gulf of Mexico pelagic longline fishery was greatly enhanced (approaching 55%) to collect more robust information on the interactions between pelagic longline vessels and spawning bluefin tuna. Therefore, the high annual observer coverage rates during 2009–2013 (Table 2) primarily reflect high coverage rates during the second quarter of each year. During the second quarter, this elevated coverage results in an increased probability that relatively rare interactions will be detected. Species within the oceanic Gulf of Mexico are presumed to be resident year-round; however, it is unknown if the bycatch rate observed during the second quarter is representative of that which occurs throughout the year.

Table 2. Summary of the incidental mortality and serious injury of northern Gulf of Mexico pantropical spotted dolphins in the pelagic longline commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).

Fishery	Years	Vessels[a]	Data Type[b]	Observer Coverage[c]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Est. CVs	Mean Annual Mortality
Pelagic Longline	09-13	47, 46, 42, 47, 47	Obs. Data Logbook	.22, .28, .18, .11, .25	4, 0, 0, 0, 1	0, 0, 0, 1, 0	16.0, 0, 0, 0, 2.1	0, 0, 0, 1.0, 0	16.0, 0, 0, 1.0, 2.1	.69, NA, NA, NA, 1.0	3.8 (0.59)

[a] Number of vessels in the fishery is based on vessels reporting effort to the pelagic longline logbook.

[b] Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Observer Program. Mandatory logbook data were used to measure total effort for the longline fishery. These data are collected at the Southeast Fisheries Science Center (SEFSC). Observer coverage in the GOM is dominated by very high coverage rates during April-June associated with efforts to improve estimates of bluefin tuna bycatch.

[c] Proportion of sets observed.

Other Mortality

Three research-related mortalities were documented during 2009–2013. In 2011, 3 pantropical spotted dolphins were incidentally captured and killed during a research mid-water trawl. These mortalities were included in the stranding database and in Table 3.

Seven pantropical spotted dolphins were reported stranded in the Gulf of Mexico during 2009–2013 (Table 3; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). Evidence of human interaction was detected for 3 strandings (mortalities), which were the result of incidental capture in a research trawling net. No evidence of human interaction was detected for 2 stranded animals, and for the remaining 2 animals, it could not be determined if there was evidence of human interaction. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

An Unusual Mortality Event (UME) was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010, and as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see "Habitat Issues" below), during the spill, and after. During 2010, no animals from this stock were considered to be part of the UME, but the 3 strandings during 2011 were included in the UME.

Table 3. Pantropical spotted dolphin (*Stenella attenuata*) strandings along the northern Gulf of Mexico coast, 2009–2013.

STATE	**2009**	**2010**	**2011**	**2012**	**2013**	**TOTAL**
Alabama	1	0	0	0	0	1
Florida	1	0	0	0	0	1
Louisiana	0	0	3[a]	0	0	3
Mississippi	0	0	0	0	0	0
Texas	1	1	0	0	0	2
TOTAL	3	1	3	0	0	7

[a] These 3 strandings were incidental takes during a research trawl. They are included in the Northern Gulf of Mexico UME.

HABITAT ISSUES

The *Deepwater Horizon* (DWH) MC252 drilling platform, located approximately 50 miles southeast of the Mississippi River Delta in waters about 1500 m deep, exploded on 20 April 2010. The rig sank, and over 87 days up to ~4.9 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (McNutt *et al.* 2012). During the response effort dispersants were applied extensively at the seafloor and at the sea surface (Lehr *et al.* 2010; OSAT 2010). In-situ burning, or controlled burning of oil at the surface, was also used extensively as a response tool (Lehr *et al.* 2010). The oil, dispersant and burn residue compounds present ecological concerns (Buist *et al.* 1999; NOAA 2011). The magnitude of this oil spill was unprecedented in U.S. history, causing impacts to wildlife, natural habitats and human communities along coastal areas from western Louisiana to the Florida Panhandle (NOAA 2011). It could be years before the entire scope of damage is ascertained (NOAA 2011).

Shortly after the oil spill, the Natural Resource Damage Assessment (NRDA) process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies are being conducted to determine potential impacts of the spill on marine mammals. These studies have focused on identifying the type, magnitude, severity, length and impact of oil exposure to oceanic, continental shelf, coastal and estuarine marine mammals. For continental shelf and oceanic cetaceans, the NOAA-led efforts include: aerial surveys to document the distribution, abundance, species and exposure relative to oil from the DWH spill; and ship surveys to evaluate exposure to oil and other chemicals and to assess changes in animal behavior and distribution relative to oil exposure through visual and acoustic surveys, deployment of passive acoustic monitoring systems, collection of tissue samples, and deployment of satellite tags on sperm and Bryde's whales.

Vessel and aerial surveys documented common bottlenose dolphins, Atlantic spotted dolphins, rough-toothed dolphins, spinner dolphins, pantropical spotted dolphins, Risso's dolphins, striped dolphins, sperm whales, dwarf/pygmy sperm whales and a Cuvier's beaked whale swimming in oil or potentially oil-derived substances (e.g., sheen, mousse) in offshore waters of the northern Gulf of Mexico following the DWH oil spill. The effects of oil exposure on marine mammals depend on a number of factors including the type and mixture of chemicals involved, the amount, frequency and duration of exposure, the route of exposure (inhaled, ingested, absorbed, or external) and biomedical risk factors of the particular animal (Geraci 1990). In general, direct external contact with petroleum compounds or dispersants with skin may cause skin irritation, chemical burns and infections. Inhalation of volatile petroleum compounds or dispersants may irritate or injure the respiratory tract, which could lead to pneumonia or inflammation. Ingestion of petroleum compounds may cause injury to the gastrointestinal tract, which could affect an animal's ability to digest or absorb food. Absorption of petroleum compounds or dispersants may damage kidney, liver and brain function in addition to causing immune suppression and anemia. Long term chronic effects such as lowered reproductive success and decreased survival may occur (Geraci 1990).

STATUS OF STOCK

Pantropical spotted dolphins are not listed as threatened or endangered under the Endangered Species Act, and the northern Gulf of Mexico stock is not considered strategic under the MMPA. Total fishery-related mortality and serious injury for this stock is less than 10% of PBR and can be considered to be insignificant and approaching zero mortality and serious injury rate. The status of pantropical spotted dolphins in the northern Gulf of Mexico, relative to OSP, is unknown. There are insufficient data to determine the population trends for this stock.

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RISSO'S DOLPHIN (*Grampus griseus*): Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Risso's dolphins are distributed worldwide in tropical to warm temperate waters (Leatherwood and Reeves 1983). Risso's dolphins in the northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) occur throughout oceanic waters but are concentrated in continental slope waters (Figure 1; Baumgartner 1997; Maze-Foley and Mullin 2006). Risso's dolphins were seen in all seasons during GulfCet aerial surveys of the northern Gulf of Mexico between 1992 and 1998 (Hansen *et al.* 1996; Mullin and Hoggard 2000).

Although there are only a few records from Gulf of Mexico waters beyond U.S. boundaries (e.g., Jefferson and Schiro 1997, Ortega Ortiz 2002), Risso's dolphins almost certainly occur throughout the oceanic Gulf of Mexico (Jefferson *et al.* 2008), including waters belonging to Mexico and Cuba where there is currently little information on cetacean species abundance and distribution. U.S. waters comprise about 40% of the entire Gulf of Mexico and 35% of the oceanic (i.e., >200 m) Gulf of Mexico.

The Gulf of Mexico population is being considered a separate stock for management purposes, although there is currently little information to differentiate this stock from the Atlantic Ocean stock. In 2006, a Risso's dolphin that stranded on the Florida Gulf Coast was rehabilitated, tagged with a satellite-linked transmitter and released into the Gulf southwest of Tampa Bay. Over a 23-day period the Risso's dolphin moved from the Gulf release site into the Atlantic Ocean and north to just off of Delaware (Wells *et al.* 2009). During September 2007 – January 2008, tracking of an adult female Risso's dolphin that had been rehabilitated and released by Mote Marine Laboratory after stranding on the southwest coast of Florida documented movements throughout the northern Gulf of Mexico. The dolphin, released with its young calf, traveled as far as Bahia de Campeche, Mexico, and waters off Texas and Louisiana before returning to the shelf edge southwest of its stranding site off Florida (Wells *et al.* 2008). As Wells *et al.* (2009) note, it is difficult to determine the effects of stranding and rehabilitation on post-release behavior, so it is unknown whether these movements were representative of Risso's dolphin ranging patterns in either the Gulf of Mexico or Atlantic Ocean. Additional morphological, genetic and/or behavioral data are needed to provide further information on stock delineation.

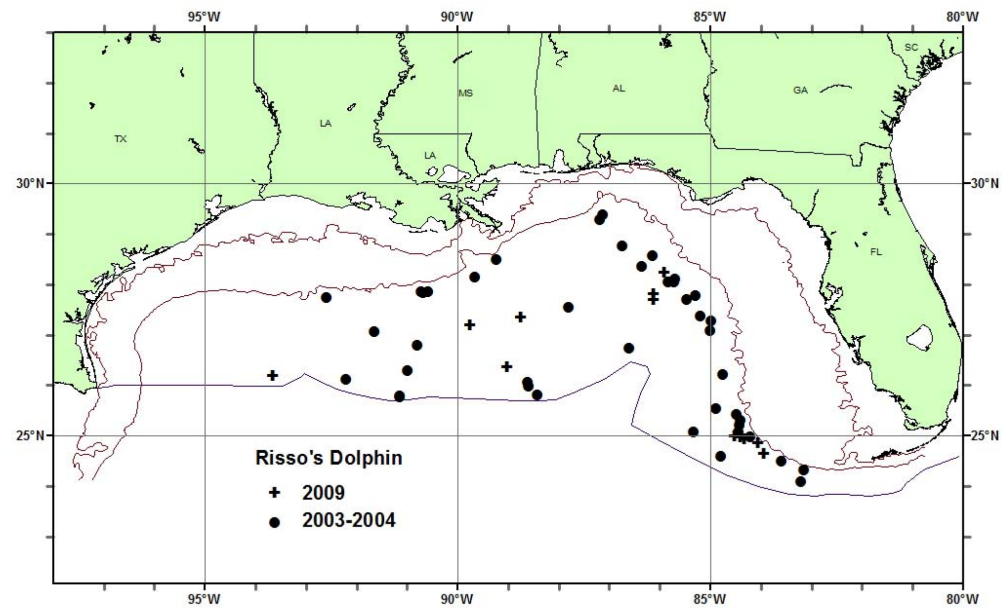

Figure 1. *Distribution of Risso's dolphin sightings from SEFSC vessel surveys during summer 2003 and spring 2004, and during summer 2009. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 20-m and 200-m isobaths and the offshore extent of the U.S. EEZ.*

POPULATION SIZE

The best abundance estimate available for northern Gulf of Mexico Risso's dolphins is 2,442 (CV=0.57; Table 1). This estimate is from a summer 2009 oceanic survey covering waters from the 200-m isobath to the seaward extent of the U.S. EEZ.

Earlier abundance estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions.

Recent survey and abundance estimate

During summer 2009, a vessel-based line-transect survey dedicated to estimating the abundance of oceanic cetaceans was conducted in the northern Gulf of Mexico. Survey lines were stratified in relation to depth and the location of the Loop Current. The abundance estimate for Risso's dolphins in oceanic waters during 2009 was 2,442 (CV=0.57; Table 1).

Table 1. Summary of abundance estimates for northern Gulf of Mexico Risso's dolphins. Month, year and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Apr-Jun 1991-1994	Oceanic waters	2,749	0.27
Apr-Jun 1996-2001 (excluding 1998)	Oceanic waters	2,169	0.32
Jun-Aug 2003, Apr-Jun 2004	Oceanic waters	1,589	0.27
Jun-Aug 2009	Oceanic waters	2,442	0.57

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for Risso's dolphins is 2,442 (CV=0.57). The minimum population estimate for the northern Gulf of Mexico is 1,563 Risso's dolphins.

Current Population Trend

A trend analysis has not been conducted for this stock. Four point estimates of Risso's dolphin abundance have been made based on data from surveys covering 1991-2009 (Table 1). The estimates vary by a maximum factor of nearly two. To determine whether changes in abundance have occurred over this period, an analysis of all the survey data needs to be conducted which incorporates covariates (e.g., survey conditions, season) that could potentially affect estimates. It should be noted that since this is a transboundary stock and the abundance estimates are for U.S. waters only, it will be difficult to interpret any detected trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one half the maximum net productivity rate and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 1,563. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because the stock is of unknown status. PBR for the northern Gulf of Mexico Risso's dolphin is 16.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The estimated mean annual fishery-related mortality and serious injury for this stock during 2009–2013 was 7.9 Risso's dolphins (CV=0.85; Table 2) due to interactions with the pelagic longline fishery.

Fisheries Information

The commercial fisheries that interact, or that could potentially interact, with this stock in the Gulf of Mexico are the Category I Atlantic Highly Migratory Species (high seas longline) fishery and the Atlantic Ocean, Caribbean, Gulf of Mexico large pelagic longline fishery (Appendix III). There is very little effort within the Gulf of Mexico by the high seas longline fishery, and no takes of Risso's dolphins within high seas waters of the Gulf of Mexico have been observed or reported thus far. Pelagic swordfish, tunas and billfish are the targets of the large pelagic longline fishery operating in the northern Gulf of Mexico. During the second quarters (15 April – 15 June) of 2009–2013, observer coverage in the Gulf of Mexico pelagic longline fishery was greatly enhanced (approaching 55%) to collect more robust information on the interactions between pelagic longline vessels and spawning bluefin tuna. Therefore, the high annual observer coverage rates during 2009–2013 (Table 2) primarily reflects high coverage rates during the second quarter of each year. During the second quarter, this elevated coverage results in an increased probability that relatively rare interactions will be detected. Species within the oceanic Gulf of Mexico are presumed to be resident year-round; however, it is unknown if the bycatch rate observed during the second quarter is representative of that which occurs throughout the year.

For the 5-year period 2009–2013, the estimated annual combined serious injury and mortality attributable to the pelagic longline fishery in the northern Gulf of Mexico was 7.9 (CV=0.85) Risso's dolphins. During 2009–2013, 3 serious injuries of Risso's dolphins were observed during interactions with the pelagic longline fishery. These interactions occurred during the second quarter of 2011, during the fourth quarter of 2012 and during the third quarter of 2013 (Table 2; Garrison and Stokes 2010; 2012a,b; 2013; 2014). In addition, in the second quarter of 2011, 1 Risso's dolphin was observed entangled and released alive without serious injury in the northern Gulf of Mexico (Garrison and Stokes 2012b).

Prior to 2009, 1 mortality and 2 serious injuries were observed in 2008, and in 2005 a Risso's dolphin was observed entangled and released alive without serious injury in the northern Gulf of Mexico (Fairfield Walsh and Garrison 2006; Garrison *et al.* 2009).

Table 2. Summary of the incidental mortality and serious injury of northern Gulf of Mexico Risso's dolphins in the pelagic longline commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).

Fishery	Years	Vessels [a]	Data Type [b]	Observer Coverage [c]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Est. CVs	Mean Annual Mortality
Pelagic Longline	09-13	47, 46, 42, 47, 47	Obs. Data Logbook	.22, .28, .18, .11, .25	0, 0, 1, 1, 1	0, 0, 0, 0, 0	0, 0, 1.5, 29.8, 15.2	0, 0, 0, 0, 0	0, 0, 1.5, 29.8, 15.2	NA, NA, 1.0, 1.0, 1.0	7.9 (0.85)

[a] Number of vessels in the fishery is based on vessels reporting effort to the pelagic longline logbook.
[b] Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Observer Program. Mandatory logbook data were used to measure total effort for the longline fishery. These data are collected at the Southeast Fisheries Science Center (SEFSC). Observer coverage in the GOM is dominated by very high coverage rates during April-June associated with efforts to improve estimates of bluefin tuna bycatch.
[c] Proportion of sets observed.

Other Mortality

There were 7 reported strandings of Risso's dolphins in the Gulf of Mexico during 2009–2013 (Table 3; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). This includes one mass stranding of 2 animals in Florida during January 2009. No evidence of human interactions was detected for 2 of the stranded animals, and it could not be determined if there was evidence of human interactions for the remaining 5 stranded animals. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury, particularly for offshore species such as Risso's dolphins, because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

Since 1990, there have been 13 common bottlenose dolphin or cetacean die-offs or Unusual Mortality Events (UMEs) in the northern Gulf of Mexico, and 2 of these included a Risso's dolphin. Between August 1999 and May

2000, 152 common bottlenose dolphins died coincident with *Karenia brevis* blooms and fish kills in the Florida Panhandle. Additional strandings included 3 Atlantic spotted dolphins, *Stenella frontalis*, 1 Risso's dolphin, 2 Blainville's beaked whales, *Mesoplodon densirostris*, and 4 unidentified dolphins. A UME was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010, and as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see "Habitat Issues" below), during the spill, and after. During 2010, 2011, and 2013, no animals from this stock were considered to be part of the UME, but during 2012, 1 stranded Risso's dolphin was included in the UME.

Table 3. Risso's dolphin (*Grampus griseus*) strandings along the northern Gulf of Mexico coast, 2009-2013.

STATE	2009	2010	2011	2012	2013	TOTAL
Alabama	0	0	0	0	0	0
Florida	2[a]	0	1	1[b]	1	5
Louisiana	0	0	0	0	0	0
Mississippi	0	1	0	0	0	1
Texas	1	0	0	0	0	1
TOTAL	3	1	1	1	1	7

[a] Includes Florida mass stranding of 2 animals in January 2009.
[b] This stranding is included in the Northern Gulf of Mexico UME.

HABITAT ISSUES

The *Deepwater Horizon* (DWH) MC252 drilling platform, located approximately 50 miles southeast of the Mississippi River Delta in waters about 1500 m deep, exploded on 20 April 2010. The rig sank, and over 87 days up to ~4.9 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (McNutt *et al.* 2012). During the response effort dispersants were applied extensively at the seafloor and at the sea surface (Lehr *et al.* 2010; OSAT 2010). In-situ burning, or controlled burning of oil at the surface, was also used extensively as a response tool (Lehr *et al.* 2010). The oil, dispersant and burn residue compounds present ecological concerns (Buist *et al.* 1999; NOAA 2011). The magnitude of this oil spill was unprecedented in U.S. history, causing impacts to wildlife, natural habitats and human communities along coastal areas from western Louisiana to the Florida Panhandle (NOAA 2011). It could be years before the entire scope of damage is ascertained (NOAA 2011).

Shortly after the oil spill, the Natural Resource Damage Assessment (NRDA) process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies are being conducted to determine potential impacts of the spill on marine mammals. These studies have focused on identifying the type, magnitude, severity, length and impact of oil exposure to oceanic, continental shelf, coastal and estuarine marine mammals. For continental shelf and oceanic cetaceans, the NOAA-led efforts include: aerial surveys to document the distribution, abundance, species and exposure relative to oil from the DWH spill; and ship surveys to evaluate exposure to oil and other chemicals and to assess changes in animal behavior and distribution relative to oil exposure through visual and acoustic surveys, deployment of passive acoustic monitoring systems, collection of tissue samples, and deployment of satellite-linked tags on sperm and Bryde's whales.

Vessel and aerial surveys documented Risso's dolphins, bottlenose dolphins, Atlantic spotted dolphins, rough-toothed dolphins, spinner dolphins, pantropical spotted dolphins, striped dolphins, sperm whales, dwarf/pygmy sperm whales and a Cuvier's beaked whale swimming in oil or potentially oil-derived substances (e.g., sheen, mousse) in offshore waters of the northern Gulf of Mexico following the DWH oil spill. The effects of oil exposure on marine mammals depend on a number of factors including the type and mixture of chemicals involved, the amount, frequency and duration of exposure, the route of exposure (inhaled, ingested, absorbed, or external) and biomedical risk factors of the particular animal (Geraci 1990). In general, direct external contact with petroleum compounds or dispersants with skin may cause skin irritation, chemical burns and infections. Inhalation of volatile petroleum compounds or dispersants may irritate or injure the respiratory tract, which could lead to pneumonia or inflammation. Ingestion of petroleum compounds may cause injury to the gastrointestinal tract, which could affect an animal's ability to digest or absorb food. Absorption of petroleum compounds or dispersants may damage kidney, liver and brain function in addition to causing immune suppression and anemia. Long term chronic effects such as lowered reproductive success and decreased survival may occur (Geraci 1990).

STATUS OF STOCK

Risso's dolphins are not listed as threatened or endangered under the Endangered Species Act, and the northern Gulf of Mexico stock is not considered strategic under the MMPA. Total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and therefore cannot be considered to be insignificant and approaching zero mortality and serious injury rate. The mean annual fishery-related mortality and serious injury does not exceed PBR. The status of Risso's dolphins in the northern Gulf of Mexico, relative to OSP, is unknown. There are insufficient data to determine the population trends for this species.

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SHORT-FINNED PILOT WHALE (*Globicephala macrorhynchus*): Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The short-finned pilot whale is distributed worldwide in tropical to temperate waters (Leatherwood and Reeves 1983). Sightings of these animals in the northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) occur primarily on the continental slope west of 89˚W (Figure 1; Mullin and Fulling 2004; Maze-Foley and Mullin 2006). Short-finned pilot whales were seen in all seasons during GulfCet aerial surveys of the northern Gulf of Mexico between 1992 and 1998 (Hansen *et al.* 1996; Mullin and Hoggard 2000).

Because there are many confirmed records from Gulf of Mexico waters beyond U.S. boundaries (e.g., Jefferson and Schiro 1997, Ortega Ortiz 2002), short-finned pilot whales almost certainly occur throughout the oceanic Gulf of Mexico (Jefferson *et al.* 2008), which is also composed of waters belonging to Mexico and Cuba where there is currently little information on cetacean species abundance and distribution. U.S. waters comprise about 40% of the entire Gulf of Mexico and 35% of the oceanic (i.e., >200 m) Gulf of Mexico.

A May 2011 mass stranding of 23 short-finned pilot whales in the Florida Keys has been considered to be Gulf of Mexico stock whales based on stranding location, yet two tagged and released individuals from this stranding travelled directly into the Atlantic (Wells *et al.* 2013). Studies are currently being conducted at the Southeast Fisheries Science Center to evaluate genetic population structure in short-finned pilot whales. Pending these results, the *Globicephala macrorhynchus* population occupying northern Gulf of Mexico waters is considered separate from both the U.S. western North Atlantic stock and short-finned pilot whales occupying Caribbean waters.

POPULATION SIZE

The best abundance estimate available for northern Gulf of Mexico short-finned pilot whales is 2,415 (CV=0.66; Table 1). This estimate is from a summer 2009 oceanic survey covering waters from the 200m isobath to the seaward extent of the U.S. EEZ.

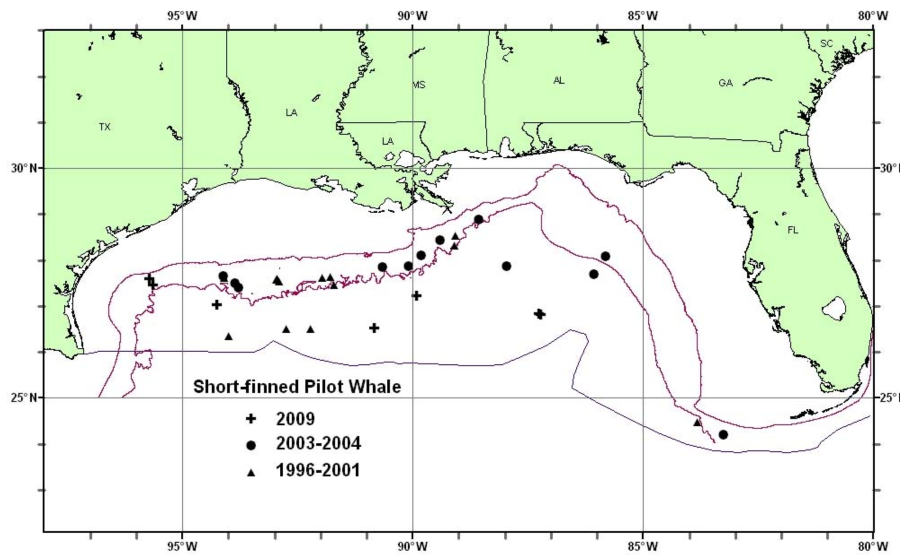

Figure 1. *Distribution of short-finned pilot whale sightings from SEFSC vessel surveys during spring 1996-2001, summer 2003 and spring 2004, and summer 2009. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 100m and 1,000m isobaths and the offshore extent of the U.S. EEZ.*

Earlier abundance estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions.

Recent survey and abundance estimate

During summer 2009, a line-transect survey dedicated to estimating the abundance of oceanic cetaceans was conducted in the northern Gulf of Mexico. Survey lines were stratified in relation to depth and the location of the Loop Current. The abundance estimate for short-finned pilot whales in oceanic waters during 2009 was 2,415 (CV=0.66; Table 1).

Table 1. Summary of abundance estimates for northern Gulf of Mexico short-finned pilot whales. Month, year and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Apr-Jun 1991-1994	Oceanic waters	353	0.89
Apr-Jun 1996-2001 (excluding 1998)	Oceanic waters	2,388	0.48
Jun-Aug 2003, Apr-Jun 2004	Oceanic waters	716	0.34
Jun-Aug 2009	Oceanic waters	2,415	0.66

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for short-finned pilot whales is 2,415 (CV=0.66). The minimum population estimate for the northern Gulf of Mexico is 1,456 short-finned pilot whales.

Current Population Trend

A trend analysis has not been conducted for this stock. Four point estimates of short-finned pilot whale abundance have been made based on data from surveys covering 1991-2009 (Table 1). The estimates vary by a maximum factor of nearly seven. To determine whether changes in abundance have occurred over this period, an analysis of all the survey data needs to be conducted which incorporates covariates (e.g., survey conditions, season) that could potentially affect estimates. It should be noted that since this is a transboundary stock and the abundance estimates are for U.S. waters only, it will be difficult to interpret any detected trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one half the maximum net productivity rate and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 1,456. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because the stock is of unknown status. PBR for the northern Gulf of Mexico short-finned pilot whale is 15.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The estimated mean annual fishery-related mortality and serious injury for this stock during 2009–2013 was 0.5 short-finned pilot whales (CV=1.00; Table 2) due to interactions with the pelagic longline fishery.

New Serious Injury Guidelines

NMFS updated its serious injury designation and reporting process, which uses guidance from previous serious injury workshops, expert opinion, and analysis of historic injury cases to develop new criteria for distinguishing serious from non-serious injury (Angliss and DeMaster 1998; Andersen *et al*. 2008; NOAA 2012). NMFS defines serious injury as an "*injury that is more likely than not to result in mortality*". Injury determinations for stock assessments revised in 2013 or later incorporate the new serious injury guidelines, based on the most recent 5-year period for which data are available.

Fisheries Information

The commercial fishery that interacts with this stock in the Gulf of Mexico is the Atlantic Ocean, Caribbean, Gulf of Mexico large pelagic longline fishery (Appendix III). Pelagic swordfish, tunas and billfish are the targets of the longline fishery operating in the northern Gulf of Mexico. The average annual serious injury and mortality in the Gulf of Mexico pelagic longline fishery for the 5-year period from 2009 to 2013 is 0.5 (CV=1.00; Table 2). During 2013, 1 short-finned pilot whale was observed to be seriously injured, and 1 additional short-finned pilot whale was released alive with no presumed serious injuries (both during quarter 2) (Garrison and Stokes 2014). There were no reports of mortality or serious injury to short-finned pilot whales by this fishery during 1998-2012 (Yeung 1999; Yeung 2001; Garrison 2003; Garrison and Richards 2004; Garrison 2005; Fairfield Walsh and Garrison 2006; Fairfield-Walsh and Garrison 2007; Fairfield and Garrison 2008; Garrison *et al.* 2009; Garrison and Stokes 2010; 2012a,b; 2013). Prior to the 2013 interactions, the most recent interaction documented occurred during 2006 when 1 short-finned pilot whale was observed entangled and released alive with no serious injury (Fairfield-Walsh and Garrison 2007). There was 1 logbook report of a fishery-related injury of a pilot whale in the northern Gulf of Mexico in 1991.

During the second quarters (15 April – 15 June) of 2009–2013, observer coverage in the Gulf of Mexico pelagic longline fishery was greatly enhanced (approaching 55%) to collect more robust information on the interactions between pelagic longline vessels and spawning bluefin tuna. Therefore, the high annual observer coverage rates during 2009–2013 (Table 2) primarily reflect high coverage rates during the second quarter of each year. During the second quarter, this elevated coverage results in an increased probability that relatively rare interactions will be detected. Species within the oceanic Gulf of Mexico are presumed to be resident year-round; however, it is unknown if the bycatch rate observed during the second quarter is representative of that which occurs throughout the year.

Table 2. Summary of the incidental mortality and serious injury of northern Gulf of Mexico short-finned pilot whales in the pelagic longline commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).

Fishery	Years	Vessels [a]	Data Type [b]	Observer Coverage [c]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Est. CVs	Mean Annual Mortality
Pelagic Longline	09-13	47, 46, 42, 47, 47	Obs. Data Logbook	.22, .28, .18, .11, .25	0, 0, 0, 0, 1	0, 0, 0, 0, 0	0, 0, 0, 0, 2.5	0, 0, 0, 0, 0	0, 0, 0, 0, 2.5	NA, NA, NA, NA, 1.0	0.5 (1.00)

[a] Number of vessels in the fishery is based on vessels reporting effort to the pelagic longline logbook.
[b] Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Observer Program. Mandatory logbook data were used to measure total effort for the longline fishery. These data are collected at the Southeast Fisheries Science Center (SEFSC). Observer coverage in the GOM is dominated by very high coverage rates during April-June associated with efforts to improve estimates of bluefin tuna bycatch.
[c] Proportion of sets observed.

Other Mortality

There have been 3 reported stranding events of short-finned pilot whales in the Gulf of Mexico during 2009–2013 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). During May 2011 there was a mass stranding of 23 short-finned pilot whales in the Florida Keys, including 8 live animals and 15 dead animals. During November 2013 there was 1 stranding of a single short-finned pilot whale in Florida. During December 2013 there was a mass stranding of an estimated 51 short-finned pilot whales, both alive and dead, in the Florida Keys. Twenty-three of the estimated 51 whales were examined or handled by NMFS and included in the stranding database. It could not be determined if there was evidence of human interaction for any of the stranded whales. Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury, particularly for offshore species such as pilot whales, because not all of the whales that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al.* 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

An Unusual Mortality Event (UME) was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010, and as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see "Habitat Issues" below), during the spill, and after. One short-finned pilot whale stranding from 2013 in Florida was considered to be part of the UME.

HABITAT ISSUES

The *Deepwater Horizon* (DWH) MC252 drilling platform, located approximately 50 miles southeast of the Mississippi River Delta in waters about 1500 m deep, exploded on 20 April 2010. The rig sank, and over 87 days up to ~4.9 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (McNutt *et al.* 2012). During the response effort dispersants were applied extensively at the seafloor and at the sea surface (Lehr *et al.* 2010; OSAT 2010). In-situ burning, or controlled burning of oil at the surface, was also used extensively as a response tool (Lehr *et al.* 2010). The oil, dispersant and burn residue compounds present ecological concerns (Buist *et al.* 1999; NOAA 2011). The magnitude of this oil spill was unprecedented in U.S. history, causing impacts to wildlife, natural habitats and human communities along coastal areas from western Louisiana to the Florida Panhandle (NOAA 2011). It could be years before the entire scope of damage is ascertained (NOAA 2011).

Shortly after the oil spill, the Natural Resource Damage Assessment (NRDA) process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies are being conducted to determine potential impacts of the spill on marine mammals. These studies have focused on identifying the type, magnitude, severity, length and impact of oil exposure to oceanic, continental shelf, coastal and estuarine marine mammals. For continental shelf and oceanic cetaceans, the NOAA-led efforts include: aerial surveys to document the distribution, abundance, species and exposure relative to oil from the DWH spill; and ship surveys to evaluate exposure to oil and other chemicals and to assess changes in animal behavior and distribution relative to oil exposure through visual and acoustic surveys, deployment of passive acoustic monitoring systems, collection of tissue samples, and deployment of satellite tags on sperm and Bryde's whales.

Vessel and aerial surveys documented bottlenose dolphins, Atlantic spotted dolphins, rough-toothed dolphins, spinner dolphins, pantropical spotted dolphins, Risso's dolphins, striped dolphins, sperm whales, dwarf/pygmy sperm whales and a Cuvier's beaked whale swimming in oil or potentially oil-derived substances (e.g., sheen, mousse) in offshore waters of the northern Gulf of Mexico following the DWH oil spill. The effects of oil exposure on marine mammals depend on a number of factors including the type and mixture of chemicals involved, the amount, frequency and duration of exposure, the route of exposure (inhaled, ingested, absorbed, or external) and biomedical risk factors of the particular animal (Geraci 1990). In general, direct external contact with petroleum compounds or dispersants with skin may cause skin irritation, chemical burns and infections. Inhalation of volatile petroleum compounds or dispersants may irritate or injure the respiratory tract, which could lead to pneumonia or inflammation. Ingestion of petroleum compounds may cause injury to the gastrointestinal tract, which could affect an animal's ability to digest or absorb food. Absorption of petroleum compounds or dispersants may damage kidney, liver and brain function in addition to causing immune suppression and anemia. Long term chronic effects such as lowered reproductive success and decreased survival may occur (Geraci 1990).

STATUS OF STOCK

Short-finned pilot whales are not listed as threatened or endangered under the Endangered Species Act, and the northern Gulf of Mexico stock is not considered strategic under the MMPA. Total fishery-related mortality and serious injury for this stock is less than 10% of PBR and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate. The status of short-finned pilot whales in the northern Gulf of Mexico, relative to OSP, is unknown. There are insufficient data to determine the population trends for this stock.

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APPENDIX I: Estimated serious injury and mortality (SI&M) of Western North Atlantic marine mammals listed by U.S. observed fisheries. Marine mammal species with zero (0) observed SI&M are not shown in this table. (unk = unknown).

Category, Fishery, Species	Yrs. observed	observer coverage	Est. SI by Year (CV)	Est. Mortality by Year (CV)	Mean Annual Mortality (CV)	PBR
CATEGORY I						
Gillnet Fisheries: Northeast gillnet						
Harbor porpoise	2009–2013	.04, .17, .19, .15, .11		591(.23), 387(.27), 273(.20), 277(.59), 399(.33)	386(.14)	706
Atlantic white sided dolphin	2009–2013	.04, .17, .19, .15, .11	0, 4, 1, 0, 0	0, 66(.9), 18(.43), 9(.92), 4(1.03)	19(.62)	304
Short-beaked common dolphin	2009–2013	.04, .17, .19, .15, .11		43(.77), 69(.81), 49(.71), 95(.40), 104 (.46)	70(.26)	1,125
Long-finned pilot whale	2009–2013	.04, .17, .19, .15, .11		0, 3(.82), 0, 0, 0	0.6(.82)	35
Risso's dolphin	2009–2013	.04, .17, .19, .15, .11		0, 0, 0, 6(.87), 23(1.0)	5.8 (.81)	126
Bottlenose dolphin (offshore)	2009–2013	.04, .17, .19, .15, .11		0, 0, 0, 0, 26(.95)	5.2	561
Harbor seal	2009–2013	.04, .17, .19, .15, .11		513(.28), 540(.25), 343(.19), 252(.26), 142(.31)	358 (.12)	2,006
Gray seal	2009–2013	.05, .04, .17, .19, .15, .11		1063(.26), 1,155(.28), 1,550(.22), 542(.19), 1127(.20)	1076(.11)	unk
Harp seal	2007-2011	.05, .04, .17, .19		238(.38), 415(.27), 253(.61), 14(.46)	218(.20)	unk
Gillnet Fisheries:US Mid-Atlantic gillnet						
Harbor porpoise	2009–2013	.03, .04, .02, .02, .03		201(.55), 259(.88), 123(.41), 63(.83), 19(1.06)	133(.14)	706
Short-beaked common dolphin	2009–2013	.03, .04, .02, .02, .03		0, 30(.48), 29(.53), 15(.93), 62(.67)	27(.36)	1,125
Harbor seal	2009–2013	.03, .04, .02, .02, .03		47(.68), 89(.39), 21(.67), 0, 0	31.4(.31)	2,006
Harp Seal	2007-2011	.03, .03, .04, .02		176(.74), 70(.67), 32(.93), 0	63(.46)	unk
Gray Seal	2009–2013	.03, .04, .02, .02, .03		0, 267(.75), 19(.60), 14(98), 0	60(.67)	unk
Longline Fisheries: Pelagic longline (excluding NED-E)						
Risso's dolphin	2009–2013	.10, .08, .09, .07, .09	11(.71), 0, 12(.63), 15 (1.0), 1.9(1.0)	0, 0, 0, 0, 0	8.1(.47)	126
Short-finned pilot whale	2009–2013	.10, .08, .09, .07, .09	17(.70), 127(.78), 286 (.29), 170(.33), 124(.32)	0, 0, 19, 0, 0	148 (.20)	159
Short-beaked common dolphin	2009–2013	.10, .08, .09, .07, .09	0, 0, 0, 0, 0	8.5(1.0), 0, 0, 0, 0	1.7(1.0)	1,125

Bottlenose dolphin (offshore)	2009–2013	.10, .08, .09, .07, .09	8.8(1.0),0,0, 61.8(.68), 0	0, 0, 0, 0, 0	14.1(.61)	561
CATEGORY II						
Mid-Atlantic Mid-Water Trawl – Including Pair Trawl						
White-sided dolphin	2009–2013	.13, .25, .41, .21, .07		4.3(.92), 0, 0, 0, 0	0.8(0.92)	304
Gray Seal	2009–2013	.13, .25, .41, .21, .07		0, na, 0, 0	0.2	unk
Harbor Seal	2009–2013	.13, .25, .41, .21, .07		0, na, 0, 0, 0	0.2	2,006
Trawl Fisheries:Northeast bottom trawl						
Harp seal	2007-2011	.06, .08, .09, .16, .26		unk, 0, 0, 0, unk	unk	unk
Harbor seal	2009–2013	09, .16, .26, .17, .15	0, 0, 0, 0, 0	0, 0, 9(.58), 3(1), 4(.96)	3.2(0.44)	2,006
Gray seal	2009–2013	.09, .16, .26, .17, .15		22(.46), 30(.34), 58(.25), 37(.49), 30(.37)	33.4 (.18)	unk
Risso's dolphin	2009–2013	.09, .16, .26, .17, .15		3(.53), 2(.55), 3(.55), 0, 0	1.6 (.32)	126
Bottlenose dolphin (offshore)	2009–2013	.09, .16, .26, .17, .15	0, 0, 0, 0, 0	,18(.92),4(.53),10(.84), 0, 0	6.4(.58)	561
Long-finned pilot whale	2009–2013	.09, .16, .26, .17, .15		13(.70), 30 (43), 55(.18), 33(.32), 16(.42)	29.4(0.15)	35
Short-beaked common dolphin	2009–2013	.09, .16, .26, .17, .15	1, 3, 2, 0, 0	23(.60), 111(.32), 70(.37), 40(.54), 17(.54)	53 (.21)	1,125
Atlantic white-sided dolphin	2009–2013	.09, .16, .26, .17, .15	3, 1, 3, 0, 0	168(.28), 36(.32), 138(.24), 27(.47), 33(.31)	82(.15)	304
Minke whale	2009–2013	.09, .16, .26, .17, .15		0, 0, 0, 0, 1	0.2(0)	162
Harbor porpoise	2009–2013	.09, .16, .26, .17, .15	0, 0, 2.0, 0, 0	0, 0, 3.9(.71), 0, 7(.98)	2.6(.62)	706
Mid-Atlantic Bottom Trawl						
Short-beaked common dolphin	2009–2013	.05, .06, .08, .05, .06	5, 1, 8, 7, 0	162(.46), 20(.96), 263(.25), 316(.26), 269(.29)	210 (.17)	1,125
Risso's dolphin	2009–2013	.05, .06, .08, .05, .06		23(.50), 54(.74), 62(.56), 7(1.0), 46(.71)	38 (.33)	126
Bottlenose dolphin (offshore)	2009–2013	.05, .06, .08, .05, .06	0, 0, 0, 0, 0	21(.45),20(.34),34(.31), 16(1.0), 0	18.2(.25)	561
Harbor seal	2009–2013	.05, .06, .08, .05, .06	0, 0, 0, 0, 0	24(.92), 11(1.1), 0, 23(1), 11(.96)	1308(0.53)	2,006
Gray seal	2009–2013	.05, .06, .08, .05, .06	0, 0, 0, 0, 0	38(.70), 0, 25(.57), 30(1.1), 29(.67)	24.4(.04)	unk
Northeast Mid-Water Trawl Including Pair Trawl						
Long -finned pilot whale	2009–2013	.42, .41, .17, .45, .37	0, 0, 0, 0, 0,	0, 0, 1, 1, 3	1.0(na)	35
Short-beaked common dolphin	2009–2013	.42, .41, .17,		0 ,1, 0, 1, 0	0.4	1,125

		.45, .37				
Harbor seal	2009–2013	.42, .41, .17, .45, .37		1.3 (.81), na, 0, na, 0	0.9(.24)	2,006
Gray seal	2009–2013	.42, .41, .17, .45, .37	0, 0, 0, 0, 0,	0, 0, 0, na,na	0.4	unk

Appendix II. Summary of the confirmed anecdotal human-caused mortality and serious injury (SI) events involving baleen whale stocks along the Gulf of Mexico Coast, US East Coast, and adjacent Canadian Maritimes, 2009–2013, with number of events attributed to entanglements or vessel collisions by year.

Stock	Mean annual mortality and SI rate (PBR[1] for reference)	Entanglements			Vessel Collisions		
		Annual rate (US waters / Canadian waters/unknown first sighted in US/unknown first sighted in Canada)	Confirmed mortalities (2009, 2010, 2011, 2012, 2013)	Confirmed SIs (2009, 2010, 2011, 2012, 2013)	Annual rate (US waters / Canadian waters/unknown first sighted in US/unknown first sighted in Canada)	Confirmed mortalities (2009, 2010, 2011, 2012, 2013)	Confirmed SIs (2009, 2010, 2011, 2012, 2013)
Western North Atlantic right whale *(Eubalaena glacialis)*	4.3 (1)	3.4 (0.20/ 0.00/ 2.05/ 1.15)	(0, 3, 1, 2, 0)	(3, 1, 5, 2, 1)	0.9 (0.70/ 0.00/ 0.20/ 0.00)	(0, 1, 1, 0, 0)	(0, 0, 2, 1, 0)
Gulf of Maine humpback whale *(Megaptera novaeangliae)*	9.0 (2.7)	7.4 (1.8/ 035/ 4.55/ 0.70)	(2, 4, 0, 0, 2)	(9, 8, 9, 5, 2)	1.6 (1.40/ 0.00/ 0.00/ 0.00)	(0, 3, 3, 0, 2)	0
Western North Atlantic fin whale *(Balaenoptera physalus)*	3.55 (2.5)	1.75 (0.20/ 0.60/ 0.65/ 0.30)	(0, 0, 3, 0, 0)	(3, 0, 1, 2, 1)	1.8 (1.80/ 0.00/ 0.00/ 0.00)	(1, 2, 1, 4, 1)	0
Nova Scotian sei whale *(B. borealis)*	0.4 (0.5)	0	0	0	0.4 (0.40/ 0.00/ 0.00/ 0.00)	(1, 0, 1, 0, 0)	0
Western North Atlantic blue whale[2] *(B.musculus)*	0 (0.9)	0	0	0	0	0	0
Canadian East Coast minke whale *(B. acutorostrata)*	7.7 (162)	6.5 (1.70/ 2.75/ 2.05/ 0.00)	(0, 2, 4, 6, 1)	(6, 2, 5, 7, 3)	1.2 (1.20/ 0.00/ 0.00/ 0.00)	(1, 1, 3, 1, 0)	0
Northern Gulf of Mexico Bryde's whale *(B. edeni)*	0.2 (0.16)	0	0	0	0.2 (0.2 / 0)	(1, 0, 0, 0, 0)	0

[1] Potential Biological Removal (PBR)

[2] Stock abundance estimates outdated; no PBR established for this stock.

Appendix III
Fishery Descriptions

This appendix is broken into two parts: Part A describes commercial fisheries that have documented interactions with marine mammals in the Atlantic Ocean; and Part B describes commercial fisheries that have documented interactions with marine mammals in the Gulf of Mexico. A complete list of all known fisheries for both oceanic regions, the 2013 List of Fisheries, is published in the *Federal Register*, (78 FR 53336;August 29, 2013). Each part of this appendix contains three sections: I. data sources used to document marine mammal mortality/entanglements and commercial fishing effort trip locations, II. fishery descriptions for Category I, II and some category III fisheries that have documented interactions with marine mammals and their historical level of observer coverage, and III. historical fishery descriptions.

Part A. Description of U.S Atlantic Commercial Fisheries

I. Data Sources

Items 1-5 describe sources of marine mammal mortality, serious injury or entanglement data; items 6-9 describe the sources of commercial fishing effort data used to summarize different components of each fishery (i.e. active number of permit holders, total effort, temporal and spatial distribution) and generate maps depicting the location and amount of fishing effort.

1. Northeast Region Fisheries Observer Program (NEFOP)

In 1989 a Fisheries Observer Program was implemented in the Northeast Region (Maine-Rhode Island) to document incidental bycatch of marine mammals in the Northeast Region Multi-species Gillnet Fishery. In 1993 sampling was expanded to observe bycatch of marine mammals in Gillnet Fisheries in the Mid-Atlantic Region (New York-North Carolina). The Northeast Fisheries Observer Program (NEFOP) has since been expanded to sample multiple gear types in both the Northeast and Mid-Atlantic Regions for documenting and monitoring interactions of marine mammals, sea turtles and finfish bycatch attributed to commercial fishing operations. At sea observers onboard commercial fishing vessels collect data on fishing operations, gear and vessel characteristics, kept and discarded catch composition, bycatch of protected species, animal biology, and habitat (NMFS-NEFSC 2003).

2. Southeast Region Fishery Observer Programs

Three Fishery Observer Programs are managed by the Southeast Fisheries Science Center (SEFSC) that observe commercial fishery activity in U.S. Atlantic waters. The Pelagic Longline Observer Program (POP) administers a mandatory observer program for the U.S. Atlantic Large Pelagics Longline Fishery. The program has been in place since 1992 and randomly allocates observer effort by eleven geographic fishing areas proportional to total reported effort in each area and quarter. Observer coverage levels are mandated under the Highly Migratory Species Fisheries Management Plan (HMS FMP, 50 CFR Part 635). The second program is the Shark Gillnet Observer Program that observes the Southeastern U.S. Atlantic Shark Gillnet Fishery. The Observer Program is mandated under the HMS FMP, the Atlantic Large Whale Take Reduction Plan (ALWTRP) (50 CFR Part 229.32), and the Biological Opinion under Section 7 of the Endangered Species Act. Observers are deployed on any active fishing vessel reporting shark drift gillnet effort. In 2005, this program also began to observe sink gillnet fishing for sharks along the southeastern U.S. coast. The observed fleet includes vessels with an active directed shark permit and fish with sink gillnet gear (Carlson and Bethea 2007). The third program is the Southeastern Shrimp Otter Trawl Fishery Observer Program. Prior to 2007, this was a voluntary program administered by SEFSC in cooperation with the Gulf and South Atlantic Fisheries Foundation. The program was funding and project dependent, therefore observer coverage is not necessarily randomly allocated across the fishery. In 2007, the observer program was expanded, and it became mandatory for fishing vessels to take an observer if selected. The program now includes more systematic sampling of the fleet based upon reported landings and effort patterns. The total level of observer coverage for this program is approximately 1% of the total fishery effort. In each Observer Program, the observers record information on the total target species catch, the number and type of interactions with protected species (including both marine mammals and sea turtles), and biological information on species caught.

3. Regional Marine Mammal Stranding Networks

The Northeast and Southeast Region Stranding Networks are components of the Marine Mammal Health and Stranding Response Program (MMHSRP). The goals of the MMHSRP are to facilitate collection and dissemination of data, assess health trends in marine mammals, correlate health with other biological and environmental parameters, and coordinate effective responses to unusual mortality events (Becker *et al.* 1994). Since 1997, the Northeast Region Marine Mammal Stranding Network has been collecting and storing data on marine mammal strandings and entanglements that occur from Maine through Virginia. The Southeast Region Strandings Program is responsible for data collection and stranding response coordination along the Atlantic coast from North Carolina to Florida, along the U.S. Gulf of Mexico coast from Florida through Texas, and in the U.S. Virgin Islands and Puerto Rico. Prior to 1997, stranding and entanglement data were maintained by the New England Aquarium and the National Museum of Natural History, Washington, D.C. Volunteer participants, acting under a letter of agreement, collect data on stranded animals that include: species; event date and location; details of the event (i.e., signs of human interaction) and determination on cause of death; animal disposition; morphology; and biological samples. Collected data are reported to the appropriate Regional Stranding Network Coordinator and are maintained in regional and national databases.

4. Marine Mammal Authorization Program

Commercial fishing vessels engaging in Category I or II fisheries are automatically registered under the Marine Mammal Authorization Program (MMAP) in order to lawfully take a non-endangered/threatened marine mammal incidental to fishing operations. These fishermen are required to carry an Authorization Certificate onboard while participating in the listed fishery, must be prepared to carry a fisheries observer if selected, and must comply with all applicable take reduction plan regulations. All vessel owners, regardless of the category of fishery they are operating in, are required to report, within 48 hours of the incident and even if an observer has recorded the take, all incidental injuries and mortalities of marine mammals that have occurred as a result of fishing operations (NMFS-OPR 2003). Events are reported by fishermen on the Marine Mammal Mortality/Injury forms then submitted to and maintained by the NMFS Office of Protected Resources. The data reported include: captain and vessel demographics; gear type and target species; date, time and location of event; type of interaction; animal species; mortality or injury code; and number of interactions. Reporting forms are available online at http://www.nmfs.noaa.gov/pr/pdfs/interactions/mmap_reporting_form.pdf.

5. Other Data Sources for Protected Species Interactions/Entanglements/Ship Strikes

In addition to the above, data on fishery interactions/entanglements and vessel collisions with large cetaceans are reported from a variety of other sources including the New England Aquarium (Boston, Massachusetts); Provincetown Center for Coastal Studies (Provincetown, Massachusetts); U.S. Coast Guard; whale watch vessels; Canadian Department of Fisheries and Oceans (DFO)); and members of the Atlantic Large Whale Disentanglement Network. These data, photographs, etc. are maintained by the Protected Species Division at the Greater Atlantic Regional Fisheries Office (GARFO), the Protected Species Branch at the Northeast Fisheries Science Center (NEFSC) and the Southeast Fisheries Science Center (SEFSC).

6. Northeast Region Vessel Trip Reports

The Northeast Region Vessel Trip Report Data Collection System is a mandatory, but self-reported, commercial fishing effort database (Wigley *et al.* 1998). The data collected include: species kept and discarded; gear types used; trip location; trip departure and landing dates; port; and vessel and gear characteristics. The reporting of these data is mandatory only for vessels fishing under a federal permit. Vessels fishing under a federal permit are required to report in the Vessel Trip Report even when they are fishing within state waters.

7. Southeast Region Fisheries Logbook System

The Fisheries Logbook System (FLS) is maintained at the SEFSC and manages data submitted from mandatory Fishing Vessel Logbook Programs under several FMPs. In 1986 a comprehensive logbook program was initiated for the Large Pelagics Longline Fishery and this reporting became mandatory in 1992. Logbook reporting has also been initiated since the 1990s for a number of other fisheries including: Reef Fish Fisheries; Snapper-Grouper Complex Fisheries; federally managed Shark Fisheries; and King and Spanish Mackerel Fisheries. In each case, vessel captains are required to submit information on the fishing location, the amount and type of fishing gear used, the total amount of fishing effort (e.g., gear sets) during a given trip, the total weight and composition of the catch, and the disposition of the catch during each unit of effort (e.g., kept, released alive, released dead). FLS data are used to estimate the total amount of fishing effort in the fishery and thus expand bycatch rate estimates from observer data to estimates of the total incidental take of marine mammal species in a given fishery. More information is available at http://www.sefsc.noaa.gov/fisheries/logbook.htm.

8. Northeast Region Dealer Reported Data
The Northeast Region Dealer Database houses trip level fishery statistics on fish species landed by market category, vessel ID, permit number, port location and date of landing, and gear type utilized. The data are collected by both federally permitted seafood dealers and NMFS port agents. Data are considered to represent a census of both vessels actively fishing with a federal permit and total fish landings. It also includes vessels that fish with a state permit (excluding the state of North Carolina) that land a federally managed species. Some states submit the same trip level data to the Northeast Region, but contrary to the data submitted by federally permitted seafood dealers, the trip level data reported by individual states does not include unique vessel and permit information. Therefore, the estimated number of active permit holders reported within this appendix should be considered a minimum estimate. It is important to note that dealers were previously required to report weekly in a dealer call in system. However, in recent years the NER regional dealer reporting system has instituted a daily electronic reporting system. Although the initial reports generated from this new system did experience some initial reporting problems, these problems have been addressed and the new daily electronic reporting system is providing better real time information to managers.

9. Northeast At Sea Monitoring Program
At-sea monitors collect scientific, management, compliance, and other fisheries data onboard commercial fishing vessels through interviews of vessel captains and crew, observations of fishing operations, photographing catch, and measurements of selected portions of the catch and fishing gear. At-sea monitoring requirements are detailed under Amendment 16 to the NE Multispecies Fishery Management Plan with a planned implementation date of May 1st, 2010. At-sea monitoring coverage is an integral part of catch monitoring to ensure that Annual Catch Limits are not exceeded. At-sea monitors collect accurate information on catch composition and the data are used to estimate total discards by sectors (and common pool), gear type, and stock area. Coverage levels are expected around 30%.

II. Marine Mammal Protection Act's List of Fisheries

The List of Fisheries (LOF) classifies U.S. commercial fisheries into one of three Categories according to the level of incidental mortality or serious injury of marine mammals:

I. frequent incidental mortality or serious injury of marine mammals
II. occasional incidental mortality or serious injury of marine mammals
III. remote likelihood of/no known incidental mortality or serious injury of marine mammals

The Marine Mammal Protection Act (MMPA) mandates that each fishery be classified by the level of serious injury and mortality of marine mammals that occurs incidental to each fishery as reported in the annual Marine Mammal Stock Assessment Reports for each stock. A fishery may qualify as one Category for one marine mammal stock and another Category for a different marine mammal stock. A fishery is typically categorized on the LOF according to its highest level of classification (e.g., a fishery that qualifies for Category III for one marine mammal stock and Category II for another marine mammal stock will be listed under Category II). The classifications listed below are based on the Final 2013 LOF published in the Federal Register (78 FR 53336; August 29, 2013)

III. U.S Atlantic Commercial Fisheries

Northeast Sink Gillnet

Current category: Category I

Basis for current classification on the LOF: The annual mortality and serious injury to harbor porpoises (Gulf of Maine/Bay of Fundy [GME/BF] stock), humpback whales (Gulf of Maine stock), minke whales (Canadian East Coast stock), and North Atlantic right whales (Western North Atlantic [WNA] stock) in this fishery exceeds 50% of each stock's Potential Biological Removal (PBR) level.

Current list of marine mammal species/stocks killed/injured (a (1) indicates those stocks driving the fishery's classification): Bottlenose dolphin, WNA offshore; Common dolphin, WNA; Fin whale, WNA; Gray seal, WNA; Harbor porpoise, GME/BF(1); Harbor seal, WNA; Harp seal, WNA; Hooded seal, WNA; Humpback whale, GME; Minke whale, Canadian East Coast; North Atlantic right whale, WNA; Risso's dolphin, WNA; White-sided dolphin, WNA; Long-finned pilot whale, WNA; Short-finned pilot whale, WNA. Not mentioned here are possible interactions with sea turtles and sea birds.

Gear description/method for fishing: This fishery uses sink gillnet gear, which is anchored gillnet (bottom tending net) fished in the lower one-third of the water column. The dominant material is monofilament twine with stretched mesh sizes from 6-12 in (15-30.5 cm) and string lengths from 600-10,500 ft (183-3,200 m), depending on the target species. The mesh size and string length vary by the primary fish species targeted for catch.

Target species: Atlantic cod, haddock, pollock, yellowtail flounder, winter flounder, witch flounder, American plaice, windowpane flounder, spiny dogfish, monkfish, silver hake, red hake, white hake, ocean pout, skate spp, mackerel, redfish, and shad.

Spatial/temporal distribution of effort: The fishery operates from the U.S.-Canada border to Long Island, New York, at 72° 30'W. long. south to 36° 33.03'N. lat. (corresponding with the Virginia-North Carolina border) and east to the eastern edge of the Exclusive Economic Zone (EEZ), including the Gulf of Maine, Georges Bank, and Southern New England, and excluding Long Island Sound and other waters where gillnet fisheries are listed as Category II and III. At this time, these Category II and III fisheries include: the Northeast anchored float gillnet; Northeast drift gillnet; Long Island Sound inshore gillnet; and RI, southern MA (to Monomoy Island), and NY Bight (Raritan and Lower NY Bays) inshore gillnet. Fishing effort occurs year-round, peaking from May-July primarily on continental shelf regions in depths from 30-750 ft. (9-228.6 m), with some nets deeper than 800 ft. (244 m). Figures 1-5 document the distribution of sets and marine mammal interactions observed from 2009 to 2013, respectively.

Management and Regulations: This gear is addressed by several federal and state FMPs; the Atlantic Large Whale Take Reduction Plan (ALWTRP) and Harbor Porpoise Take Reduction Plan (HPTRP). These fisheries are primarily managed by total allowable catch (TACs); individual trip limits (i.e., quotas); effort caps (i.e., limited number of days at sea per vessel); time and area closures; and gear restrictions.

Total Effort (includes descriptions of Northeast anchored float and Northeast drift gillnets): Total metric tons of fish landed from 1998 to 2012 were 22,933, 18,681, 14,487, 14, 634, 15,201, 17,680, 19,080, 15.390, 14,950, 15,808, 18,808, 17,207, 18,170, 19,279 and 17,490 respectively (NMFS). Data on total quantity of gear fished (i.e., number of sets) have not been reported consistently among commercial gillnet fishermen on vessel logbooks, and therefore will not be reported here.

Observer Coverage (includes descriptions of Northeast anchored float and Northeast drift gillnets): During the period 1990-2013, estimated percent observer coverage (number of trips observed/total commercial trips reported) was 1, 6, 7, 5, 7, 5, 4, 6, 5, 6, 6, 4, 2, 3, 6, 7, 4, 7, 5, 4, 17,19, 15, and 11 respectively.

Comments: Effort patterns in this fishery are heavily influenced by fish time/area closures, and gear restrictions due to fish conservation measures, time/area closures and gear restrictions under the ALWTRP, and seasonal pinger requirements and time/area closures under the HPTRP.

Northeast Anchored Float Gillnet Fishery

Current category: Category II

Basis for current classification on the LOF: Based on analogy with other Category II gillnet fisheries that use similar gear and operate in a similar manner to this fishery.

Current list of marine mammal species/stocks killed/injured: Harbor seal, Western North Atlantic (WNA); Humpback whale, Gulf of Maine; White-sided dolphin, WNA.

Gear description/method for fishing: This fishery uses gillnet gear of any size anchored and fished in the upper two-thirds of the water column.

Target species: Mackerel, herring (particularly for bait), shad, and menhaden.

Spatial/temporal distribution of effort: The fishery operates from the U.S.-Canada border to Long Island, New York, at 72° 30'W. long south to 36° 33.03'N. lat. (corresponding with the Virginia-North Carolina border) and east to the eastern edge of the EEZ, not including Long Island Sound or other waters where gillnet fisheries are listed as Category III.

Management and regulations: The fishery is managed by the Atlantic States Marine Fisheries Commission [ASMFC] under the Interstate Fishery Management Plans (ISFMP) for Atlantic Menhaden and Shad and is subject to ALWTRP implementing regulations. A total closure of the American shad ocean intercept fishery was fully implemented in January, 2005.

Total Effort (includes descriptions of Northeast anchored float and Northeast drift gillnets): Total metric tons of fish landed from 1998 to 2012 were 22,933, 18,681, 14,487, 14, 634, 15,201, 17,680, 19,080, 15.390, 14,950, 15,808, 18,808, 17,207, 18,170, 19,279 and 17,490 respectively (NMFS). Data on total quantity of gear fished (i.e., number of sets) have not been reported consistently among commercial gillnet fishermen on vessel logbooks, and therefore will not be reported here.

Observer Coverage (includes descriptions of Northeast anchored float and Northeast drift gillnets): During the period 1990-2013, estimated percent observer coverage (number of trips observed/total commercial trips reported) was 1, 6, 7, 5, 7, 5, 4, 6, 5, 6, 6, 4, 2, 3, 6, 7, 4, 7, 5, 4, 17, 19, 15 and 11 respectively.

Comments: Effort patterns in this fishery are heavily influenced by fish time/area closures, and gear restrictions due to fish conservation measures, time/area closures and gear restrictions under the ALWTRP, and seasonal pinger requirements and time/area closures under the HPTRP.

Northeast Drift Gillnet Fishery

Current category: Category II

Basis of current classification on the LOF: Based on analogy to other Northeast gillnet fisheries that use similar gear and operate in a similar manner to this fishery.

Current list of marine mammal species/stocks killed/injured: None documented

Gear description/method for fishing: This fishery uses drift gillnet gear, which is gillnet gear not anchored to the bottom and is free-floating on both ends or free-flowing at one end and attached to the vessel at the other end. Mesh sizes are likely less than those used to target large pelagics.

Target species: This fishery targets species including shad, herring, mackerel, and menhaden and any residual large pelagic driftnet effort in New England.

Spatial/temporal distribution of effort: The fishery includes any residual large pelagic driftnet effort in New England and occurs at any depth in the water column from the U.S.-Canada border to Long Island, New York, at 72° 30'W. long. south to 36° 33.03'N. lat. (corresponding with the Virginia-North Carolina border) and east to the eastern edge of the Exclusive Economic Zone (EEZ).

Management and regulations: The fishery is managed under the Interstate Fishery Management Plans (ISFMPs) for Atlantic Menhaden and Shad (managed by the Atlantic States Marine Fisheries Commission [ASMFC]) and is subject to ALWTRP implementing regulations. A total closure of the American shad ocean intercept fishery was fully implemented in January, 2005.

Total Effort (includes descriptions of Northeast anchored float and Northeast drift gillnets): Total metric tons of fish landed from 1998 to 2011 were 22,933, 18,681, 14,487, 14, 634, 15,201, 17,680, 19,080, 15.390, 14,950, 15,808, 18,808, 17,207, 18,170, 19,279 and 17,490 respectively (NMFS). Data on total quantity of gear fished (i.e., number of sets) have not been reported consistently among commercial gillnet fishermen on vessel logbooks, and therefore will not be reported here.

Observer Coverage (includes descriptions of Northeast anchored float and Northeast drift gillnets): During the period 1990-2013, estimated percent observer coverage (number of trips observed/total commercial trips reported) was 1, 6, 7, 5, 7, 5, 4, 6, 5, 6, 6, 4, 2, 3, 6, 7, 4, 7, 5, 4, 17, 19 15 and 11 respectively.

Comments: Effort patterns in this fishery are heavily influenced by fish time/area closures, and gear restrictions due to fish conservation measures, time/area closures and gear restrictions under the ALWTRP, and seasonal

Mid-Atlantic Gillnet

Current category: Category I

Basis for current classification on the LOF: The species listed in the section below with a "(1)" following the stock name drive the classification because the annual mortality and serious injury of that stock in this fishery was greater than 50% of the stock's PBR level.

Current list of marine mammal species/stocks killed/injured (a (1) indicates those stocks driving the fishery's classification): Bottlenose dolphin, Northern Migratory coastal (1); Bottlenose dolphin, Southern Migratory coastal(1); Bottlenose dolphin, Northern North Carolina (NC) estuarine system (1); Bottlenose dolphin, Southern NC estuarine system (1) ; Bottlenose dolphin, WNA offshore; Common dolphin, WNA; Gray seal, WNA; Harbor porpoise, Gulf of Maine/Bay of Fundy; Harbor seal, WNA; Harp seal, WNA; Humpback whale, Gulf of Maine; Long-finned pilot whale, WNA; Minke whale, Canadian East Coast; Short-finned pilot whale, WNA; White-sided dolphin, WNA; Risso's dolphin, WNA. Not mentioned here are possible interactions with sea turtles and sea birds and interactions with large whale species in which the gear may not be identified to a specific area or gear.

Gear description/method for fishing: This fishery uses drift and sink gillnets, including nets set in a sink, stab, set, strike, run-around or drift fashion, with some unanchored drift or sink nets used to target specific species. The dominant material is monofilament twine with stretched mesh sizes from 2.5-12 in (6.4-30.5 cm), and string lengths from 150-8,400 ft. (46-2,560 m).

Target Species: Monkfish, Spiny and Smooth Dogfish, Bluefish, Weakfish, Menhaden, Spot, Croaker, Striped Bass, Coastal Sharks, Spanish Mackerel, King Mackerel, American Shad, Black Drum, Skate spp., Yellow perch, White Perch, Herring, Scup, Kingfish, Spotted Seatrout, and Butterfish.

Spatial/temporal distribution of effort: This fishery operates year-round, extending from New York to North Carolina, not including waters where Category II and III inshore gillnet fisheries operate in bays, sounds, estuaries, and rivers. It is comprised of a combination of small vessels that target a variety of fish species. This fishery includes any residual large pelagic driftnet effort in the mid-Atlantic, shark and dogfish gillnet effort in the mid-Atlantic, and those North Carolina small and large mesh beach-anchored gillnets formerly placed in the Category II Mid-Atlantic haul/ beach seine fishery in the mid-Atlantic zone described. For more details on construction of this gear specifically please refer to 2009 Proposed List of Fisheries, published in the *Federal Register*, (73 FR 73760; June 13, 2008). This fishery can be prosecuted right off the beach (6 feet) or in nearshore coastal waters to offshore waters (250 feet). The eastern boundary of this fishery is a line drawn at 72° 30' W long. from Long Island south to 36º 33.03' N lat., then east to the EEZ, and then south to the North Carolina/South Carolina border. The area does not include waters where Category II and III inshore gillnet fisheries operate in bays, estuaries, and rivers. Figures 6-10 document the distribution of sets and marine mammal interactions observed from 2009 to 2013, respectively.

Management and Regulations: Gear in this fishery is managed by several federal and interstate Fishery Management Plans by the Atlantic States Marine Fisheries Commission, ALWTRP, HPTRP, and BDTRP. Fisheries are primarily managed by total allowable catch limits; individual trip limits (quotas); effort caps (limited number of days at sea per vessel); time and area closures; and gear restrictions and modifications.

Total Effort: Total metric tons of fish landed from 1998 to 2012 were 15,494, 19,130, 16,333, 14,855, 13,389, 13,107, 15,124, 12, 994, 8,755, 9,359, 8,622, 8,703, 10,725, 11,292 and 9,035 respectively (NMFS). Data on total quantity of gear fished (i.e. number of sets) have not been reported consistently among commercial gillnet fishermen on vessel logbooks, therefore will not be reported here.

Observer Coverage: During the period 1995-2013, the estimated percent observer coverage was 5, 4, 3, 5, 2, 2, 2, 1, 1, 2, 3, 4, 4, 3, 3, 4, 2,2 and 3 respectively.

Comments: Effort patterns in this fishery are heavily influenced by marine mammal time/area closures and /or gear restrictions under the ALWTRP, HPTRP, and BDTRP; and gear restrictions due to fish conservation measures.

Mid-Atlantic Bottom Trawl

Current category: Category II

Basis for current classification on the LOF: The total mortality and serious injury of common dolphins (Western North Atlantic [WNA] stock), long-finned pilot whales (WNA stock), Risso's dolphins (WNA), and short-finned pilot whales (WNA stock) in this fishery is greater than 1% and less than 50% of each of the stocks' PBR.

Current list of marine mammal species/stocks killed/injured (a (1) indicates those stocks driving the fishery's classification): Bottlenose dolphin, WNA offshore; Common dolphin, Western North Atlantic (WNA)(1); Gray seal, WNA; Harbor seal, WNA; Long-finned pilot whale, WNA (1); Risso's dolphin, WNA (1); Short-finned pilot whale, WNA(1); White-sided dolphin, WNA. Not mentioned here are possible interactions with sea turtles and sea birds.

Gear description/method for fishing: This fishery uses bottom trawl gear. Gear types such as flynets utilized in the mid-Atlantic region. The Mid-Atlantic bottom trawls using flynets target species through nearshore and offshore components that operate along the east coast of the mid-Atlantic United States. Flynets typically range from 80–120 ft. (24–36.6 m) in headrope length, with wing mesh sizes of 16–64 in (41–163 cm), following a slow 3:1 taper to smaller mesh sizes in the body, extension, and codend sections of the net.

Target species: Target species include, but are not limited to: bluefish, croaker, monkfish, summer flounder (fluke), winter flounder, silver hake (whiting), spiny dogfish, smooth dogfish, scup, and black sea bass. The nearshore fishery targets Atlantic croaker, weakfish, butterfish, harvestfish, bluefish, menhaden, striped bass, kingfish species, and other finfish species; the deeper water fisheries target bluefish, Atlantic mackerel, Loligo squid, black sea bass, and scup.

Spatial/temporal distribution of effort: The fishery occurs year-round from all waters due east from the NC/SC border to the EEZ and north to Cape Cod, MA in waters west of 70° W. long. In areas where 70° W. long. is east of the EEZ, the EEZ serves as the eastern boundary. The nearshore fishery operates from October to April inside of 30 fathoms (180 ft.; 55 m.) from NJ to NC. Flynet fishing is no longer permitted in Federal waters south of Cape Hatteras in order to protect weakfish stocks. The offshore component operates from November to April outside of 30 fathoms (180 ft.; 55 m.) from the Hudson Canyon off NY, south to Hatteras Canyon off NC. Figures 11-15 document the distribution of tows and marine mammal interactions observed from 2009 to 2013, respectively.

Management and regulations: There are at least two distinct components to this fishery. One is the mixed groundfish bottom trawl fishery. It is managed by several federal and state FMPs that range from Massachusetts to North Carolina. The relevant FMPs include, but may not be limited to, Monkfish (FR 68(81), 50 CFR Part 648); Spiny Dogfish (FR 65(7), 50 CFR Part 648); Summer Flounder, Scup, and Black Sea Bass (FR 68(1), 50 CFR part 648); and Northeast Skate Complex (FR 68(160), 50 CFR part 648). The second major component is the squid, mackerel, butterfish fishery. This component is managed by the federal Squid, Mackerel, Butterfish FMP. The *Illex* and *Loligo* Squid Fisheries are managed by moratorium permits, gear and area restrictions, quotas, and trip limits. The Atlantic Mackerel and Atlantic Butterfish Fisheries are managed by an annual quota system.

Mixed Groundfish Bottom Trawl Total Effort: Total effort, measured in trips, for the Mixed Groundfish Trawl from 1998 to 2013 was 27,521, 26,525, 24,362, 27,890, 28,103, 25,725, 22,303, 15,070, 12,457, 11,279, 10,785, 10,497, 10,849, 10,528, and 12,021 and 12,754 respectively (NMFS). The number of days absent from port, or days at sea, is yet to be determined.

Squid, Mackerel, Butterfish Bottom Trawl Total Effort: Total effort, measured in trips, for the domestic Atlantic Mackerel Fishery in the Mid-Atlantic Region (bottom trawl only) from 1997 to 2013 was 373, 278, 262, 102, 175, 310, 238, 231, 0, 117, 88, 0, 66, 19, 13, 15, and 28 respectively (NMFS). Total effort, measured in trips, for the *Illex* Squid Fishery from 1998 to 2012 was 412, 141, 108, 51, 39, 103, 445, 181, 159, 103, 172, 177, 231, 232, 151 and 57 respectively (NMFS). Total effort, measured in trips, for the *Loligo* Squid Fishery from 1998 to 2013 was 1,048, 495, 529, 413, 3,585, 1,848, 1,124, 1,845, 3,058, 2,137, 2,578, 2,234, 2.039, 2,157, 3,186 and 2,205 respectively (NMFS). Atlantic Butterfish is a bycatch (non-directed) fishery; therefore effort on this species will not be reported. The number of days absent from port or days at sea, is yet to be determined.

Observer Coverage: During the period 1996-2013, estimated percent observer coverage (measured in trips) for the Mixed Groundfish Bottom Trawl Fishery was 0.24, 0.22, 0.15, 0.14,1, 1, 1, 1, 3, 3, 2, 3, 3, 5, 5, 7, 5 and 6 respectively. During the period 1996-2013, estimated percent observer coverage (trips) in the *Illex* Fishery was 3.7, 6.21, 0.97, 2.84, 11.11, 0, 0, 8.74, 5.07, 6, 15, 14, 5, 10, 14, 11, 1 and 1.47 respectively. During the period 1996-2013, estimated percent observer coverage (trips) of the *Loligo* Fishery was 0.37, 1.07, 0.72, 0.69, 0.61, 0.95, 0.42, 0.65, 5.07, 4, 3, 2, 2, 7, 8, 11, 4 and 7 respectively. During the period 1997-2013, estimated percent observer coverage (trips) of the domestic Atlantic Mackerel Fishery was 0.81, 0, 1.14, 4.90, 3.43, 0.97, 5.04, 18.61, 0, 3, 2, 0, 8, 11, 8, 20 and 4 respectively. Observer coverage for 2010-2013 includes both observers and at-sea monitors.

Comments: Mobile Gear Restricted Areas (GRAs) were put in place for fishery management purposes in November 2000. The intent of the GRAs is to reduce bycatch of scup. The GRAs are spread out in time and space along the edge of the Southern New England and Mid-Atlantic Continental Shelf Region (between 100 and 1000 meters). These seasonal closures are targeted at trawl gear with small-mesh sizes (<4.5 inches inside mesh measurement). The Atlantic Herring and Atlantic Mackerel Trawl Fisheries are exempt from the GRAs. Access to the GRAs to harvest non-exempt species (*Loligo* Squid, Black Sea Bass, and Silver Hake) can be granted by a special permit. For detailed information regarding GRAs refer to (FR 70(2), (50 CFR Part 648.122 parts A and B)).

Northeast Bottom Trawl

Current category: Category II

Basis for current classification on the LOF: The total annual mortality and serious injury of white-sided dolphins (Western North Atlantic [WNA] stock) in this fishery is greater than 1% and less than 50% of the stock's Potential Biological Removal (PBR) level.

Current list of marine mammal species/stocks killed/injured (a (1) indicates those stocks driving the fishery's classification): Bottlenose dolphin, WNA offshore; Common dolphin, WNA; Gray seal, WNA; Harbor porpoise, Gulf of Maine/Bay of Fundy (GME/BF); Harbor seal, WNA; Harp seal, WNA; Long-finned pilot whale, WNA; Short-finned pilot whale, WNA; White-sided dolphin, WNA(1); Minke whale, Canadian East Coast stock . Not mentioned here are possible interactions with sea turtles and sea birds.

Gear description/method for fishing: The average footrope length for the bottom trawl fleet was about 84 feet from 1996 – 1999; in 2000 there was a sharp increase to almost 88 feet followed by a steady decline to 85 feet in 2004. Seasonality was evident, with larger footrope lengths in the first quarter, which drop sharply from March to the low in May, and followed by a steady increase in size until December. There are some differences in mean gear size between species. Compared to other species, gear size was smaller for trips that caught winter flounder, cod, yellowtail flounder, fluke, skate, dogfish, and Atlantic herring. Trips that caught haddock, *Illex* squid, and monkfish tended to have larger gear. For most species, seasonal variation was limited. Seasonality was evident for witch flounder, American plaice, scup, butterfish, both squid species, and monkfish. Further characterization of the Northeast and Mid-Atlantic bottom and mid-water trawl fisheries based on Vessel Trip Report (VTR) data can be found at
http://www.nefsc.noaa.gov/nefsc/publications/crd/crd0715/).

Target species: This fishery targets species including, but not limited to: Atlantic cod, haddock, pollock, yellowtail flounder, winter flounder, witch flounder, American plaice, Atlantic halibut, redfish, windowpane flounder, summer flounder, spiny dogfish, monkfish, silver hake, red hake, white hake, ocean pout, and skate species.

Management and regulations: The fishery is primarily managed by TACs, individual trip limits (quotas), effort caps (limited number of days at sea per vessel), time and area closures, and gear restrictions under several interstate and federal FMPs.

Total Effort: Total effort, measured in trips, for the Northeast Bottom Trawl Fishery from 1998 to 2013 was 13,263, 10,795, 12,625, 12,384, 12,711, 11,577, 10,354, 10,803, 8,603, 8,950, 8,900, 6,791, 5,747, 8,219 and 6,440 respectively (NMFS).

Spatial/temporal distribution of effort: The fishery operates year-round, with a peak from May-July. The Northeast bottom trawl fishery includes all U.S. waters south of Cape Cod, MA that are east of 70° W and extending south to the intersection of the Exclusive Economic Zone (EEZ) and 70° W (approximately 37° 54' N), as well as all U.S. waters north of Cape Cod to the Maine-Canada border. Figures 16-20 document the distribution of tows and marine mammal interactions observed from 2009 to 2013 respectively.

Observer Coverage: During the period 1994-2013, estimated percent observer coverage (measured in trips) was 0.4, 1.1, 0.2, 0.2, 0.1, 0.3, 1.0, 1.0, 3, 4, 5, 12, 6, 6, 8 , 9, 16, 26, 17 and 15 respectively. Observer coverage for 2010-2013 includes both observers and at-sea monitors.

Comments: Mobile Gear Restricted Areas (GRAs) were put in place for fishery management purposes in November 2000. The intent of the GRAs is to reduce bycatch of Scup. The GRAs are spread out in time and space along the edge of the Southern New England and mid-Atlantic continental shelf region (between 100 and 1000 meters). These seasonal closures are targeted at trawl gear with small-mesh sizes (<4.5 inches inside mesh measurement). The Atlantic Herring and Atlantic Mackerel Trawl Fisheries are exempt from the GRAs. For detailed information regarding GRAs refer to (50 CFR Part 648.122 parts A and B).

Northeast Mid-Water Trawl Fishery (includes pair trawls)

Current category: Category II

Basis for current classification on the LOF: The total annual mortality and serious injury of long-finned pilot whales (Western North Atlantic [WNA] stock) and short-finned pilot whales (WNA stock) in this fishery is greater than 1% and less than 50% of the stocks' Potential Biological Removal (PBR).

Current list of marine mammal species/stocks injured/killed (a (1) indicates those stocks driving the fishery's classification): Harbor seal, WNA; Long-finned pilot whale, WNA (1); Short-finned pilot whale, WNA(1); Whitesided dolphin, WNA; Short-beaked common dolphin, WNA; Gray seal, WNA. Not mentioned here are possible interactions with sea turtles and sea birds.

Gear description/method for fishing: This fishery uses primarily mid-water (pelagic) trawls (single and paired), which is trawl gear designed, capable, or used to fish for pelagic species with no portion designed to be operated in contact with the bottom.

Target species: This fishery targets Atlantic herring with bycatch of several finfish species, predominantly mackerel, spiny dogfish, and silver hake.

Spatial/temporal distribution of effort: The fishery occurs primarily in Maine state waters, Jeffrey's Ledge, southern New England, and Georges Bank during the winter months when the target species continues its southerly migration from the Gulf of Maine/Georges Bank, into mid-Atlantic waters. This fishery includes all U.S. waters south of Cape Cod, MA that are east of 70° W and extending south to the intersection of the EEZ and 70° W (approximately 37° 54'N), as well as all U.S. waters north of Cape Cod to the Maine-Canada border." Figures 21-25 document the distribution of tows and marine mammal interactions observed from 2009 to 2013 respectively.

Management and regulations: The fishery is managed jointly by the Mid-Atlantic Fishery Management Council, Mid-Atlantic Fishery Management Council, and the Atlantic States Marine Fisheries Commission. This fishery is included in the Atlantic Trawl Gear Take Reduction Strategy which recommends voluntary measures to reduce incidental interactions with marine mammals.

Total Effort: Total effort, measured in trips, for the Northeast Mid-Water Trawl Fishery (across all gear types) from 1997 to 2013 was 578, 289, 553, 1,312, 2,404, 1,736, 2,158, 1,564, 717, 590, 286, 236, 236, 294, 331, 413 and 291 respectively (NMFS).

Observer Coverage: During the period 1997-2013, estimated percent observer coverage (trips) was 0, 0, 0.73, 0.46, 0.06, 0, 2.25, 11.48, 19.9, 3.1, 8.04, 19.92, 42, 53, 41, 45 and 37 respectively. Observer coverage for 2010 -2013 includes both observers and at-sea monitors.

Comments: Mobile Gear Restricted Areas (GRAs) were put in place for fishery management purposes in November 2000. The intent of the GRAs is to reduce bycatch of Scup. The GRAs are spread out in time and space along the edge of the Southern New England and mid-Atlantic continental shelf region (between 100 and 1000 meters). These seasonal closures are targeted at trawl gear with small-mesh sizes (<4.5 inches inside mesh measurement). The Atlantic Herring and Atlantic Mackerel Trawl Fisheries are exempt from the GRAs. For detailed information regarding GRAs refer to (50 CFR Part 648.122 parts A and B)

Mid-Atlantic Mid-Water Trawl Fishery (includes pair trawls)

Current category: Category II

Basis for current classification on the LOF: The total annual mortality and serious injury of white-sided dolphins (Western North Atlantic [WNA] stock) in this fishery is greater than 1% and less than 50% of the stock's Potential Biological Removal (PBR) level.

Current list of marine mammal species/stocks killed/injured (a (1) indicates those stocks driving the fishery's classification): Bottlenose dolphin, WNA offshore; Common dolphin, WNA; Long-finned pilot whale, WNA; Risso's dolphin, WNA; Short-finned pilot whale, WNA; White-sided dolphin, WNA (1). Not mentioned here are possible interactions with sea turtles and sea birds.

Gear description/method for fishing: This fishery uses both single and pair trawls, which are designed, capable, or used to fish for pelagic species with no portion of the gear designed to be operated in contact with the bottom of the ocean.

Target species: Atlantic mackerel, chub mackerel, and miscellaneous other pelagic species.

Spatial/temporal distribution of effort: The fishery for Atlantic mackerel occurs primarily from southern New England through the mid-Atlantic from January-March and in the Gulf of Maine during the summer and fall (May-December). The Mid-Atlantic mid-water trawl fishery includes all waters due east from the NC/SC border to the EEZ and north to Cape Cod, MA in waters west of 70° W. long. Figures 26-30 document the distribution of tows and marine mammal interactions observed from 2009 to 2013 respectively.

Management and regulations: This fishery is managed under the Federal Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan using an annual quota system. This fishery is included in the Atlantic Trawl Gear Take Reduction Strategy which recommends voluntary measures to reduce incidental interactions with marine mammals.

Total Effort: Total effort, measured in trips, for the Mid-Atlantic Mid-Water Trawl Fishery (across both gear types) from 1997 to 2013 was 331, 223, 374, 166, 408, 261, 428, 360, 359, 405, 312, 255, 280,173, 140, 143 and 284 respectively (NMFS).

Observer Coverage: During the period 1997-2013, estimated percent observer coverage (trips) was 0, 0, 1.01, 8.43, 0, 0.77, 3.50, 12.16, 8.40, 8.90, 3.85, 13.33, 13.2, 25, 41, 21 and 7 respectively. Observer coverage for 2010-2013 includes both observers and at-sea monitors.

Comments: Mobile Gear Restricted Areas (GRAs) were put in place for fishery management purposes in November 2000. The intent of the GRAs is to reduce bycatch of Scup. The GRAs are spread out in time and space along the edge of the Southern New England and mid-Atlantic continental shelf region (between 100 and 1000 meters). These seasonal closures are targeted at trawl gear with small-mesh sizes (<4.5 inches inside mesh measurement). The Atlantic Herring and Atlantic Mackerel Trawl Fisheries are exempt from the GRAs. For detailed information regarding GRAs refer to (50 CFR Part 648.122 parts A and B).

Bay of Fundy Herring Weir

Category: N/A

Protected Species Interactions: Documented interactions with harbor porpoise and minke whales were reported in this fishery. Right whales are also vulnerable to entrapment, though very rarely.

Gear description/method for fishing: Weirs are large, heart-shaped structures (roughly 100 feet across) consisting of long wooden stakes (50-80 feet) pounded 3-6 feet into the sea floor and surrounded by a mesh net (the "twine") of about ¾ inch stretch mesh. Weirs are typically located within 100-400 feet of shore. The twine runs from the sea floor to the surface, and the only opening (the "mouth") is positioned close to shore. Herring swimming along the shore at night, encounter a fence (net of the same twine from sea floor to surface) that runs from the weir to the shoreline and directs the fish into the weir. At dawn, the weir fisherman tends the weir and if Herring are present, he/she may close off the weir until the fish can be harvested. Harvesting takes place when the tidal current is the slackest, usually just before low tide. A large net ("seine") is deployed inside the weir, and, much like a purse seine, it is drawn up to the surface so that the fish become concentrated. They are then pumped out with a vacuum hose into the waiting carrier for transport to the processing plant.

Target Species: Atlantic herring

Spatial/temporaldistribution of effort: In Canadian waters, the Herring Weir Fishery occurs from May to October along the southwestern shore of the Bay of Fundy, and is scattered along the coasts of western Nova Scotia.

Management and Regulations: To Be Determined

Total Effort: Effort is difficult to measure. Weirs may or may not have twine (i.e., be actively fishing) on them in a given year and the amount of time the twine is up varies from year to year. Most weirs tend to fish (i.e., have twine on them) during July, August, and September. Some fishermen keep their twine on longer, into October and November, if it is a good year or there haven't been any storms providing incentive to take the twine down. Effort cannot simply be measured by multiplying the number of weirs with twine times the average number of fishing days (this will provide a very generous estimation of effort) because if a weir fills up with fish the fisherman will pull up the drop (close the net at the mouth) which prevents loss of fish, but also means no new fish can get in, therefore the weir is not actively fishing during that period.

Observer Coverage: From mid-July to early September, on a daily basis, scientists from the Grand Manan Whale & Seabird Research Station check only the weirs around Grand Manan Island for the presence of cetaceans.

Comments: Marine mammals occasionally swim into weirs, in which they can breathe and move about. Marine mammals are vulnerable during the harvesting/seining process where they can become tangled in the seine and suffocate if care is not taken to remove them from the net or to remove them from the weir prior to the onset of the seining process. Small marine mammals, like porpoises, can be removed from the net, lifted into small boats, and taken out of the weir for release without interrupting the seining process. Larger marine mammals, such as whales, must be removed from the weir either through the creation of a large enough escape hole in the back of the weir (taking down the twine and removing some poles) or sometimes by sweeping them out with a specialized mammal net, although this approach carries with it a few more risks to the animal than the "escape hole" technique.

Through the cooperation of weir fishermen and the Grand Manan Whale & Seabird Research Station, weir-associated mortality of cetaceans is relatively low. Over 91% of all entrapped porpoises, dolphins and whales are successfully released from weirs around Grand Manan Island. Thus the total number of entrapments (which can vary annually from 6 to 312) is in no way reflective or indicative of cetacean mortality caused by this fishery.

Gulf of Maine Atlantic Herring Purse Seine Fishery

Category: III

Basis for current classification on the LOF: There are no reports of marine mammal mortalities in this fishery.

Marine mammals can be captured by the gear, but because the mesh size of nets used is small there is only a small chance of entanglement. When marine mammals including harbor seals, grey seals, humpback whales, fin whale and/or sei whales are caught in this gear, they are released alive without injury and thus are not included as species/stocks that are incidentally killed/injured by this fishery.

Current list of marine mammal species/stocks killed/injured: Harbor seal, WNA; Gray seal, WNA.

Gear description/method for fishing: The purse seine is a deep nylon mesh net with floats on the top and lead weights on the bottom. Rings are fastened at intervals to the lead line and a purse line runs completely around the net through the rings (www.gma.org, Gulf of Maine Research Institute, GOMRI). One end of the net remains in the vessel and the other end is attached to a power skiff or "bug boat" that is deployed from the stern of the vessel and remains in place while the vessel encircles a school of fish with the net. Then the net is pursed and brought back aboard the vessel through a hydraulic power block. Purse seines vary in size according to the size of the vessel and the depth to be fished. Most purse seines used in the New England Herring Fishery range from 30 to 50 meters deep (100-165 ft.) (NMFS 2005). Purse seining is a year round pursuit in the Gulf of Maine, but is most active in the summer when herring are more abundant in coastal waters and are mostly utilized at night, when herring are feeding near the surface. This fishing technique is less successful when fish remain in deeper water and when they do not form "tight" schools.

Target Species: Atlantic herring

Spatial/temporal distribution of effort: Most U.S. Atlantic herring catches occur between May and October in the Gulf of Maine, consistent with the peak season for the lobster fishery. The connection between the herring and lobster fisheries is the reliance of the lobster industry on herring for bait. In addition, there is a relatively substantial winter fishery in southern New England, and catches from Georges Bank have increased somewhat in recent years. There is a very small recreational fishery for Atlantic herring that generally occurs from early spring to late fall, and herring is caught by tuna boats with gillnets for use as live bait in the recreational tuna fisheries. In addition, there is a Canadian fishery for Atlantic herring from New Brunswick to the Gulf of St. Lawrence, which primarily utilizes fixed gear. Fish caught in the New Brunswick (NB) weir fishery are assumed to come from the same stock (inshore component) as that targeted by U.S. fishermen (http://www.nefmc.org/herring/index.html, Northeast Fisheries Management Council, NEFMC). Figures 31-35 document the distribution of sets and marine mammal interactions observed from 2009 to 2013, respectively.

Management and Regulations: The Gulf Of Maine Atlantic Herring Purse Seine Fishery is defined as a Category III fishery in the 2010 List of Fisheries (74 FR 58859, November 16, 2009).fishery. This gear is managed by federal and state FMPs that range from Maine to North Carolina. The relevant FMPs include, but may not be limited to the Atlantic Herring FMP (FR 70(19), 50 CFR Part 648.200 through 648.207) and the Northeast Multi-species (FR 67, CFR Part 648.80 through 648.97). This fishery is primarily managed by total allowable catch (TACs).

Total Effort: Total metric tons of fish landed from 1998 to 2013 were 24,256, 39,866, 29,609, 20,691, 20,096, 17,939, 19,958, 16,306, 18,700, 31,019, 27,327, 22,547, 8,566, 16,981, 19,413 and 23,218 respectively (NMFS, Unpbl.). Total effort, measured in trips, for the Gulf of Maine Atlantic Herring Purse Seine Fishery from 2002 to 2013 was 343, 339, 276, 202, 173, 249, 344, 249, 228, 242, 273, 273, 288 and 318 respectively (NMFS, Unpbl.).

Observer Coverage: During the period 1994 to 2002, estimated observer coverage (number of trips observed/total commercial trips reported) was 0. From 2003 to 2013, percent observer coverage was 0.34, 9.8, 0.27, 0, 3.2, 12, 21, 12, 33, 17 and 17 respectively.

Northeast/Mid-Atlantic American Lobster Trap/Pot

Current category: Category I

Basis for current classification on the LOF: The annual level of serious injury and mortality of North Atlantic right whales (Western North Atlantic [WNA] stock), humpback whales (Gulf of Maine stock), and minke whales (Canadian East Coast stock) in this fishery exceeds 50% of each stocks' Potential Biological Removal (PBR) level.

Current list of marine mammal species/stocks killed/injured (a (1) indicates those stocks driving the fishery's classification): Harbor seal, WNA; Humpback whale, Gulf of Maine; Minke whale, Canadian East Coast; North Atlantic right whale, WNA (1)
.
Gear description/method for fishing: This fishery operates with traps. 2-3% of the target species are taken by mobile gear (trawls and dredges), that are classified within the Category III Northeast Shellfish Bottom Trawl fishery.

Target species: American lobster.

Spatial/temporal distribution of effort: The fishery operates in inshore and offshore waters from Maine to New Jersey and may extend as far south as Cape Hatteras, North Carolina. Approximately 80% of American lobsters are harvested from state waters.

Management and regulations: The Atlantic States Marine Fisheries Commission has a primary regulatory role for this fishery because the majority of the harvest is taken from state waters. The Exclusive Economic Zone (EEZ) portion of the fishery operates under regulations from the Federal American Lobster Fishery Management Plan (FMP). Both the EEZ and state fishery are operating under Federal regulations from the Atlantic Large Whale Take Reduction Plan.

Observer coverage: There has not been observer coverage in this fishery.

Atlantic Mixed Species Trap/Pot Fishery

Current category: Category II

Basis for current classification on the LOF: Based on analogy with the Category I "Northeast/Mid-Atlantic American lobster trap/pot fishery" and the Category II "Atlantic blue crab trap/pot fishery." The gear used in these lobster and crab pot fisheries, which have been involved in entanglement events, is similar to the gear used in this fishery.

Current list of marine mammal species/stocks killed/injured: Fin whale, Western North Atlantic (WNA); Humpback whale, Gulf of Maine.

Gear description/method for fishing: This fishery uses trap/pot gear.

Target species: Target species include, but are not limited to, hagfish, shrimp, conch/whelk, red crab, Jonah crab, rock crab, black sea bass, scup, tautog, cod, haddock, Pollock, redfish (ocean perch) white hake, spot, skate, catfish, stone crab, and cunner.

Spatial/temporal distribution of effort: The fishery includes all trap/pot operations from the U.S.-Canada border south through the waters east of the fishery management demarcation line between the Atlantic Ocean and the Gulf of Mexico (50 CFR 600.105), but does not include the following Category I, II, and III trap/pot fisheries: Northeast/Mid-Atlantic American lobster trap/pot; Atlantic blue crab trap/pot; FL spiny lobster trap/ pot; Southeastern U.S. Atlantic, Gulf of Mexico stone crab trap/pot; U.S. Mid-Atlantic eel trap/pot; and the Southeastern U.S. Atlantic, Gulf of Mexico golden crab fisheries.

Management and regulations: The fishery is managed under various Interstate Fishery Management Plans and is subject to ALWTRP implementing regulations.
Observer coverage: There has not been observer coverage in this fishery.

Atlantic Ocean, Caribbean, Gulf of Mexico Large Pelagics Longline

Current category: Category I

Basis for current classification on the LOF: The total annual mortality and serious injury of long-finned pilot whale (Western North Atlantic [WNA] stock), pygmy sperm whale (WNA stock), and short-finned pilot whale (WNA stock) in this fishery is greater than 50% of the stocks' Potential Biological Removal (PBR) levels.

Current list of marine mammal species/stocks killed/injured (a (1)indicates those stocks driving the fishery's classification): Atlantic spotted dolphin, Gulf of Mexico (GMX) continental and oceanic; Atlantic spotted dolphin, WNA; Bottlenose dolphin, Northern GMX oceanic; Bottlenose dolphin, WNA offshore; Common dolphin, WNA; Cuvier's beaked whale, WNA; Gervais beaked whale, GMX oceanic stock; Killer whale, GMX oceanic stock; Long-finned pilot whale, WNA(1); Mesoplodon beaked whale, WNA; Northern bottlenose whale, WNA; Pantropical spotted dolphin, Northern GMX; Pantropical spotted dolphin, WNA; Risso's dolphin, Northern GMX; Risso's dolphin, WNA; Short-finned pilot whale, Northern GMX; Short-finned pilot whale, WNA(1); Sperm whale, GMX oceanic stock. Not mentioned here are documented interactions with sea turtles and sea birds.

Gear description/method for fishing: The fishery uses a mainline of >700 lb (317.5 kg) test monofilament typically ranging from 10-45 mi (16-72 km) long (although limited to 20 nm in the Mid-Atlantic Bight) . Bullet-shaped floats are suspended at regular intervals along the mainline and long sections of gear are marked by radio beacons. Long gangion lines of 200-400 lb (91-181 kg) test monofilament of typically 100-200 ft (30.5-61 m) are suspended from the mainline. Only certain sized hooks and baits are allowed based on fishing location. Hooks are typically fished at depths between 40-120 ft (12-36.6 m). Longlines targeting tuna are typically set at dawn are hauled near dusk, while longlines targeting swordfish are typically set at night and hauled in the morning. Gear remains in the water typically for 10-14 hours. Fishermen generally modify only select sections of longline gear to target dolphin fish or wahoo, with the remaining gear configured to target swordfish, tuna, and/or sharks.

Target species: Swordfish, tuna (yellowfin, bigeye, bluefin, and albacore), dolphin fish, wahoo, shortfin mako shark, and a variety of other shark species.

Temporal and Spatial Distribution: Fishing effort occurs year round and operates in waters both inside and outside the U.S. EEZ throughout Atlantic, Caribbean and Gulf of Mexico waters. The "Atlantic" component of the fleet operates both in coastal and continental shelf waters along the U.S. Atlantic coast from Florida to Massachusetts. The fle*et al*so operates in distant waters of the Atlantic including the central equatorial Atlantic Ocean and the Canadian Grand Banks. Fishing effort is reported in 11 defined fishing areas including the Gulf of Mexico. During 2012, the majority of fishing effort was reported in the Gulf of Mexico (441 sets) fishing areas (Garrison and Stokes 2013).

Management and regulations: This fishery is managed under the Consolidated Atlantic Highly Migratory Species Fishery Management Plan (FMP). The dolphin fish and wahoo portions of the fishery are managed under the South Atlantic FMP for Dolphin and Wahoo. Regulations under the Magnuson-Stevens Fishery Conservation and Management Act address the target fish species, as well as bycatch species protected under the Endangered Species Act and/or the MMPA. A portion of this fishery is subject to regulations under the Pelagic Longline Take Reduction Plan (50 CFR 229.36).

Total Effort: The total fishing effort in the Atlantic component of the Pelagic Longline Fishery has been declining since a peak reported effort of 12,318 sets (7.41 million hooks) during 1995. The mean effort reported to the Fisheries Logbook System between 1995 and 2000 was 9,370 sets (5.62 million hooks). Between 2001 and 2007, a mean of 4,551 sets (3.19 million hooks) was reported each year. During 2011, the total reported fishing effort was 8,044 sets and 5.9 thousand hooks (Garrison and Stokes 2012). During 2012, the total reported fishing effort was 11,025 sets and 8.04 thousand hooks (Garrison and Stokes 2013).

Observer Coverage: The Pelagic Longline Observer Program (POP) is a mandatory observer program managed by the SEFSC that has been in place since 1992. Observers are placed upon randomly selected vessels with total observer effort allocated on a geographic basis proportional to the total amount of fishing effort reported by the fleet. The target observer coverage level was 5% of reported sets through 2001, and was elevated to 8% of total sets in 2002. In 2011, the overall percent observer coverage during regular fishing was 10.9% expressed as a proportion of reported hooks and 10.1% as a proportion of reported sets (Garrison and Stokes 2012). Observed longline sets and marine mammal interactions are shown for 2009–2013 in Figures 36 through 45.

Comments: This fishery has been the subject of numerous management actions since 2000 associated with bycatch of both billfish and sea turtles. These changes have resulted in a reduction of overall fishery effort and changes in the behaviors of the fishery. The most significant change was the closure of the NED area off the Canadian Grand Banks and near the Azores as of June 1, 2001 (50 CFR Part 635). An experimental fishery was conducted in this area during both 2001 and 2002 to evaluate gear characteristics and fishing practices that increase the bycatch rate of sea turtles. Several marine mammals, primarily Risso's Dolphins, were seriously injured during this experimental fishery. In addition, there have been a number of time-area closures since late 2000 including year-round closures in the DeSoto Canyon area in the Gulf of Mexico and the Florida East Coast area; and additional seasonal closures in the Charleston Bump area and off of New Jersey (NMFS 2003). Additionally, a ban on the use of live fish bait was initiated in 1999 due to concerns over billfish bycatch. The June 2004 Biological Opinion has resulted in a significant change in the gear and fishing practices of this fishery that will likely impact marine mammal bycatch. The majority of interactions with marine mammals in this fishery have been with Pilot Whales and Risso's Dolphin. These interactions primarily occurred along the shelf break in the Mid-Atlantic Bight region during the third and fourth quarters (Garrison 2003; 2005; Fairfield Walsh and Garrison 2006; Fairfield Walsh and Garrison 2007, Garrison *et al.* 2009). The Pelagic Longline Take Reduction Team was convened during 2005 to develop approaches to reduce the serious injury of pilot whales in the mid-Atlantic, and the resulting take reduction plan is currently being implemented by NOAA Fisheries (http://www.nmfs.noaa.gov/pr/pdfs/fr/fr74-23349.pdf).

Southeast Atlantic Gillnet

Current category: Category II

Basis for current classification on the LOF: Based on analogy to other Atlantic gillnet fisheries that use similar gear and operate in a similar manner to this fishery. Also, based on a 2001 recommendation by the Atlantic Scientific Review Group (SRG) to elevate all gillnet fisheries to Category II (unless there is evidence to the contrary).

Current list of marine mammal species/stocks killed/injured: Bottlenose dolphin, Southern Migratory coastal; Bottlenose dolphin, Central FL coastal; Bottlenose dolphin, Northern FL coastal; Bottlenose dolphin, SC/GA.

Gear description/method for fishing: This fishery uses gillnets set in sink, stab, set, or strike fashion.

Target species: This fishery targets finfish including, but not limited to: king mackerel, Spanish mackerel, whiting, bluefish, pompano, spot, croaker, little tunny, bonita, jack crevalle, cobia, and striped mullet.

Spatial/temporal distribution of effort: This fishery operates in waters south of a line extending due east from the North Carolina/South Carolina border and south and east of the fishery management council demarcation line between the Atlantic Ocean and the Gulf of Mexico. The majority of fishing effort occurs in Federal waters because South Carolina, Georgia, and Florida prohibit the use of gillnets, with limited exceptions, in state waters. This fishery does not include gillnet effort targeting sharks, which are a target species of the "Southeastern U.S. Atlantic shark gillnet fishery."

Management and regulations: Fishing for king mackerel, Spanish mackerel, cobia, cero, and little tunny in Federal waters is managed under the Coastal Migratory Pelagic Resources FMP. None of the other target species are Federally managed under the Magnuson-Stevens Fishery Conservation and Management Act. In state waters, state and Atlantic States Marine Fisheries Commission Interstate FMPs apply. The fishery is also subject to BDTRP and ALWTRP implementing regulations (because of the potential for interactions with North Atlantic right whales in the Southeast U.S. Restricted Areas).

Observer Coverage: ?

Southeastern U.S. Atlantic Shark Gillnet Fishery

Current category: Category II

Basis for current classification on the LOF: The 2010 LOF included a superscript "1" following bottlenose dolphin (WNA coastal stock) because the annual mortality and serious injury of that stock in this fishery was greater than 1% and less than 50% of the stock's Potential Biological Removal (PBR) level. When the stocks of bottlenose dolphins killed/injured in this fishery were updated on the 2011 LOF, the superscript "1" was retained after the new stocks because NMFS cannot yet differentiate to which stock a killed/injured animal belongs. In this case, there is only one stock the killed/injured animals could have come from.

Current list of marine mammal species/stocks killed/injured (a (1)indicates those stocks driving the fishery's classification): Bottlenose dolphin, Central Florida (FL) coastal (1); Bottlenose dolphin, Northern FL coastal; North Atlantic right whale, WNA.

Gear description/method for fishing: This fishery uses gillnets set in a sink, set, strike, or drift fashion. Mesh size is typically greater than 5 in (13 cm), but may be as small as 2.87 in (7.3 cm) when targeting small coastal sharks. Drift gillnets most commonly use a mesh size of 6.1-15.2 cm, and average 4.07 hours from setting the gear through completion of haulback; sink gillnets most frequently use a mesh size of 6.4-19.1 cm, soaking for approximately 7.64 hours; and strike gillnets use the largest mesh size of 8.9 -12.1cm), soaking for approximately 8.46 hours. (Sources for this information include Passerotti et al. 2010, Passerotti et al. 2011, Gulack et al. 2012, and Mathers et al. 2013).

Target species: Large and small coastal sharks (blacktip, blacknose, finetooth, bonnethead, and sharpnose).

Spatial/temporal distribution of effort: This fishery has traditionally operated in coastal waters off Florida and Georgia. However, more recently sets ranged from North Carolina to the Florida Keys in both the Atlantic and Gulf of Mexico (Mathers et al. 2013).

Management and regulations: This fishery is managed under the Consolidated Atlantic Highly Migratory Species Fishery Management Plan (FMP), ALWTRP, and BDTRP. Regulations implemented under the Magnuson-Stevens Fishery Conservation and Management Act address managed target species, as well as bycatch species, including some protected under the ESA and Marine Mammal Protection Act (e.g., sea turtles, smalltooth sawfish, and right whales). Due to Amendment 2 and 3 to the Consolidated Atlantic Highly Migratory Species FMP, the large and small coastal shark gillnet fishery has been significantly reduced (NMFS 2007).

Total Effort: Gillnets targeting sharks in the southeastern U.S. Atlantic are fished in a variety of configurations including long soak drift sets, short soak encircling strike sets, and short duration sink sets. In addition, sink gillnets are used to target other finfish species. The same fishing vessels will fish the different types of sets. In the reported logbook data, it is difficult to identify these different gear types and distinguish sets targeting sharks from those targeting finfish. The total amount of effort was therefore estimated based upon observer data and reported fishing gear and catch characteristics (Garrison 2007). Between 2001 and 2005, an annual average of 74 drift sets, 40 strike sets, and 241 sink sets targeting sharks were reported and/or observed. The number of drift sets has been declining steadily while the number of strike sets has been increasing. During 2006, there were 8 drift sets, 40 strike sets, and 301 sink sets targeting sharks reported or observed (Garrison 2007). However, there is direct evidence of under-reporting as some observed sets were not reported to the FLS system, and the total effort remains highly uncertain. In 2007, a total of 85 drift net sets were observed with 4 of those targeting sharks and the remainder Spanish mackerel. A total of 112 sink net sets were observed, with 60 of those targeting sharks and the remainder targeting various fish species (Baremore *et al.* 2007). During 2008, there was very limited targeted fishing for sharks off the coast of Florida due to the closure of the large coastal shark fishery during the first half of the year, and there were no strike sets observed targeting sharks and only a few sink sets (Passerotti and Carlson 2009).

Observer coverage: A dedicated observer program for the Shark Drift Gillnet Fishery has been in place since 1998. Since 2000, due to the provisions of the ALWTRP, observer coverage has been high during the winter months. However, due to limited funding, observer coverage outside of this period was generally low (less than 5%) prior to 2000, and has been increasing since. From 2001 to 2006, the annual observer coverage of the drift gillnet fishery was 68%, 85%, 50%, 66%, 58%, and 48%, respectively. The annual coverage of the strike component from 2001 to 2006 was 63%, 86%, 72%, 81%, and 84%, respectively. The sink component of the fishery was observed in 2005 and 2006 with coverage levels of 10% and 22%, respectively. However, given the uncertainties in the level of reported effort, these estimates of observer coverage are highly uncertain. Due to these uncertainties, effort levels for the fishery and estimated observer coverage for 2007 and 2008 are not available.

Comments: There is a significant level of uncertainty surrounding estimating the total level of effort in this fishery. There is direct evidence of inconsistency in reporting. It is not possible to reliably distinguish trips targeting sharks from those targeting other fish species, and it is not possible to distinguish different types of sets in the logbook data. In fact, many gillnet fishers now target Spanish and king mackerel as well as bluefish (Passerotti et al. 2010) . However, the overall marine mammal and sea turtle bycatch rate is very low, therefore it is unlikely that even severe biases would result in large increases in the estimated total protected species bycatch in this fishery. In addition to marine mammal interactions, this fishery has been the subject of management concern due to recent interactions with endangered sea turtles including leatherback and loggerhead turtles.

Atlantic Blue Crab Trap/Pot

Current category: Category II

Basis for current classification on the LOF: The total annual mortality and serious injury West Indian manatees (FL stock) in this fishery is greater than 1% and less than 50% of the stocks' Potential Biological Removal (PBR) level. Also, when the stocks of bottlenose dolphins killed/injured in this fishery were updated on the 2011 LOF, the superscript "1" was retained after each of these stocks. The 2010 LOF included a superscript "1" following bottlenose dolphin (WNA coastal stock) and NMFS cannot yet differentiate to which stock a killed/injured animal belongs. Until NMFS is able to do so, each stock of bottlenose dolphin is considered to be driving the classification of the fishery.

Current list of marine mammal species/stocks killed/injured (a (1) indicates those stocks driving the fishery's classification): Bottlenose dolphin, Northern North Carolina (NC) estuarine system (1); Bottlenose dolphin, Southern NC estuarine system (1); Bottlenose dolphin, Charleston estuarine system (1); Bottlenose dolphin, Northern Georgia (GA)/Southern South Carolina (SC) estuarine system (1); Bottlenose dolphin, Southern GA estuarine system (1); Bottlenose dolphin, Jacksonville estuarine system (1); Bottlenose dolphin, Indian River Lagoon estuarine system (1); Bottlenose dolphin, Northern Migratory coastal (1); Bottlenose dolphin, Southern Migratory coastal (1); Bottlenose dolphin, Northern Florida (FL) coastal (1); Bottlenose dolphin, Central FL coastal(1); Bottlenose dolphin, SC/GA coastal (1); West Indian manatee, FL (1).

Gear description/method for fishing: This fishery uses pots baited with fish or poultry typically set in rows in shallow water. The pot position is marked by a buoy line attached to a surface buoy.

Target species: Blue crab.

Spatial/temporal distribution of effort: The fishery occurs year-round from the south shore of Long Island at 72° 30'W. long. in the Atlantic and east of the fishery management demarcation line between the Atlantic Ocean and the Gulf of Mexico (50 CFR 600.105), including state waters.

Management and Regulations: It is managed under state Fishery Management Plans, the Bottlenose Dolphin Take Reduction Plan (voluntary measures), and Atlantic Large Whale Take Reduction Plan.

Levels of observer coverage each year: There has not been observer coverage in this fishery.

Comments: In recent years, reports of strandings with evidence of interactions between bottlenose dolphins and both recreational and commercial crab pot fisheries have been increasing in the Southeast region (McFee and Brooks 1998; Burdett and McFee 2004). Interactions with crab pots appear to generally involve a dolphin becoming wrapped in the buoy line. The total number of these interactions and associated mortality rates has not been documented; however, based on stranding data from 2007-2012, there have been 36 reports of interactions between bottlenose dolphins and Atlantic trap/pots or possible trap/pot gear, and of those 18 were confirmed as Altantic blue crab trap/pot gear..

Mid-Atlantic Haul/Beach Seine

Current category: Category II

Basis for current classification on the LOF: The 2010 LOF included a superscript "1" following bottlenose dolphin (WNA coastal stock) because the annual mortality and serious injury of that stock in this fishery was greater than 1% and less than 50% of the stock's Potential Biological Removal (PBR) level. When the stocks of bottlenose dolphins killed/injured in this fishery were updated on the 2011 LOF, the superscript "1" was retained after each of these stocks because NMFS cannot yet differentiate to which stock a killed/injured animal belongs. Until NMFS is able to do so, each stock of bottlenose dolphin is considered to be driving the classification of the fishery.

Current list of marine mammal species/stocks killed/injured (a (1) indicates those stocks driving the fishery's classification): Bottlenose dolphin, Northern North Carolina (NC) estuarine system (1); Bottlenose dolphin, Northern Migratory coastal (1); Bottlenose dolphin, Southern Migratory coastal (1).

Gear description/method for fishing: This fishery uses seines with one end secured (e.g., swipe nets and long seines); both ends secured; or those anchored to hauled up on the beach. The beach seine system is generally constructed of a wash, wing, and bunt that are attached to the beach and extend into the surf and are traditionally used to encircle or encompass fish.

Target Species: Striped bass, mullet, spot, weakfish, sea trout, bluefish, kingfish, and harvestfish.

Spatial/temporal distribution of effort: This fishery operates in waters west of 72° 30'W. long. and north of a line extending due east from the North Carolina/South Carolina border and includes haul seining in other areas of the mid-Atlantic, including Virginia, Maryland, and New Jersey. The North Carolina Atlantic Ocean Striped Bass fishery operates primarily along the Outer Banks using small and large mesh nets and primarily during the fall and winter months.

Management and Regulations: The fishery is managed under several state and Interstate Fishery Management Plans and is an affected fishery under the BDTRP. Large mesh nets are regulated in North Carolina via North Carolina Marine Fisheries Commission rules and NCDMF proclamations.

Observer Coverage: North Carolina beach-based fishing has been observed since April 7, 1998 by the NMFS Fisheries Sampling Program (Observer Program) based at the NEFSC and the North Carolina Alternate Platform Observer Program. The numbers of observed beach seine sets from 1998 to 2008 were 63, 60, 52, 12, 6, 23, 36, 29, 9, 27, and 39. Overall, there has been very limited observer coverage by the NEFSC and the NC Alternate Platform Observer program.

Comments: The only haul/beach seine gear operating in North Carolina included in this Category II fishery is the ''Atlantic Ocean striped bass beach seine fishery'' during the winter.NCDMF defines a beach seine operating under the Atlantic Ocean Striped Bass beach seine fishery as a ''swipe net constructed of multifilament, multifiber webbing fished from the ocean beach that is deployed from a vessel launched from the ocean beach where the fishing operation takes place, and one end of the beach seine is attached to the shore at all times during the operation.'' All other NC small and large mesh beach- anchored gillnets with webbing constructed of all monofilament material or a combination of monofilament and multifilament.

North Carolina Inshore Gillnet Fishery

Current category: Category II

Basis for current classification on the LOF: The 2010 LOF included a superscript "1" following bottlenose dolphin (WNA coastal stock) because the annual mortality and serious injury of that stock in this fishery was greater than 1% and less than 50% of the stock's Potential Biological Removal (PBR) level. When the stocks of bottlenose dolphins killed/injured in this fishery were updated on the 2011 LOF, the superscript "1" was retained after each of these stocks because NMFS cannot yet differentiate to which stock a killed/injured animal belongs. Until NMFS is able to do so, each stock of bottlenose dolphin is considered to be driving the classification of the fishery.

Current list of marine mammal species/stocks killed/injured (a (1) indicates those stocks driving the fishery's classification): Bottlenose dolphin, Northern North Carolina (NC) estuarine (1); Bottlenose dolphin, Southern NC estuarine (1).

Gear description/method for fishing: This fishery includes any fishing effort using any type of gillnet gear, including set (float and sink), drift, and runaround gillnet.

Target species: Target species include, but are not limited to: southern flounder, weakfish, bluefish, Atlantic croaker, striped mullet, spotted seatrout, Spanish mackerel, striped bass, spot, red drum, black drum, and shad.

Spatial/temporal distribution of effort: This fishery includes any gillnet effort for any target species inshore of the

COLREGS demarcation lines in North Carolina (COLREGS demarcation lines delineate those waters upon which mariners shall comply with the International Regulations for Preventing Collisions at Sea and those waters upon which mariners shall comply with the Inland Navigation Rules).

Management and Regulations: This fishery is managed under state and Interstate Fishery Management Plans, applying net and mesh size regulations, and seasonal area closures in the Pamlico Sound Gillnet Restricted Area. It is an affected fishery under the BDTRP and Endangered Species Act.
Observer Coverage: Observer coverage, up to 10% in some cases, is provided by the North Carolina Division of Marine Fisheries, primarily during the fall flounder fishery in Pamlico Sound. The Northeast Fishery Observer Program has observed the fishery at low levels, as well as the North Carolina Alternative Platform Observer Program.

North Carolina Long Haul Seine

Current category: Category II

Basis for current classification on the LOF: The 2010 LOF included a superscript "1" following bottlenose dolphin (WNA coastal stock) because the annual mortality and serious injury of that stock in this fishery was greater than 1% and less than 50% of the stock's Potential Biological Removal (PBR) level. When the stocks of bottlenose dolphins killed/injured in this fishery were updated on the 2011 LOF, the superscript "1" was retained after the new stocks because NMFS cannot yet differentiate to which stock a killed/injured animal belongs. In this case, there is only one stock the killed/injured animals could have come from.

Current list of marine mammal species/stocks killed/injured (a (1) indicates those stocks driving the fishery's classification): Bottlenose dolphin, Northern North Carolina (NC) estuarine system (1); Bottlenose dolphin, Southern NC estuarine system.

Gear description/method for fishing: This fishery uses multi-filament seines consisting of a 1,000-2,000 yard (3,000-6,000 ft) net pulled by two boats for 1-2 nmi (2-4 km). Fish are encircled and concentrated by pulling the net around a fixed stake.

Target species: This fishery targets species including, but not limited to: weakfish, spot, croaker, menhaden, bluefish, spotted seatrout, and hogfish

Spatial/temporal distribution of effort: The fishery includes fishing with long haul seine gear to target any species in waters off North Carolina, including estuarine waters in Pamlico and Core Sounds and their tributaries. The fishery occurs from February-November, with peak effort occurring from June-October.

Management and regulations: The fishery is managed under Atlantic States Marine Fisheries Commission Interstate Fishery Management Plans, and is an affected fishery under the BDTRP.

Observer coverage: There has not been observer coverage in this fishery.

North Carolina Roe Mullet Stop Net

Current category: Category II

Basis for current classification on the LOF: The 2010 LOF included a superscript "1" following bottlenose dolphin (WNA coastal stock) because the annual mortality and serious injury of that stock in this fishery was greater than 1% and less than 50% of the stock's Potential Biological Removal (PBR) level. When the stocks of bottlenose dolphins killed/injured in this fishery were updated on the 2011 LOF, the superscript "1" was retained after the new stocks because NMFS cannot yet differentiate to which stock a killed/injured animal belongs. In this case, there is only one stock the killed/injured animals could have come from.

Current list of marine mammal species/stocks killed/injured (a (1) indicates those stocks driving the fishery's classification): Bottlenose dolphin, Southern North Carolina (NC) estuarine system (1).
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Gear description/method for fishing: This fishery uses a stop net and a beach seine. The stop net is a stationary,

multi-filament net set in an "L" shape that is anchored to the beach and extended out perpendicular to the beach. The stop net herds schools of fish, while the beach haul seine is used to capture fish and bring them ashore. The beach seine is constructed of multi-filament and monofilament panels with stretched mesh ranging from 3-4 inches stretched. The stop net is traditionally left in the water for 1-5 days, but can be left as long as 15 days.

Target species: Traditionally striped mullet, but has now expanded to include other teleost species as well.

Spatial/temporal distribution of effort: Effort occurs from October-November and is unique to Bogue Banks, North Carolina.

Management and regulations: This fishery is managed under the North Carolina Striped Mullet Fishery Management Plan, North Carolina Department of Marine Fisheries, and is an affected fishery under the BDTRP.

Observer coverage: There has not been Federal observer coverage in this fishery; however, the NMFS Beaufort laboratory observed this fishery in 2001-2002.

Virginia Pound Net

Current category: Category II

Basis for current classification on the LOF: The 2010 LOF included a superscript "1" following bottlenose dolphin (WNA coastal stock) because the annual mortality and serious injury of that stock in this fishery was greater than1% and less than 50% of the stock's Potential Biological Removal (PBR) level. When the stocks of bottlenose dolphins killed/injured in this fishery were updated on the 2011 LOF, the superscript "1" was retained after each of these stocks because NMFS cannot yet differentiate to which stock a killed/injured animal belongs. Until NMFS is able to do so, each stock of bottlenose dolphin is considered to be driving the classification of the fishery.

Current list of marine mammal species/stocks killed/injured (a (1)indicates those stocks driving the fishery's classification): Bottlenose dolphin, Northern Migratory coastal (1); Bottlenose dolphin, Northern North Carolina (NC) estuarine system; Bottlenose dolphin, Southern Migratory coastal (1).

Gear description/method for fishing: This fishery uses stationary gear. Pound net gear includes a large mesh lead posted perpendicular to the shoreline and extending outward to the corral, or "heart," where the catch accumulates.

Target species: Weakfish, spot, and croaker.

Spatial/temporal distribution of effort: Effort in this fishery occurs in nearshore coastal and estuarine waters off Virginia. This fishery includes all pound net effort in Virginia state waters, including waters inside the Chesapeake Bay.

Management and regulations: The fishery is managed by the Atlantic States Marine Fisheries Commission under the Interstate Fishery Management Plans for Atlantic Croaker and Spot, and is an affected fishery under the BDTRP and Endangered Species Act.

Observer Coverage: There has not been formal observer coverage in this fishery; however, the Northeast Fishery Observer Program (NEFOP) has monitoring and characterization that occurs sporadically in this fishery.

Comments: In 2004 and 2005, an experimental fishery was conducted in an area of the Chesapeake Bay that was closed to commercial pound net fishing effort from May to July for sea turtle conservation. The results from these studies determined a modified pound net leader could be used for pound net fishing while providing sea turtle conservation benefits. The modified leader design is also an effective solution to reduce dolphin interactions with Virginia pound net leaders. The reduced mesh webbing and spacing and design of the vertical lines of the modified leader reduce areas for dolphin entanglements. Therefore, the modified leader likely reduces the bycatch of dolphins (Schaffler et al. 2011). Stranding and observer data also indicate the modified leader design reduces bottlenose dolphin interactions.

Mid-Atlantic Menhaden Purse Seine

Current category: Category II

Basis for current classification on the LOF: Based on analogy to other purse seine fisheries, such as the Category II Gulf of Mexico Menhaden purse seine fishery, and potential interactions with bottlenose dolphins (Northern Migratory coastal and Southern Migratory coastal stocks).

Current list of marine mammal species/stocks killed/injured: Bottlenose dolphin, Northern Migratory coastal; Bottlenose dolphin, Southern Migratory coastal.

Gear description/method for fishing: This fishery uses purse seine gear for reduction or baitfish. The purse seine net is made of nylon fiber and is about 1 ¾ inch stretched mesh; net length is about 1,000-1,400 ft; and net depth is from 65-90 ft. Soak time is approximately 35-45 minutes from deployment of net until the purse is closed. Fishing vessels are either large (up to 200 ft) carrying two smaller purse seine boats (39 ft), or small snapper rigs (60-75 ft).Schools of menhaden are spotted from larger vessels and/or spotted planes. Purse seines are deployed over schools vertically from large vessel or two smaller boats. The floatline and leadline has a series of rings threaded with a purse line that is winched closed around the school. The net is retrieved by power block.

Target species: Menhaden and thread herring.

Spatial/temporal distribution of effort: Most sets occur within 3 mi (4.8 km) of shore with the majority of the effort occurring off North Carolina from November-January, and moving northward during warmer months to southern New England. Fishing effort is year-round with concentrated migratory peaks from May-September from Virginia northward, and November-January in North Carolina. A majority of the fishing effort by the Virginia fleet occurs in the Virginia portion of Chesapeake Bay, and along the ocean beaches of Eastern Shore Virginia. Most sets in Chesapeake Bay are in the main stem of the Bay, greater than one mile from shore. In summer, the Virginia fleet occasionally ranges as far north as northern New Jersey. Purse-seining for reduction purposes is prohibited by state law in Maryland, Delaware, and New Jersey; hence, purse-seine sets in the ocean off Delmarva and New Jersey are by definition greater than 3 miles from shore.

Management and regulations: The fishery is managed by the Atlantic States Marine Fisheries Commission under the Interstate Fishery Management Plan for Atlantic Menhaden.

Observer coverage: There has been very limited observer coverage since 2008.

Southeastern U.S. Atlantic/Gulf of Mexico Shrimp Trawl

Current category: Category II

Basis for current classification on the LOF: Based on interactions reported through observer reports, stranding data, and fisheries research data, with multiple strategic and non-strategic marine mammal stocks. Due to the lack of PBR data for most of the stocks and the low observer coverage in this fishery, NMFS conducted a qualitative analysis to determine the appropriate classification for this fishery. Even with low coverage, NMFS observed 12 dolphin takes (of which 11 were serious injuries or mortalities) from 1993-2009; 11 of which were taken since 2002. Also, the final 2009 SARs note that "occasional interactions with bottlenose dolphins have been observed.and there is infrequent evidence of interactions from stranded animals." Further, Marine Mammal Authorization Program (MMAP) records list 1 dolphin take in shrimp trawl gear in South Carolina in 2002. Lastly, 13 dolphin takes since 2009, 10 of which were taken since 2002, have been documented by NMFS in Southeast U.S. research trawl operations, and/or relocation trawls conducted.

Current list of marine mammal species/stocks killed/injured (a (1) indicates those stocks driving the fishery's classification): Atlantic spotted dolphin, Gulf of Mexico (GMX) continental and oceanic; Bottlenose dolphin, GMX continental shelf; Bottlenose dolphin, Northern GMX coastal; Bottlenose dolphin, South Carolina/Georgia(SC/GA) coastal (1); Bottlenose dolphin, Eastern GMX coastal (1); Bottlenose dolphin, Western GMX coastal(1); Bottlenose dolphin, GMX bay, sound, estuarine (1)

Gear description/method for fishing: The most commonly employed gear in this fishery is a double-rig otter trawl, which normally includes a lazy line attached to each bag's codend. The lazy line floats free during active trawling, and as the net is hauled back, it is retrieved with a boat- or grappling-hook to assist in guiding and emptying the trawl nets. Shrimp trawl soak time is about three hours. Skimmer nets for shrimp are also included in this LOF fishery classification.

Target species: Brown, pink and white shrimp within estuaries, and near coastal and offshore regions. Royal Red shrimp along the deep continental slope.

Spatial/temporal distribution of effort: The pelagic or bottom trawl fishery operating virtually year-round in the Atlantic Ocean from NC through FL, and in the Gulf of Mexico from FL through TX. Effort occurs in estuarine, near shore coastal waters, and along the continental slope of the Atlantic and estuarine, near shore coastal, and offshore continental shelf and slope waters in the Gulf of Mexico. Fishery typically operates from sunset to sunrise when shrimp are most likely to swim higher in the water column.

Management and regulations: The shrimp fishery is managed by both by state and federal regulations. The shrimp trawl fishery is affected under the Bottlenose Dolphin Take Reduction Plan and Endangered Species Act.

Levels of observer coverage each year: This fishery was observed between 1992 and 2006 under a voluntary program, which became mandatory in 2007. Observer coverage was less than 1% for all observed years.

Comments: Although shrimp trawlers are required under Endangered Species Act regulations to use turtle excluder devices to reduce sea turtle bycatch (50 CFR 223.206), the fishery currently does not use any method or gear modification to deter, or reduce bycatch of, marine mammals.

Southeastern U.S. Atlantic, Gulf of Mexico Stone Crab Trap/Pot Fishery

Current category: Category II

Basis for current classification on the LOF: Based on analogy to the Category II "Atlantic blue crab trap/pot" fishery, and serious injury and mortality to bottlenose dolphins (multiple stocks) reported in stranding data.

Current list of marine mammal species/stocks killed/injured: Bottlenose dolphin, Biscayne Bay estuarine; Bottlenose dolphin, Central Florida (FL) coastal; Bottlenose dolphin, Eastern Gulf of Mexico (GMX) coastal; Bottlenose dolphin, FL Bay; Bottlenose dolphin, GMX bay, sound, estuarine (FL west coast portion); Bottlenose dolphin, Indian River Lagoon estuarine system; Bottlenose dolphin, Jacksonville estuarine system; Bottlenose dolphin, Northern GMX coastal.

Gear description/method for fishing: Traps are the most typical gear type used for the commercial and recreational stone crab fishery. Baited traps are frequently set in waters of 65 ft (19.8 m) depth or less in a double line formation, generally 100-300 ft (30.5-91.4 m) apart, running parallel to a bottom contour. Buoys are attached to the trap/pot via float line.

Target Species: Florida stone crab (*Menippe mercenaria*).

Spatial/temporal distribution of effort: Operates primarily nearshore in the State of Florida. Stone crab fishing outside of this area is likely very minimal. The margins of seagrass flats and bottoms with low rocky relief are also favored areas for trap placement. The season for commercial and recreational stone crab harvest is from October 15 to May 15.

Management and regulations: There is not fishery management plan for stone crab, but rather, the federal and state fishery is managed by the Florida Fish and Wildlife Commission in order to streamline state and federal management. Besides Florida, Southeastern states do not specifically offer stone crab permits, rather they provide general trap/pot endorsements.

Total Effort: Due to the Stone Crab Trap Reduction Schedule [F.A.C Chapter 68B-13.010(3)(f) Florida Statutes], the number of commercial trap certificates issued by the State of Florida has decreased from approximately 1,475,000 in the 2002-2003 fishing season to 1,119,449 in the 2011-2012 fishing season. The Stone Crab Trap Reduction Schedule [F.A.C Chapter 68B-13.010(3)(f) Florida Statutes] will eventually reduce the number of trap tags to 600,000 trap/pots statewide. Pots will be reduced by a pre-specified percentage each year until the number of trap tags reaches 600,000 (Muller *et al.* 2006).

Observer Coverage: There is no observer coverage in this fishery.

Comments: Based on the similar gear type used in a number of different pot fisheries (e.g., blue crab, spiny lobster, etc.) especially in coastal Florida waters, bottlenose dolphin strandings associated with this fishery are likely underestimated. Derelict trap/pot gear is also a substantial concern for marine life entanglements. In FL, commercial trap/pot buoys are required to be marked with the letter "X," the trap owner's stone crab endorsement number (in characters at least 2 inches high), and a tag that corresponds to a valid FWC-issued trap certificate.

III. Historical Fishery Descriptions

Atlantic Foreign Mackerel

Prior to 1977, there was no documentation of marine mammal bycatch in DWF activities off the Northeast coast of the U.S. With implementation of the Magnuson Fisheries Conservation and Management Act (MFCMA) in that year, an Observer Program was established which recorded fishery data and information on incidental bycatch of marine mammals. DWF effort in the U.S. Atlantic Exclusive Economic Zone (EEZ) under MFCMA had been directed primarily towards Atlantic Mackerel and Squid. From 1977 through 1982, an average mean of 120 different foreign vessels per year (range 102-161) operated within the U.S. Atlantic EEZ. In 1982, there were 112 different foreign vessels; 16%, or 18, were Japanese Tuna longline vessels operating along the U.S. east coast. This was the first year that the Northeast Regional Observer Program assumed responsibility for observer coverage of the longline vessels. Between 1983 and 1991, the numbers of foreign vessels operating within the U.S. Atlantic EEZ each year were 67, 52, 62, 33, 27, 26, 14, 13, and 9 respectively. Between 1983 and 1988, the numbers of DWF vessels included 3, 5, 7, 6, 8, and 8 respectively, Japanese longline vessels. Observer coverage on DWF vessels was 25-35% during 1977-1982, and increased to 58%, 86%, 95% and 98%, respectively, in 1983-1986. One hundred percent observer coverage was maintained during 1987-1991. Foreign fishing operations for Squid ceased at the end of the 1986 fishing season and for Mackerel at the end of the 1991 season. Documented interactions with white sided dolphins were reported in this fishery.

Pelagic Drift Gillnet

In 1996 and 1997, NMFS issued management regulations which prohibited the operation of this fishery in 1997. The fishery operated during 1998. Then, in January 1999 NMFS issued a Final Rule to prohibit the use of drift net gear in the North Atlantic Swordfish Fishery (50 CFR Part 630). In 1986, NMFS established a mandatory self-reported fisheries information system for Large Pelagic Fisheries. Data files are maintained at the SEFSC. The estimated total number of hauls in the Atlantic Pelagic Drift Gillnet Fishery increased from 714 in 1989 to 1,144 in 1990; thereafter, with the introduction of quotas, effort was severely reduced. The estimated number of hauls from 1991 to 1996 was 233, 243, 232, 197, 164, and 149 respectively. Fifty-nine different vessels participated in this fishery at one time or another between 1989 and 1993. In 1994 to 1998 there were 11, 12, 10, 0, and 11 vessels, respectively, in the fishery. Observer coverage, expressed as percent of sets observed, was 8% in 1989, 6% in 1990, 20% in 1991, 40% in 1992, 42% in 1993, 87% in 1994, 99% in 1995, 64% in 1996, no fishery in 1997, and 99% coverage during 1998. Observer coverage dropped during 1996 because some vessels were deemed too small or unsafe by the contractor that provided observer coverage to NMFS. Fishing effort was concentrated along the southern edge of Georges Bank and off Cape Hatteras, North Carolina. Examination of the species composition of the catch and locations of the fishery throughout the year suggest that the Drift Gillnet Fishery was stratified into two strata: a southern, or winter, stratum and a northern, or summer, stratum. Documented interactions with North Atlantic right whales, humpback whales, sperm whales, pilot whale spp., Mesoplodon spp., Risso's dolphins, common dolphins, striped dolphins and white sided dolphins were reported in this fishery.

Atlantic Tuna Purse Seine

The Tuna Purse Seine Fishery occurring between the Gulf of Maine and Cape Hatteras, North Carolina is directed at large medium and giant Bluefin Tuna (BFT). Spotter aircraft are typically used to locate fish schools. The official start date, set by regulation, is 15 July of each year. Individual Vessel Quotas (IVQs) and a limited access system prevent a derby fishery situation. Catch rates for large medium and giant Tuna can be high and consequently, the season can last only a few weeks, however, over the last number of years, effort expended by this sector of the BFT fishery has diminished dramatically due to the unavailability of BFT on the fishing grounds.

The regulations allocate approximately 18.6% of the U.S. BFT quota to this sector of the fishery (5 IVQs) with a tolerance limit established for large medium BFT (15% by weight of the total amount of giant BFT landed.

Limited observer data is available for the Atlantic Tuna Purse Seine Fishery. Out of 45 total trips made in 1996, 43 trips (95.6%) were observed. Forty-four sets were made on the 43 observed trips and all sets were observed. A total of 136 days were covered. No trips were observed during 1997 through 1999. Two trips (seven hauls) were observed in October 2000 in the Great South Channel Region. Four trips were observed in September 2001. No marine mammals were observed taken during these trips. Documented interactions with pilot whale spp. were reported in this fishery.

Atlantic Tuna Pelagic Pair Trawl

The Pelagic Pair Trawl Fishery operated as an experimental fishery from 1991 to 1995, with an estimated 171 hauls in 1991, 536 in 1992, 586 in 1993, 407 in 1994, and 440 in 1995. This fishery ceased operations in 1996 when NMFS rejected a petition to consider pair trawl gear as an authorized gear type in the Atlantic Tuna Fishery. The fishery operated from August to November in 1991, from June to November in 1992, from June to October in 1993 (Northridge 1996), and from mid-summer to December in 1994 and 1995. Sea sampling began in October of 1992 (Gerrior *et al.* 1994) where 48 sets (9% of the total) were sampled. In 1993, 102 hauls (17% of the total) were sampled. In 1994 and 1995, 52% (212) and 55% (238), respectively, of the sets were observed. Nineteen vessels have operated in this fishery. The fishery operated in the area between 35N to 41N and 69W to 72W. Approximately 50% of the total effort was within a one degree square at 39N, 72W, around Hudson Canyon, from 1991 to 1993. Examination of the 1991-1993 locations and species composition of the bycatch, showed little seasonal change for the six months of operation and did not warrant any seasonal or areal stratification of this fishery (Northridge 1996). During the 1994 and 1995 Experimental Pelagic Pair Trawl Fishing Seasons, fishing gear experiments were conducted to collect data on environmental parameters, gear behavior, and gear handling practices to evaluate factors affecting catch and bycatch (Goudy 1995, 1996), but the results were inconclusive. Documented interactions with pilot whale spp., Risso's dolphin and common dolphins were reported in this fishery.

Part B. Description of U.S. Gulf of Mexico Fisheries

I. Data Sources

Items 1 and 2 describe sources of marine mammal mortality, serious injury or entanglement data, and item 3 describes the source of commercial fishing effort data used to generate maps depicting the location and amount of fishing effort and the numbers of active permit holders. In general, commercial fisheries in the Gulf of Mexico have had little directed observer coverage and the level of fishing effort for most fisheries that may interact with marine mammals is either not reported or highly uncertain.

1. Southeast Region Fishery Observer Programs

Two fishery observer programs are managed by the SEFSC that observe commercial fishery activity in the U.S. Gulf of Mexico. The Pelagic Longline Observer Program (POP) administers a mandatory observer program for the U.S. Atlantic Large Pelagics Longline Fishery. The program has been in place since 1992, and randomly allocates observer effort by eleven geographic fishing areas proportional to total reported effort in each area and quarter. Observer coverage levels are mandated under the Highly Migratory Species FMP (HMS FMP, 50 CFR Part 635). The second is the Southeastern Shrimp Otter Trawl Fishery Observer Program. Prior to 2007, this was a voluntary program administered by SEFSC in cooperation with the Gulf and South Atlantic Fisheries Foundation. The program was funding and project dependent, therefore observer coverage is not necessarily randomly allocated across the fishery. In 2007, the observer program was expanded, and it became mandatory for fishing vessels to take an observer if selected. The program now includes more systematic sampling of the fleet based upon reported landings and effort patterns. The total level of observer coverage for this program is ~ 1% of the total fishery effort. In each Observer Program, the observers record information on the total target species catch, the number and type of interactions with protected species (including both marine mammals and sea turtles), and biological information on species caught. In each Observer Program, the observers record information on the total target species catch, the number and type of interactions with protected species including both marine mammals and sea turtles, and biological information on species caught.

2. Regional Marine Mammal Stranding Networks

The Southeast Regional Stranding Network is a component of the Marine Mammal Health and Stranding Response Program (MMHSRP). The goals of the MMHSRP are to facilitate collection and dissemination of data, assess health trends in marine mammals, correlate health with other biological and environmental parameters, and coordinate effective responses to unusual mortality events (Becker *et al.* 1994). The Southeast Region Strandings Program is responsible for data collection and stranding response coordination along the U.S. Gulf of Mexico coast from Florida through Texas. Prior to 1997, stranding and entanglement data were maintained by the New England Aquarium and the National Museum of Natural History, Washington, D.C. Volunteer participants, acting under a letter of agreement with NOAA Fisheries, collect data on stranded animals that include: species; event date and location; details of the event including evidence of human interactions; determinations of the cause of death; animal disposition; morphology; and biological samples. Collected data are reported to the appropriate Regional Stranding Network Coordinator and are maintained in regional and national databases.

3. Southeast Region Fisheries Logbook System

The FLS is maintained at the SEFSC and manages data submitted from mandatory fishing vessel logbook programs under several FMPs. In 1986, a comprehensive logbook program was initiated for the Large Pelagics Longline Fisheries, and this reporting became mandatory in 1992. Logbook reporting has also been initiated since the early 1990s for a number of other fisheries including: reef fish fisheries; snapper-grouper complex fisheries; federally managed shark fisheries; and king and Spanish mackerel fisheries. In each case, vessel captains are required to submit information on the fishing location, the amount and type of fishing gear used, the total amount of fishing effort (e.g., gear sets) during a given trip, the total weight and composition of the catch, and the disposition of the catch during each unit of effort (e.g., kept, released alive, released dead). FLS data are used to estimate the total amount of fishing effort in the fishery and thus expand bycatch rate estimates from observer data to estimates of the total incidental take of marine mammal species in a given fishery.

4. Marine Mammal Authorization Program

Commercial fishing vessels engaging in Category I or II fisheries are automatically registered under the Marine Mammal Authorization Program (MMAP) in order to lawfully take a non-endangered/threatened marine mammal incidental to fishing operations. These fishermen are required to carry an Authorization Certificate onboard while participating in the listed fishery, must be prepared to carry a fisheries observer if selected, and must comply with all applicable take reduction plan regulations.. All vessel owners, regardless of the category of fishery they are operating in, are required to report, within 48 hours of the incident even if an observer has recorded the take, all incidental injuries and mortalities of marine mammals that have occurred as a result of fishing operations (NMFS-OPR 2003). Events are reported by fishermen on the Marine Mammal Mortality/Injury forms then submitted to and maintained by the NMFS Office of Protected Resources. The data reported include: captain and vessel demographics; gear type and target species; date, time and location of event; type of interaction; animal species; mortality or injury code; and number of interactions. Reporting forms are available online at http://www.nmfs.noaa.gov/pr/pdfs/interactions/mmap_reporting_form.pdf.

II. Gulf of Mexico Commercial Fisheries

Spiny Lobster Trap/Pot Fishery

Current category: Category III

Basis for current classification on the LOF: Entanglements of cetaceans in trap/pot fisheries have been documented, but the degree to which marine mammals become entangled in this fishery needs to be investigated further.

Current list of marine mammal species/stocks killed/injured: Bottlenose dolphin, Biscayne Bay estuarine; Bottlenose dolphin, FL Bay estuarine; Bottlenose dolphin, Central FL coastal; and Bottlenose dolphin, Eastern GMX coastal.

Gear Description: Spiny lobster trap/pot gear most commonly used in the commercial fishery consists of a cube made of wooden slats. Wire traps are occasionally used, but more frequently in deeper water. Concrete is typically poured in the bottom of traps to weight them. A buoy is attached to the trap via a float line and floated at the surface. Buoys attached to spiny lobster traps must be marked with the letter "C" in Florida state waters. Tags displaying the crawfish endorsement number are also required on all traps by the state of Florida. Diving to collect spiny lobster is another known fishing method.

The type of bait used in traps depends on fisher preference. Some traps are set unbaited, some are baited with fish scraps, sardines, cat food or cowhide, while others are baited with legal sized or undersized lobsters used to attract larger lobsters. Soak times average from 8 to 28 days, with soak times increasing as the season progresses and catch rates decline (Matthews 2001).

Target Species: Caribbean spiny lobster (*Panulirus argus*), smooth tail spiny lobster (*Panulirus lauvicauda*) and spotted spiny lobster (*Panulirus guttatus*).

Spatial/temporal distribution of effort: The distribution of the commercial and recreational spiny lobster harvest off Florida is almost exclusively limited to the waters of the Florida Keys (GMFMC and SAFMC 1982). Effort occurs on both the Atlantic and Gulf side of the Florida Keys; however, diving for lobster is most common on the Gulf side (NMFS 2009). Fishing occurs from very nearshore areas out to water depths of 200 ft, although most fishing occurs in waters less than 100 ft.

The commercial and regular recreational spiny lobster seasons (in both state and federal waters of Florida and other Gulf states) start on August 6 and end on March 31 (F.A.C. Chapter 68B-24.005(1) Florida Statutes; 50 CFR 640.20(b)) with the exception of the two-day sport season in which trap gear is prohibited.

Management and Regulations: Since the majority of this fishery occurs off South Florida, the management involves both State and Federal jurisdictions. The fishery is currently managed via bag limits, minimum size limits, regulated fishing seasons for the commercial and recreational sectors, gear restrictions, trap construction requirements and a trap limitation and permitting program.

Total Effort: Over the last 10 years, commercial trap fishing has been the dominant gear type in the spiny lobster fishery, accounting for approximately 70 percent of all commercial landings (Robson 2006). The remaining landings are collected via divers by hand or via bully nets (which accounts for only a very small percentage). A trap limitation program initiated by the State of Florida in 1993 has reduced the number of lobster traps available annually from approximately one million to 485,891 trap tag certificates for the 2010 season (A. Podey, Florida Fish and Wildlife Conservation Commission (FFWCC) to A. Herndon, NMFS, pers. comm., 2010).

Observer Coverage: There is no observer coverage in this fishery.

Comments: Based on the similar gear type used in a number of different trap/pot fisheries (e.g., blue crab, stone crab, etc.) especially in coastal Florida waters, bottlenose dolphin strandings associated with this fishery are likely underestimated. Derelict trap/pot gear is also a substantial concern for marine life entanglements. It is estimated that between 10-20% of all traps (i.e., 50,000-100,000) are lost annually.

Southeastern U.S. Atlantic, Gulf of Mexico Stone Crab Trap/Pot Fishery

Current category: Category II

Basis for current classification on the LOF: Based on analogy to the Category II "Atlantic blue crab trap/pot" fishery, and serious injury and mortality to bottlenose dolphins (multiple stocks) reported in stranding data.

Current list of marine mammal species/stocks killed/injured: Bottlenose dolphin, Biscayne Bay estuarine; Bottlenose dolphin, Central Florida (FL) coastal; Bottlenose dolphin, Eastern Gulf of Mexico (GMX) coastal; Bottlenose dolphin, FL Bay; Bottlenose dolphin, GMX bay, sound, estuarine (FL west coast portion); Bottlenose dolphin, Indian River Lagoon estuarine system; Bottlenose dolphin, Jacksonville estuarine system; Bottlenose dolphin, Northern GMX coastal.

Gear description/method for fishing: Traps are the most typical gear type used for the commercial and recreational stone crab fishery. Baited traps are frequently set in waters of 65 ft (19.8 m) depth or less in a double line formation, generally 100-300 ft (30.5-91.4 m) apart, running parallel to a bottom contour. Buoys are attached to the trap/pot via float line.

Target Species: Florida stone crab (*Menippe mercenaria*)

Spatial/temporal distribution of effort: Operates primarily nearshore in the state of Florida. Stone crab fishing outside of this area is likely very minimal. The margins of seagrass flats and bottoms with low rocky relief are also favored areas for trap placement. The season for commercial and recreational stone crab harvest is from October 15 to May 15.

Management and regulations: There is not fishery management plan for stone crab, but rather, the federal and state fishery is managed by the Florida Fish and Wildlife Commission in order to streamline state and federal management. Besides Florida, Southeastern states do not specifically offer stone crab permits, rather they provide general trap/pot endorsements.

Total Effort: Due to the Stone Crab Trap Reduction Schedule [F.A.C Chapter 68B-13.010(3)(f) Florida Statutes], the number of commercial trap certificates issued by the State of Florida has decreased from approximately 1,475,000 in the 2002-2003 fishing season to 1,119,449 in the 2011-2012 fishing season. The Stone Crab Trap Reduction Schedule [F.A.C Chapter 68B-13.010(3)(f) Florida Statutes] will eventually reduce the number of trap tags to 600,000 trap/pots statewide. Pots will be reduced by a pre-specified percentage each year until the number of trap tags reaches 600,000 (Muller *et al.* 2006).

Observer Coverage: There is no observer coverage in this fishery.

Comments: Based on the similar gear type used in a number of different pot fisheries (e.g., blue crab, spiny lobster, etc.) especially in coastal Florida waters, bottlenose dolphin strandings associated with this fishery are likely underestimated. Derelict trap/pot gear is also a substantial concern for marine life entanglements. In FL, commercial trap/pot buoys are required to be marked with the letter "X," the trap owner's stone crab endorsement number (in characters at least 2 inches high), and a tag that corresponds to a valid FWC-issued trap certificate.

Gulf of Mexico Menhaden Purse Seine Fishery

Current category: Category II

Basis for current classification on the LOF: Based on a review of observer data from 1992-1995. Observers recorded 9 incidental takes, 8 (3 mortalities) from the Western Gulf of Mexico [GMX] coastal bottlenose stock and 1 from the Northern GMX coastal stock. All of the lethal takes occurred in an area encompassing the Western GMX coastal stock of bottlenose dolphins. Extrapolating the takes from the average observer effort indicated the annual average mortality and serious injury was 68 animals/year, exceeding 100% of the Potential Biological Removal (PBR) level for the Western coastal stock (PBR=29), qualifying this fishery as a Category I fishery on the LOF. However, NMFS categorized this fishery as a Category II pending a revised analysis of stock structure for bottlenose dolphin in the GMX. If all bottlenose stocks in the GMX were grouped together PBR would equal 154, putting the fishery in Category II (68 animals/year is 44% of PBR when PBR is 154).

Current list of marine mammal species/stocks killed/injured ((1) indicates those stocks driving the fishery's classification): Bottlenose dolphin, GMX bay, sound, estuarine; Bottlenose dolphin, Northern GMX coastal(1); Bottlenose dolphin, Western GMX coastal (1). Gear description/method for fishing: This fishery uses purse seine gear. All catch is processed at the "mother ship."

Target species: Menhaden and thread herring.

Spatial/temporal distribution of effort: This fishery operates in bays, sounds, and nearshore coastal waters along the GMX coast. The majority of the fishing effort is concentrated off Louisiana and Mississippi, with lesser effort off Florida, Alabama, and Texas .

Management and regulations: Florida prohibits the use of purse seines in state waters. This fishery is managed under the Gulf States Marine Fisheries Commission Interstate Gulf Menhaden Fishery Management Plan.

Observer coverage: Observed in 1992, 1994, and 1995 through an observer program conducted by Louisiana State University. There has been no observer coverage since 1995. There was a pilot observer program conducted in 2011.

Gulf of Mexico Gillnet Fishery

Current category: Category II

Basis for current classification on the LOF: Primarily by analogy with other Category I and II Atlantic gillnet fisheries, as well as research takes and stranding data Gulf of Mexico (GMX) bottlenose dolphin stocks showing signs of interaction with gillnets, and a recommendation from the Atlantic Scientific Review Group (SRG) to elevate unless there were data to the contrary.

Current list of marine mammal species/stocks killed/injured: Bottlenose dolphin, GMX bay, sound, and estuarine; Bottlenose dolphin, Northern GMX coastal; Bottlenose dolphin, Western GMX coastal.

Gear description/method for fishing: This fishery uses any type of gillnet configuration, including strike and straight gillnets.

Target species: This fishery targets a wide variety of target species, including, but not limited to: black drum, sheepshead, weakfish, mullet, spot, croaker, king mackerel, Spanish mackerel, Florida pompano, flounder, shark, menhaden, bluefish, blue runner, ladyfish, spotted seatrout, croaker, kingfish, and red drum.

Spatial/temporal distribution of effort: This fishery operates year-round in waters north of the U.S.-Mexico border and west of the fishery management council demarcation line between the Atlantic Ocean and the Gulf of Mexico. Gillnets are currently prohibited in Texas and Florida state waters. Mississippi currently has no state permits available for gillnet fisheries.

Management and regulations: Gillnet gear is prohibited in Texas and Florida state waters, but fixed and runaround gillnets are currently used in Louisiana and Alabama with highly variable fishing effort. Fishing for king mackerel, Spanish mackerel, cobia, cero, little tunny, dolphin fish, and bluefish are managed under the Coastal Migratory Pelagic Resources Fishery Management Plan (CMPR FMP). In the Gulf of Mexico, CMPR FMP species are the only federally managed species for which gillnet gear is authorized, and only run-around gillnetting for these species is allowed. In state waters, state and Gulf States Marine Fisheries Commission Interstate FMPs apply. Furthermore, Texas state does use gillnets for research that have associated takes of bottlenose dolphins.

Observer coverage: There has not been observer coverage in this fishery.

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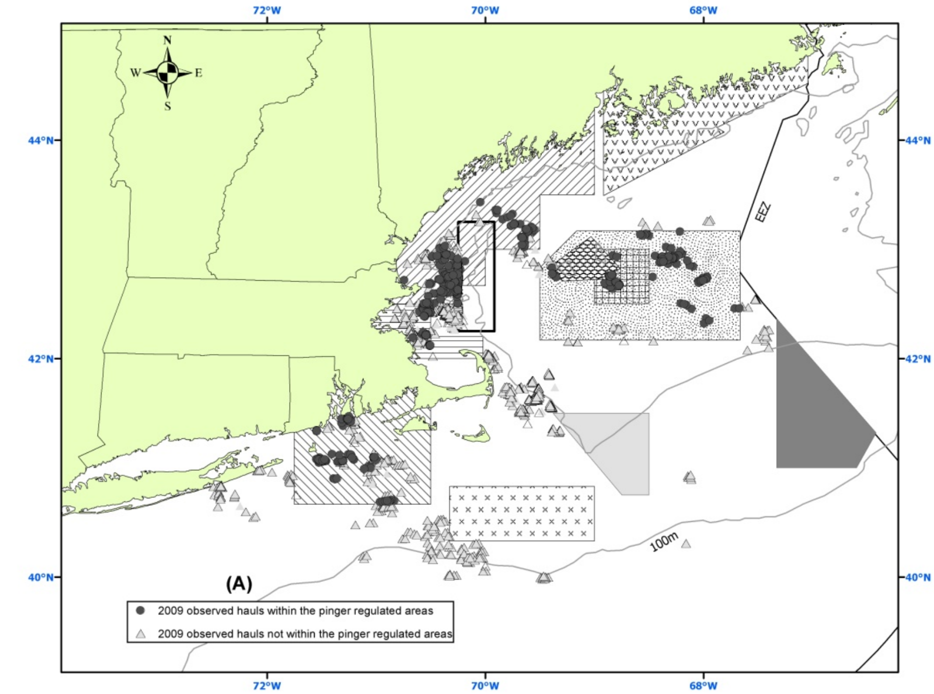
Appendix III: Fishery Descriptions - List of Figures

Figure 1. 2009 Northeast sink gillnet observed hauls (A) and observed takes (B).



Multispecies Fisheries Management Plan year-round closures:

Closed Area 1 | Closed Area 2 | Western Gulf of Maine Closed Area | Nantucket Lightship Closed Area | Cashes Ledge Closure

Harbor porpoise Take Reduction Plan management areas:

Offshore Closure | Northeast Closure | MidCoast Closure | Mass Bay Closure | Cape Cod South Closure | Cashes Ledge Closure

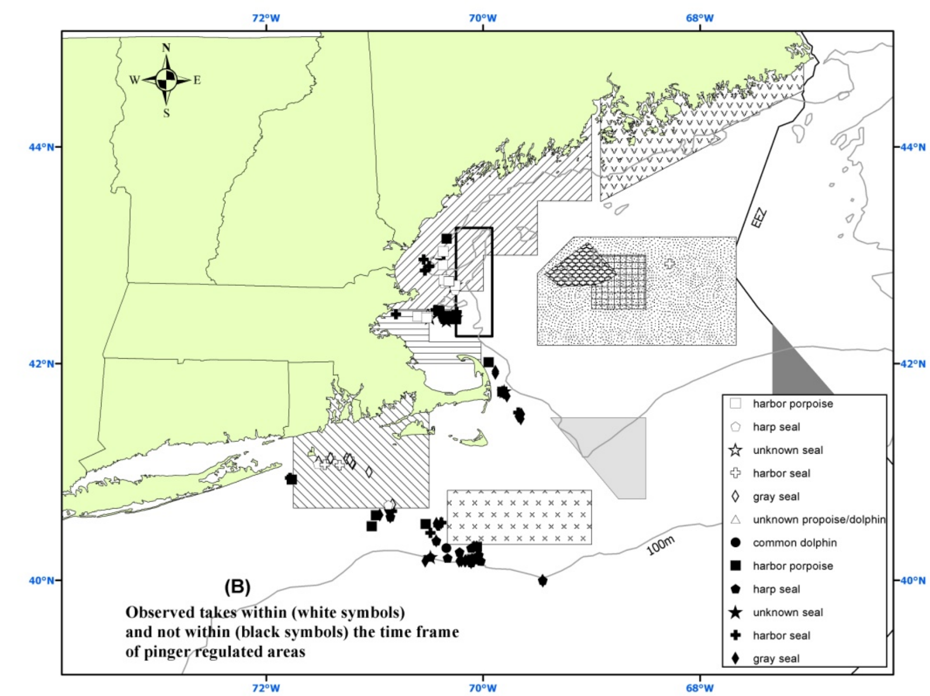
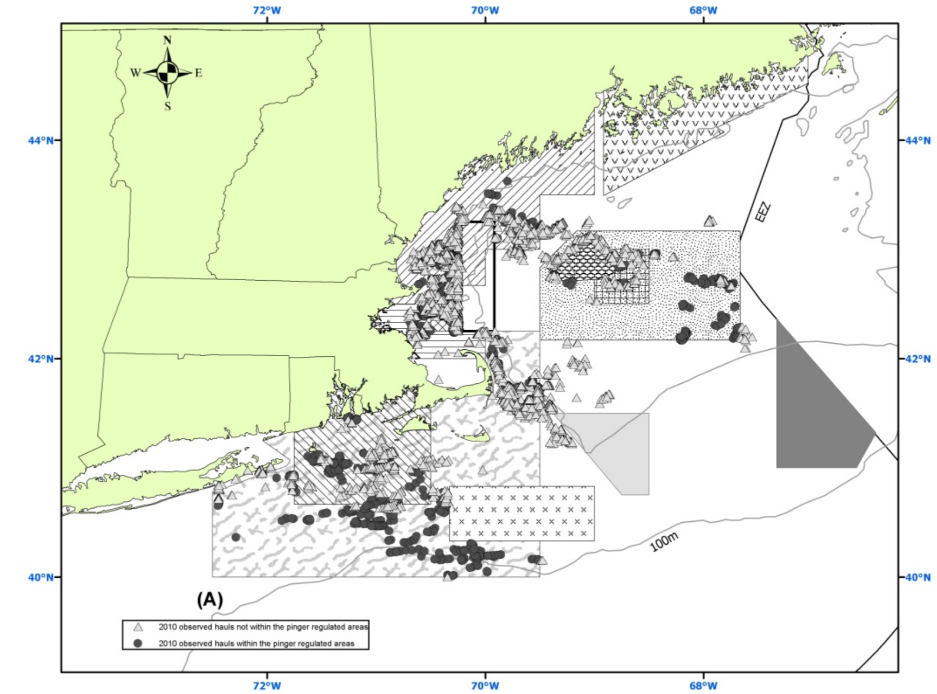


Figure 2. 2010 Northeast sink gillnet observed hauls (A) and observed takes (B).



Multispecies Fisheries Management Plan year-round closures:

Closed Area 1 | Closed Area 2 | Western Gulf of Maine Closed Area | Nantucket Lightship Closed Area | Cashes Ledge Closure

Harbor porpoise Take Reduction Plan management areas:

Offshore Closure | Northeast Closure | MidCoast Closure | Mass Bay Closure | Cape Cod South Closure | Cashes Ledge Closure

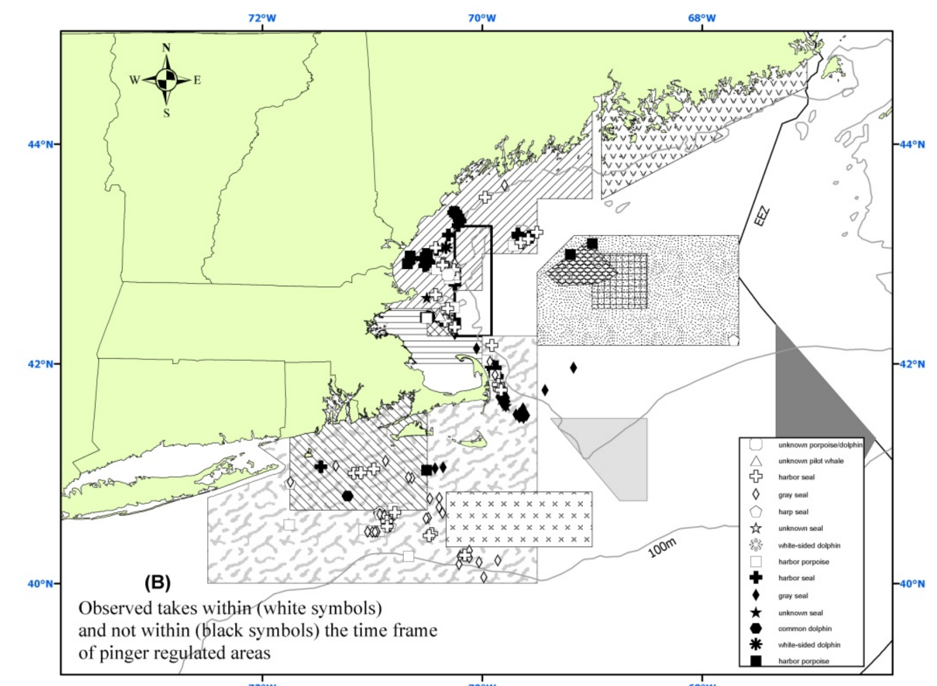
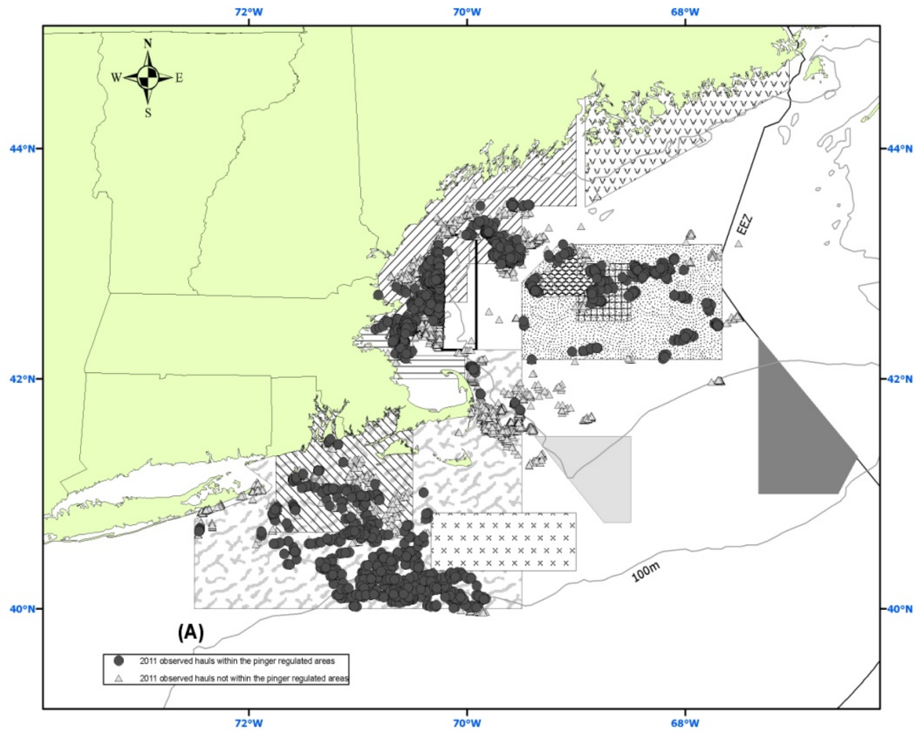


Figure 3. 2011 Northeast sink gillnet observed hauls (A) and observed takes (B).



Multispecies Fisheries Management Plan year-round closures:

Closed Area 1 | Closed Area 2 | Western Gulf of Maine Closed Area | Nantucket Lightship Closed Area | Cashes Ledge Closure

Harbor porpoise Take Reduction Plan management areas:

Offshore Closure | Northeast Closure | MidCoast Closure | Mass Bay Closure | Cape Cod South Closure | Cashes Ledge Closure

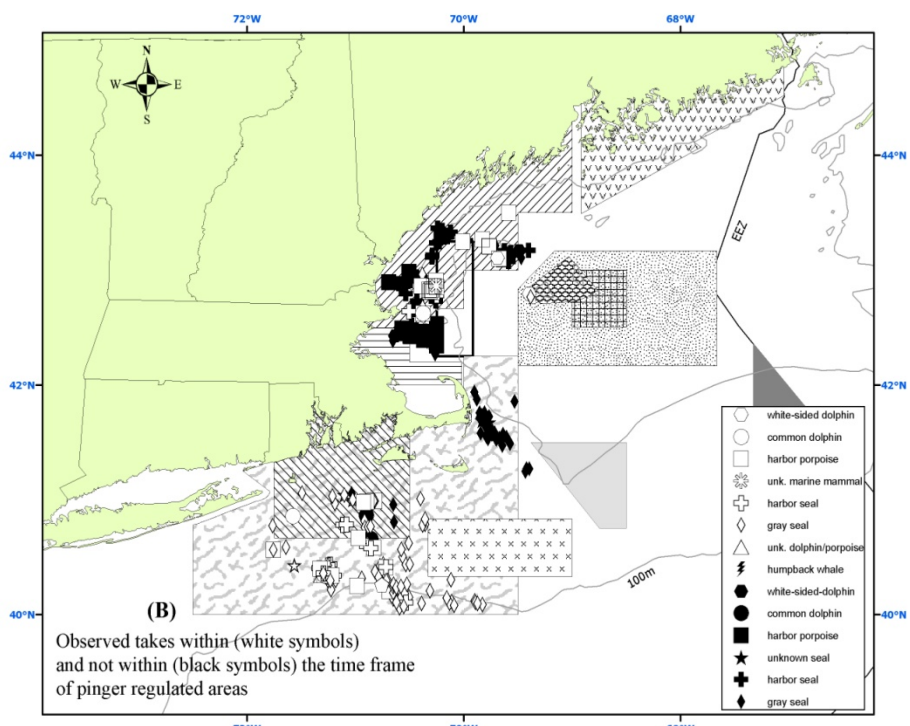
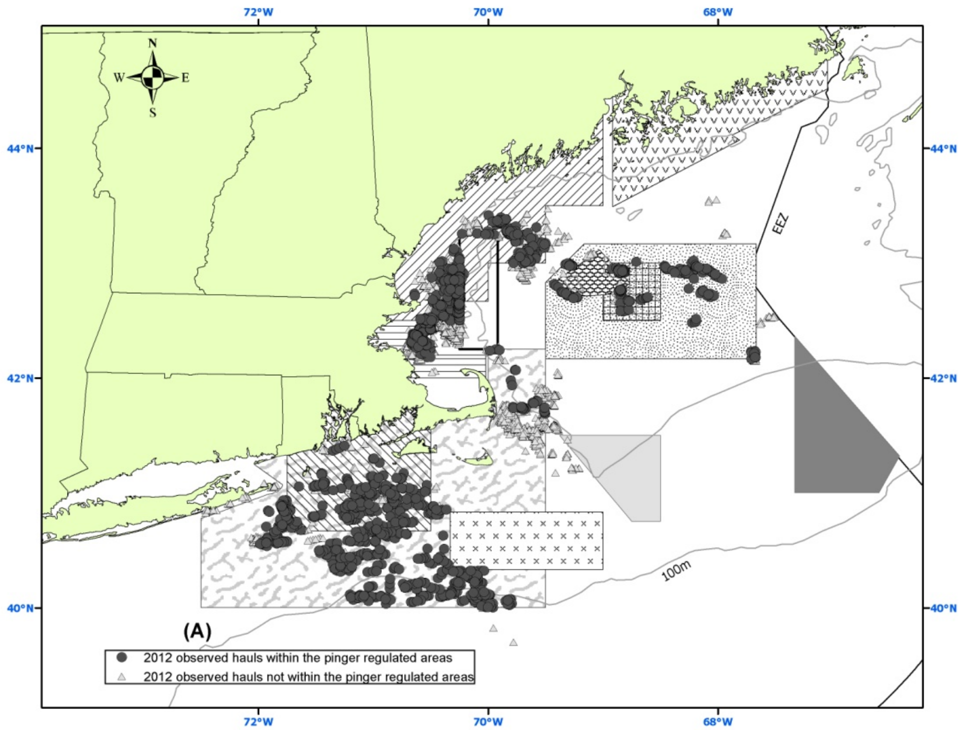


Figure 4. 2012 Northeast sink gillnet observed hauls (A) and observed takes (B).



Multispecies Fisheries Management Plan year-round closures:

Closed Area 1 | Closed Area 2 | Western Gulf of Maine Closed Area | Nantucket Lightship Closed Area | Cashes Ledge Closure

Harbor porpoise Take Reduction Plan management areas:

Offshore Closure | Northeast Closure | MidCoast Closure | Mass Bay Closure | Cape Cod South Closure | Cashes Ledge Closure

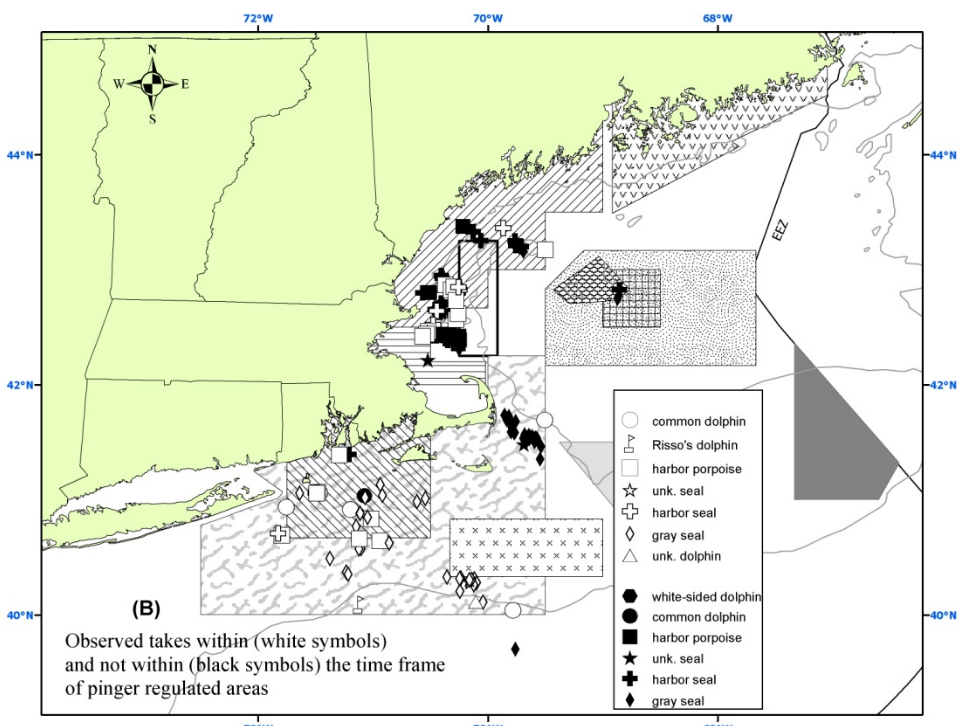
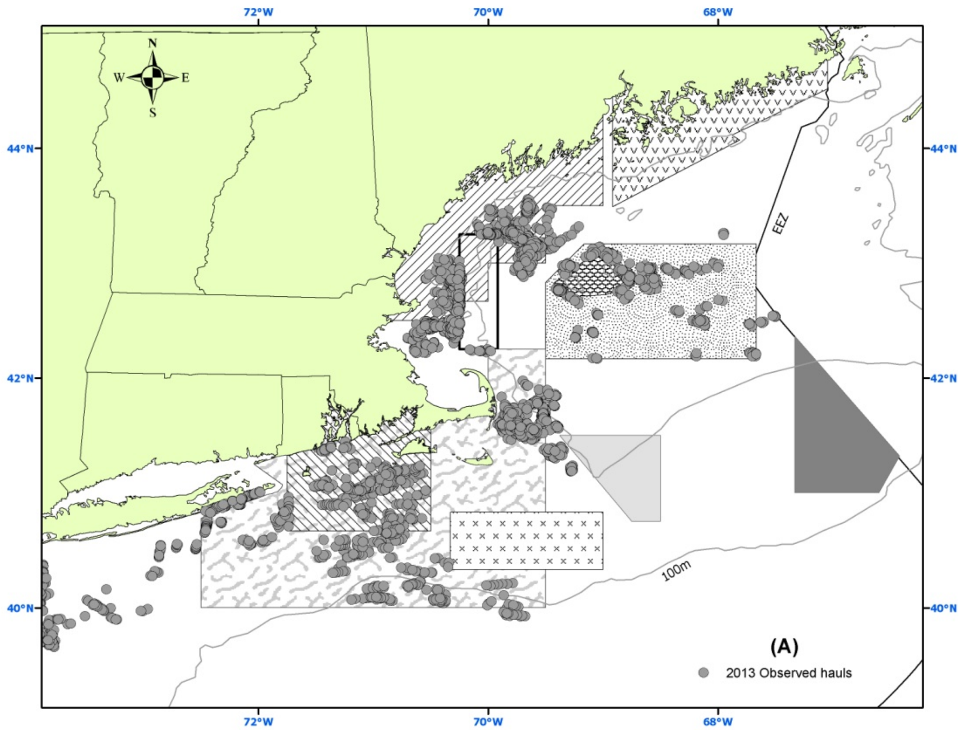


Figure 4. 2013 Northeast sink gillnet observed hauls (A) and observed takes (B).



Multispecies Fisheries Management Plan year-round closures:

Closed Area 1 | Closed Area 2 | Western Gulf of Maine Closed Area | Nantucket Lightship Closed Area | Cashes Ledge Closure

Harbor porpoise Take Reduction Plan management areas:

Offshore Closure | Northeast Closure | MidCoast Closure | Mass Bay Closure | Cape Cod South Closure | Cashes Ledge Closure

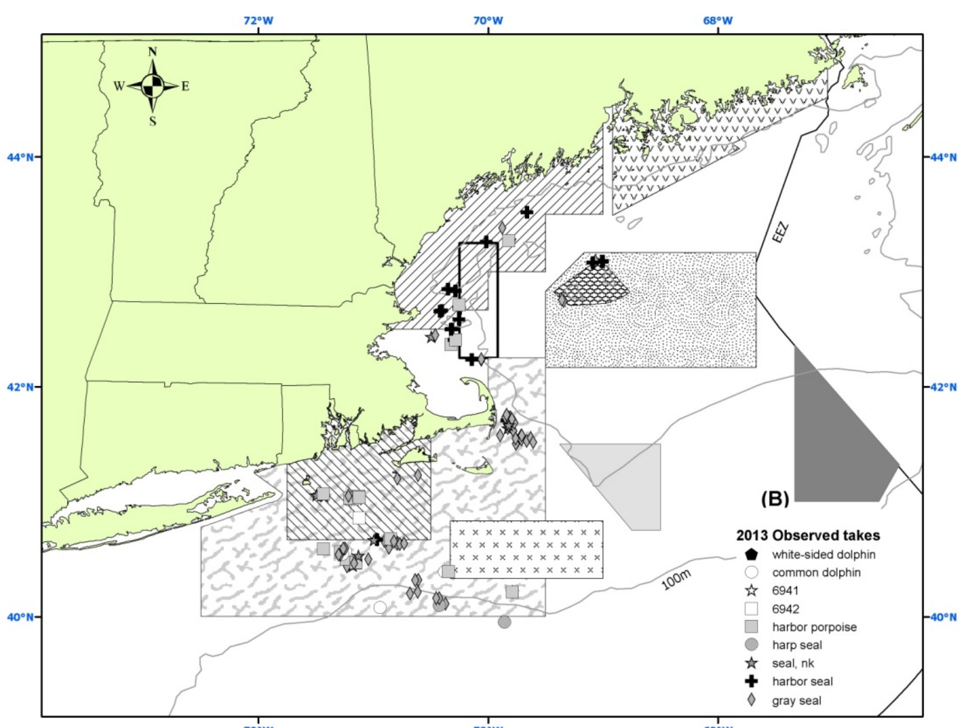
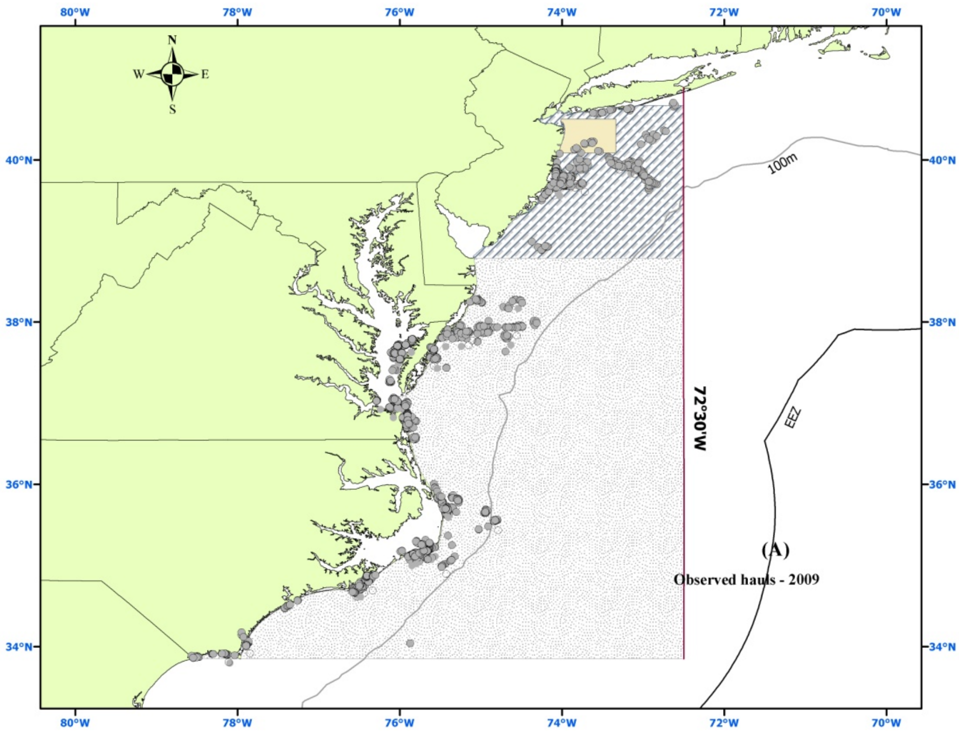


Figure 6. 2009 Mid-Atlantic gillnet observed hauls (A) and observed takes (B).



Harbor porpoise Take Reduction Plan management areas:

Southern mid-Atlantic waters | New Jersey Mudhole | waters off New Jersey

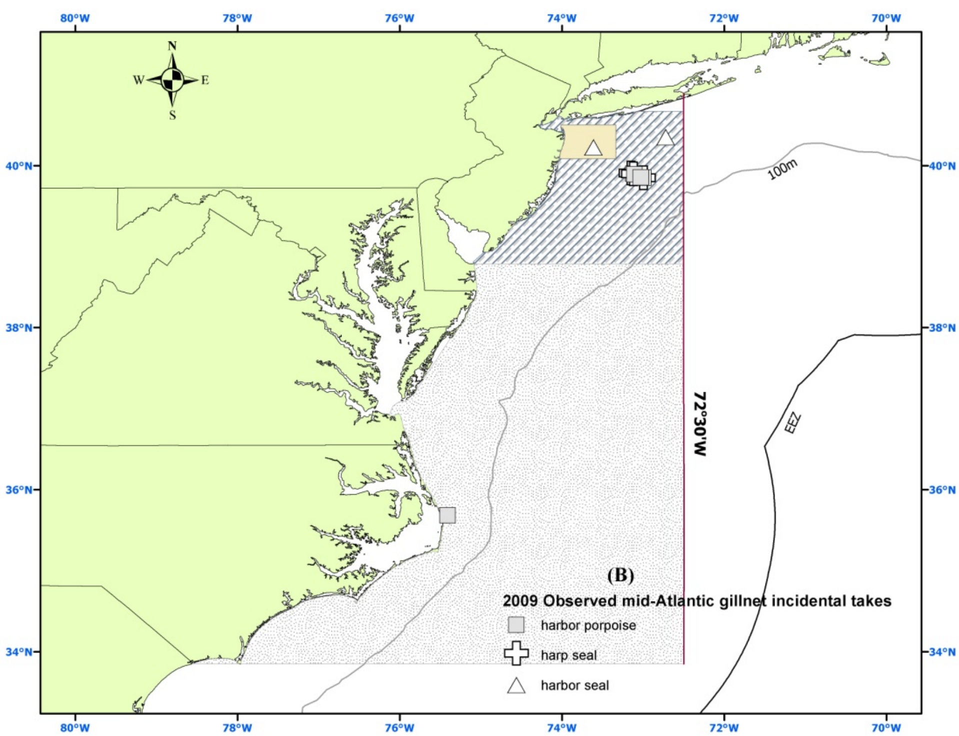
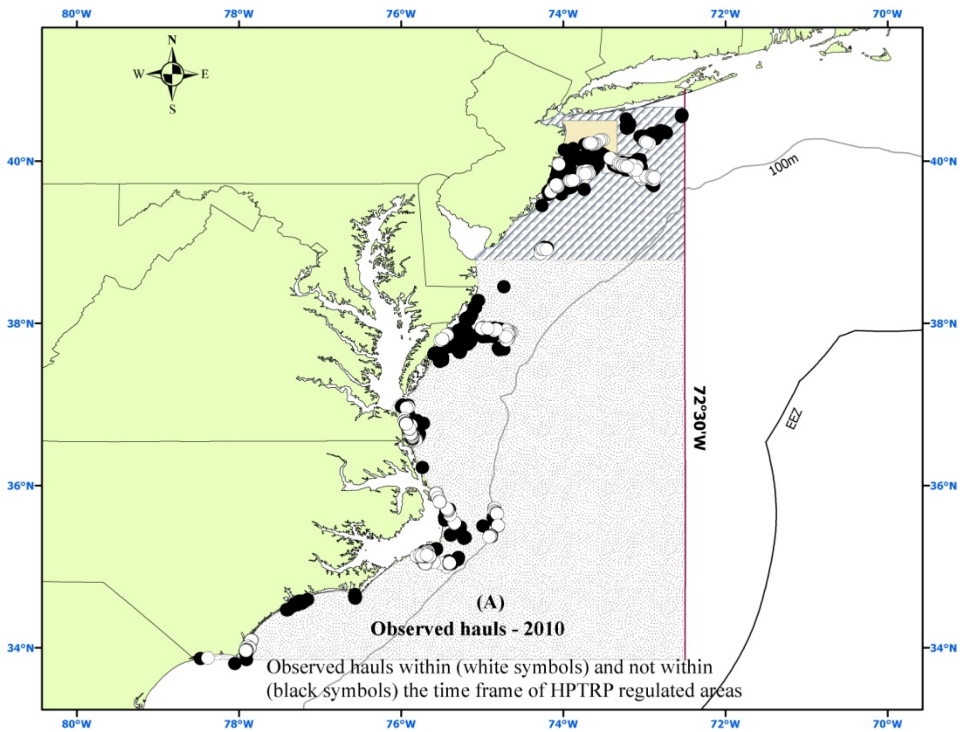


Figure 7. 2010 Mid-Atlantic gillnet observed hauls (A) and observed takes (B).



Harbor porpoise Take Reduction Plan management areas:

Southern mid-Atlantic waters New Jersey Mudhole waters off New Jersey

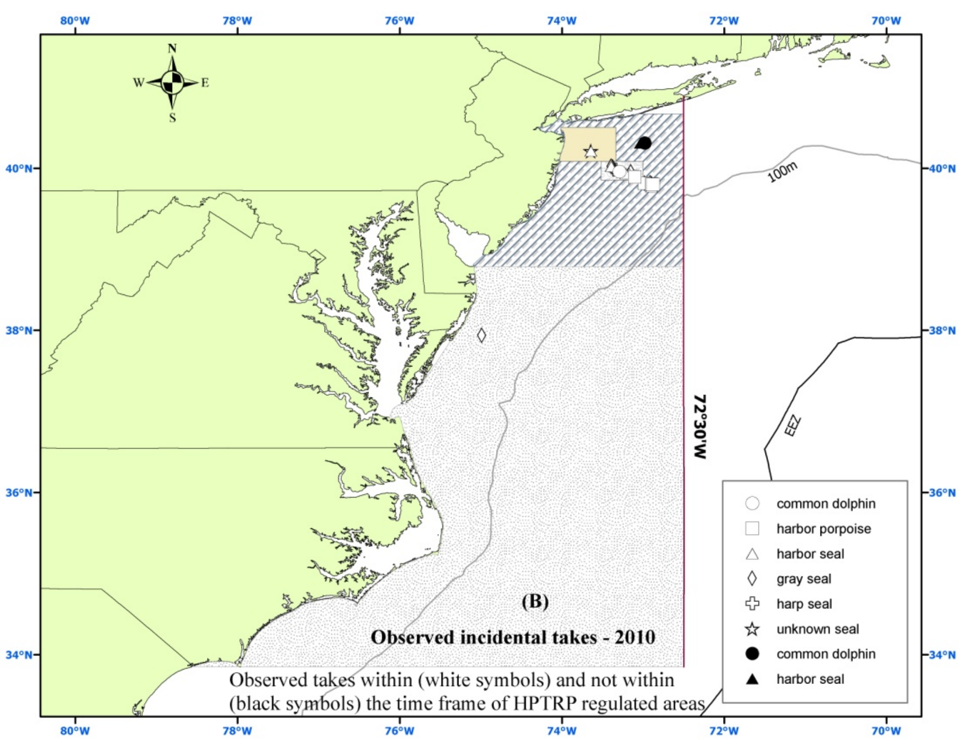
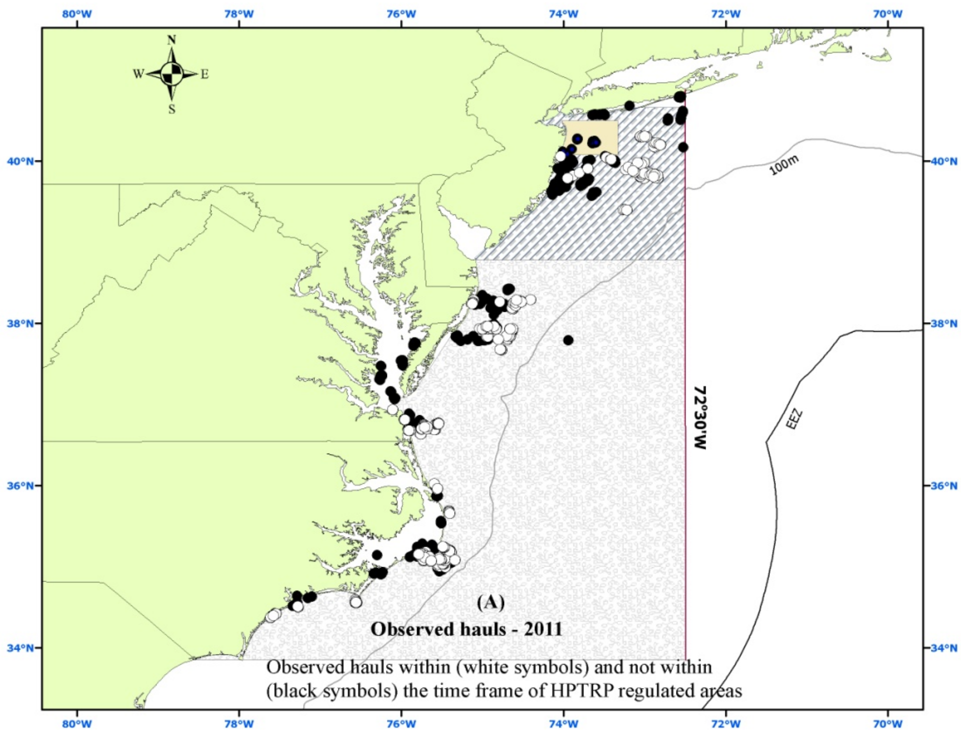


Figure 8. 2011 Mid-Atlantic gillnet observed hauls (A) and observed takes (B).



Harbor porpoise Take Reduction Plan management areas:

Southern mid-Atlantic waters   New Jersey Mudhole   waters off New Jersey

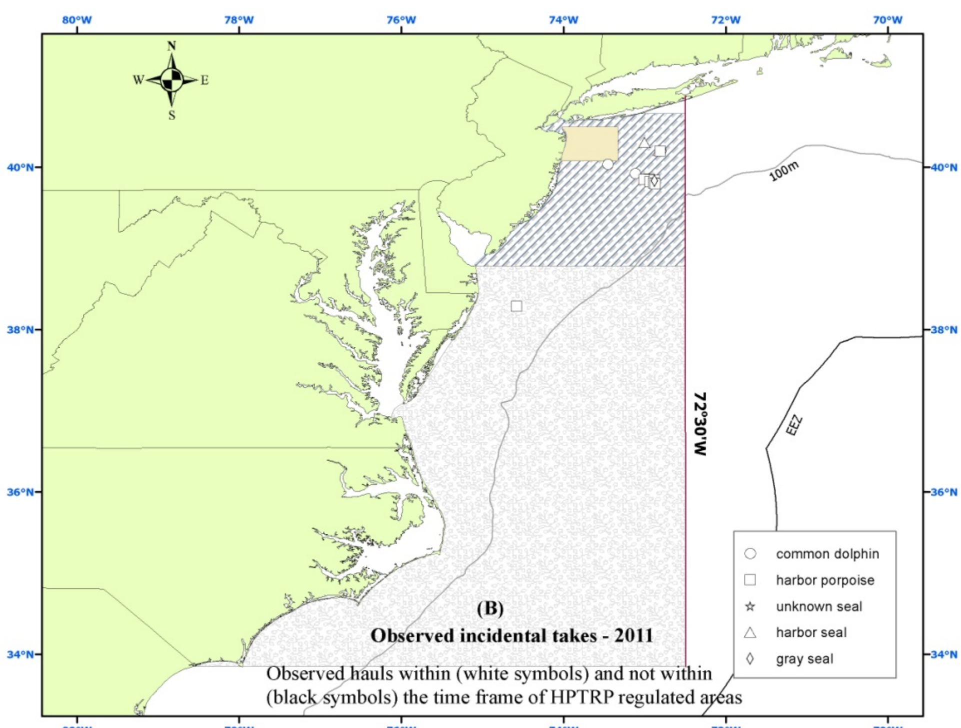
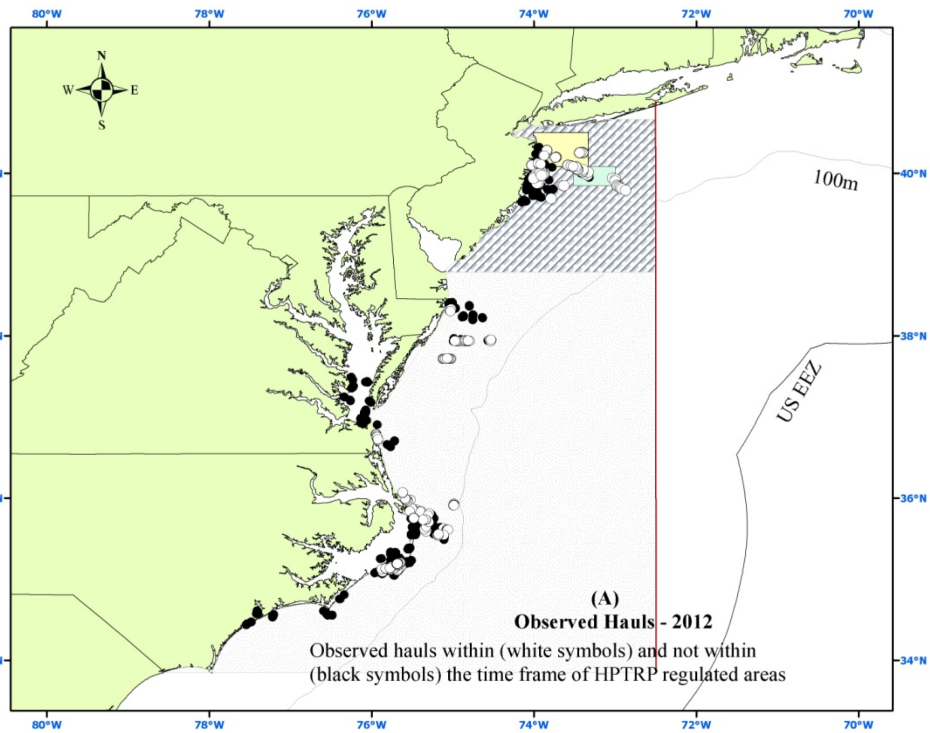


Figure 9. 2012 Mid-Atlantic gillnet observed hauls (A) and observed takes (B).



Harbor porpoise Take Reduction Plan management areas:

Southern mid-Atlantic waters   New Jersey Mudhole   waters off New Jersey

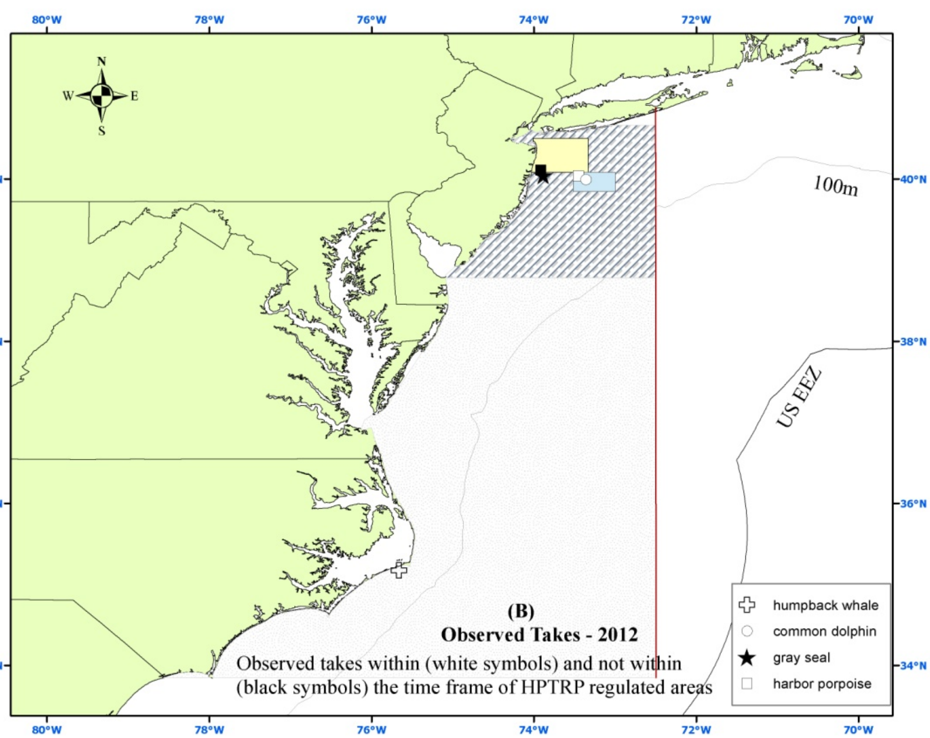
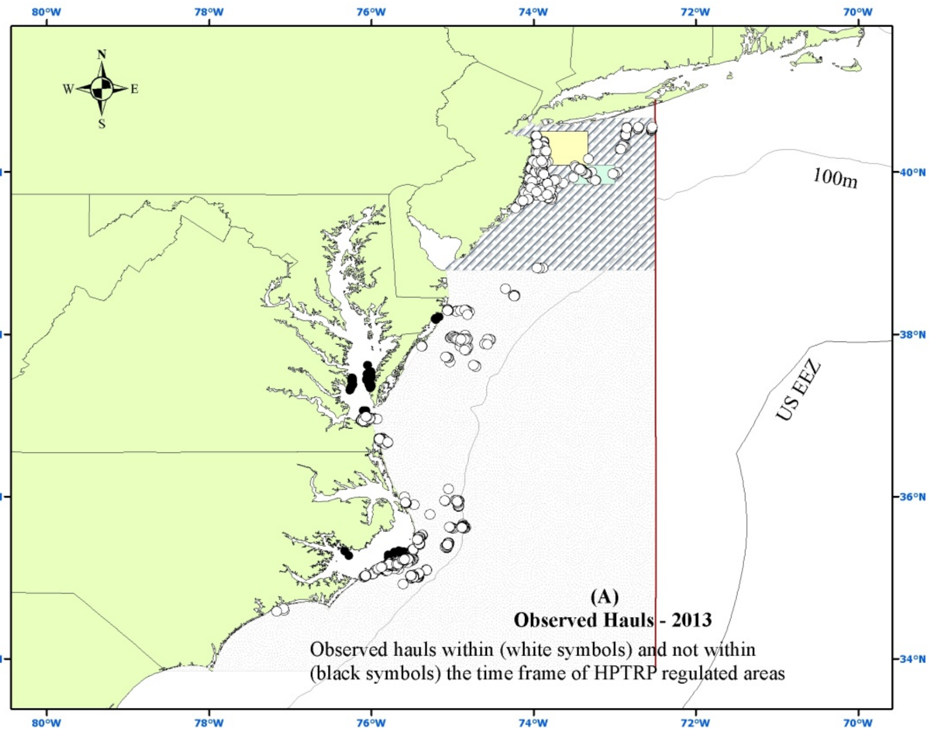


Figure 10. 2013 Mid-Atlantic gillnet observed hauls (A) and observed takes (B).



Harbor porpoise Take Reduction Plan management areas:

Southern mid-Atlantic waters New Jersey Mudhole waters off New Jersey

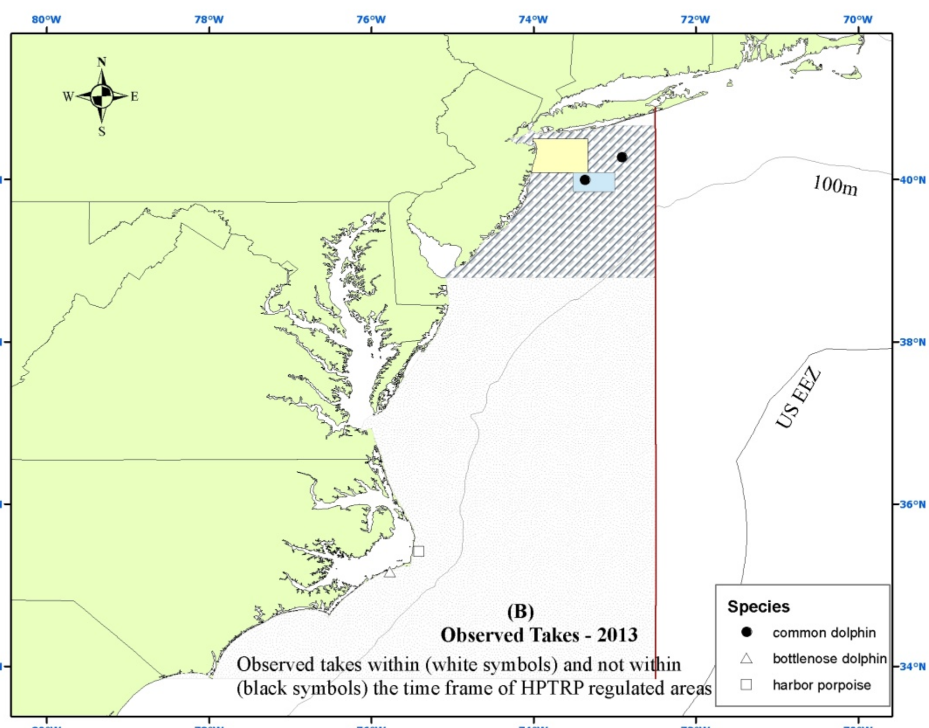


Figure 11. 2009 Mid-Atlantic bottom trawl observed tows (A) and observed takes (B).

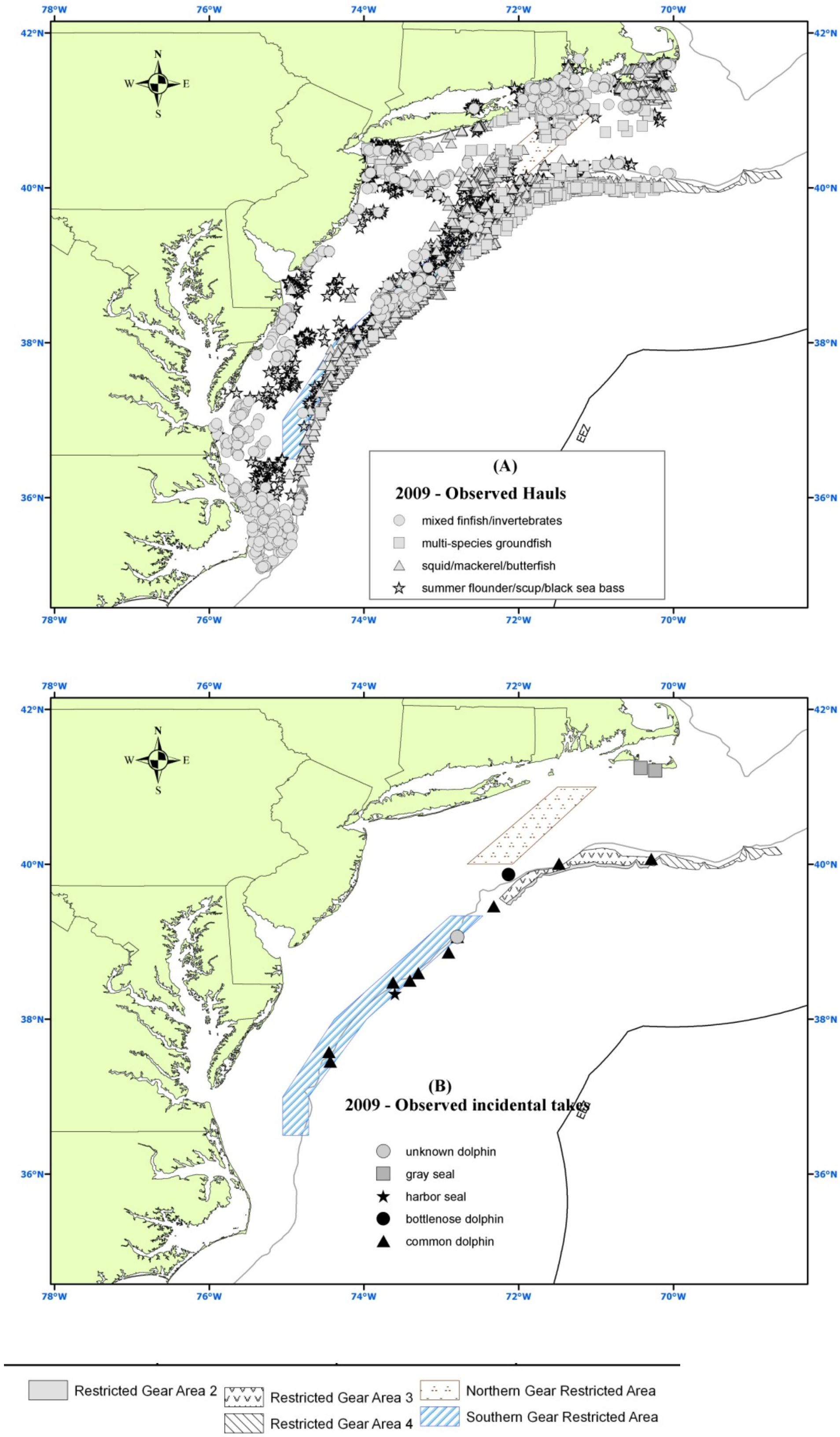


Figure 12. 2010 Mid-Atlantic bottom trawl observed tows (A) and observed takes (B).

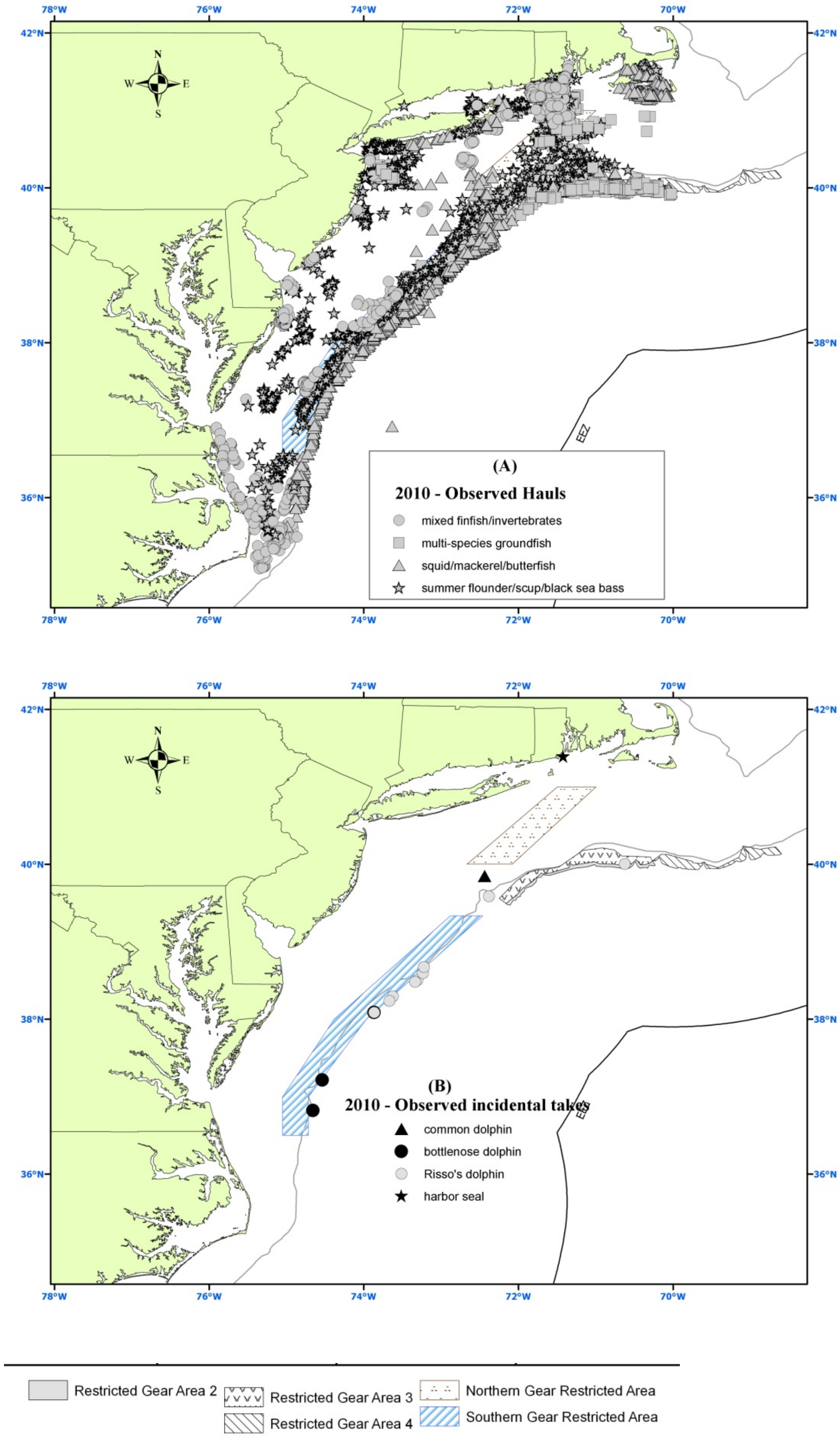


Figure 13. 2011 Mid-Atlantic bottom trawl observed tows (A) and observed takes (B).

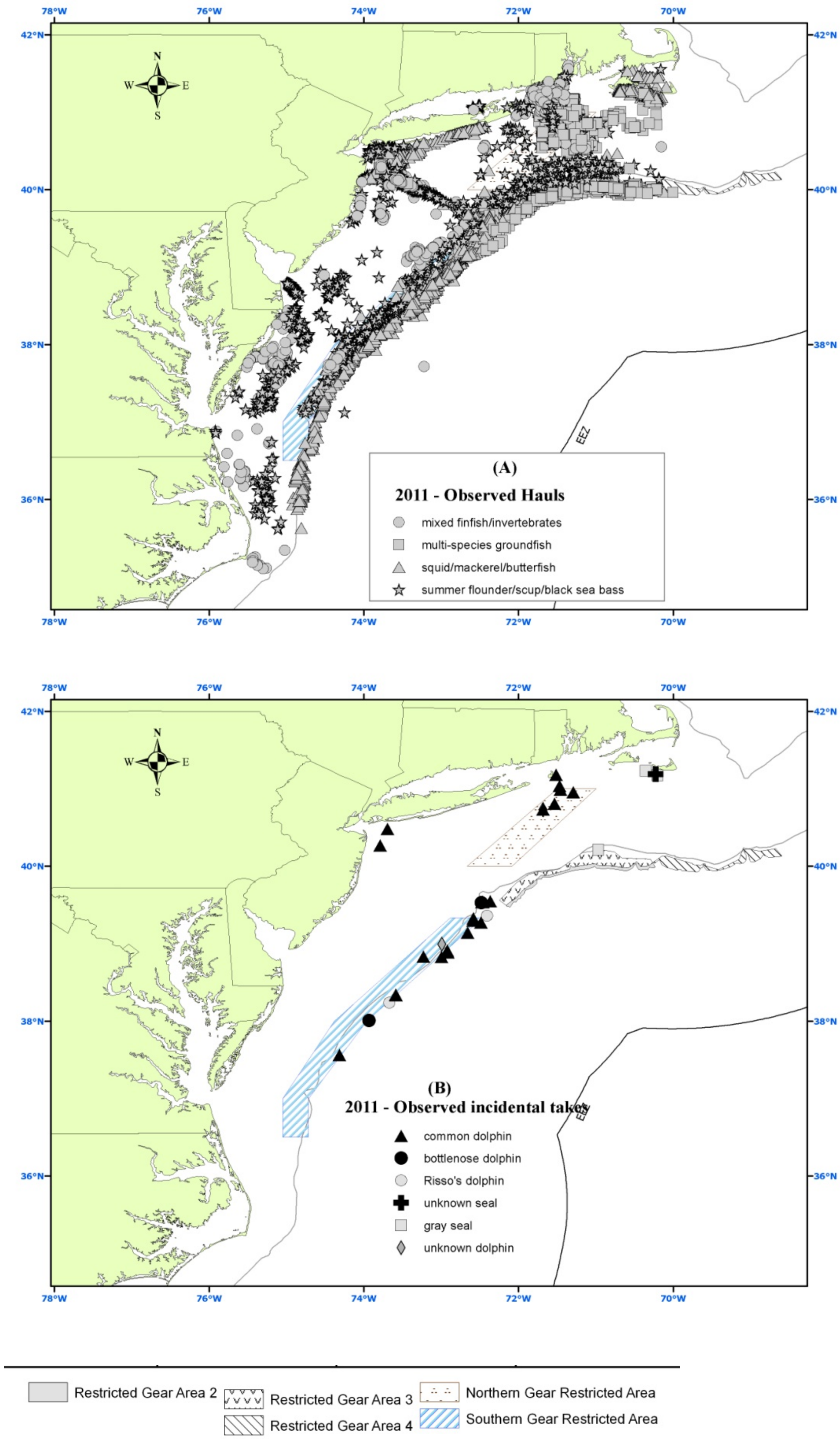
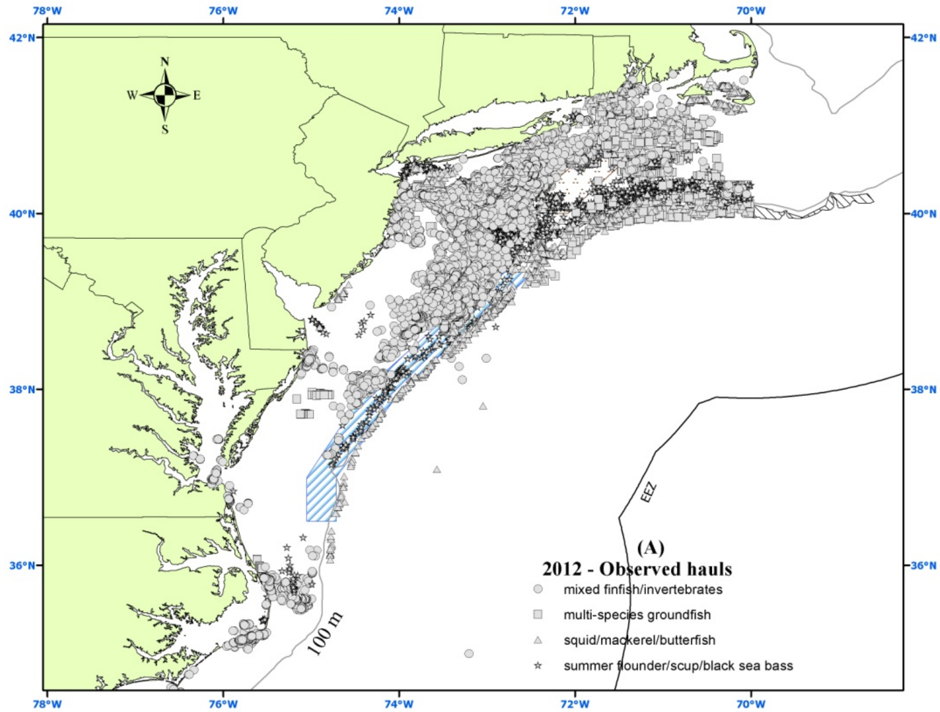


Figure 14. 2012 Mid-Atlantic bottom trawl observed tows (A) and observed takes (B).



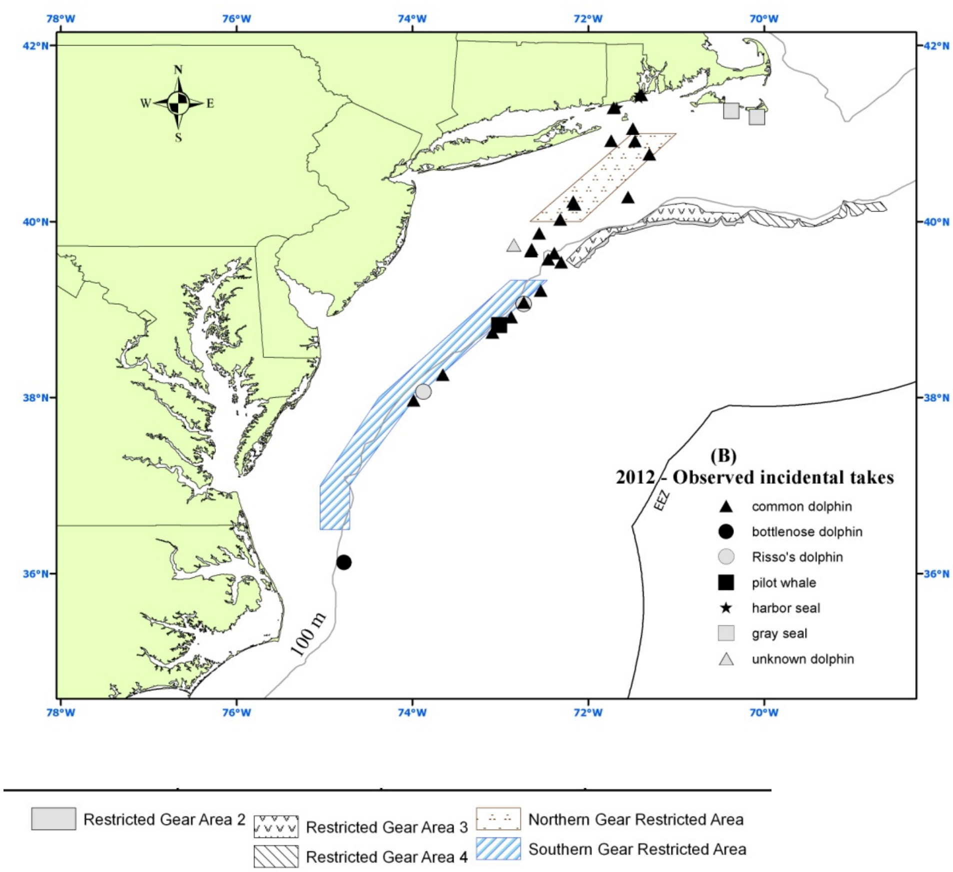
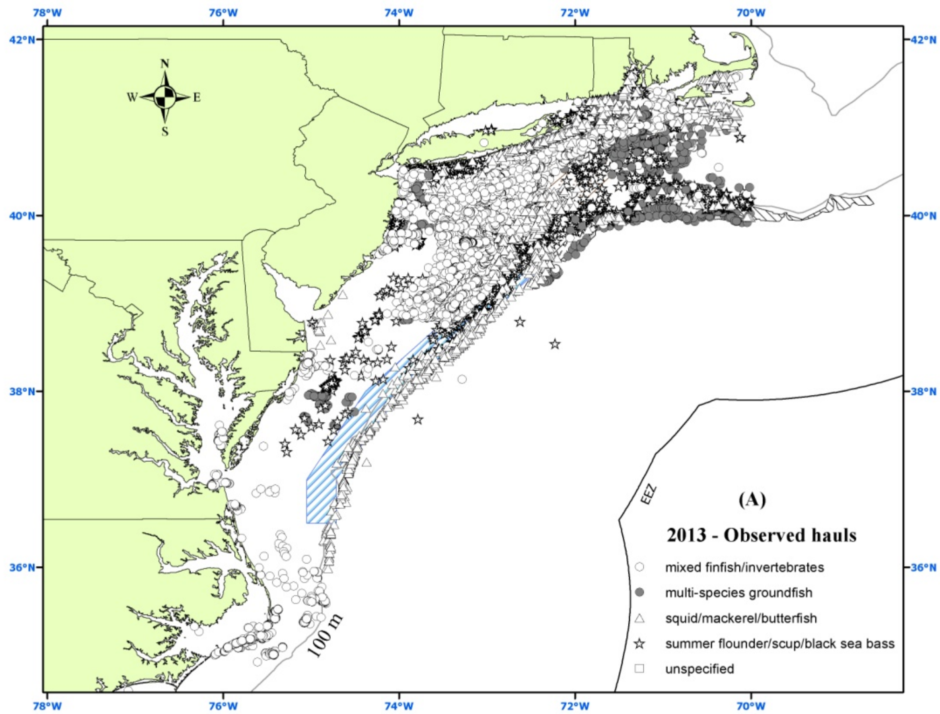


Figure 15. 2013 Mid-Atlantic bottom trawl observed tows (A) and observed takes (B).



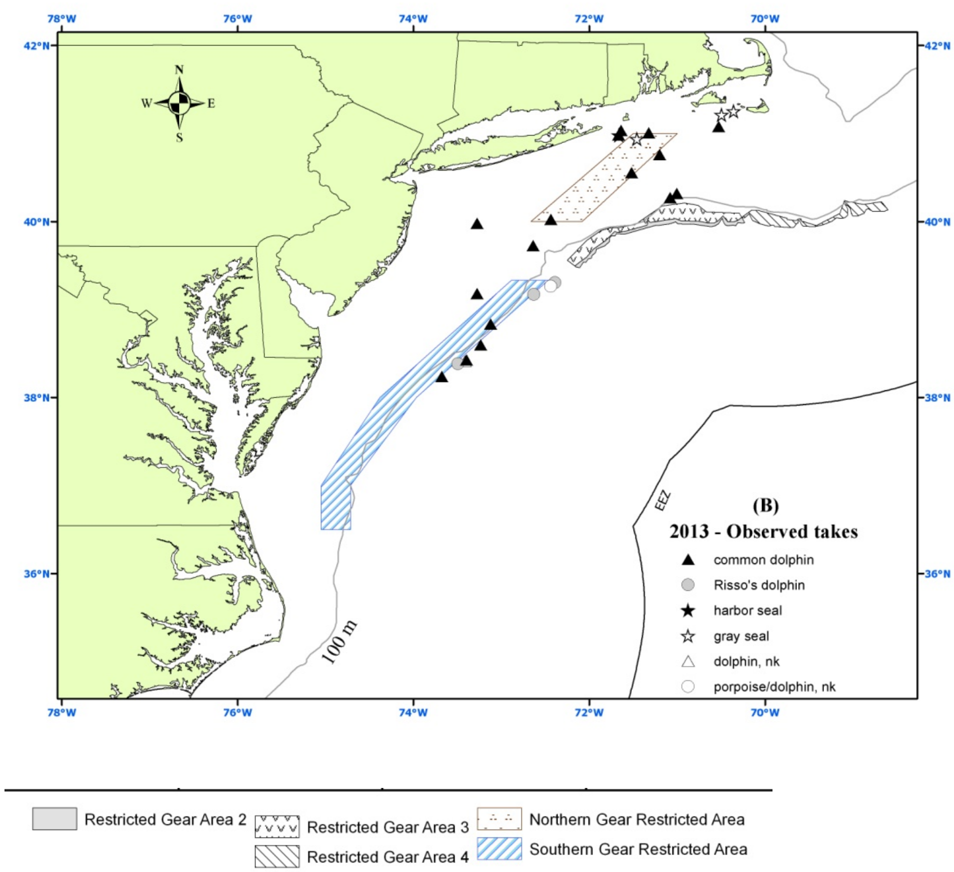


Figure 16. 2009 Northeast bottom trawl observed tows (A) and observed takes (B).

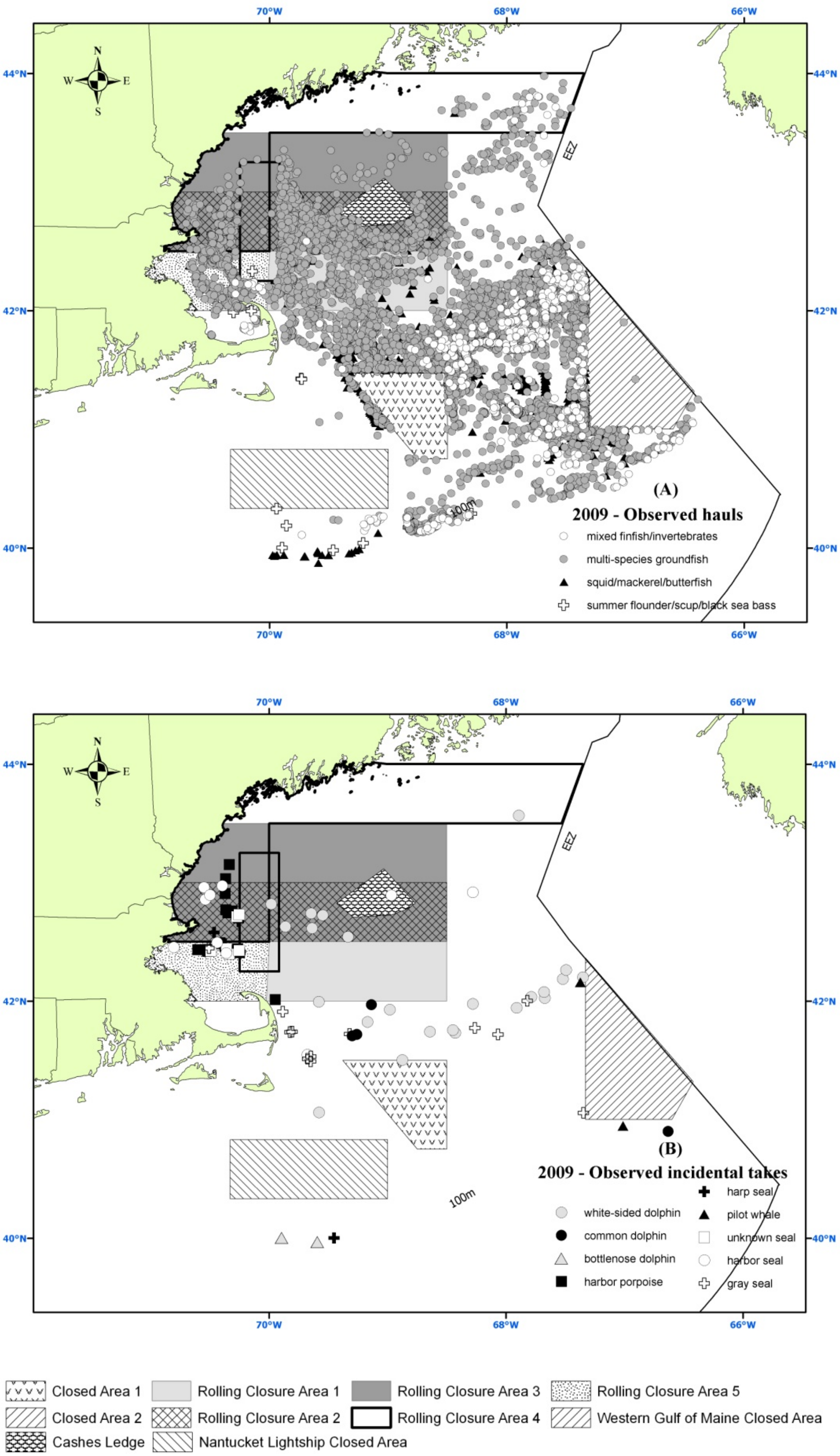


Figure 17. 2010 Northeast bottom trawl observed tows (A) and observed takes (B).

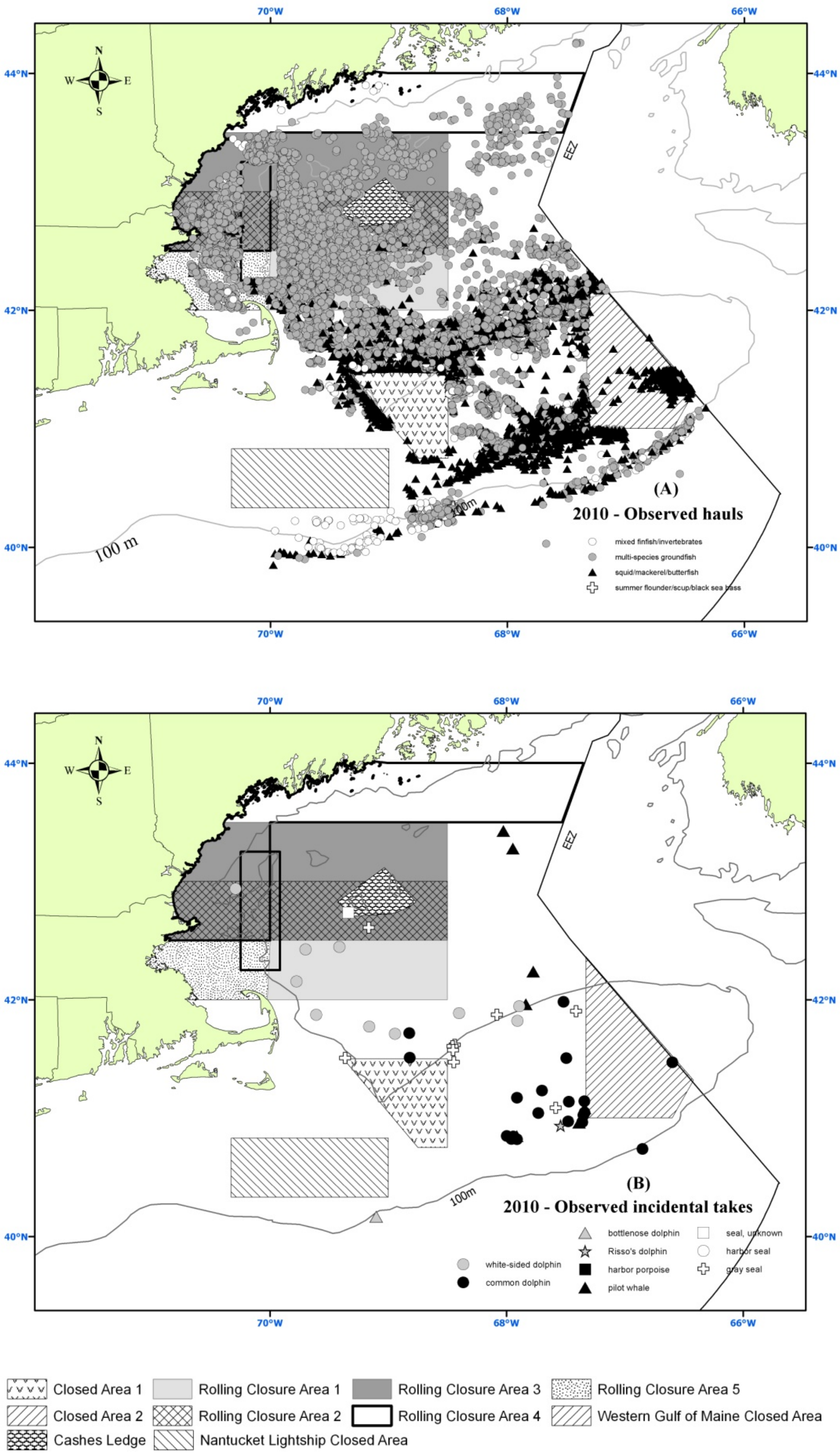


Figure 18. 2011 Northeast bottom trawl observed tows (A) and observed takes (B).

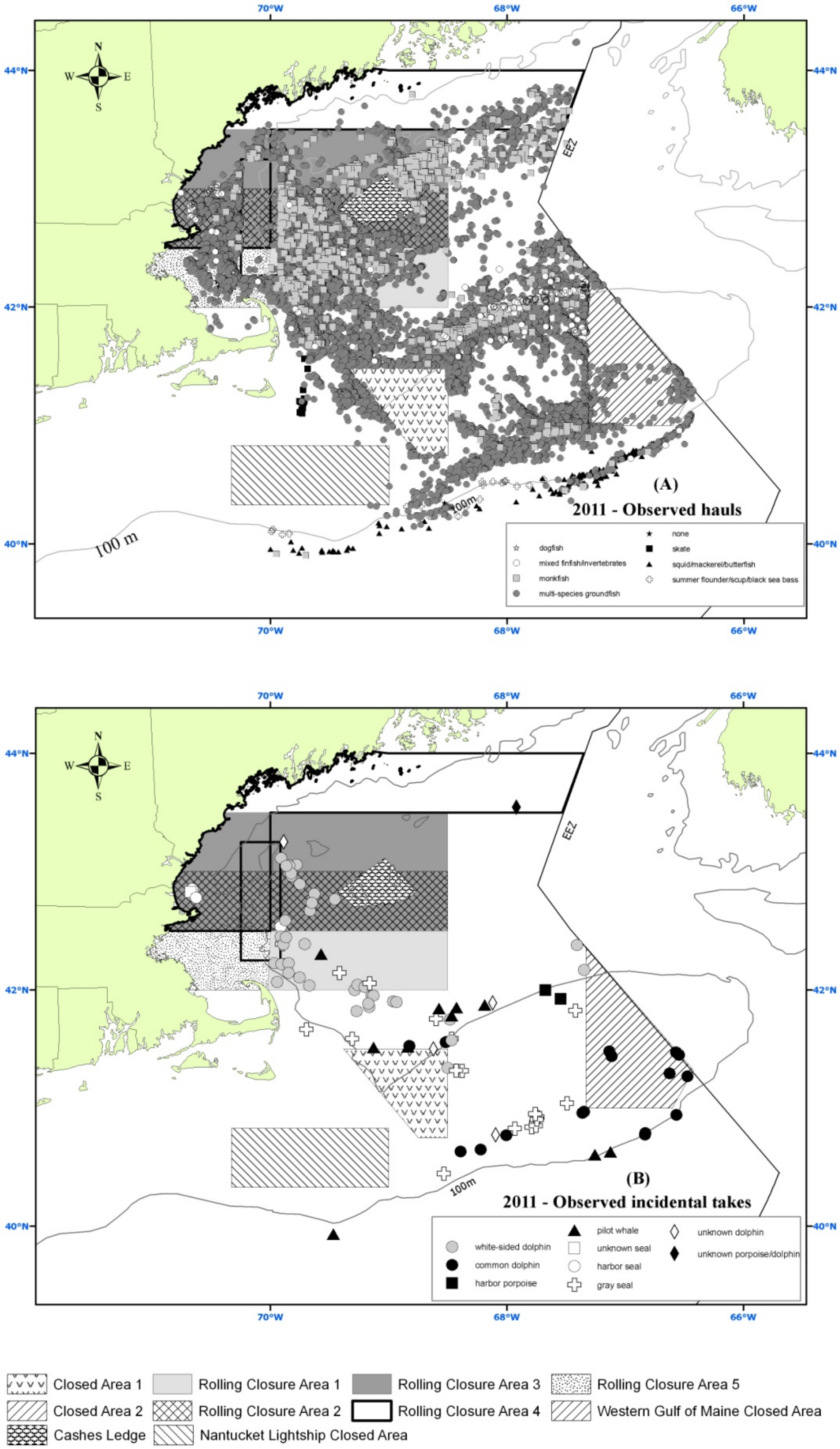


Figure 19. 2012 Northeast bottom trawl observed tows (A) and observed takes (B).

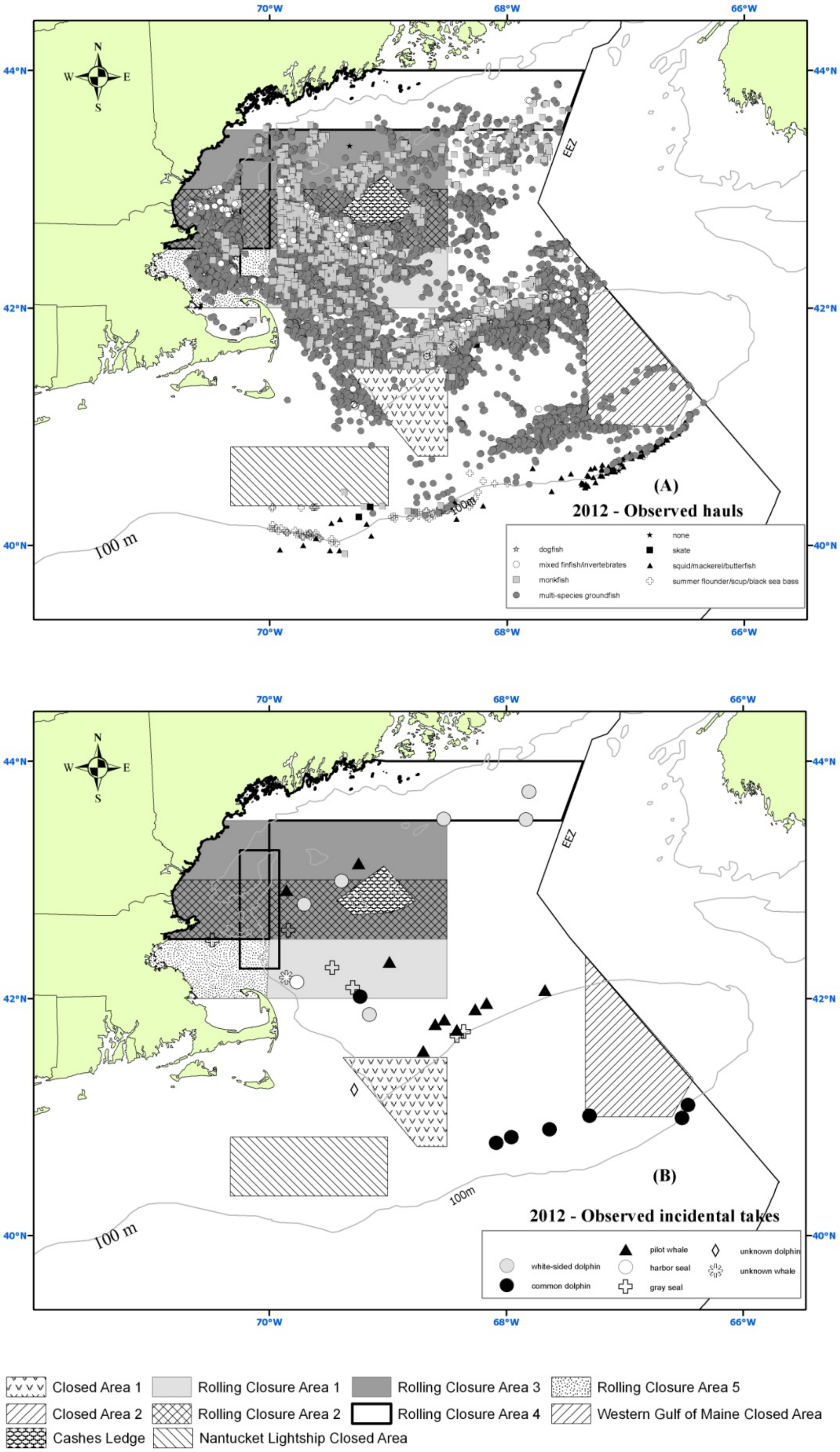


Figure 20. 2013 Northeast bottom trawl observed tows (A) and observed takes (B).

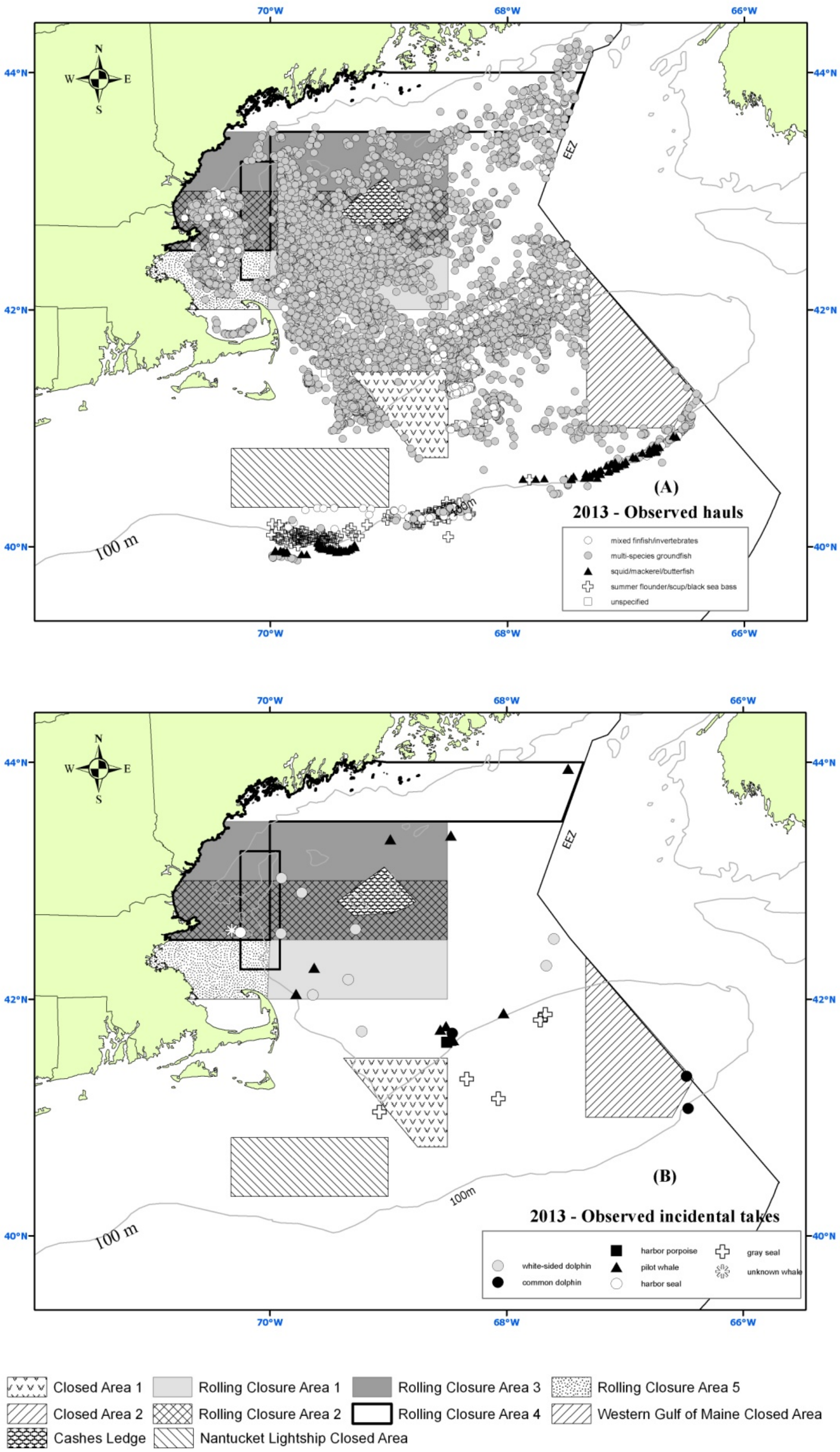
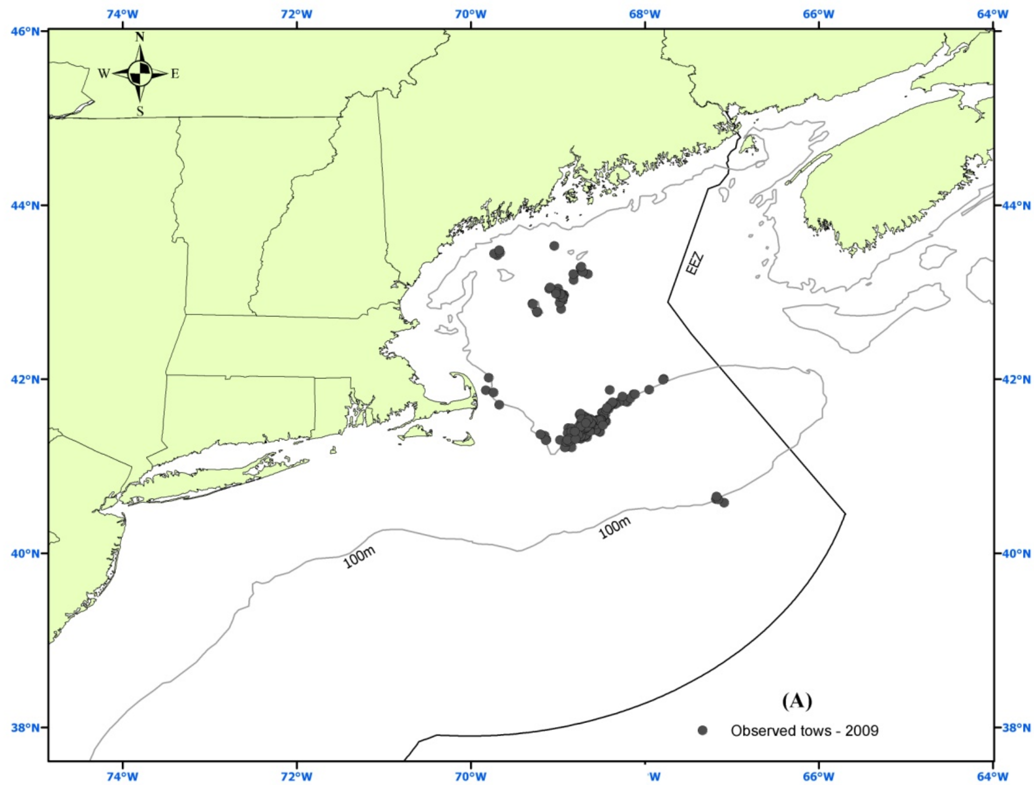


Figure 21. 2009 Northeast mid-water trawl observed tows (A) and observed takes (B).



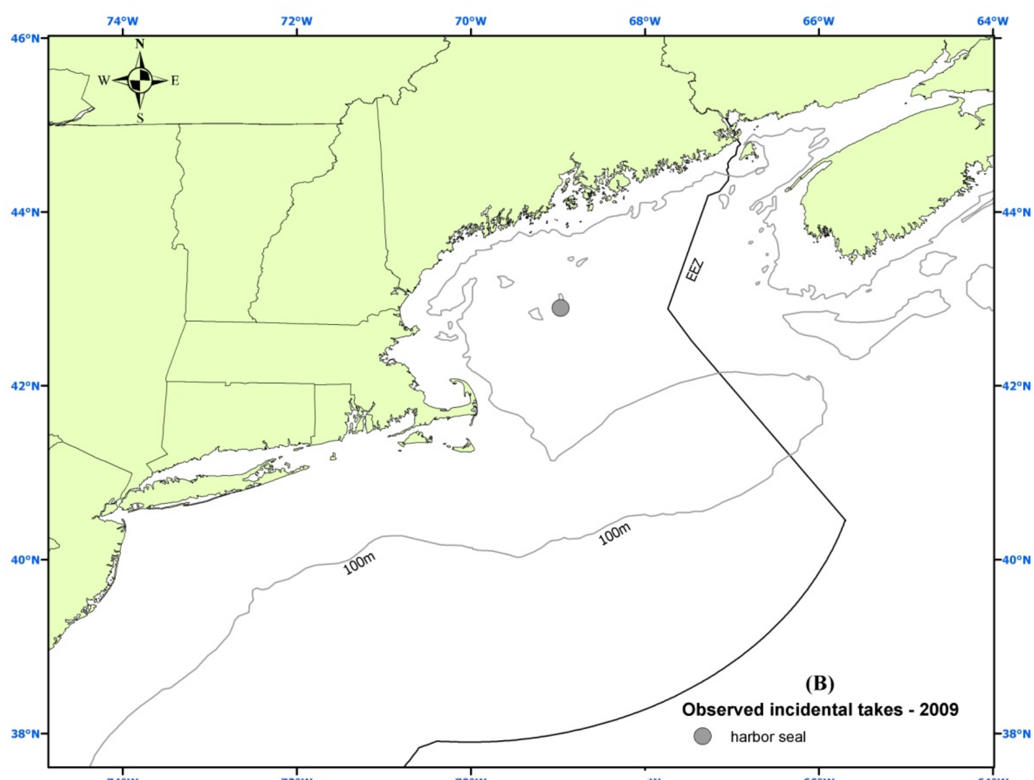
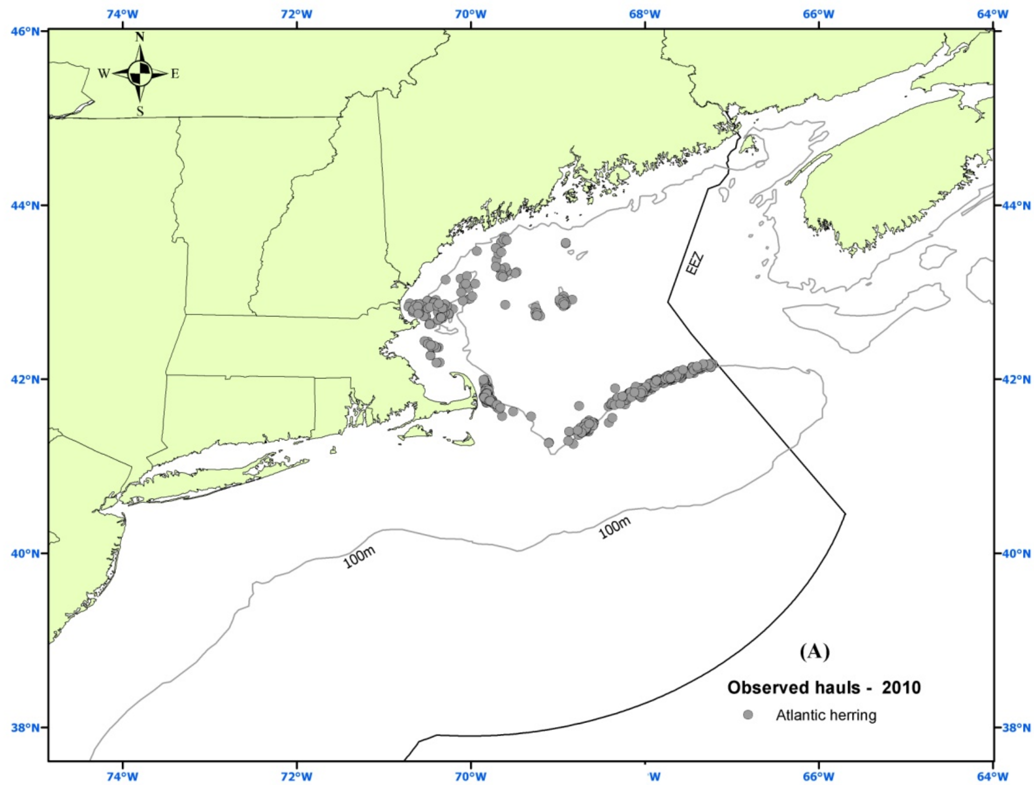


Figure 22. 2010 Northeast mid-water trawl observed tows (A) and observed takes (B).



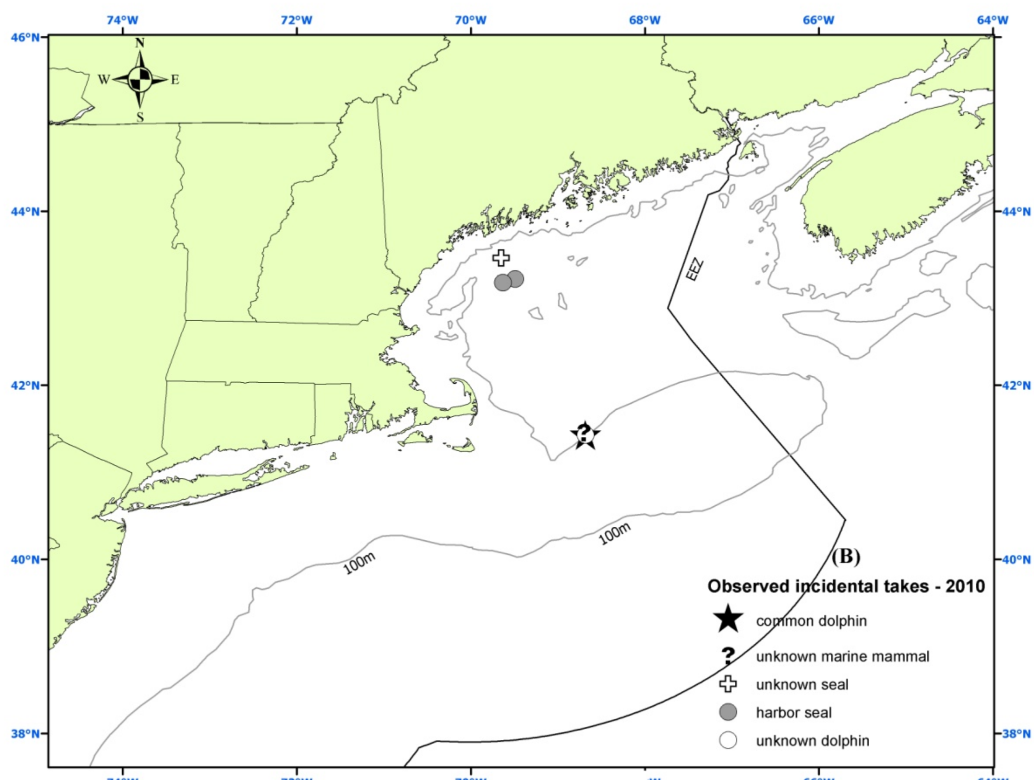
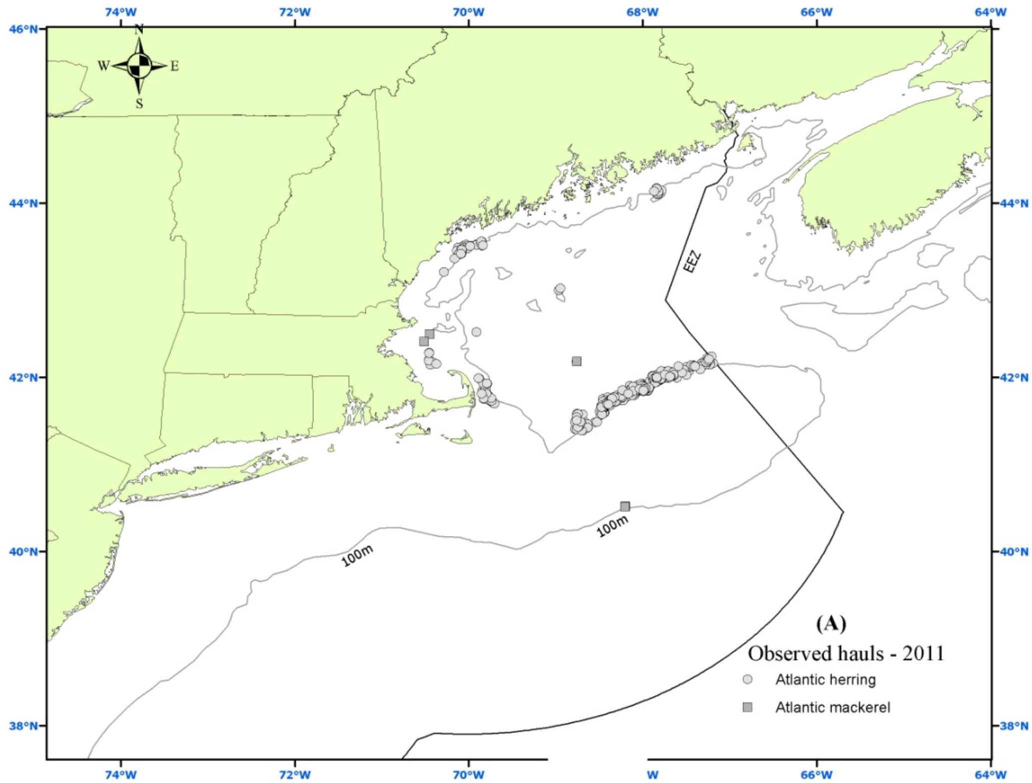


Figure 23. 2011 Northeast mid-water trawl observed tows (A) and observed takes (B).



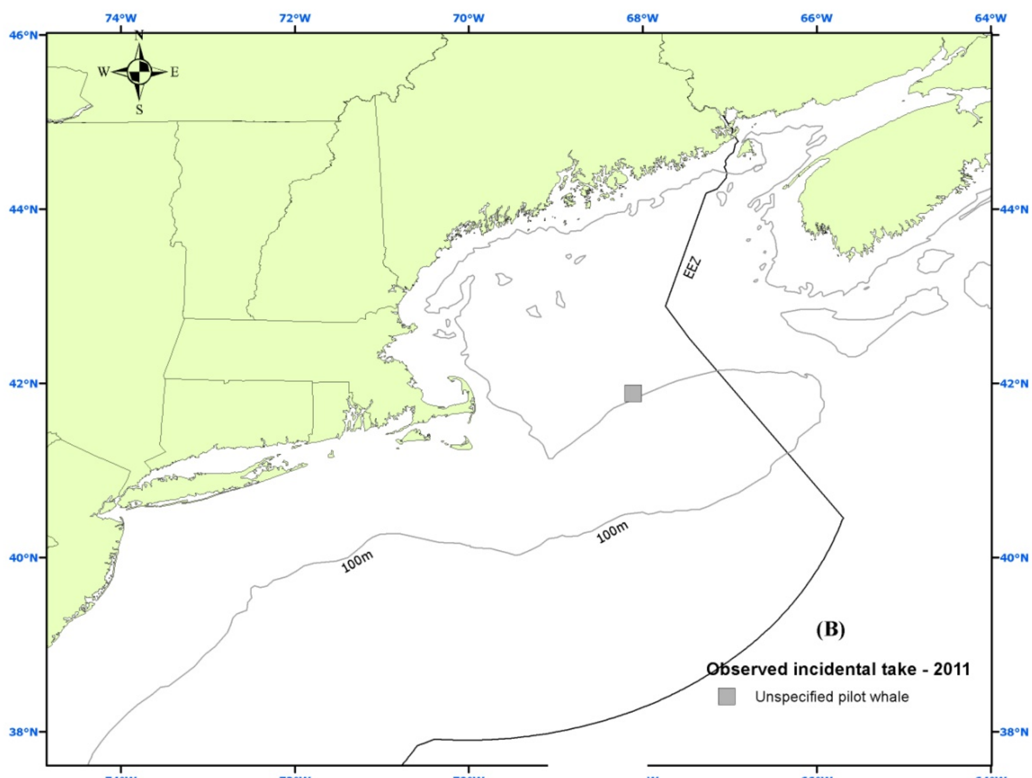
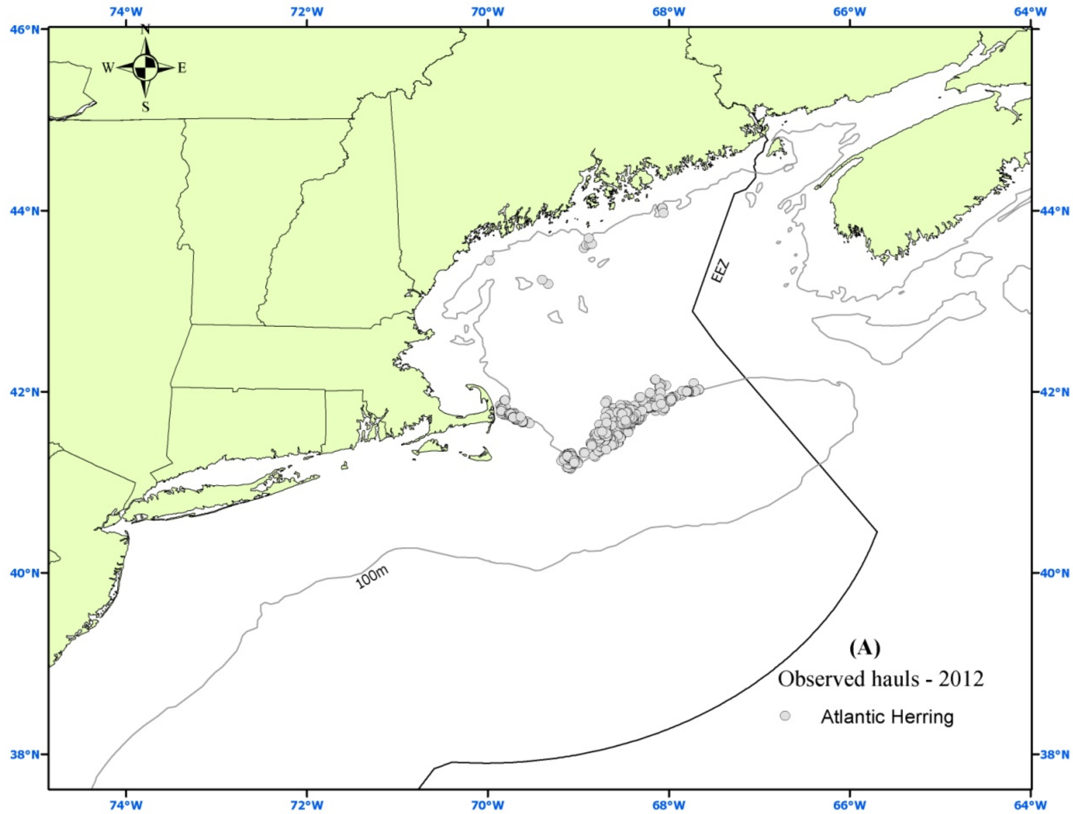


Figure 24. 2012 Northeast mid-water trawl observed tows (A) and observed takes (B).



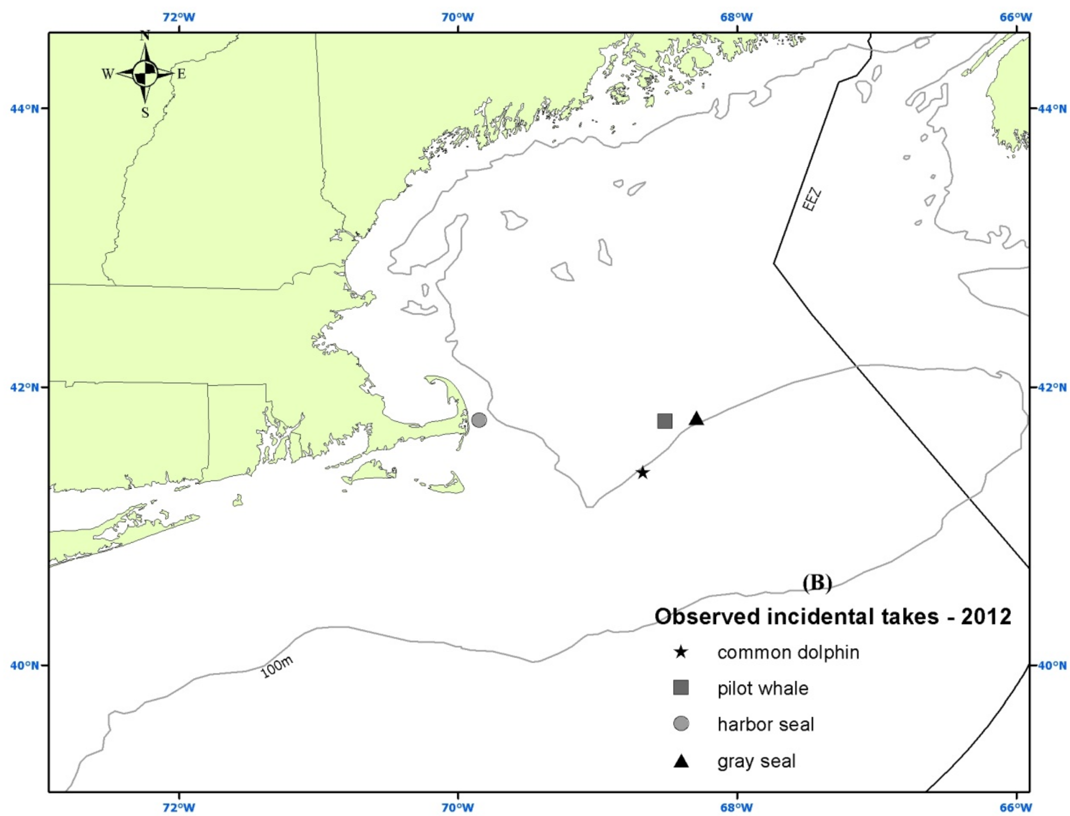
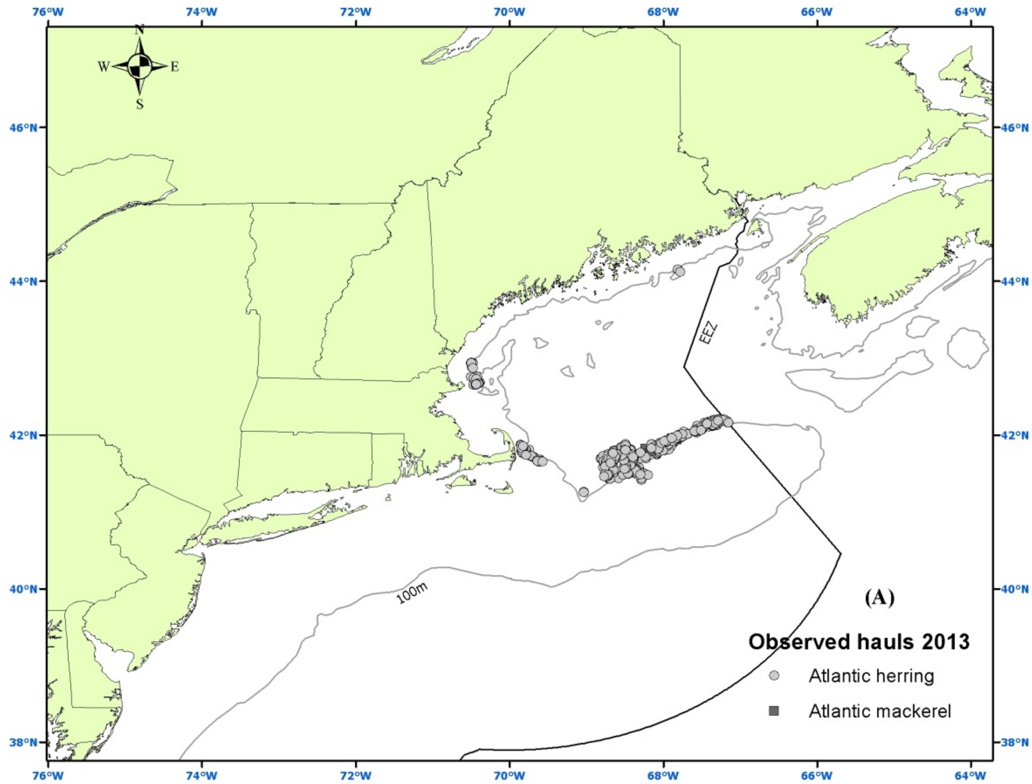


Figure 25. 2013 Northeast mid-water trawl observed tows (A) and observed takes (B).



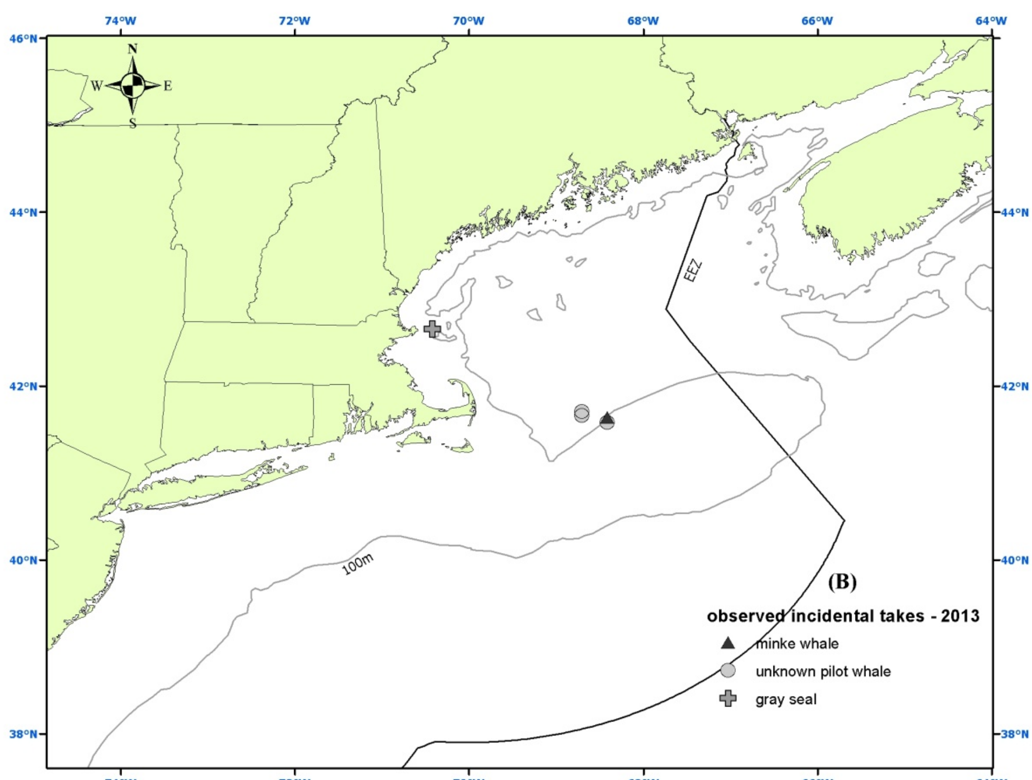
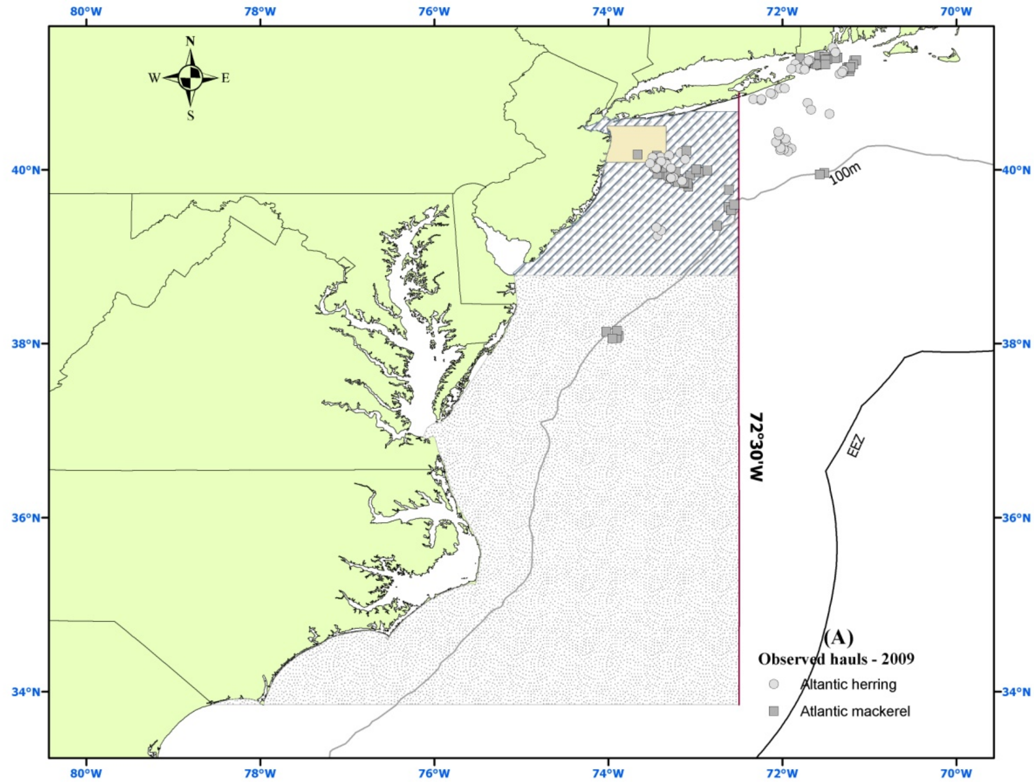


Figure 26. 2009 Mid-Atlantic mid-water trawl observed tows (A) and observed takes (B).



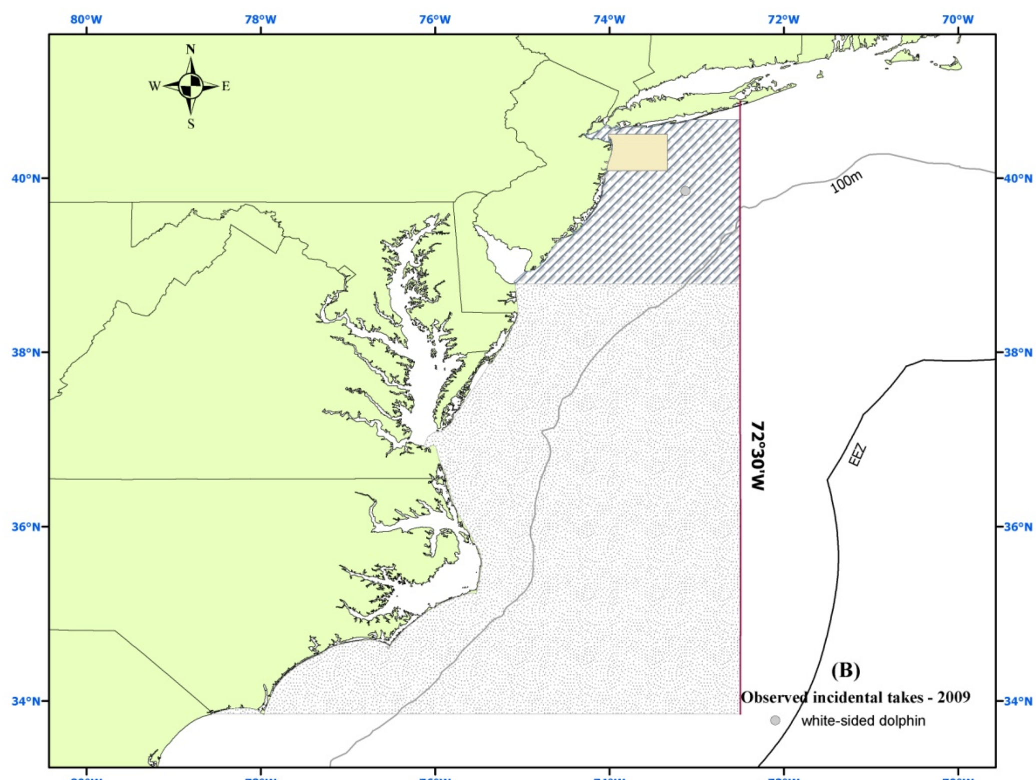
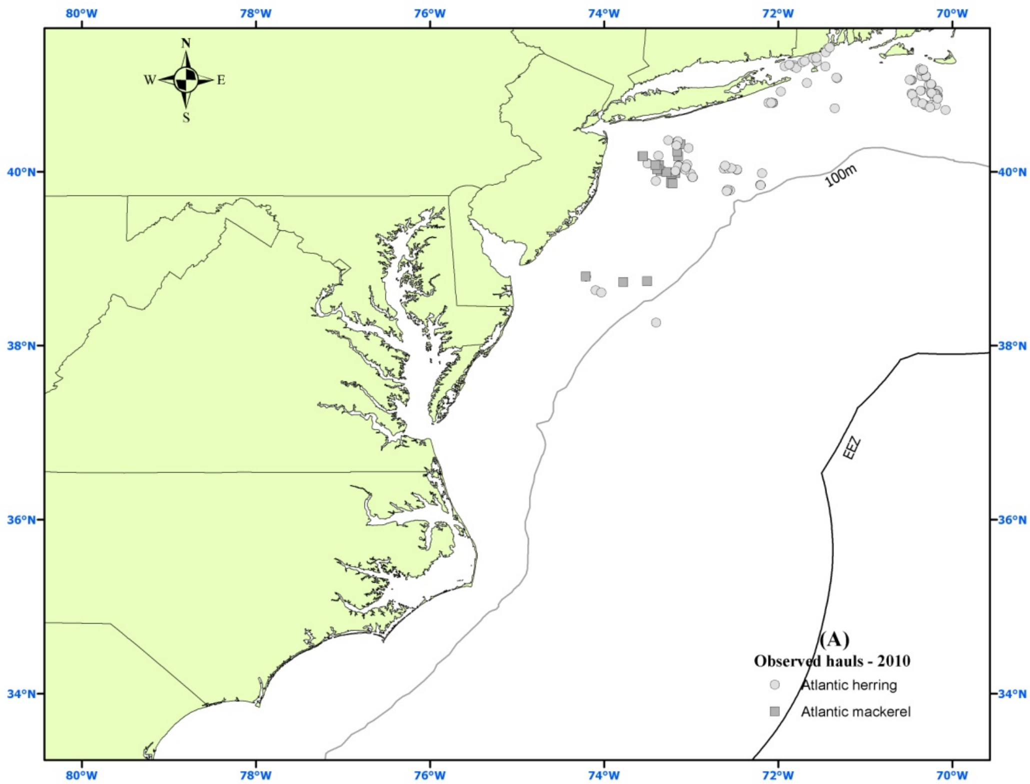


Figure 27. 2010 Mid-Atlantic mid-water trawl observed tows (A) and observed takes (B).



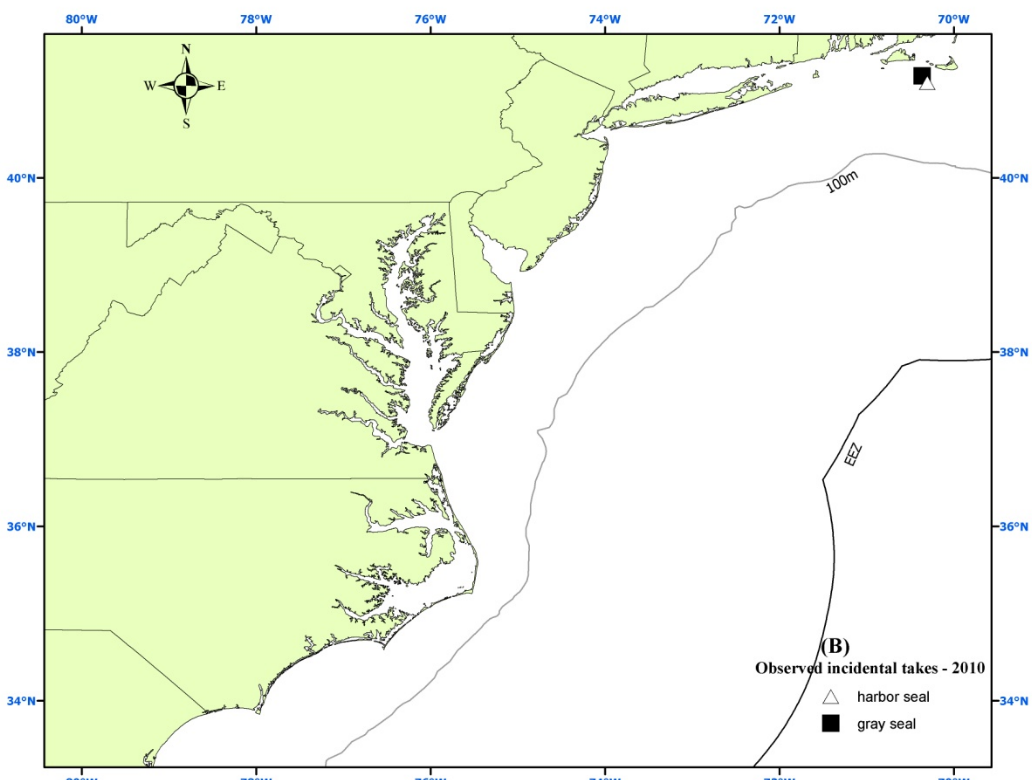
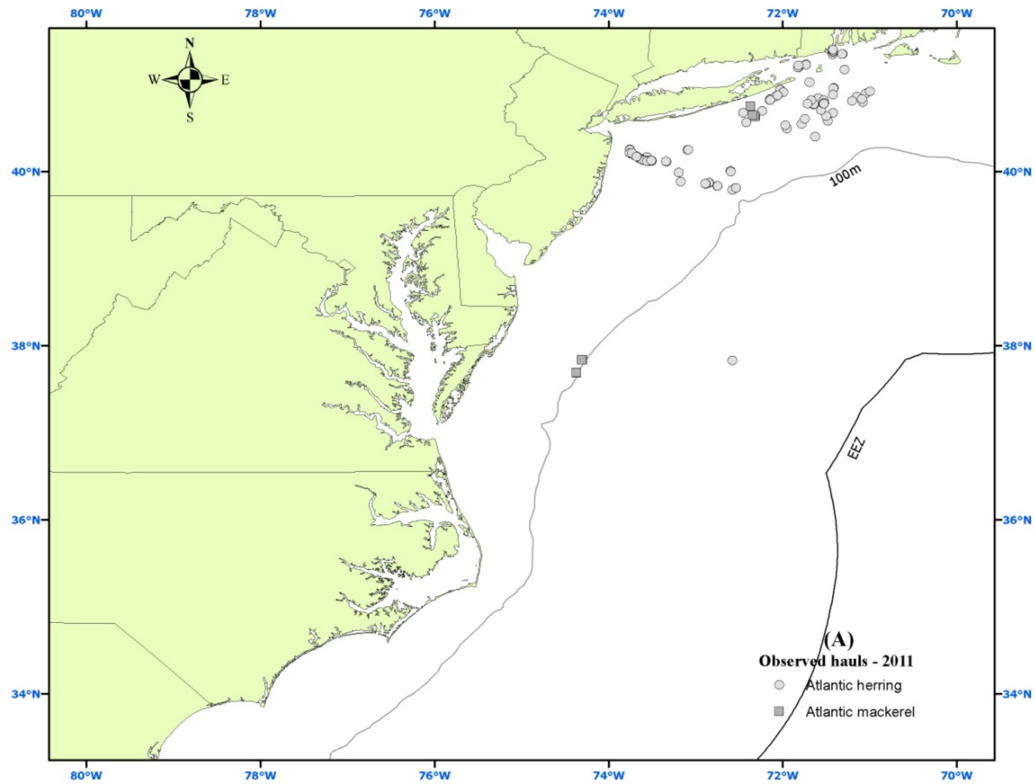


Figure 28. 2011 Mid-Atlantic mid-water trawl observed tows (A) and observed takes (B).



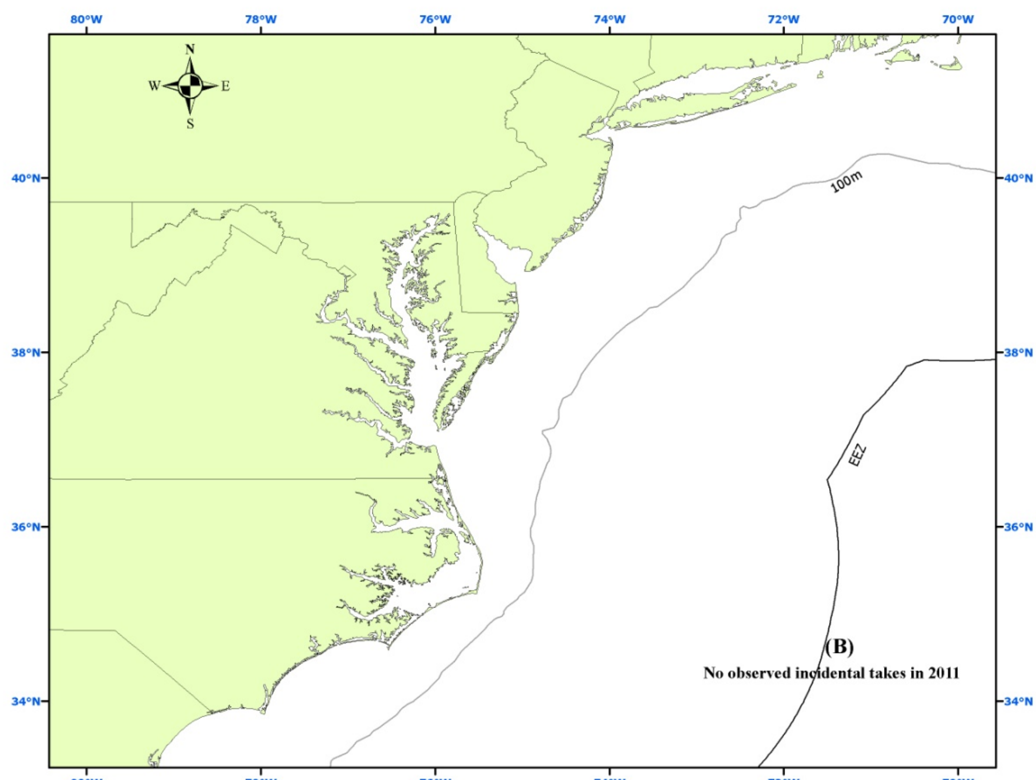
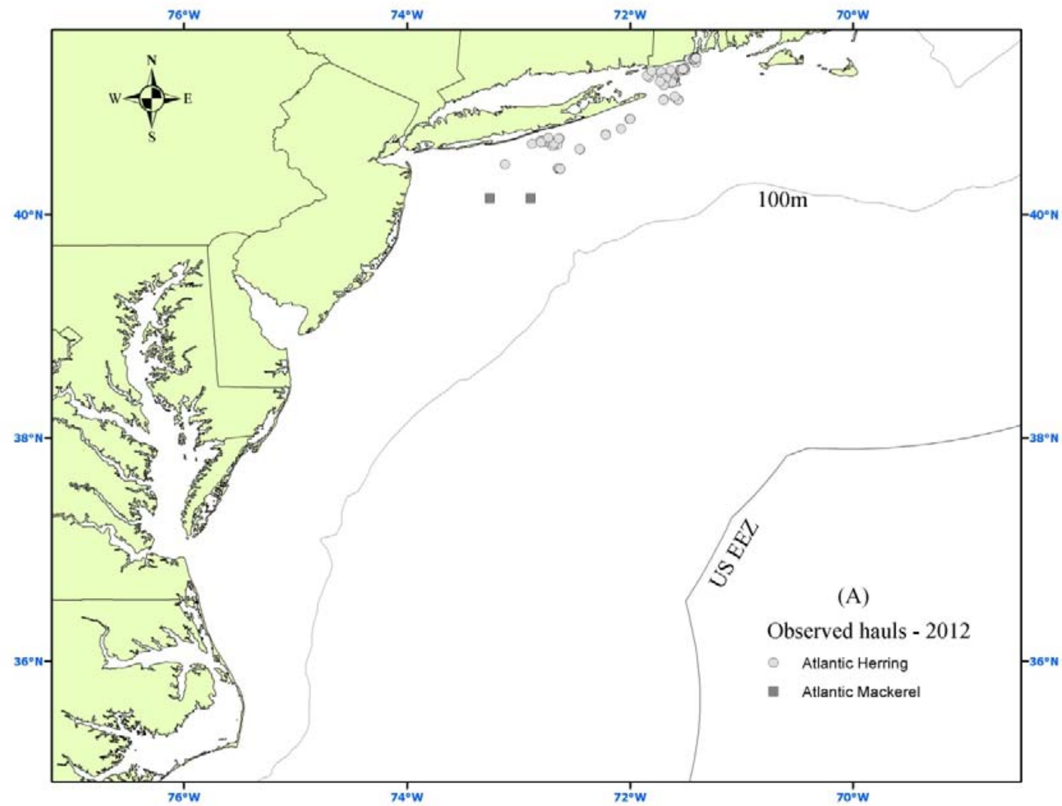


Figure 29. 2012 Mid-Atlantic mid-water trawl observed tows (A) and observed takes (B).



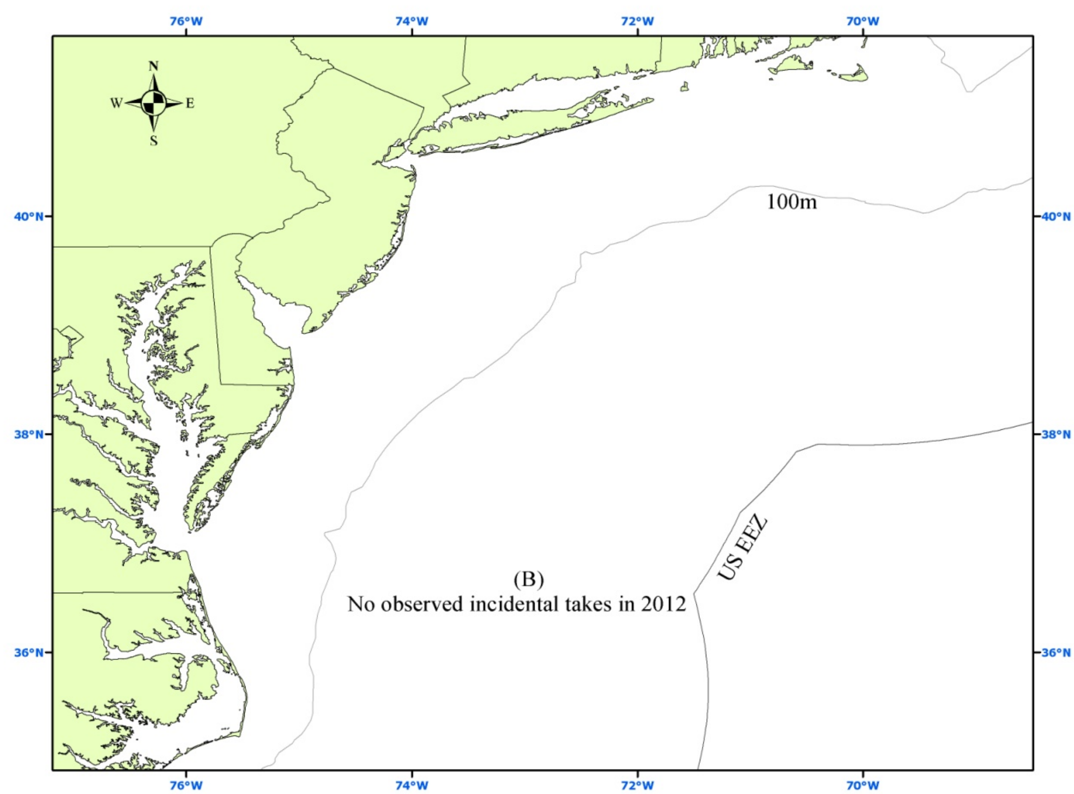
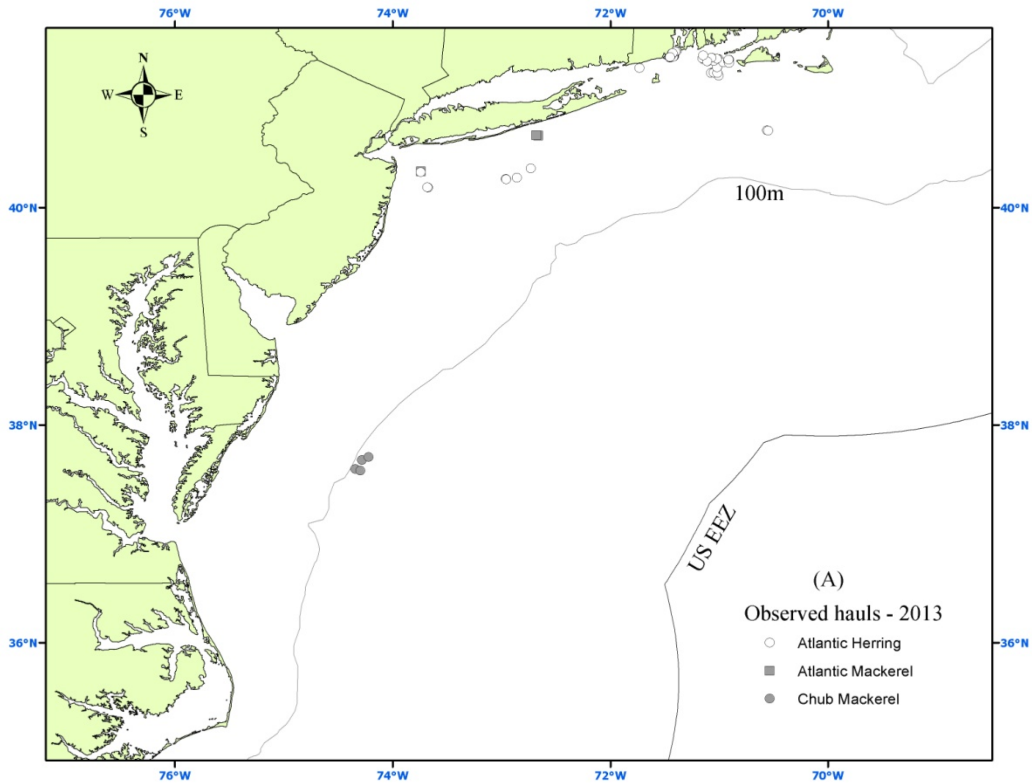


Figure 30. 2013 Mid-Atlantic mid-water trawl observed tows (A) and observed takes (B).



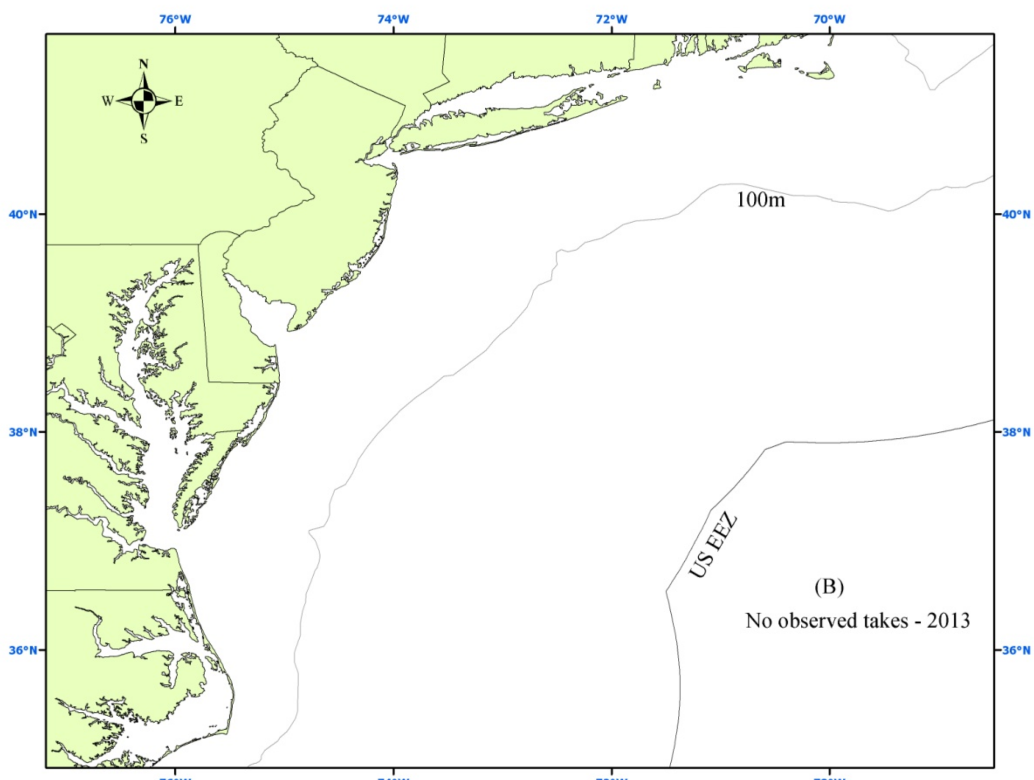
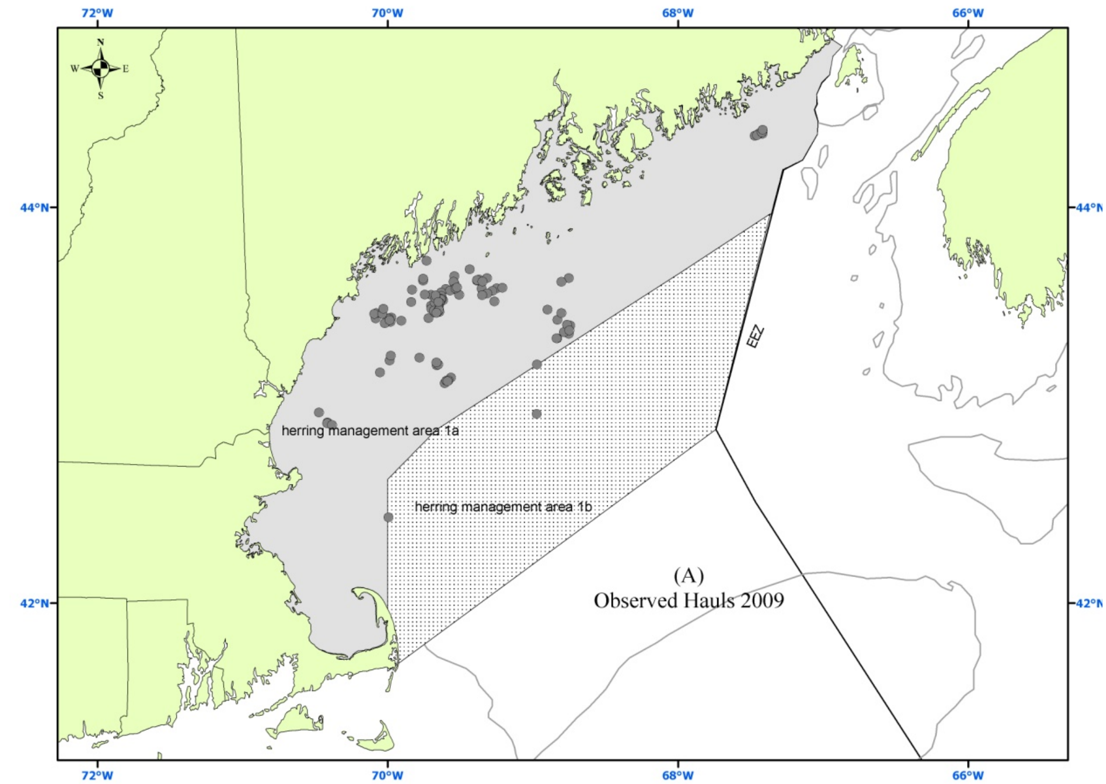


Figure 31. 2009 Herring Purse Seine observed hauls (A) and observed takes (B).



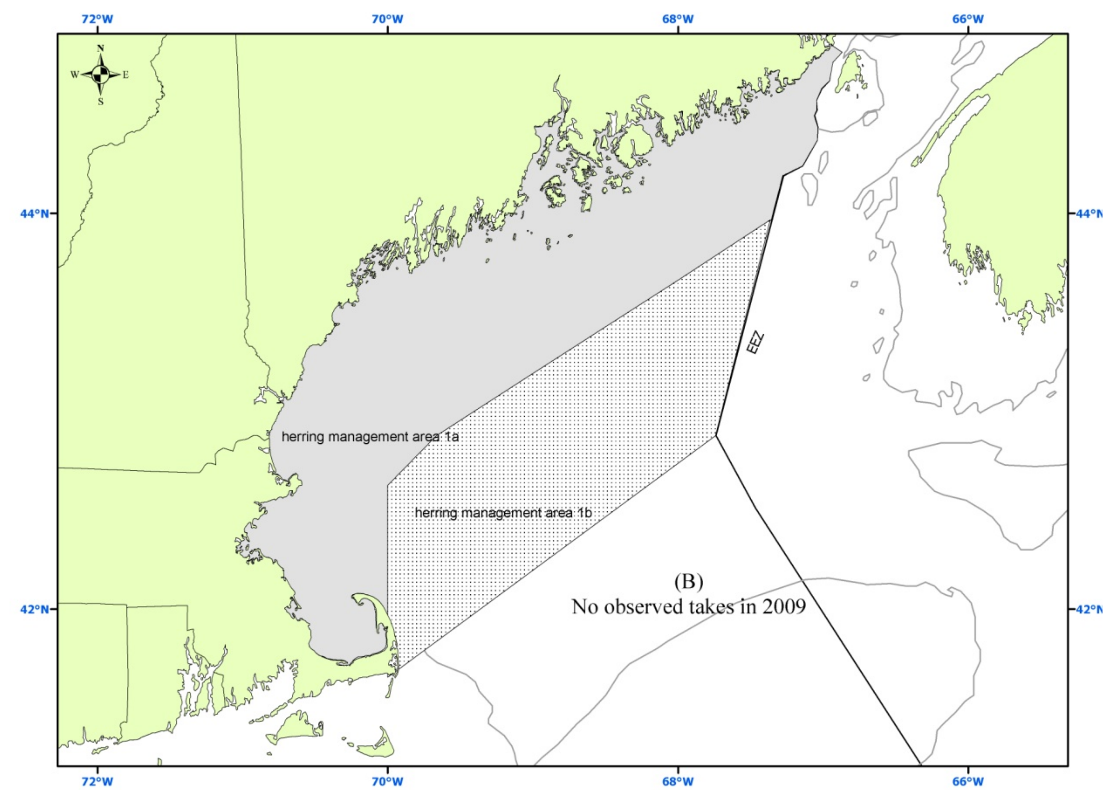
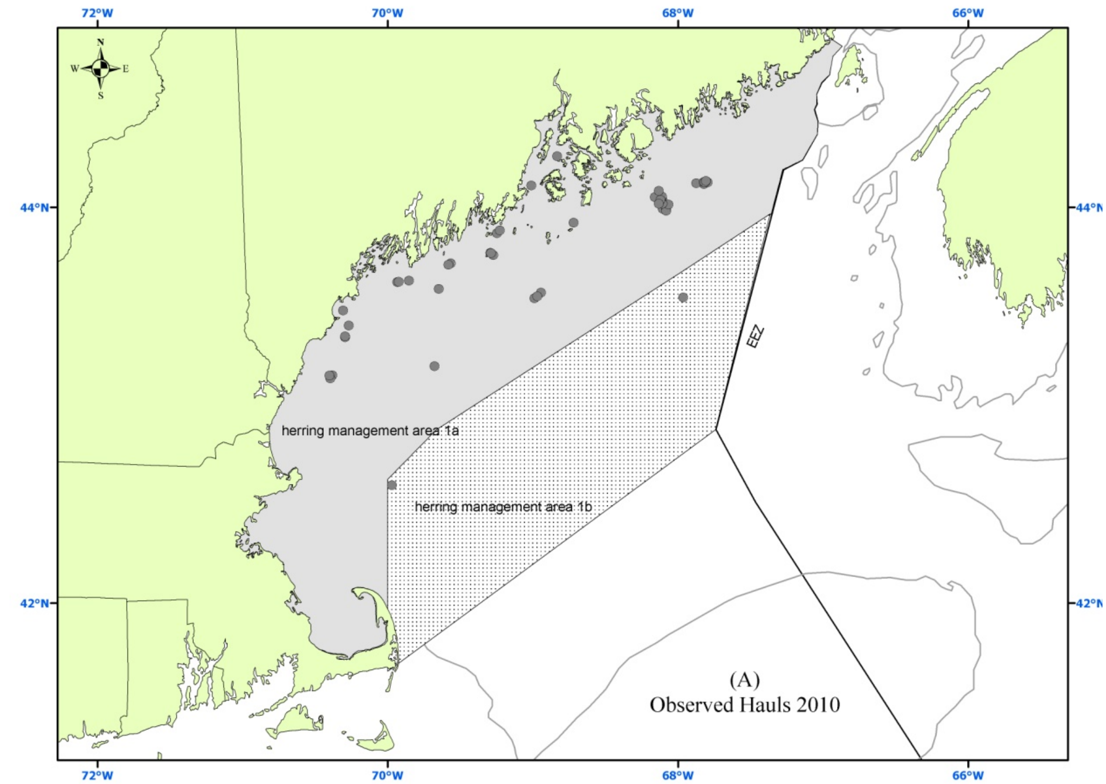


Figure 32. 2010 Herring Purse Seine observed hauls (A) and observed takes (B).



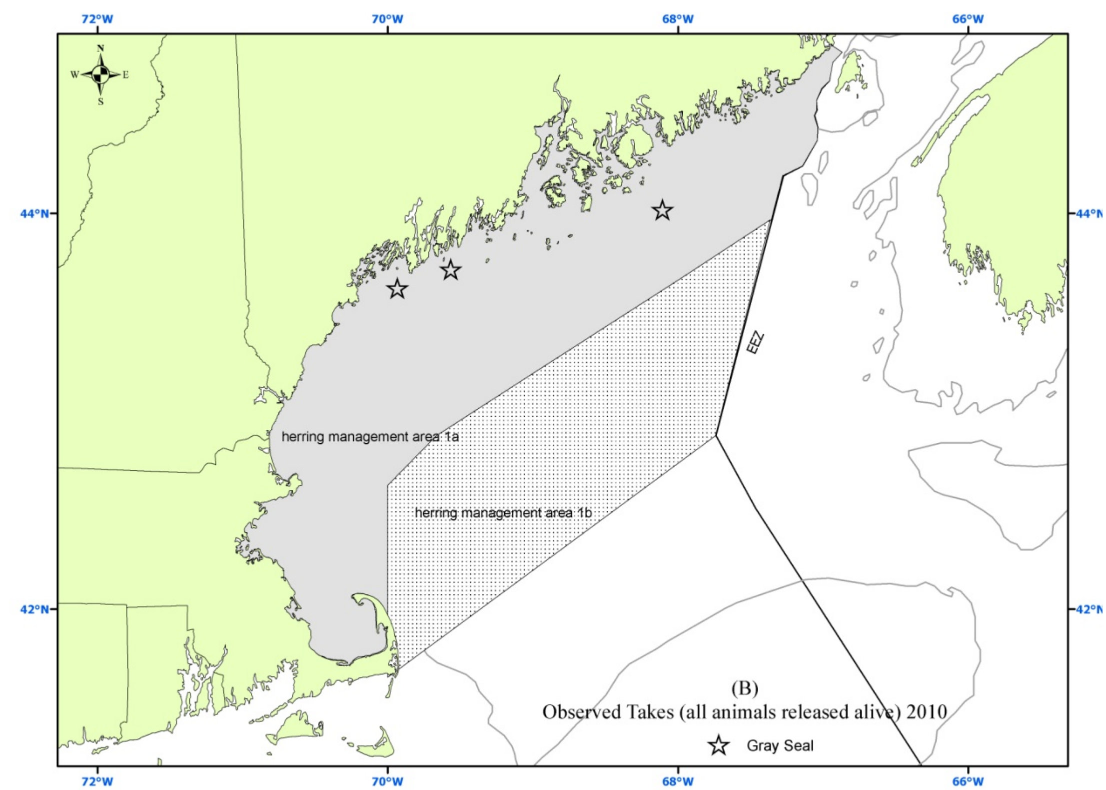
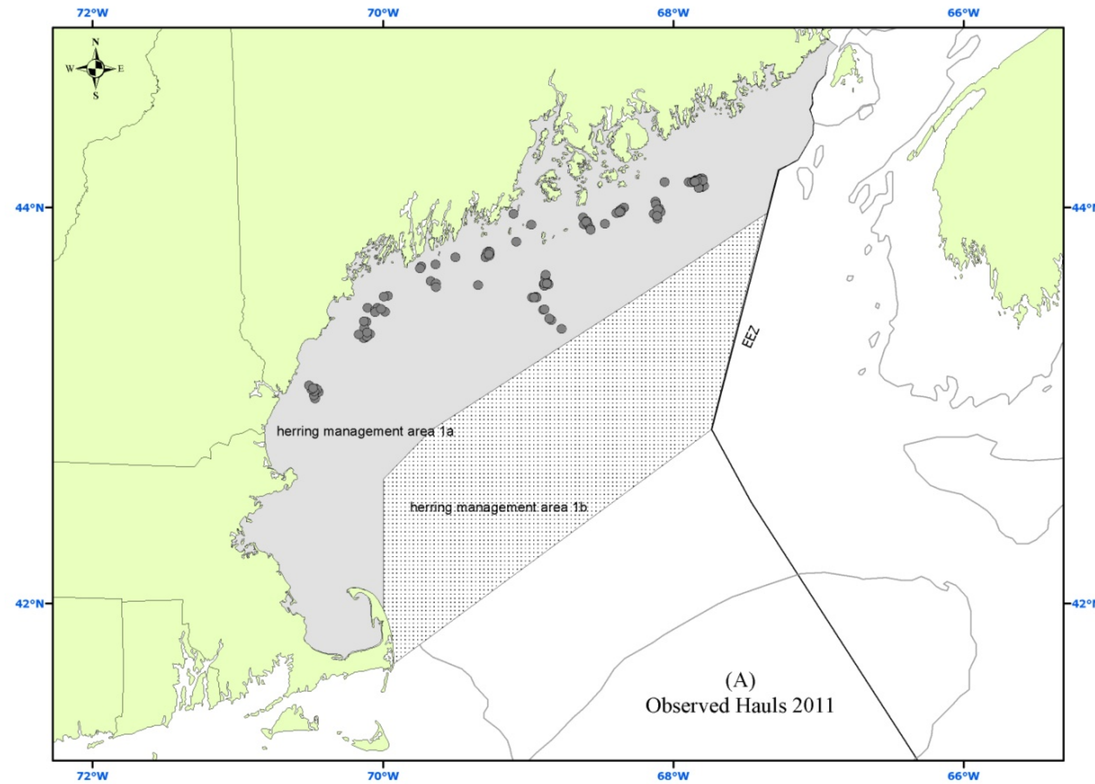


Figure 33. 2011 Herring Purse Seine observed hauls (A) and observed takes (B).



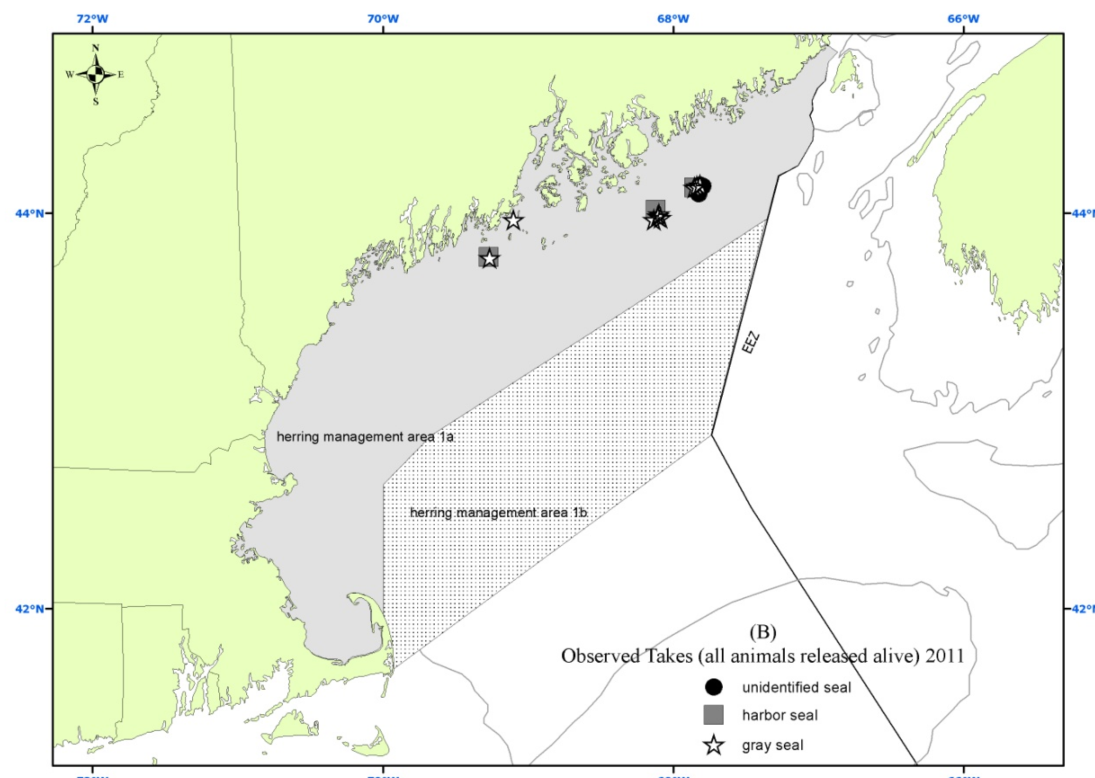
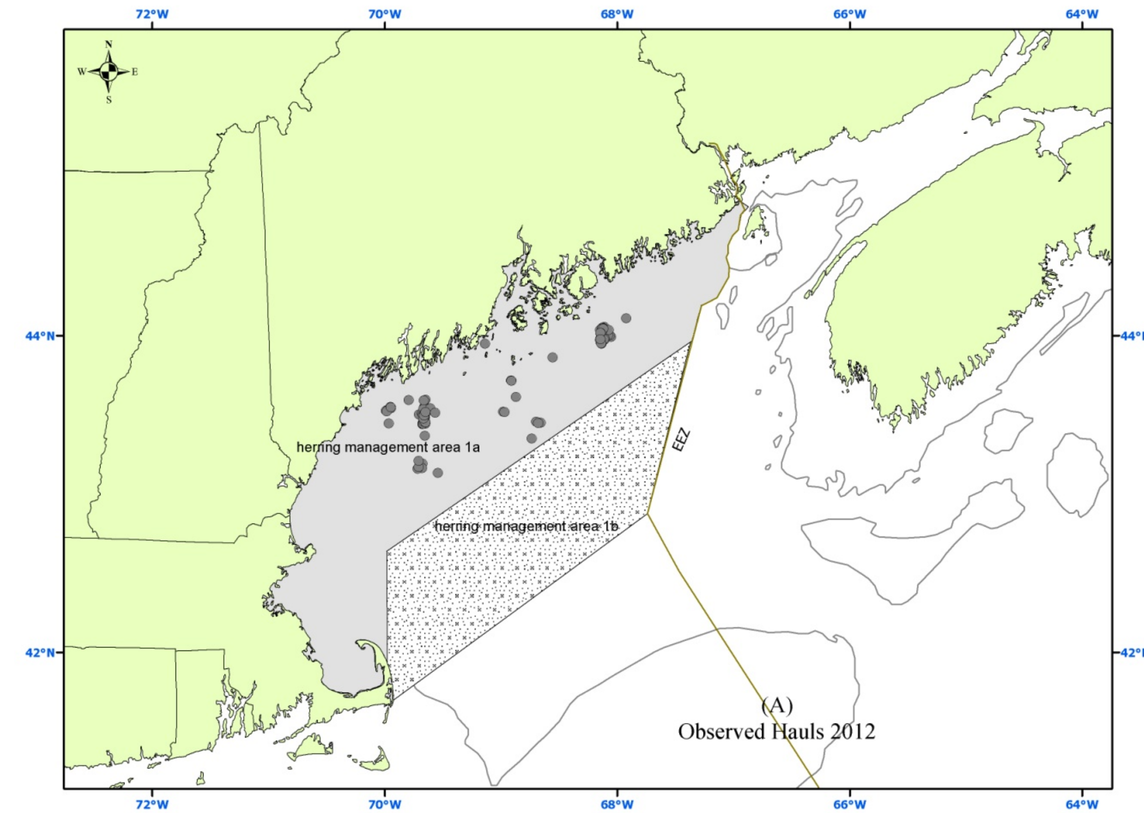


Figure 34. 2012 Herring Purse Seine observed hauls (A) and observed takes (B).



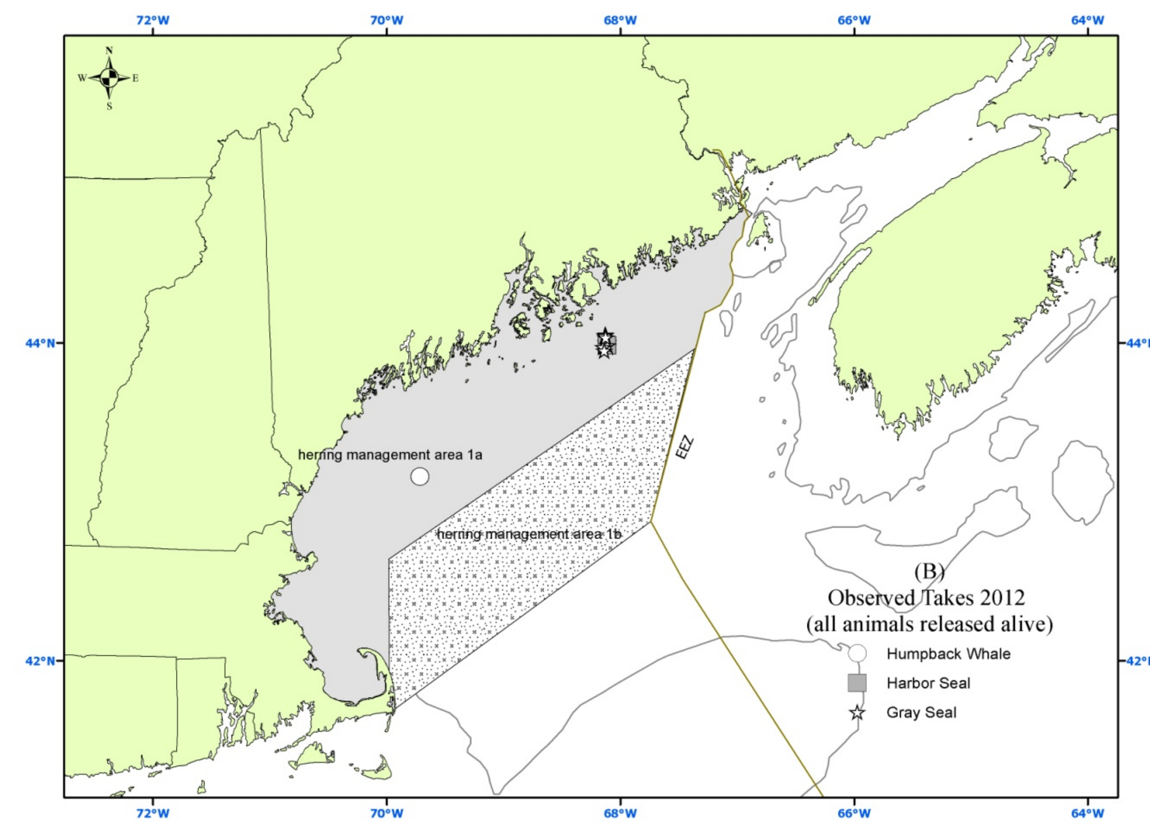
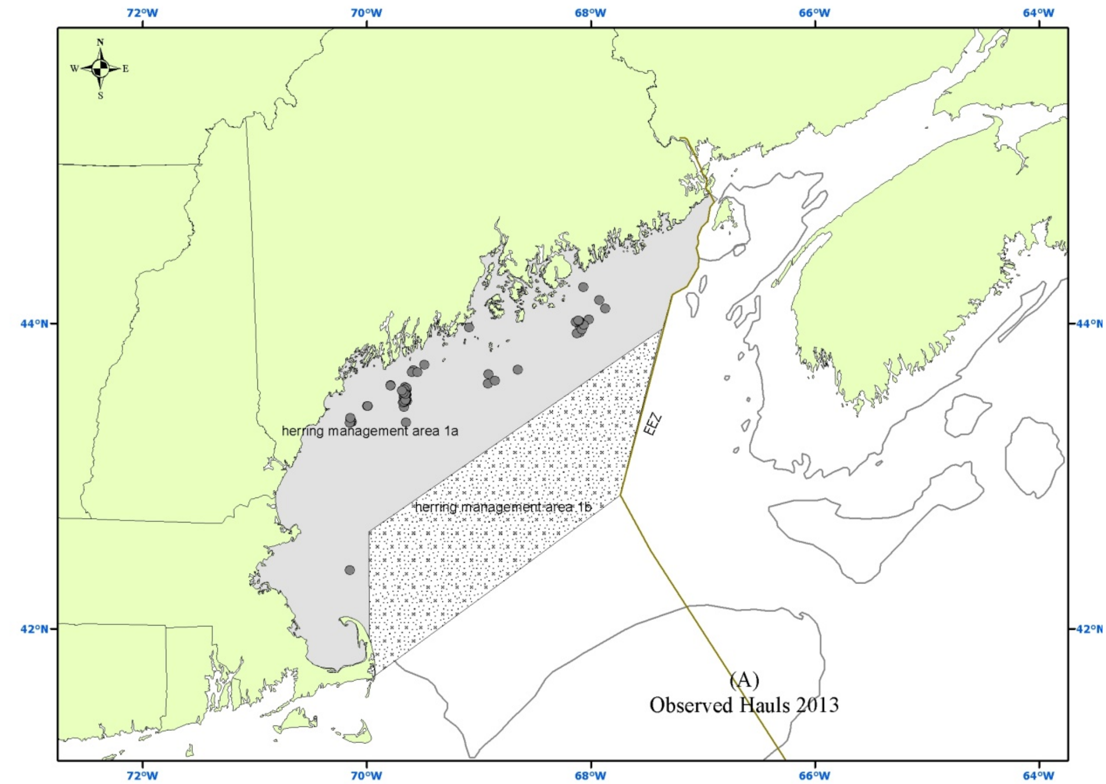


Figure 35. 2013 Herring Purse Seine observed hauls (A) and observed takes (B).



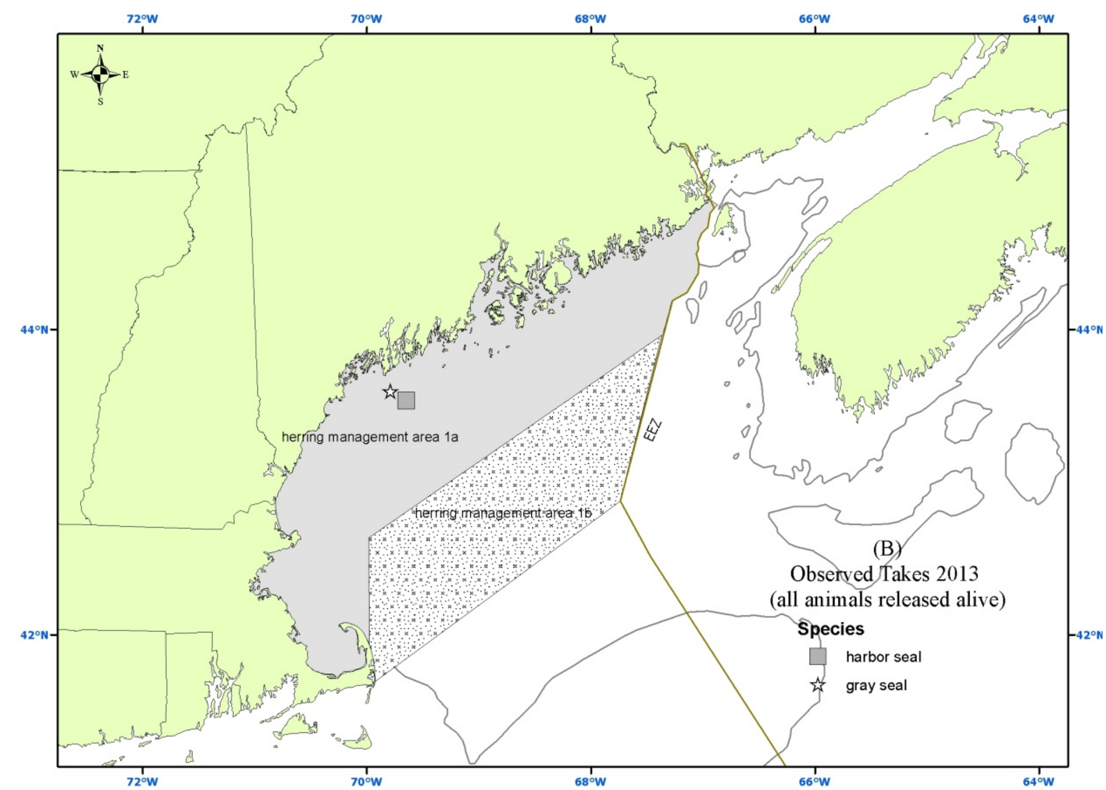


Figure 36. Observed sets and marine mammal interactions in the Pelagic longline fishery along the U.S. Atlantic coast during 2009. The boundaries of the Florida East Coast (FEC), South Atlantic Bight (SAB), Mid-Atlantic Bight (MAB), Northeast Coastal (NEC), and Sargasso Sea (SAR) fishing areas are shown. Seasonal closed areas instituted in 2001 under the HMS FMP are shown as hatched areas.

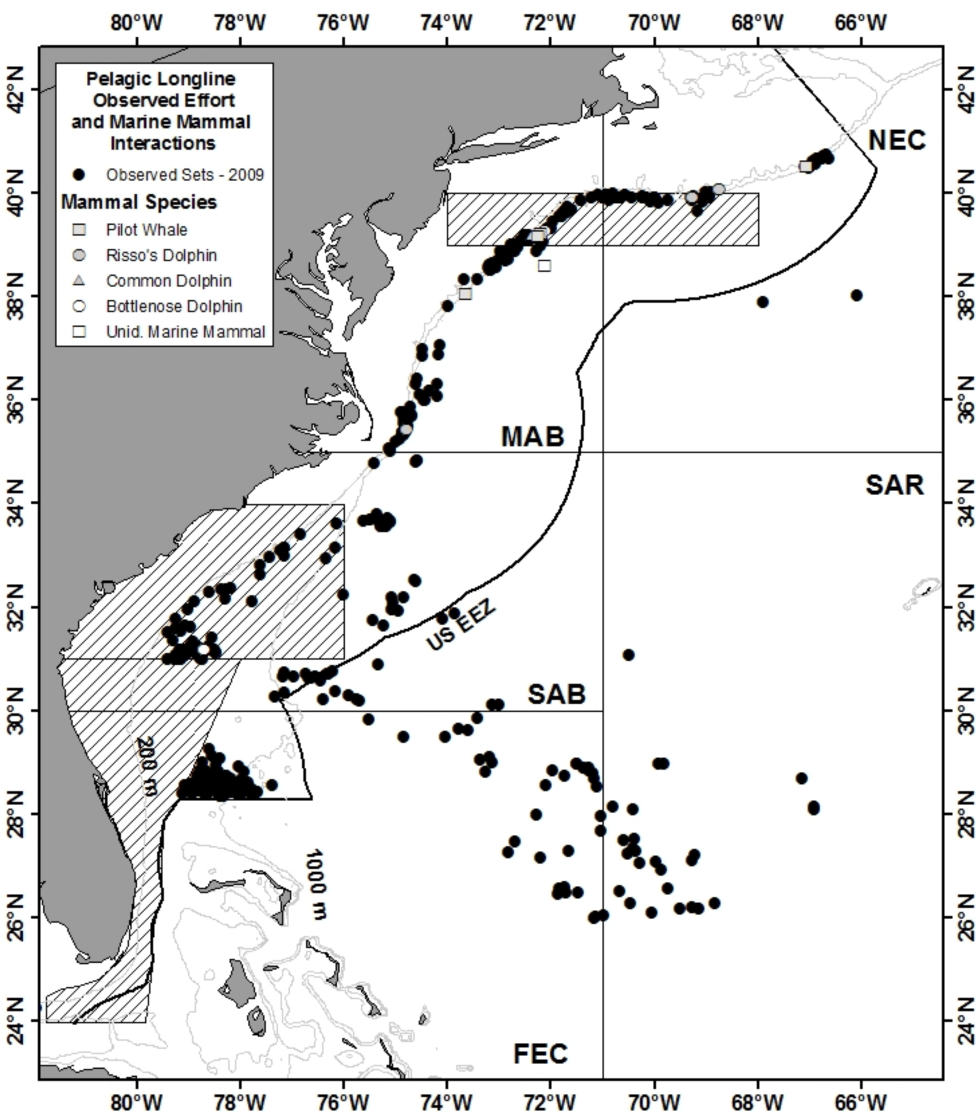


Figure 37. Observed sets and marine mammal interactions in the Pelagic longline fishery along the U.S. Atlantic coast during 2010. The boundaries of the Florida East Coast (FEC), South Atlantic Bight (SAB), Mid-Atlantic Bight (MAB), Northeast Coastal (NEC), and Sargasso Sea (SAR) fishing areas are shown. Seasonal closed areas instituted in 2001 under the HMS FMP are shown as hatched areas.

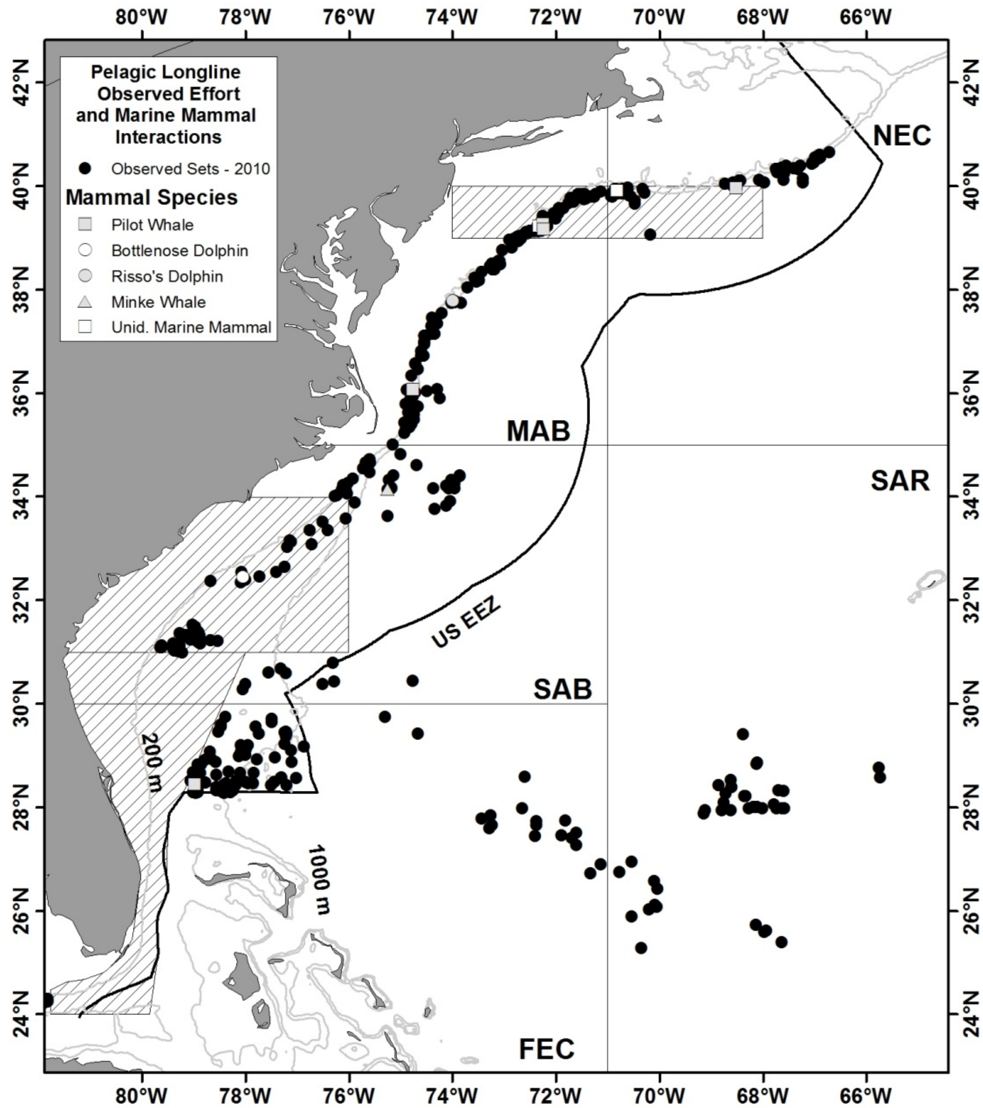


Figure 38. Observed sets and marine mammal interactions in the Pelagic longline fishery along the U.S. Atlantic coast during 2011. The boundaries of the Florida East Coast (FEC), South Atlantic Bight (SAB), Mid-Atlantic Bight (MAB), Northeast Coastal (NEC), and Sargasso Sea (SAR) fishing areas are shown. Seasonal closed areas instituted in 2001 under the HMS FMP are shown as hatched areas.

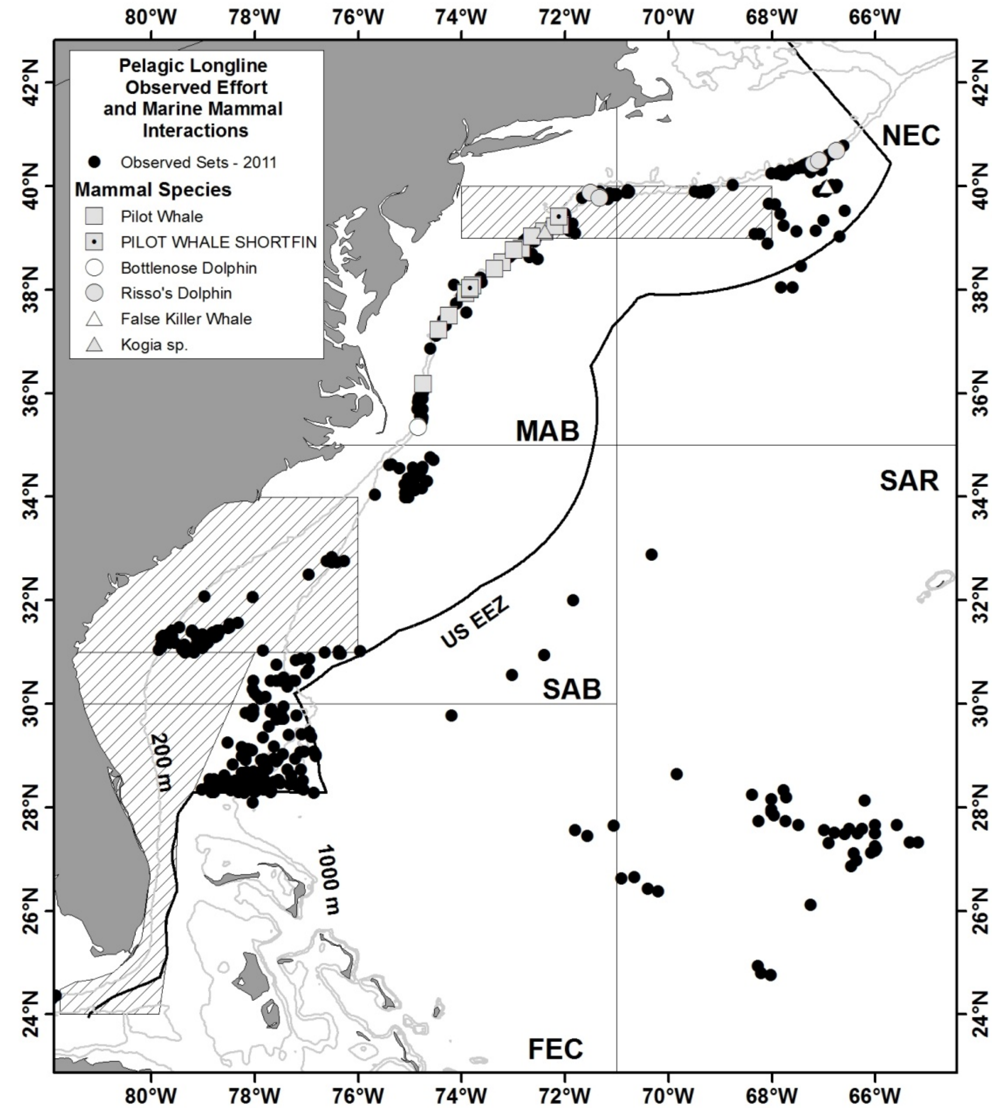


Figure 39. Observed sets and marine mammal interactions in the Pelagic longline fishery along the U.S. Atlantic coast during 2012. The boundaries of the Florida East Coast (FEC), South Atlantic Bight (SAB), Mid-Atlantic Bight (MAB), Northeast Coastal (NEC), and Sargasso Sea (SAR) fishing areas are shown. Seasonal closed areas instituted in 2001 under the HMS FMP are shown as hatched areas.

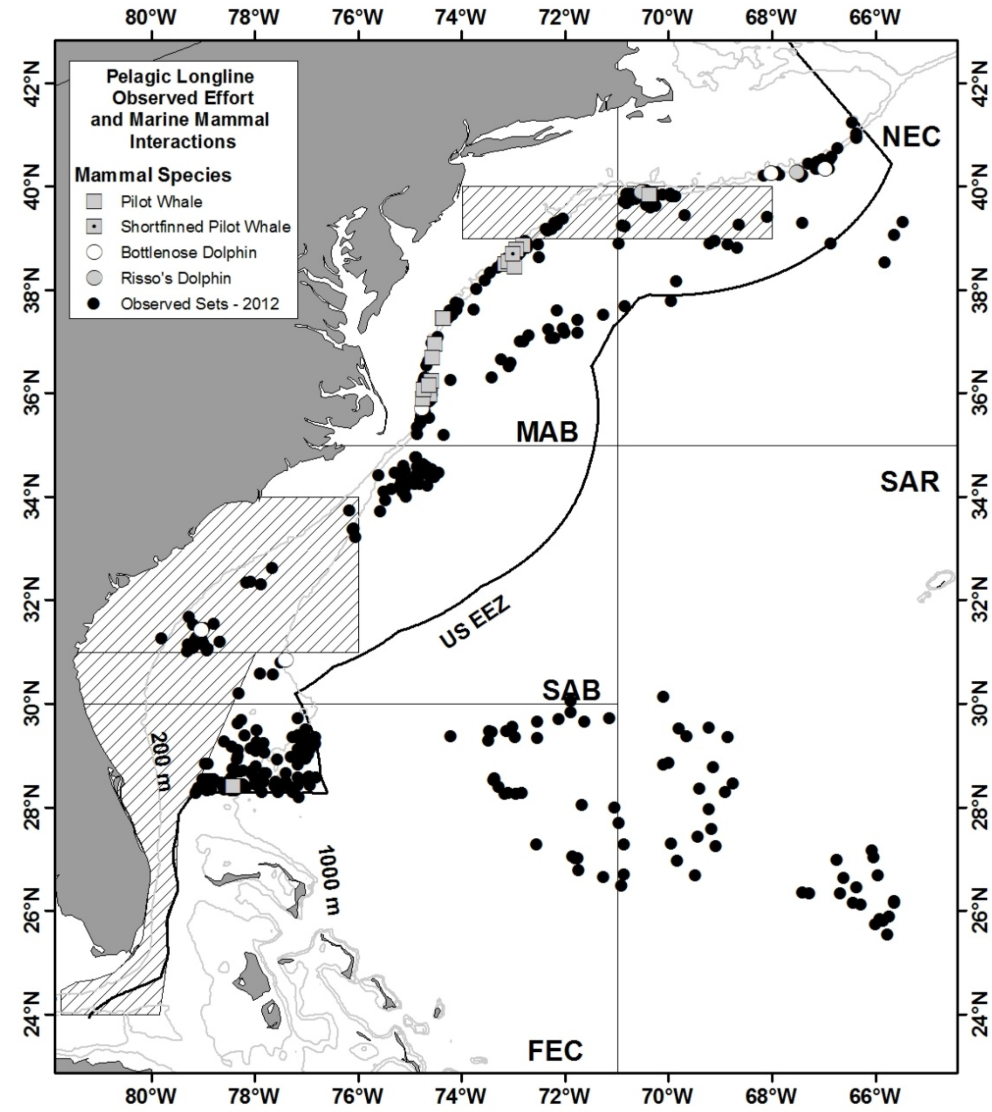


Figure 40. Observed sets and marine mammal interactions in the Pelagic longline fishery along the U.S. Atlantic coast during 2013. The boundaries of the Florida East Coast (FEC), South Atlantic Bight (SAB), Mid-Atlantic Bight (MAB), Northeast Coastal (NEC), and Sargasso Sea (SAR) fishing areas are shown. Seasonal closed areas instituted in 2001 under the HMS FMP are shown as hatched areas.

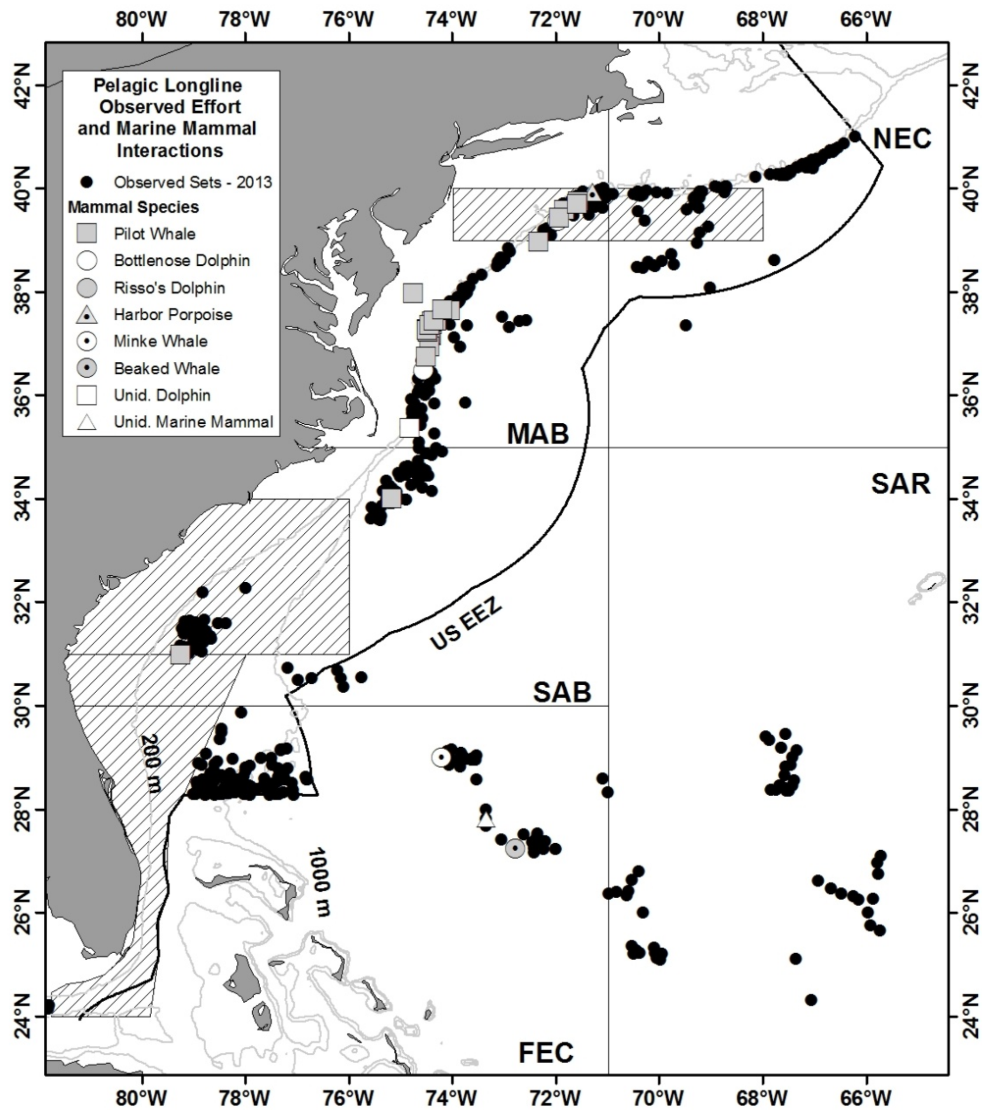


Figure 41. Observed sets in the Pelagic longline fishery in the Gulf of Mexico during 2012. Closed areas in the DeSoto canyon instituted in 2009 are shown as hatched areas.

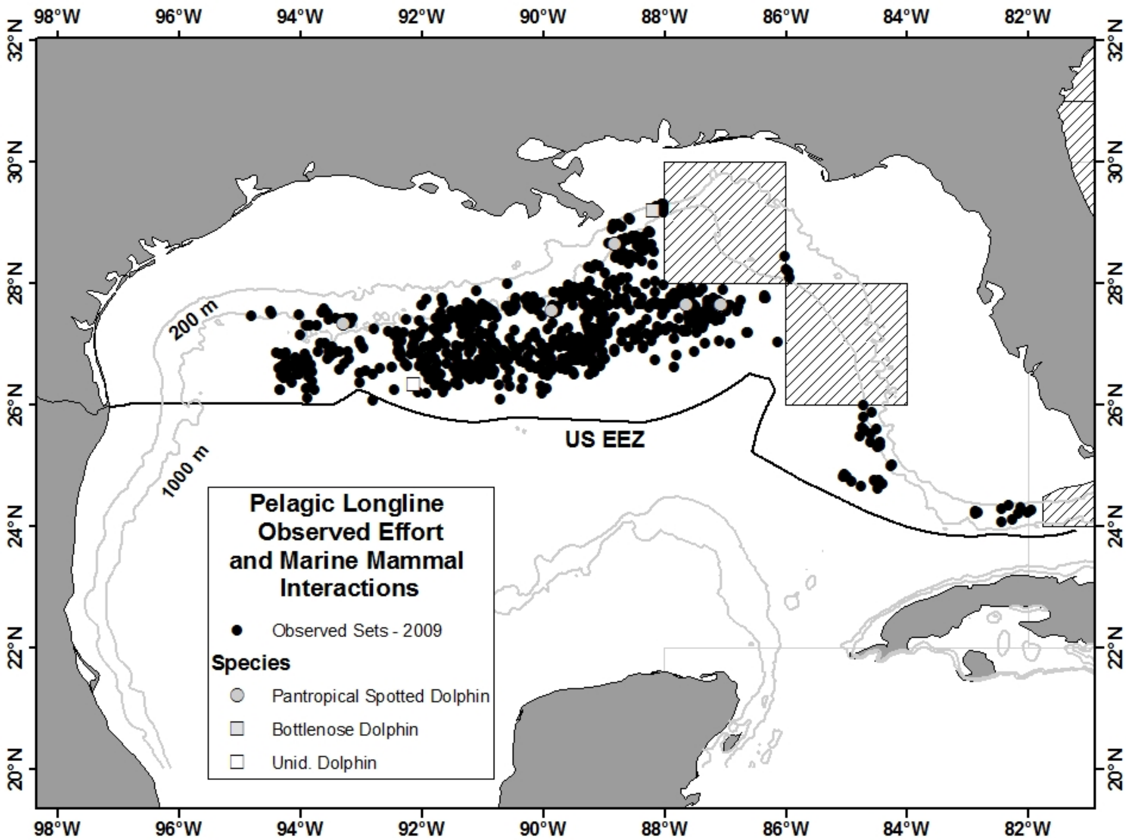


Figure 42. Observed sets in the Pelagic longline fishery in the Gulf of Mexico during 2010. Closed areas in the DeSoto canyon instituted in 2010 are shown as hatched areas.

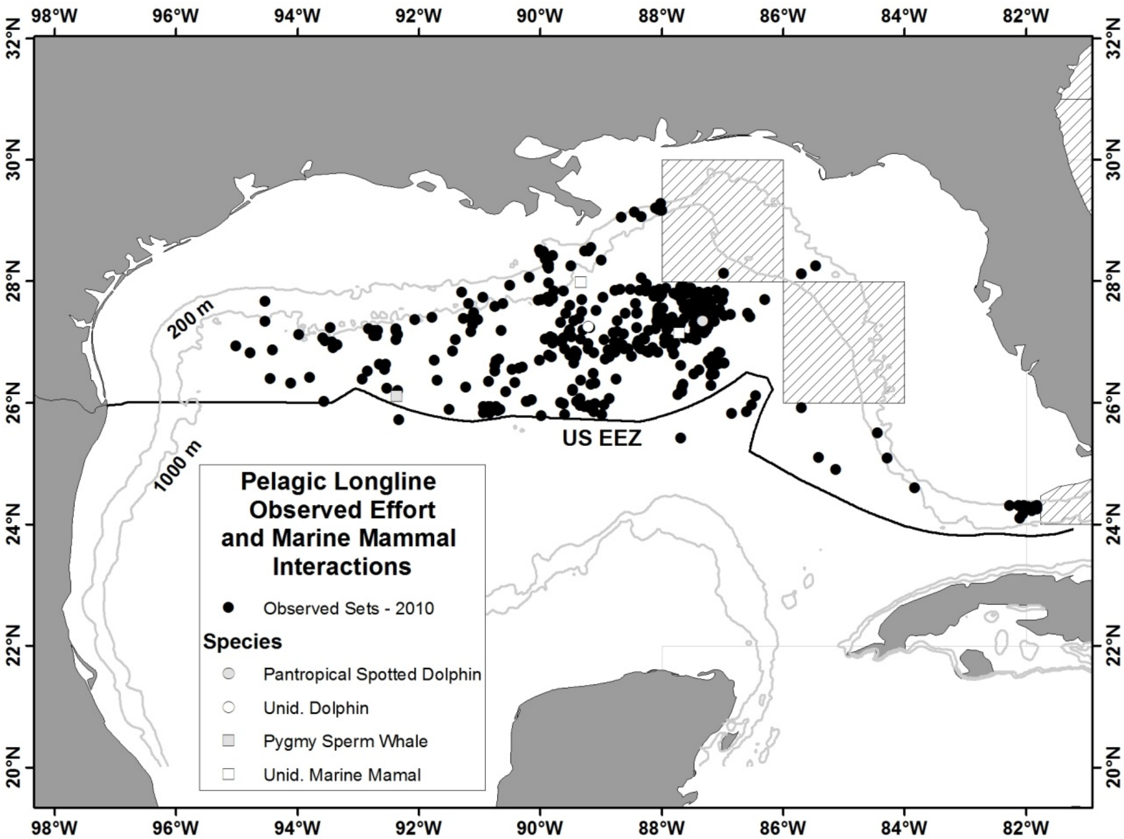


Figure 43. Observed sets in the Pelagic longline fishery in the Gulf of Mexico during 2011. Closed areas in the DeSoto canyon instituted in 2001 are shown as hatched areas.

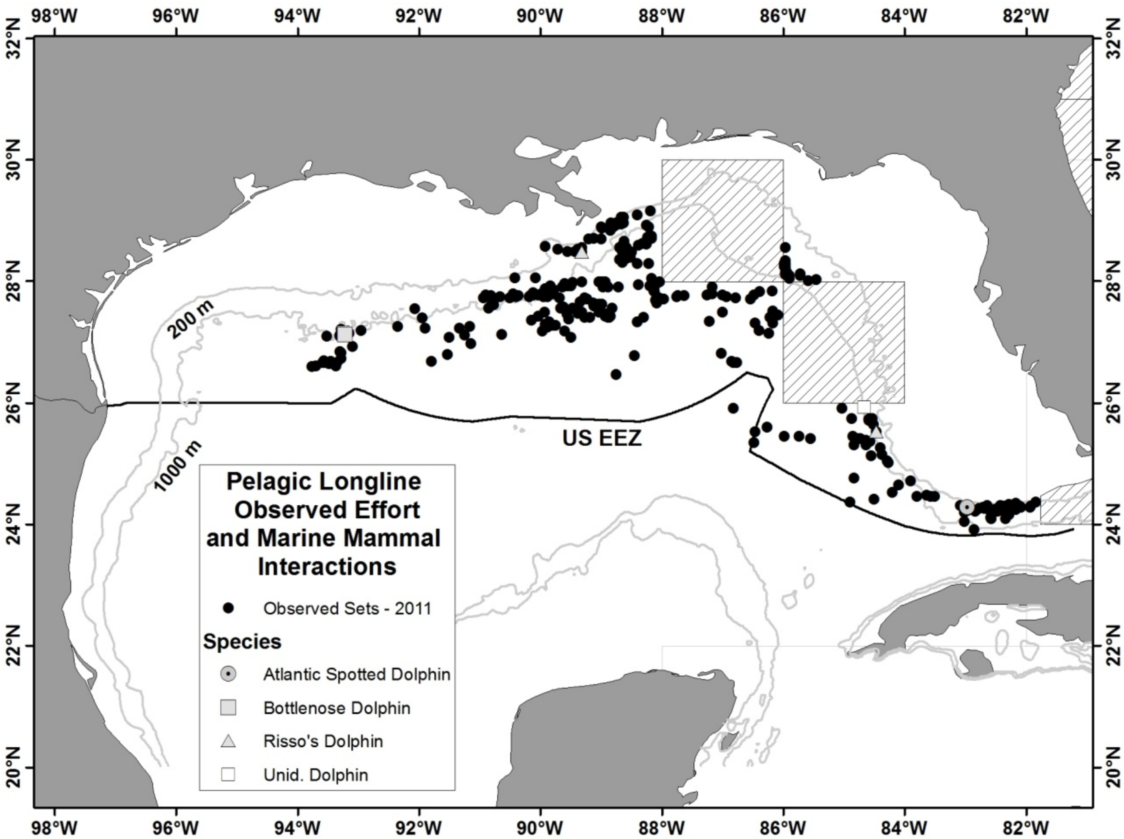


Figure 44. Observed sets in the Pelagic longline fishery in the Gulf of Mexico during 2012. Closed areas in the DeSoto canyon instituted in 2001 are shown as hatched areas.

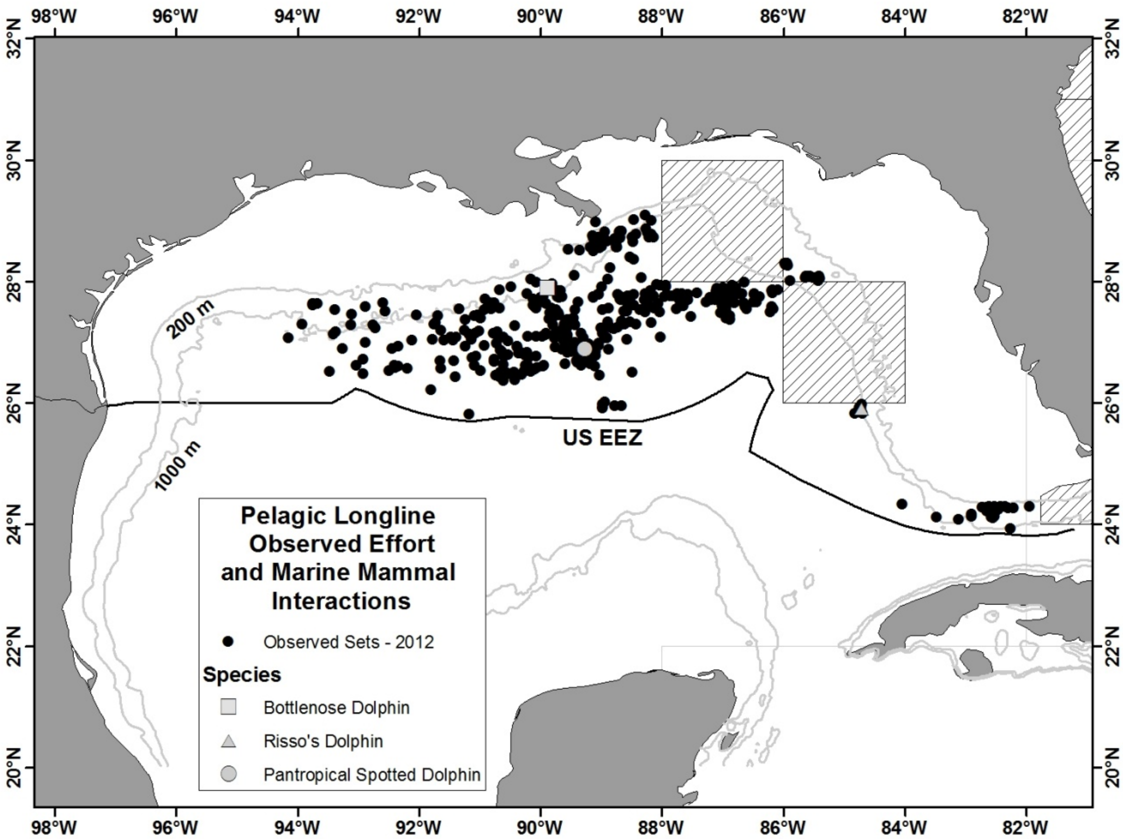
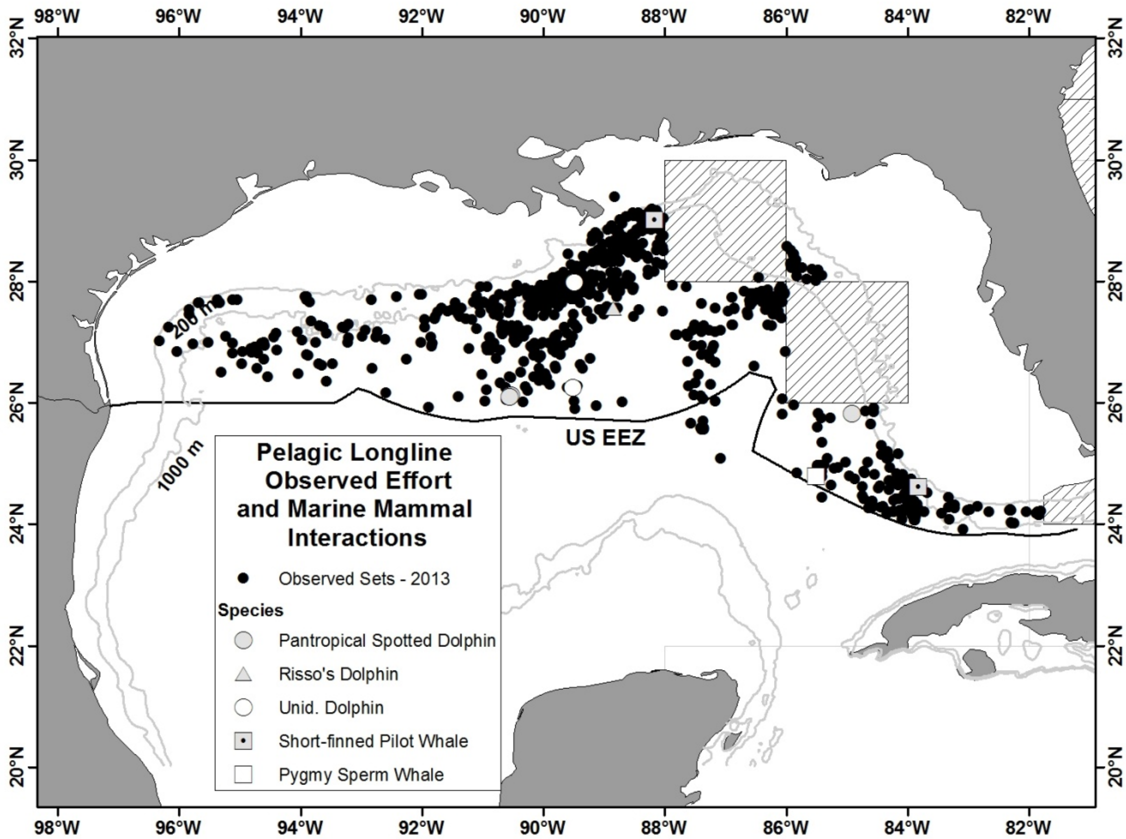


Figure 45. Observed sets in the Pelagic longline fishery in the Gulf of Mexico during 2013. Closed areas in the DeSoto canyon instituted in 2001 are shown as hatched areas.



Appendix IV

Surveys and Abundance Estimates

APPENDIX IV: Table A. Surveys									
Survey Number	Year	Season	Platform	Track line length (km)	Area	Agency / Program	Analysis	Corrected for g(0)	Reference
1	1982	year-round	plane	211,585	Cape Hatteras, NC to Nova Scotia, continental shelf and shelf edge waters	CETAP	Line transect analyses of distance data	N	CETAP 1982
2	1990	Aug	ship (Chapman)	2,067	Cape Hatteras, NC to Southern New England, north wall of the Gulf Stream	NEC	One team data analyzed by DISTANCE	N	NMFS 1990
3	1991	Jul-Aug	ship (Abel-J)	1,962	Gulf of Maine, lower Bay of Fundy, southern Scotian Shelf	NEC	Two independent team data analyzed with modified direct duplicate method.	Y	Palka 1995
4	1991	Aug	boat (Sneak Attack)	640	inshore bays of Maine	NEC	One team data analyzed by DISTANCE.	Y	Palka 1995
5	1991	Aug-Sep	plane 1(AT-11)	9,663	Cape Hatteras, NC to Nova Scotia, continental shelf and shelf edge waters	NEC/SEC	One team data analyzed by DISTANCE.	N	NMFS 1991
6	1991	Aug-Sep	plane 2 (Twin Otter)		Cape Hatteras, NC to Nova Scotia, continental shelf and shelf edge waters	NEC/SEC	One team data analyzed by DISTANCE.	N	NMFS 1991
7	1991	Jun-Jul	ship (Chapman)	4,032	Cape Hatteras to Georges Bank, between 200 and 2,000m isobaths	NEC	One team data analyzed by DISTANCE.	N	Waring et al. 1992; Waring 1998
8	1992	Jul-Sep	ship (Abel-J)	3,710	N. Gulf of Maine and lower Bay of Fundy	NEC	Two independent team data analyzed with	Y	Smith et al. 1993

							modified direct duplicate method.		
9	1993	Jun-Jul	ship (Delaware II)	1,874	S. edge of Georges Bank, across the Northeast Channel, to the SE. edge of the Scotian Shelf	NEC	One team data analyzed by DISTANCE.		NMFS 1993
10	1994	Aug-Sep	ship (Relentless)	534	shelf edge and slope waters of Georges Bank	NEC	One team data analyzed by DISTANCE.	N	NMFS 1994
11	1995	Aug-Sep	plane (Skymaster)	8,427	Gulf of St. Lawrence	DFO	One team data analyzed using quenouille's jackknife bias reduction procedure that modeled the left truncated sighting curve	N	Kingsley and Reeves 1998
12	1995	Jul-Sep	2 ships (Abel-J and Pelican) and plane (Twin Otter)	32,600	Virginia to the mouth of the Gulf of St. Lawrence	NEC	Ship: two independent team data analyzed with modified direct duplicate method. Plane: one team data analyzed by DISTANCE.	Y/N	Palka 1996
13	1996	Jul-Aug	plane	3,993	Northern Gulf of St. Lawrence	DFO	Quenouille's jackknife bias reduction procedure on line transect methods that modeled the left truncated sighting curve	N	Kingsley and Reeves 1998
14	1998	Jul-Aug	ship	4,163	south of Maryland	SEC	One team data analyzed by DISTANCE.	N	Mullin and Fulling 2003
15	1998	Aug-Sep	plane (1995 and 1998)		Gulf of St. Lawrence	DFO			Kingsley and Reeves 1998
16	1998	Jul-Sep	ship (Abel-J) and plane (Twin Otter)	15,900	north of Maryland	NEC	Ship: two independent team data analyzed with the modifed direct duplicate or Palka & Hammond analysis methods, depending on the presence of responsive movement. Plane: one team data	Y	

							analyzed by DISTANCE.		
17	1999	Jul-Aug	ship (Abel-J) and plane (Twin Otter)	6,123	south of Cape Cod to mouth of Gulf of St. Lawrence	NEC	Ship: two independent team data analyzed with modified direct duplicate or Palka & Hammond analysis methods, depending on the presence of responsive movement. Plane: circle-back data pooled with aerial data collected in 1999, 2002, 2004, 2006, 2007, and 2008 to calculate pooled g(0)'s and year-species specific abundance estimates for all years except 2008.	Y	
18	2002	Jul-Aug	plane (Twin Otter)	7,465	Georges Bank to Maine	NEC	Same as for plane in survey 17.	Y	Palka 2006
19	2002	Feb-Apr	ship (Gunter)	4,592	SE US continental shelf Delaware - Florida	SEC	One team data analyzed by DISTANCE.	N	
20	2002	Jun-Jul	plane	6,734	Florida to New Jersey	SEC	Two independent team data analyzed with modified direct duplicate method.	Y	
21	2004	Jun-Aug	ship (Gunter)	5,659	Florida to Maryland	SEC	Two independent team data analyzed with modified direct duplicate method.	Y	Garrison et al. 2010
22	2004	Jun-Aug	ship (Endeavor) and plane (Twin Otter)	10,761	Maryland to Bay of Fundy	NEC	Same methods used in survey 17.	Y	Palka 2006
23	2006	Aug	plane (Twin Otter)	10,676	Georges Bank to Bay of Fundy	NEC	Same as for plane in survey 17.	Y	Palka 2005

24	2007	Aug	ship (Bigelow) and plane (Twin Otter)	8,195	Georges Bank to Bay of Fundy	NEC	Ship: Tracker data analyzed by DISTANCE. Plane: same as for plane in survey 17.	Y	Palka 2005
25	2007	Jul-Aug	plane	46,804	Canadian waters from Nova Scotia to Newfoundland	DFO	uncorrected counts	N	Lawson and Gosselin 2009
26	2008	Aug	plane (Twin Otter)	6,267	NY to Maine in US waters	NEC	Same as for plane in survey 17.	Y	Palka 2005
27	2001	May-Jun	plane		Maine coast	NEC/UM	corrected counts	N	Gilbert et al. 2005
28	1999	Mar	plane		Cape Cod	NEC	uncorrected counts	N	Barlas 1999
29	1983-1986	1983 (Fall); 1984 (Winter, Spring, Summer);1985 (Summer, Fall); 1986 (Winter)	plane (Beechcraft D-18S modified with a bubblenose)	103,490	northern Gulf of Mexico bays and sounds, coastal waters from shoreline to 18-m isobath, and OCS waters from 18-m isobath to 9.3 km past the 18-m isobath	SEC	One team data analyzed with Line-transect theory	N	Scott et al. 1989
30	1991-1994	Apr-Jun	ship (Oregon II)	22,041	northern Gulf of Mexico from 200 m to U.S. EEZ	SEC	One team data analyzed by DISTANCE	N	Hansen et al. 1995
31	1992-1993	Sep-Oct	plane (Twin Otter)		northern Gulf of Mexico bays and sounds, coastal waters from shoreline to 18-m isobath, and OCS waters from 18-m isobath to 9.3 km past the 18-m isobath	GOMEX92, GOMEX93	One team data analyzed by DISTANCE	N	Blaylock and Hoggard 1994
33	1996-1997,1999-2001	Apr-Jun	ship (Oregon II and Gunter)	12,162	northern Gulf of Mexico from 200 m to U.S. EEZ	SEC	One team data analyzed by DISTANCE	N	Mullin and Fulling 2004
34	1998-2001	end Aug-early Oct	ship (Gunter and Oregon II)	2,196	northern Gulf of Mexico outer continental shelf (OCS, 20-200 m)	SEC	One team data analyzed by DISTANCE	N	Fulling et al. 2003
36	2004	12-13 Jan	helicopter		Sable Island	DFO	Pup count	na	Bowen et al. 2007

37	2004		plane		Gulf of St Lawrence and Nova Scotia Eastern Shore	DFO	Pup count	na	Hammill 2005
38	2009	10 Jun-13 Aug	ship	4,600	northern Gulf of Mexico from 200m to U.S. EEZ	SEC	One team data analyzed by DISTANCE		
39	2007	17 Jul-8 Aug	plane		northern Gulf of Mexico from shore to 200m(majority of effort 0- 20m)	SEC	One team data analyzed by DISTANCE		
40	2011	4 Jun-1 Aug	ship (Bigelow)	3,107	Virginia to Massachusetts (waters that were deeper than the 100-m depth contour out to beyond the US EEZ)	NEC	Two-independent teams, both using big-eyes. Analyzed using DISTANCE, the independent observer option assuming point independence	Y	Palka 2012
41	2011	7-26 Aug	Plane (Twin Otter)	5,313	Massachusetts to New Brunswick, Canada (waters north of New Jersey and shallower than the 100-m depth contour, through the US and Canadian Gulf of Maine and up to and including the lower Bay of Fundy)	NEC	Two-independent teams, both using naked eye in the same plane. Analyzed using DISTANCE, the independent observer option assuming point independence	Y	Palka 2012
42	2011	19 Jun- 1 Aug	Ship (Gunter)	4,445	Florida to Virginia	SEC	Two-independent teams, both using naked eye in the same plane. Analyzed using DISTANCE, the independent observer option assuming point independence	Y	
43	2012	May-Jun	plane		Maine coast	NEC	corrected counts	N	Waring et al. 2015
44	1992	Jan–Feb	Ship (Oregon II)	3,464	Cape Canaveral to Cape	SEC		N	NMFS 1992

					Hatteras, US EEZ				
45	2010	24 July–14 Aug	plane	7,944	southeastern Florida to Cape May, New Jersey	SEC	Two-independent teams, both using naked eye in the same plane.		
46	2011	6 –29 July	plane	8,665	southeastern Florida to Cape May, New Jersey	SEC	Two-independent teams, both using naked eye in the same plane.		

APPENDIX IV: Table B. Abundance estimates – "Survey Number" refers to surveys described in Table A. "Best" estimate for each species in bold font.

Species	Stock	Year	Nbest	CV	Survey Number	Notes
Humpback Whale	Gulf of Maine	1992	501			minimum pop'n size estimated from photo-ID data
		1993	652	0.29		YONAH sampling (Clapham *et al.* 2003)
		1997	497			minimum pop'n size estimated from photo-ID data
		1999	902	0.45	17	
		2002	521	0.67	18	Palka 2006
		2004	359	0.75	22	Palka 2006
		2006	847	0.55	23	Palka 2005
		2008	**823**			Mark-recapture estimate Robbins 2010
		2011	335	0.42	40+41	Palka 2012
Fin Whale	Western North Atlantic	1995	2,200	0.24	12	Palka 1996
		1999	2,814	0.21	18	Palka 2006
		2002	2,933	0.49	18	Palka 2006
		2004	1,925	0.55	22	Palka 2006
		2006	2,269	0.37	23	Palka 2005
		2007	3,522	0.27	25	Lawson and Gosselin 2009
		2011	1,595	0.33	40+41	Palka 2012
		2011	23	0.87	42	
		2011	**1,618**	**0.33**	**40+41+42**	Estimate summed from north and south surveys
Sei Whale	Nova Scotia Stock	1977	1,393-2,248			based on tag-recapture data (Mitchell and Chapman 1977)
		1977	870			based on census data (Mitchell and Chapman 1977)
		1982	280		1	CETAP 1982
		2002	71	1.01	18	Palka 2006
		2004	386	0.85	22	Palka 2006
		2006	207	0.62	23	Palka 2005
		2011	**357**	**0.52**	**40+41**	Palka 2012

Minke Whale	Canadian East Coast	1982	320	0.23	1	CETAP 1982
		1992	2,650	0.31	3+8	
		1993	330	0.66	9	
		1995	2,790	0.32	12	Palka 1996
		1995	1,020	0.27	11	
		1996	620	0.52	13	
		1999	2,998	0.19	17	
		2002	756	0.9	18	Palka 2006
		2004	600	0.61	22	Palka 2006
		2006	3,312	0.74	23	
		2007	**20,741**	**0.3**	**25**	Lawson and Gosselin 2009
		2011	2,591	0.81	40+41	Palka 2012
Sperm Whale	North Atlantic	1982	219	0.36	1	CETAP 1982
		1990	338	0.31	2	
		1991	736	0.33	7	Waring *et al.*1992:1998
		1991	705	0.66	6	
		1991	337	0.5	5	
		1993	116	0.4	9	
		1994	623	0.52	10	
		1995	2,698	0.67	12	Palka 1996
		1998	2,848	0.49	16	
		1998	1,181	0.51	14	Mullin and Fulling 2003
		2004	2,607	0.57	22	Palka 2006
		2004	2,197	0.47	21	Garrison *et al.* 2010
		2004	4,804	0.38	21+22	Estimate summed from north and south surveys
		2011	1,593	0.36	40+41	Palka 2012
		2011	695	0.39	42	
		2011	**2,288**	**0.28**	**40+41+42**	Estimate summed from north and south surveys
Kogia spp.	Western North Atlantic	1998	115	0.61	16	
		1998	580	0.57	14	Mullin and Fulling 2003
		2004	358	0.44	22	Palka 2006
		2004	37	0.75	21	Garrison *et al.* 2010
		2004	395	0.4	21+22	Estimate summed from north and south surveys
		2011	1,783	0.62	40+41	Palka 2012
		2011	2,002	0.69	42	
		2011	**3,785**	**0.47**	**40+41+42**	Estimate summed from north and south surveys
Beaked Whales	Western North Atlantic	1982	120	0.71	1	CETAP 1982
		1990	442	0.51	2	
		1991	262	0.99	7	Waring *et al.*1992:1998
		1991	370	0.65	6	
		1991	612	0.73	5	
		1993	330	0.66	9	

		1994	99	0.64	10	
		1995	1,519	0.69	12	Palka 1996
		1998	2,600	0.4	16	
		1998	541	0.55	14	Mullin and Fulling 2003
		2004	2,839	0.78	22	Palka 2006
		2004	674	0.36	21	Garrison *et al.* 2010
		2004	3,513	0.63	21+22	Estimate summed from north and south surveys
		2006	922	1.47	23	
		2011	5,500	0.67	40+41	2011 estimates are for *Mesoplodon* spp. beaked whales alone (not including *Ziphias*; Palka 2012)
		2011	1,592	0.67	42	2011 estimates are for *Mesoplodon* spp. beaked whales alone (not including *Ziphias*)
		2011	**7,092**	**0.54**	**40+41+42**	2011 estimates are for *Mesoplodon* spp. beaked whales alone (not including *Ziphias*); Estimate summed from north and south surveys
Cuvier's Beaked Whale	Western North Atlantic	2011	4,962	0.37	40+41	Palka 2012
		2011	1,570	0.65	42	
		2011	**6,532**	**0.32**	**40+41+42**	Estimate summed from north and south surveys
Risso's Dolphin	Western North Atlantic	1982	4,980	0.34	1	CETAP 1982
		1991	11,017	0.58	7	Waring *et al.*1992:1998
		1991	6,496	0.74	5	
		1991	16,818	0.52	6	
		1993	212	0.62	9	
		1995	5,587	1.16	12	Palka 1996
		1998	18,631	0.35	17	
		1998	9,533	0.5	15	
		1998	28,164	0.29	15+17	Estimate summed from north and south surveys
		2002	69,311	0.76	18	Palka 2006
		2004	15,053	0.78	21	Garrison *et al.* 2010
		2004	5,426	0.54	22	Palka 2006
		2004	20,479	0.59	21+22	Estimate summed from north and south surveys
		2006	14,408	0.38	23	
		2011	15,197	0.55	40+41	Palka 2012
		2011	3,053	0.44	42	
		2011	**18,250**	**0.46**	**40+41+42**	Estimate summed from north and south surveys
Pilot Whale	Western North Atlantic	1951	50,000			Derived from catch data from 1951-1961 drive fishery (Mitchell 1974)
		1975	43,000-96,000			Derived from population models (Mercer 1975)

		1982	11,120	0.29	1	CETAP 1982
		1991	3,636	0.36	7	Waring *et al.*1992:1998
		1991	3,368	0.28	5	
		1991	5,377	0.53	6	
		1993	668	0.55	9	
		1995	8,176	0.65	12	Palka 1996
		1995	9,776	0.55	12+16	Sum of US (#12) and Canadian (#16) surveys
		1998	1,600	0.65	16	
		1998	9,800	0.34	17	
		1998	5,109	0.41	15	
		2002	5,408	0.56	18	Palka 2006
		2004	15,728	0.34	22	Palka 2006
		2004	15,411	0.43	21	Garrison *et al.* 2010
		2004	31,139	0.27	21+22	Estimate summed from north and south surveys
		2006	26,535	0.35	23	Estimate summed from north and south surveys
		2007	16,058	0.79	25	Lawson and Gosselin 2009; long-finned pilot whales
		2011	**5,636**	**0.63**	**40+41**	**long-finned pilot whales**
		2011	11,865	0.57	40+41	unidentified pilot whales
		2011	4,569	0.57	40+41	short-finned pilot whales
		2011	16,946	0.43	42	short-finned pilot whales
		2011	**21,515**	**0.37**	**40+41+42**	**Best estimate for short-finned pilot whales alone; Estimate summed from north and south surveys**
Atlantic white-sided Dolphin	Western North Atlantic	1982	28,600	0.21	1	
		1992	20,400	0.63	2+7	
		1993	729	0.47	9	
		1995	27,200	0.43	12	Palka 1996
		1995	11,750	0.47	11	
		1996	560	0.89	13	
		1999	51,640	0.38	17	
		2002	109,141	0.3	18	Palka 2006
		2004	2,330	0.8	22	Palka 2006
		2006	17,594	0.3	23	
		2006	63,368	0.27	(18+23)/2	average of #18 and #23
		2007	5,796	0.43	25	Lawson and Gosselin 2009
		2011	**48,819**	**0.61**	**40+41**	Palka 2012
White-beaked Dolphin	Western North Atlantic	1982	573	0.69	1	CETAP 1982
			5,500			(Alling and Whitehead 1987)
		1982	3,486	0.22		(Alling and Whitehead 1987)
		2006	**2,003**	**0.94**	**23**	
		2007	11,842		25	
		2008			26	

Common Dolphin	Western North Atlantic	1982	29,610	0.39	1	
		1991	22,215	0.4	7	Waring *et al.*1992:1998
		1993	1,645	0.47	9	
		1995	6,741	0.69	12	Palka 1996
		1998	30,768	0.32	17	
		1998	0		15	
		2002	6,460	0.74	18	
		2004	90,547	0.24	22	Palka 2006
		2004	30,196	0.54	21	Garrison *et al.* 2010
		2004	120,743	0.23	21+22	Estimate summed from north and south surveys
		2006	84,000	0.36	24	
		2007	**173,486**	**0.55**	**25**	Lawson and Gosselin 2009
		2011	67,191	0.29	40+41	Palka 2012
		2011	2,993	0.87	42	
		2011	70,184	0.28	40+41+42	Estimate summed from north and south surveys
Atlantic Spotted Dolphin	Western North Atlantic	1982	6,107	0.27	1	CETAP 1982
		1995	4,772	1.27	12	Palka 1996
		1998	32,043	1.39	16	
		1998	14,438	0.63	14	Mullin and Fulling 2003
		2004	3,578	0.48	22	Palka 2006
		2004	47,400	0.45	21	Garrison *et al.* 2010
		2004	50,978	0.42	21+22	Estimate summed from north and south surveys
		2011	26,798	0.66	40+41	Palka 2012
		2011	17,917	0.42	42	
		2011	**44,715**	**0.43**	**40+41+42**	Estimate summed from north and south surveys
Pantropical Spotted Dolphin	Western North Atlantic	1982	6,107	0.27	1	CETAP 1982
		1995	4,772	1.27	12	Palka 1996
		1998	343	1.03	16	
		1998	12,747	0.56	14	Mullin and Fulling 2003
		2004	0		22	Palka 2006
		2004	4,439	0.49	21	Garrison *et al.* 2010
		2004	4,439	0.49	21+22	Estimate summed from north and south surveys
		2011	0	0	40+41	Palka 2012
		2011	3,333	0.91	42	
		2011	**3,333**	**0.91**	**40+41+42**	**Estimate summed from north and south surveys**
Striped Dolphin	Western North Atlantic	1982	36,780	0.27	1	
		1995	31,669	0.73	12	Palka 1996

		1998	39,720	0.45	16	
		1998	10,225	0.91	14	Mullin and Fulling 2003
		2004	52,055	0.57	22	
		2004	42,407	0.53	21	Garrison *et al.* 2010
		2004	94,462	0.4	21+22	Estimate summed from north and south surveys
		2011	46,882	0.33	40+41	Palka 2012
		2011	7,925	0.66	42	
		2011	**54,807**	**0.3**	**40+41+42**	**Estimate summed from north and south surveys**
Rough-toothed Dolphin	Western North Atlantic	2011	0	0	40+41	Palka 2012
		2011	271	1	42	
		2011	**271**	**1**	**40+41+42**	**Estimate summed from north and south surveys**
Bottlenose Dolphin	Western North Atlantic Offshore	1998	16,689	0.32	16	
		1998	13,085	0.4	14	Mullin and Fulling 2003
		2002	26,849	0.19	20	
		2002	5,100	0.41	18	Palka 2006
		2004	9,786	0.56	22	Palka 2006
		2004	44,953	0.26	21	Garrison *et al.* 2010
		2006	2,989	1.11	23	
		2011	26,766	0.52	40+41	Palka 2012
		2011	50,766	0.55	42	
		2011	77,532	0.4	**40+41+42**	**Estimate summed from north and south surveys**
Harbor Porpoise	Gulf of Maine/Bay of Fundy	1991	37,500	0.29	3	Palka 1995
		1992	67,500	0.23	8	Smith *et al.* 1993
		1995	74,000	0.2	12	Palka 1996
		1995	12,100	0.26	11	
		1996	21,700	0.38	14	Mullin and Fulling 2003
		1999	89,700	0.22	17	Palka 2006; survey discovered portions of the range not previously surveyed
		2002	64,047	0.48	21	Palka 2006
		2004	51,520	0.65	23	Palka 2006
		2006	89,054	0.47	24	
		2007	4,862	0.31	25	Lawson and Gosselin 2009
		2011	**79,883**	**0.32**	**40+41**	Palka 2012
Harbor Seal	Western North Atlantic	2001	99,340	0.097	27	Gilbert *et al.* 2005
						Waring *et al.* 2015
		2012	70,142	0.29	43	
Gray Seal	Western North Atlantic	1999	5,611		28	Barlas 1999
		2001	1,731		27	Gilbert *et al.* 2005
		2004	52,500	0.15	37	Gulf of St Lawrence and Nova Scotia Eastern Shore
			208,720	0.14		

			216,490	0.11		
		2004	223,220	0.08	36	Sable Island
				95% CI		
				263,000-		
		2012	331,000	458,000		DFO 2013
Bryde's Whale	Northern Gulf of Mexico	1991-1994	35	1.1	30	Hansen *et al.* 1995
		1996-2001	40	0.61	33	Mullin and Fulling 2004
		2003-2004	15	1.98	35	
		2009	**33**	**1.07**	**38**	
Sperm Whale	Northern Gulf of Mexico	1991-1994	530	0.31	30	Hansen *et al.* 1995
		1996-2001	1,349	0.23	33	Mullin and Fulling 2004
		2003-2004	1,665	0.2	35	
		2009	**763**	**0.38**	**38**	
Kogia spp.	Northern Gulf of Mexico	1991-1994	547	0.28	30	Hansen *et al.* 1995
		1996-2001	742	0.29	33	Mullin and Fulling 2004
		2003-2004	453	0.35	35	
		2009	**186**	**1.04**	**38**	
Cuvier's Beaked Whale	Northern Gulf of Mexico	1991-1994	30	0.5	30	Hansen *et al.* 1995
		1996-2001	95	0.47	33	Mullin and Fulling 2004
		2003-2004	65	0.67	35	
		2009	**74**	**1.04**	**38**	
Mesoplodon spp.	Northern Gulf of Mexico	1996-2001	106	0.41	33	Mullin and Fulling 2004
		2003-2004	57	1.4	35	
		2009	**149**	**0.91**	**38**	
Killer Whale	Northern Gulf of Mexico	1991-1994	277	0.42	30	Hansen *et al.* 1995
		1996-2001	133	0.49	33	Mullin and Fulling 2004
		2003-2004	49	0.77	35	
		2009	**28**	**1.02**	**38**	
False killer Whale	Northern Gulf of Mexico	1991-1994	381	0.62	30	Hansen *et al.* 1995
		1996-2001	1,038	0.71	33	Mullin and Fulling 2004
		2003-2004	777	0.56	35	
Short-finned Pilot Whale	Northern Gulf of Mexico	1991-1994	353	0.89	30	Hansen *et al.* 1995
		1996-2001	2,388	0.48	33	Mullin and Fulling 2004
		2003-2004	716	0.34	35	
		2009	**2,415**	**0.66**	**38**	
Melon-headed Whale	Northern Gulf of Mexico	1991-1994	3,965	0.39	30	Hansen *et al.* 1995
		1996-2001	3,451	0.55	33	
		2003-2004	2,283	0.76	35	
		2009	**2,235**	**0.75**	**38**	
Pygmy Killer Whale	Northern Gulf of Mexico	1991-1994	518	0.81	30	Hansen *et al.* 1995
		1996-2001	408	0.6	33	Mullin and Fulling 2004
		2003-2004	323	0.6	35	
		2009	**152**	**1.02**	**38**	

Risso's Dolphin	Northern Gulf of Mexico	1991-1994	2,749	0.27	30	Hansen *et al.* 1995
		1996-2001	2,169	0.32	33	Mullin and Fulling 2004
		2003-2004	1,589	0.27	35	
		2009	**2,442**	**0.57**	**38**	
Pantropical Spotted Dolphin	Northern Gulf of Mexico	1991-1994	31,320	0.2	30	Hansen *et al.* 1995
		1996-2001	91,321	0.16	33	Mullin and Fulling 2004
		2003-2004	34,067	0.18	35	
		2009	**50,880**	**0.27**	**38**	
Striped Dolphin	Northern Gulf of Mexico	1991-1994	4,858	0.44	30	Hansen *et al.* 1995
		1996-2001	6,505	0.43	33	Mullin and Fulling 2004
		2003-2004	3,325	0.48	35	
		2009	**1,849**	**0.77**	**38**	
Spinner Dolphin	Northern Gulf of Mexico	1991-1994	6,316	0.43	30	Hansen *et al.* 1995
		1996-2001	11,971	0.71	33	Mullin and Fulling 2004
		2003-2004	1,989	0.48	35	
		2009	**11,441**	**0.83**	**38**	
Clymene Dolphin	Northern Gulf of Mexico	1991-1994	5,571	0.37	30	Hansen *et al.* 1995
		1996-2001	17,355	0.65	33	Mullin and Fulling 2004
		2003-2004	6,575	0.36	35	
		2009	**129**	**1**	**38**	
Atlantic Spotted Dolphin	Northern Gulf of Mexico	1991-1994 oceanic	3,213	0.44	30	Hansen *et al.* 1995
		1996-2001 oceanic	175	0.84	33	Mullin and Fulling 2004
		1998-2001 OCS	37,611	0.28	34	This abundance estimate is from 2000-2001 surveys only (from Fulling *et al.* 2003). Current best population size estimate is unknown because data from the continental shelf portion of this species' range are more than 8 years old.
		2003-2004 oceanic	0	-	35	
		2009	2968	0.67	38	
Fraser's Dolphin	Northern Gulf of Mexico	1991-1994	127	0.9	30	Hansen *et al.* 1995
		1996-2001	726	0.7	33	
		2003-2004	0	-	35	
		2009	0	-	38	Current best population size estimate is unknown.
Rough-toothed Dolphin	Northern Gulf of Mexico	1991-1994 oceanic	852	0.31	30	
		1996-2001 oceanic	985	0.44	33	Mullin and Fulling 2004
		1998-2001 OCS	1,145	0.83	34	This abundance estimate is from 2000-2001 surveys only (from Fulling *et al.* 2003). Current best population size estimate is unknown because data from the continental shelf portion of this species' range are more than 8 years old.

		2003-2004 oceanic	1,508	0.39	35	
		2009	624	0.99	0.05	
Bottlenose Dolphin	Northern Gulf of Mexico Oceanic					Mullin and Fulling 2004
		1996-2001	2,239	0.41	33	
		2003-2004	3,708	0.42	35	
		2009	**5,806**	**0.39**	**38**	
Bottlenose Dolphin	Northern Gulf of Mexico Continental Shelf	1998-2001	17,777	0.32	34	This abundance estimate is from 2000-2001 surveys only (from Fulling *et al.* 2003). Current best population size estimate is unknown because data from the continental shelf are more than 8 years old.
Bottlenose Dolphin	Northern Gulf of Mexico Coastal (3 stocks)	Eastern 1994	9,912	0.12	32	
		Eastern 2007	**7,702**	**0.19**	**39**	
		Northern 1993	4,191	0.21	31	Blaylock and Hoggard 1994; Current best population size estimate for this stock is unknown because data are more than 8 years old.
		Northern 2007	**2,473**	**0.25**	**39**	
		Western 1992	3,499	0.21	31	Blaylock and Hoggard 1994; Current best population size estimate for this stock is unknown because data are more than 8 years old.
Bottlenose Dolphin	Northern Gulf of Mexico Bay, Sound and Estuarine (33 stocks)	Choctawhatchee Bay, 2007	179	0.04		Conn *et al.* 2011
		St. Joseph Bay, 2005-2007	146	0.18		Balmer *et al.* 2008
		St. Vincent Sound, Apalachicola Bay, St. George Sound, 2008	439	0.14		Tyson *et al.* 2011
		Sarasota Bay, Little Sarasota Bay, 2007	160	-		Direct count; Wells 2009.
		Mississippi River Delta, 2011-12	332	.93		
		Mississippi Sound/ Lake Borgne, Bay Boudreau	901	0.63		

		Pine Island Sound, Charlotte Harbor, Gasparilla Sound, Lemon Bay (2006)	826	0.09		Bassos-Hull *et al.* 2013
		Remaining 27 stocks	unknown	undetermined	31	Blaylock and Hoggard 1994; Current best population size estimate for each of these 27 stocks is unknown because data are more than 8 years old.

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APPENDIX V: Fishery Bycatch Summaries
Part A: by Fishery

Northeast Sink Gillnet

	Harbor Porpoise		Bottlenose Dolphin, Atlantic Offshore Stock		White-Sided Dolphin		Common Dolphin		Risso's Dolphin		Long-finned Pilot Whale		Harbor Seal		Gray Seal		Harp Seal	
Year	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV
1990	2900	0.32	0	0	0	0	0	0	0	0	0	0	602	0.68	0	0	0	0
1991	2000	0.35	0	0	49	0.46	0	0	0	0	0	0	231	0.22	0	0	0	0
1992	1200	0.21	0	0	154	0.35	0	0	0	0	0	0	373	0.23	0	0	0	0
1993	1400	0.18	0	0	205	0.31	0	0	0	0	0	0	698	0.19	0	0	0	0
1994	2100	0.18	0	0	240	0.51	0	0	0	0	0	0	1330	0.25	19	0.95	861	0.58
1995	1400	0.27	0	0	80	1.16	0	0	0	0	0	0	1179	0.21	117	0.42	694	0.27
1996	1200	0.25	0	0	114	0.61	63	1.39	0	0	0	0	911	0.27	49	0.49	89	0.55
1997	782	0.22	0	0	140	0.61	0	0	0	0	0	0	598	0.26	131	0.5	269	0.5
1998	332	0.46	0	0	34	0.92	0	0	0	0	0	0	332	0.33	61	0.98	78	0.48
1999	270	0.28	0	0	69	0.7	146	0.97	0	0	0	0	1446	0.34	155	0.51	81	0.78
2000	507	0.37	132	1.16	26	1	0	0	15	1.06	0	0	917	0.43	193	0.55	24	1.57
2001	53	0.97	0	0	26	1	0	0	0	0	0	0	1471	0.38	117	0.59	26	1.04
2002	444	0.37	0	0	30	0.74	0	0	0	0	0	0	787	0.32	0	0	0	0
2003	592	0.33	0	0	31	0.93	0	0	0	0	0	0	542	0.28	242	0.47	0	0
2004	654	0.36	1[a]	na	7	0.98	0	0	0	0	0	0	792	0.34	504	0.34	303	0.3
2005	630	0.23	0	0	59	0.49	5	0.8	15	0.93	0	0	719	0.2	574	0.44	35	0.68
2006	514	0.31	0	0	41	0.71	20	1.05	0	0	0	0	87	0.58	248	0.47	65	0.66
2007	395	0.37	0	0	0	0	11	0.94	0	0	0	0	92	0.49	886	0.24	119	0.35
2008	666	0.48	0	0	81	0.57	34	0.77	0	0	0	0	242	0.41	618	0.23	238	0.38
2009	591	0.23	0	0	0	0	43	0.77	0	0	0	0	513	0.28	1063	0.26	415	0.27
2010	387	0.27	0	0	66	0.9	42	0.81	0	0	0	0.82	540	0.25	1155	0.28	253	0.61
2011	273	0.2	0	0	18	0.43	64	0.71	0	0	0	0	343	0.19	1491	0.22	14	0.46
2012	277.3	0.59	0	0	9	0.92	95	0.4	6	0.87	3	0.82	252	0.26	542	0.19	0	0
2013	399	0.33	27	5	4	1.03	104	0.47	23	0.97	0	0	147	0.3	1127	0.2	22	0.75

Note: this table only includes observed bycatch. For a complete list of marine mamal species interactions with this fishery please see http://www.nmfs.noaa.gov/pr/pdfs/fisheries/lof2012/northeast_sink_gillnet.pdf

[a] Unextrapolated mortalities

[b] Due to uncertainty in stock identification both minimum and maximum estimates are provide with associated CV's. As a result of uncertainty in stock identification, minimum and maximum mortality estimates are not additive across the Atlantic coastal and estuarine bottlenose dolphin stocks.

na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

Mid-Atlantic Sink Gillnet

	Harbor Porpoise		Bottlenose Dolphin, Atlantic Offshore Stock		Bottlenose Dolphin, Northern Migratory Coastal Stock		Bottlenose Dolphin, Southern Migratory Coastal Stock		Bottlenose Dolphin, Northern NC Estuarine Stock		Bottlenose Dolphin, Southern NC Estuarine Stock		White-Sided Dolphin		Common Dolphin		Risso's Dolphin		Pilot Whale, Unidentified		Harbor Seal		Gray Seal		Harp Seal	
Year	SI&M_est	CV	SI&M_est	CV	SI&M_est (min-max)[b]	CV[b]	SI&M_est (min-max)[b]	CV[b]	SI&M_est (min-max)[b]	CV[b]	SI&M_est (min-max)[b]	CV[b]	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV
1994	0	0	0	0	na	na	na	na	na	na	na	na	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	103	0.57	56	1.66	na	na	na	na	na	na	na	na	0	0	7.4	0.69	0	0	0	0	0	0	0	0	0	0
1996	311	0.31	64	0.83	na	na	na	na	na	na	na	na	0	0	43	0.79	0	0	0	0	0	0	0	0	0	0
1997	572	0.35	0	0	na	na	na	na	na	na	na	na	45	0.82	0	0	0	0	0	0	0	0	0	0	0	0
1998	446	0.36	63	0.94	na	na	na	na	na	na	na	na	0	0	0	0	0	0	7	0	11	0.77	0	0	17	1.02
1999	53	0.49	0	0	na	na	na	na	na	na	na	na	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	21	0.76	0	0	na	na	na	na	na	na	na	na	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	26	0.95	na	na	na	na	na	na	na	na	na	na	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	unk	na	0	0	8.25-9.29	0.34-0.33	11.96-30.68	0.79-0.52	5.21-24.38	0.63-0.53	0.59-1.45	0.35-0.30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003	76	1.13	0	0	3.92-6.66	0.36-0.30	15.71-41.55	0.51-0.62	3.68-27.17	0.58-0.59	1.04-1.57	0.42-0.34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	137	0.91	0	0	4.86-7.28	0.35-0.33	33.50-40.10	0.79-0.51	4.03-18.96	0.62-0.49	0.92-2.17	0.43-0.36	0	0	0	0	0	0	0	0	15	0.86	69	0.92	0	0
2005	470	0.51	1[a]	na	4.89-6.52	0.39-0.32	69.40-80.30	0.60-0.64	3.95-15.20	0.60-0.49	0.48-0.78	0.41-0.30	0	0	0	0	0	0	0	0	63	0.67	0	0	0	0
2006	511	0.32	0	0	4.64-5.19	0.33-0.33	4.00-79.50	0.48-0.53	2.16-35.55	0.35-0.49	0.75-1.05	0.51-0.37	0	0	0	0	0	0	0	0	26	0.98	0	0	0	0
2007	58	1.03	0	0	0.00-3.18	0.00-1.08	0.00-6.00	0.00-0.97	0.00-9.69	0.00-0.95	0.00-0.00	0.00-0.00	0	0	0	0	34	0.73	0	0	0	0	0	0	38	0.9
2008	350	0.75	0	0	0.00-3.05	0.00-1.08	0.00-5.27	0.00-0.97	0.00-8.08	0.00-0.95	0.00-0.00	0.00-0.00	0	0	0	0	0	0	0	0	88	0.74	0	0	176	0.74
2009	201	0.55	0	0	0.00-23.86	0.00-0.83	0.00-37.61	0.00-0.86	0.00-46.79	0.00-0.82	0.00-0.00	0.00-0.00	0	0	0	0	0	0	0	0	47	0.68	0	0	0	0
2010	259	0.88	0	0	0.00-2.62	0.00-1.08	0.00-4.11	0.00-0.97	0.00-6.96	0.00-0.95	0.00-0.00	0.00-0.00	0	0	30	0.48	0	0	0	0	89	0.39	267	0.75	0	0
2011	123	0.41	0	0	0.00-2.98	0.00-1.08	0.00-4.33	0.00-0.97	0.00-8.38	0.00-0.95	0.00-0.00	0.00-0.00	0	0	29	0.53	0	0	0	0	21	0.67	19	0.6	0	0
2012	63.41	0.83	0	0	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	0	0	15	0.93	0	0	0	0	0	0	14	0.98	0	0

2013	19	1.06	26	0.95	tbd	tbd	tbd	tbd	tbd	tbd	tbd	tbd	0	0	62	0.67	0	0	0	0	0	0	0	0	0	0

Note: this table only includes observed bycatch. For a complete list of marine mamal species interactions with this fishery please see http://www.nmfs.noaa.gov/pr/pdfs/fisheries/lof2012/midatlantic_gillnet.pdf

[a] Unextrapolated mortalities

[b] Due to uncertainty in stock identification both minimum and maximum estimates are provide with associated CV's. As a result of uncertainty in stock identification, minimum and maximum mortality estimates are not additive across the Atlantic coastal and estuarine bottlenose dolphin stocks.

na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

New England/North Atlantic Bottom Trawl

	Harbor Porpoise		Bottlenose Dolphin, Atlantic Offshore Stock		White-Sided Dolphin		Common Dolphin		Risso's Dolphin-Atlantic		Pilot Whale, Unidentified		Long-finned Pilot Whale		Harbor Seal		Gray Seal		Harp Seal		Minke whale	
Year	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	91	0.97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	110	0.97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	182	0.71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	142	0.77	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	93	1.06	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	137	0.34	27	0.29	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	161	0.34	30	0.3	0	0	21	0.27	0	0	0	0	0	0	49	1.1	0	0
2002	0	0	0	0	70	0.32	26	0.29	0	0	22	0.26	0	0	0	0	0	0	0	0	0	0
2003	*	*	0	0	216	0.27	26	0.29	0	0	20	0.26	0	0	0	0	0	0	0	0	0	0
2004	0	0	0	0	200	0.3	26	0.29	0	0	15	0.29	0	0	0	0	0	0	0	0	0	0
2005	7.2	0.48	0	0	213	0.28	32	0.28	0	0	15	0.3	0	0	0	0	unk	unk	unk	unk	0	0
2006	6.5	0.49	0	0	40	0.5	25	0.28	0	0	14	0.28	0	0	0	0	0	0	0	0	0	0
2007	5.6	0.46	48	0.95	29	0.66	24	0.28	3	0.52	0	0	0	0	0	0	unk	unk	0	0	0	0
2008	5.6	0.97	19	0.88	13	0.57	6	0.99	2	0.56	0	0	21	0.51	0	0	16	0.52	0	0	7.8	0.69
2009	0	0	18	0.92	171	0.28	24	0.6	3	0.53	0	0	13	0.7	0	0	22	0.46	5	1.02	0	0
2010	0	0	4	0.53	37	0.32	114	0.32	2	0.55	0	0	30	0.43	0	0	30	0.34	0	0	0	0

2011	5.9	0.71	10	0.84	141	0.24	72	0.37	3	0.55	0	0	55	0.18	9	0.58	58	0.25	3	1.02	0	0
2012	0	0	0	0	27	0.47	40	0.54	0	0	0	0	33	0.32	3	1	37	0.49	0	0	0	0
2013	7	0.98	0	0	33	0.31	17	0.54	0	0	0	0	16	0.42	4	0.89	20	0.37	0	0	0	0

Note: this table only includes observed bycatch. For a complete list of marine mamal species interactions with this fishery please see http://www.nmfs.noaa.gov/pr/pdfs/fisheries/lof2012/northeast_bottom_trawl.pdf

[a] Unextrapolated mortalities

[b] Due to uncertainty in stock identification both minimum and maximum estimates are provide with associated CV's. As a result of uncertainty in stock identification, minimum and maximum mortality estimates are not additive across the Atlantic coastal and estuarine bottlenose dolphin stocks.

na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

Mid-Atlantic Bottom Trawl

	Harbor Porpoise		Bottlenose Dolphin, Atlantic Offshore Stock		White-Sided Dolphin		Common Dolphin		Risso's Dolphin-Atlantic		Pilot Whale, Unidentified		Long-finned Pilot Whale		Harbor Seal		Gray Seal	
Year	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV
1997	0	0	0	0	161	1.58	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	228	1.03	0	0	0	0	0	0
2000	0	0	0	0	27	0.17	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	27	0.19	103	0.27	0	0	39	0.3	0	0	0	0	0	0
2002	0	0	0	0	25	0.17	87	0.27	0	0	38	0.36	0	0	0	0	0	0
2003	0	0	0	0	31	0.25	99	0.28	0	0	31	0.31	0	0	0	0	0	0
2004	0	0	0	0	26	0.2	159	0.3	0	0	35	0.33	0	0	0	0	0	0
2005	0	0	0	0	38	0.29	141	0.29	0	0	31	0.31	0	0	0	0	0	0
2006	0	0	0	0	3	0.53	131	0.28	0	0	37	0.34	0	0	0	0	0	0
2007	0	0	11	0.42	2	1.03	66	0.27	33	0.34	0	0	0	0	0	0	0	0
2008	0	0	16	0.36	0	0	23	1	39	0.69	0	0	0	0	0	0	0	0
2009	0	0	21	0.45	0	0	167	0.46	23	0.5	0	0	0	0	24	0.92	38	0.7
2010	0	0	20	0.34	0	0	21	0.96	54	0.74	0	0	0	0	11	1.1	0	0
2011	0	0	34	0.31	0	0	271	0.25	62	0.56	0	0	0	0	0	0	25	0.57
2012	0	0	16	1.00	0	0	323	0.26	8	1	0	0	0	0	23	1	30	1.1
2013	0	0	0	0	0	0	269	0.29	46	0.71	0	0	0	0	11	0.96	29	0.67

Note: this table only includes observed bycatch. For a complete list of marine mamal species interactions with this fishery please see http://www.nmfs.noaa.gov/pr/pdfs/fisheries/lof2012/midatlantic_bottom_trawl.pdf

[a] Unextrapolated mortalities

[b] Due to uncertainty in stock identification both minimum and maximum estimates are provide with associated CV's. As a result of uncertainty in stock identification, minimum and maximum mortality estimates are not additive across the Atlantic coastal and estuarine bottlenose dolphin stocks.

na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

Northeast Mid-Water Trawl

	Harbor Porpoise		Bottlenose Dolphin, Atlantic Offshore Stock		White-Sided Dolphin		Common Dolphin		Risso's Dolphin-Atlantic		Pilot Whale, Unidentified		Long-finned Pilot Whale		Harbor Seal		Gray Seal	
Year	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	4.6	0.74	0	0	0	0	0	0
2001	0	0	0	0	unk	na	0	0	0	0	11	0.74	0	0	0	0	0	0
2002	0	0	0	0	unk	na	0	0	0	0	8.9	0.74	0	0	0	0	0	0
2003	0	0	0	0	22	0.97	0	0	0	0	14	0.56	0	0	0	0	0	0
2004	0	0	0	0	0	0	0	0	0	0	5.8	0.58	0	0	0	0	0	0
2005	0	0	0	0	9.4	1.03	0	0	0	0	1.1	0.68	0	0	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	0	0	0	0	0	0	16	0.61	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.3	0.81	0	0
2010	0	0	0	0	0	0	1[a]	na	0	0	0	0	0	0	1[a]	na	0	0
2011	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
2012	0	0	0	0	0	0	1[a]	na	0	0	0	0	1	0	1[a]	na	1[a]	na
2013	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	1[a]	na

Note: this table only includes observed bycatch. For a complete list of marine mamal species interactions with this fishery please see http://www.nmfs.noaa.gov/pr/pdfs/fisheries/lof2012/northeast_midwater_trawl_including_pair.pdf

[a] Unextrapolated mortalities

[b] Due to uncertainty in stock identification both minimum and maximum estimates are provide with associated CV's. As a result of uncertainty in stock identification, minimum and maximum mortality estimates are not additive across the Atlantic coastal and estuarine bottlenose dolphin stocks.

na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

Mid-Atlantic Mid-Water Trawl

	White-Sided Dolphin		Common Dolphin		Risso's Dolphin-Atlantic		Pilot Whale, Unidentified		Long-finned Pilot Whale		Harbor Seal		Gray Seal	
Year	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	unk	na	0	0	0	0	0	0	0	0	0	0	0	0
2002	unk	na	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2004	22	0.99	0	0	0	0	0	0	0	0	0	0	0	0
2005	58	1.02	0	0	0	0	0	0	0	0	0	0	0	0
2006	29	0.74	0	0	0	0	0	0	0	0	0	0	0	0
2007	12	0.98	3.2	0.7	0	0	0	0	0	0	0	0	0	0
2008	15	0.73	0	0	1[a]	na	0	0	0	0	0	0	0	0
2009	4	0.92	0	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	0	1[a]	na	1[a]	na
2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Note: this table only includes observed bycatch. For a complete list of marine mamal species interactions with this fishery please see http://www.nmfs.noaa.gov/pr/pdfs/fisheries/lof2014/mid-atlantic-mid-water-trawl.pdf

[a] Unextrapolated mortalities

[b] Due to uncertainty in stock identification both minimum and maximum estimates are provide with associated CV's. As a result of uncertainty in stock identification, minimum and maximum mortality estimates are not additive across the Atlantic coastal and estuarine bottlenose dolphin stocks.

na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

Pelagic Longline

	Pantropical Spotted dolphin - GMex		Bottlenose Dolphin, Atlantic Offshore Stock		Common Dolphin		Risso's Dolphin - Atlantic		Risso's Dolphin - Gmex		Pilot Whale, Unidentified - Atl.		Short-finned Pilot Whale - Atlantic		Beaked whale, Unidentified	
Year	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV
1992	0	0	0	0	0	0	0	0	0	0	22	0.23	0	0	0	0
1993	0	0	0	0	0	0	13	0.19	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	7	1	0	0	137	0.44	0	0	0	0
1995	0	0	0	0	0	0	103	0.68	0	0	345	0.51	0	0	0	0
1996	0	0	0	0	0	0	99	1	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	57	1	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	22	1	0	0	381	0.79	0	0	0	0
2000	0	0	0	0	0	0	64	1	0	0	133	0.88	0	0	0	0
2001	0	0	0	0	0	0	69	0.57	0	0	79	0.48	0	0	0	0
2002	0	0	0	0	0	0	28	0.86	0	0	54	0.46	0	0	0	0
2003	0	0	0	0	0	0	40	0.63	0	0	21	0.77	0	0	5.3	1
2004	0	0	0	0	0	0	28	0.72	0	0	74	0.42	0	0	0	0
2005	0	0	0	0	0	0	3	1	0	0	212	0.21	0	0	0	0
2006	0	0	0	0	0	0	0	0	0	0	185	0.47	0	0	0	0
2007	0	0	0	0	0	0	9	0.65	0	0	57	0.65	0	0	0	0
2008	0	0	0	0	0	0	16.8	0.732	8.3	0.63	0	0	80	0.42	0	0
2009	16	0.69	8.8	1	8.5	1	11.8	0.711	0	0	0	0	17	0.7	0	0
2010	0	0	0	0	0	0	0	0	0	0	0	0	127	0.78	0	0
2011	0	0	0	0	0	0	11.8	0.699	1.5	1	0	0	305	0.29	0	0
2012	1	0	61.8	0.68	0	0	15.1	1	29.8	1	0	0	170.1	0.3326	0	0
2013	0	0	0	0	0	0	1.9	1	0	0	0	0	0	0	0	0

Note: this table only includes observed bycatch. For a complete list of marine mamal species interactions with this fishery please see http://www.nmfs.noaa.gov/pr/pdfs/fisheries/lof2012/atlantic_caribbean_gulf_large_pelagics_longline.pdf

[a] Unextrapolated mortalities

[b] Due to uncertainty in stock identification both minimum and maximum estimates are provide with associated CV's. As a result of uncertainty in stock identification, minimum and maximum mortality estimates are not additive across the Atlantic coastal and estuarine bottlenose dolphin stocks.

na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

Pelagic Drift Gillnet

	White-Sided Dolphin		Common Dolphin		Risso's Dolphin-Atlantic		Pilot Whale, Unidentified		Long-finned Pilot Whale		Bottlenose Dolphin, Atlantic Offshore Stock		Beaked whale, Unidentified		Sowerby's beaked whales		Harbor porpoise	
Year	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV
1989	4.4	0.71	0	0	87	0.52	0	0	0	0	72	0.18	60	0.21	0	0	0.7	7
1990	6.8	0.71	0	0	144	0.46	0	0	0	0	115	0.18	76	0.26	0	0	1.7	2.65
1991	0.9	0.71	223	0.12	21	0.55	30	0.26	0	0	26	0.15	13	0.21	0	0	0.7	1
1992	0.8	0.71	227	0.09	31	0.27	33	0.16	0	0	28	0.1	9.7	0.24	0	0	0.4	1
1993	2.7	0.17	238	0.08	14	0.42	31	0.19	0	0	22	0.13	12	0.16	0	0	1.5	0.34
1994	0	0.71	163	0.02	1.5	0.16	20	0.06	0	0	14	0.04	0	0	3	0.09	0	0
1995	0	0	83	0	6	0	9.1	0	0	0	5	0	3	0	6	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	2	0.25	9	0.12	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	9	0	0	0	0	0	3	0	7	0	2	0	0	0
1999	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0

Note: this table only includes observed bycatch.

[a] Unextrapolated mortalities

[b] Due to uncertainty in stock identification both minimum and maximum estimates are provide with associated CV's. As a result of uncertainty in stock identification, minimum and maximum mortality estimates are not additive across the Atlantic coastal and estuarine bottlenose dolphin stocks.

na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

Pelagic Pair Trawl

	White-Sided Dolphin		Common Dolphin		Risso's Dolphin-Atlantic		Pilot Whale, Unidentified		Long-finned Pilot Whale		Bottlenose dolphin-Atlantic offshore	
Year	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV
1989	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0.6	1	0	0	0	0	13	0.52
1992	0	0	0	0	4.3	0.76	0	0	0	0	73	0.49
1993	0	0	0	0	3.2	1	0	0	0	0	85	0.41
1994	0	0	0	0	0	0	2	0.49	0	0	4	0.4
1995	0	0	0	0	3.7	0.45	22	0.33	0	0	17	0.26
1996	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0

Note: this table only includes observed bycatch.
[a] Unextrapolated mortalities
[b] Due to uncertainty in stock identification both minimum and maximum estimates are provide with associated CV's. As a result of uncertainty in stock identification, minimum and maximum mortality estimates are not additive across the Atlantic coastal and estuarine bottlenose dolphin stocks.
na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

Gulf of Mexico Shrimp Otter Trawl

	Atlantic Spotted Dolphin		Bottlenose dolphin, Continental Shelf Stock		Bottlenose dolphin, Western Coastal Stock		Bottlenose dolphin, Northern Coastal Stock		Bottlenose dolphin, Eastern Coastal Stock		Bottlenose dolphin, TX BSE Stocks		Bottlenose dolphin, LA BSE Stocks		Bottlenose dolphin, AL/MS BSE Stocks		Bottlenose dolphin, FL BSE Stocks	
Year	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV
1997	128	0.44	172	0.42	217	0.84	13	0.80	18	0.99	0	-	29	1.00	37	0.82	3	0.99
1998	146	0.44	180	0.43	148	0.80	20	0.95	23	0.99	0	-	31	0.99	37	0.83	2	0.99
1999	120	0.44	159	0.42	289	0.91	31	0.72	11	0.99	0	-	38	0.89	52	0.85	3	0.99
2000	105	0.44	156	0.43	242	0.86	15	0.72	15	0.99	0	-	21	0.86	47	0.77	8	0.99
2001	115	0.45	169	0.42	291	0.85	15	0.79	11	0.99	0	-	28	0.99	55	0.74	6	0.99
2002	128	0.44	166	0.42	223	0.80	29	0.84	12	0.99	0	-	118	0.98	69	0.84	6	0.99
2003	75	0.45	122	0.43	133	0.79	15	0.71	5	0.99	0	-	72	1.00	52	0.82	5	0.99
2004	84	0.46	132	0.43	111	0.80	14	0.88	5	0.99	0	-	77	0.90	26	0.90	2	0.99
2005	55	0.49	94	0.43	66	0.84	11	0.64	1	0.99	0	-	57	0.96	15	0.72	3	0.99
2006	49	0.44	77	0.43	105	0.89	16	0.67	6	0.99	0	-	55	0.97	17	0.64	3	0.99
2007	43	0.45	60	0.43	81	0.85	20	0.67	3	0.99	0	-	47	0.90	26	0.77	1	0.99
2008	37	0.53	46	0.44	56	0.80	22	0.77	1	0.99	0	-	61	1.00	28	0.76	1	0.99
2009	49	0.50	56	0.43	77	0.89	35	0.67	3	0.99	0	-	116	1.02	45	0.73	6	0.99
2010	44	0.42	57	0.40	57	0.83	17	0.64	3	0.99	0	-	113	1.09	58	0.64	6	0.99
2011	35	0.48	63	0.44	67	0.91	13	0.65	1	0.99	0	-	104	0.98	47	0.64	3	0.99

Note: this table only includes observed bycatch. For a complete list of marine mammal species interactions with this fishery please see http://www.nmfs.noaa.gov/pr/pdfs/fisheries/lof2012/southeastern_us_atlantic_gulf_shrimp_trawl.pdf

[a] Unextrapolated mortalities

[b] Due to uncertainty in stock identification both minimum and maximum estimates are provide with associated CV's. As a result of uncertainty in stock identification, minimum and maximum mortality estimates are not additive across the Atlantic coastal and estuarine bottlenose dolphin stocks.

na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

Harbor Porpoise

	Mid-Atlantic Gillnet		North Atlantic Bottom Trawl		NE Sink Gilllnet		Pelagic Drift Gillnet	
Year	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV
1990	na	na	0	0	2900	0.32	1.7	2.65
1991	na	na	0	0	2000	0.35	0.7	1
1992	na	na	0	0	1200	0.21	0.4	1
1993	na	na	0	0	1400	0.18	1.5	0.34
1994	na	na	0	0	2100	0.18		
1995	103	0.57	0	0	1400	0.27		
1996	311	0.31	0	0	1200	0.25		
1997	572	0.35	0	0	782	0.22		
1998	446	0.36	0	0	332	0.46		
1999	53	0.49	0	0	270	0.28		
2000	21	0.76	0	0	507	0.37		
2001	26	0.95	0	0	53	0.97		
2002	unk	na	0	0	444	0.37		
2003	76	1.13	*	*	592	0.33		
2004	137	0.91	0	0	654	0.36		
2005	470	0.51	7.2	0.48	630	0.23		
2006	511	0.32	6.5	0.49	514	0.31		
2007	58	1.03	5.6	0.46	395	0.37		
2008	350	0.75	5.6	0.97	666	0.48		
2009	201	0.55	0	0	591	0.23		
2010	259	0.88	0	0	387	0.27		
2011	123	0.41	5.9	0.71	273	0.2		
2012	63.41	0.83	0	0	277.3	0.59		
2013	19	1.06	7	0.98	399	0.33		

Note: this table only includes observed bycatch. [a] Unextrapolated mortalities
na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

Common Bottlenose Dolphin, Atlantic Offshore Stock

	Mid-Atlantic Bottom Trawl		Mid-Atlantic Gillnet		North Atlantic Bottom Trawl		NE Sink Gilllnet		Pelagic Drift Gillnet		Pelagic Longline	
Year	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV
1991	na	na	na	na	91	0.97	0	0	26	0.15	0	0
1992	na	na	na	na	0	0	0	0	28	0.1	0	0
1993	na	na	na	na	0	0	0	0	22	0.13	0	0
1994	na	na	na	na	0	0	0	0	14	0.04	0	0
1995	na	na	56	1.66	0	0	0	0	5	0	0	0
1996	na	na	64	0.83	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0			0	0
1998	0	0	63	0.94	0	0	0	0			0	0
1999	0	0	0	0	0	0	0	0			0	0
2000	0	0	0	0	0	0	132	1.16			0	0
2001	0	0	na	na	0	0	0	0			0	0
2002	0	0	0	0	0	0	0	0			0	0
2003	0	0	0	0	0	0	0	0			0	0
2004	0	0	0	0	0	0	1[a]	na			0	0
2005	0	0	1[a]	na	0	0	0	0			0	0
2006	0	0	0	0	0	0	0	0			0	0
2007	11	0.42	0	0	48	.95	0	0			0	0
2008	16	0.36	0	0	19	0.88	0	0			0	0
2009	21	0.45	0	0	18	0.92	0	0			8.8	1
2010	20	0.34	0	0	4	0.53	0	0			0	0
2011	34	0.31	0	0	10	0.84	0	0			0	0
2012	16	1	0	0	0	0	0	0			61.8	0.68
2013	0	0	0	0	0	0	27	0.95			0	0

Note: this table only includes observed bycatch. [a] Unextrapolated mortalities
na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

White-sided Dolphin

	Mid-Atlantic Bottom Trawl		Mid-Atlantic Gillnet		Mid-Atlantic Midwater Trawl		North Atlantic Bottom Trawl		NE Sink Gilllnet		Northeast Midwater Trawl		Pelagic Drift Gillnet	
Year	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV
1990	na	na	na	na	na	na	0	0	0	0	na	na		
1991	na	na	na	na	na	na	0	0	49	0.46	na	na	0	0
1992	na	na	na	na	na	na	110	0.97	154	0.35	na	na	110	0.97
1993	na	na	na	na	na	na	0	0	205	0.31	na	na	0	0
1994	na	na	0	0	na	na	182	0.71	240	0.51	na	na	182	0.71
1995	na	na	0	0	na	na	0	0	80	1.16	na	na	0	0
1996	na	na	0	0	na	na	0	0	114	0.61	na	na		
1997	161	1.58	45	0.82	na	na	0	0	140	0.61	na	na		
1998	0	0	0	0	na	na	0	0	34	0.92	na	na		
1999	0	0	0	0	0	0	0	0	69	0.7	0	0		
2000	27	0.17	0	0	0	0	137	0.34	26	1	0	0		
2001	27	0.19	0	0	unk	na	161	0.34	26	1	unk	na		
2002	25	0.17	0	0	unk	na	70	0.32	30	0.74	unk	na		
2003	31	0.25	0	0	0	0	216	0.27	31	0.93	22	0.97		
2004	26	0.2	0	0	22	0.99	200	0.3	7	0.98	0	0		
2005	38	0.29	0	0	58	1.02	213	0.28	59	0.49	9.4	1.03		
2006	3	0.53	0	0	29	0.74	40	0.5	41	0.71	0	0		
2007	2	1.03	0	0	12	0.98	29	0.66	0	0	0	0		
2008	0	0	0	0	15	0.73	13	0.57011	81	0.57	0	0		
2009	0	0	0	0	4	0.92	171	0.27826	0	0	0	0		
2010	0	0	0	0	0	0	37	0.32202	66	0.9	0	0		
2011	0	0	0	0	0	0	141	0.23983	18	0.43	0	0		
2012	0	0	0	0	0	0	27	0.47403	9	0.92	0	0		
2013	0	0	0	0	0	0	33	0.31	4	1.03	0	0		

Note: this table only includes observed bycatch. [a] Unextrapolated mortalities
na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

Risso's Dolphin, Western North Atlantic Stock

	Mid-Atlantic Bottom Trawl		Mid-Atlantic Gillnet		North Atlantic Bottom Trawl		NE Sink Gilllnet		Pelagic Longline	
Year	**SI&M_est**	**CV**	**SI&M_est**	**CV**	**SI&M_est**	**CV**	**SI&M_est**	**CV**	**SI&M_est**	**CV**
1996	0	0	0	0	0	0	0	0	99	1
1997	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	57	1
1999	0	0	0	0	0	0	0	0	22	1
2000	0	0	0	0	0	0	15	1.06	64	1
2001	0	0	0	0	0	0	0	0	69	0.57
2002	0	0	0	0	0	0	0	0	28	0.86
2003	0	0	0	0	0	0	0	0	40	0.63
2004	0	0	0	0	0	0	0	0	28	0.72
2005	0	0	0	0	0	0	15	0.93	3	1
2006	0	0	0	0	0	0	0	0	0	0
2007	33	0.34	34	0.73	3	0.52	0	0	9	0.65
2008	39	0.69	0	0	2	0.56	0	0	16.8	0.732
2009	23	0.5	0	0	3	0.53	0	0	11.8	0.711
2010	54	0.74	0	0	2	0.55	0	0	0	0
2011	62	0.56	0	0	3	0.55	0	0	11.8	0.699
2012	8	1	0	0	0	0	6	0.87	15.1	1
2013	46	0.71	0	0	0	0	23	0.97	1.9	1

Note: this table only includes observed bycatch. [a] Unextrapolated mortalities
na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

Long-finned Pilot Whale, Western North Atlantic Stock

	Mid-Atlantic Bottom Trawl		Mid-Atlantic Midwater Trawl		North Atlantic Bottom Trawl		NE Sink Gilllnet		Northeast Midwater Trawl		Pelagic Longline	
Year	**SI&M_est**	**CV**	**SI&M_est**	**CV**	**SI&M_est**	**CV**	**SI&M_est**	**CV**	**SI&M_est**	**CV**	**SI&M_est**	**CV**
2008	0	0	0	0	21	0.51	0	0	16	0.61	na	na
2009	0	0	0	0	13	0.7	0	0	0	0	na	na
2010	0	0	0	0	30	0.43	0	0.82	0	0	na	na
2011	0	0	0		55	0.18	0	0	1	0	na	na
2012	0	0	0	0	33	0.32	0	0	1	0	na	na
2013	0	0	0	0	16	0.42	0	0	3	0	na	na

Note: this table only includes observed bycatch. [a] Unextrapolated mortalities
na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

Short-finned Pilot Whale, Western North Atlantic Stock

	PLL	
Year	**SI&M_est**	**CV**
2008	80	0.42
2009	17	0.7
2010	127	0.78
2011	305	0.29
2012	170.1	0.3326
2013	124	.32

Note: this table only includes observed bycatch. [a] Unextrapolated mortalities
na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

Short-beaked Common Dolphin, Western North Atlantic Stock

	Mid-Atlantic Bottom Trawl		Mid-Atlantic Gillnet		North Atlantic Bottom Trawl		NE Sink Gilllnet		Northeast Midwater Trawl		Pelagic Drift Gillnet		Pelagic Longline	
Year	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV
1990	na	na	na	na	0	0	0	0	na	na			na	na
1991	na	na	na	na	0	0	0	0	na	na	223	0.12	na	na
1992	na	na	na	na	0	0	0	0	na	na	227	0.09	0	0
1993	na	na	na	na	0	0	0	0	na	na	238	0.08	0	0
1994	na	na	0	0	0	0	0	0	na	na	163	0.02	0	0
1995	na	na	7.4	0.69	142	0.77	0	0	na	na	83	0	0	0
1996	na	na	43	0.79	0	0	63	1.39	na	na			0	0
1997	0	0	0	0	93	1.06	0	0	na	na			0	0
1998	0	0	0	0	0	0	0	0	na	na			0	0
1999	0	0	0	0	0	0	146	0.97	0	0			0	0
2000	0	0	0	0	27	0.29	0	0	0	0			0	0
2001	103	0.27	0	0	30	0.3	0	0	0	0			0	0
2002	87	0.27	0	0	26	0.29	0	0	0	0			0	0
2003	99	0.28	0	0	26	0.29	0	0	0	0			0	0
2004	159	0.3	0	0	26	0.29	0	0	0	0			0	0
2005	141	0.29	0	0	32	0.28	5	0.8	0	0			0	0
2006	131	0.28	0	0	25	0.28	20	1.05	0	0			0	0
2007	66	0.27	0	0	24	0.28	11	0.94	0	0			0	0
2008	23	1	0	0	6	0.99	34	0.77	0	0			0	0
2009	167	0.46	0	0	24	0.6	43	0.77	0	0			8.8	1
2010	21	0.96	30	0.48	114	0.32	42	0.81	1[a]	na			0	0
2011	271	0.25	29	0.53	72	0.37	64	0.71	0	0			0	0
2012	323	0.26	15	0.93	40	0.54	95	0.4	1[a]	0			61.8	.68
2013	269	0.29	62	0.67	17	0.54	104	0.47	0	0			0	0

Note: this table only includes observed bycatch. [a] Unextrapolated mortalities

na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

Harbor Seal

	Herring Purse Seine		Mid-Atlantic Bottom Trawl		Mid-Atlantic Gillnet		Mid-Atlantic Midwater Trawl		Northeast Bottom Trawl		NE Sink Gilllnet		Northeast Midwater Trawl	
Year	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV
1990	na	na	na	na	na	na	na	na	0	0	602	0.68	na	na
1991	na	na	na	na	na	na	na	na	0	0	231	0.22	na	na
1992	na	na	na	na	na	na	na	na	0	0	373	0.23	na	na
1993	na	na	na	na	na	na	na	na	0	0	698	0.19	na	na
1994	na	na	na	na	na	na	na	na	0	0	1330	0.25	na	na
1995	na	na	na	na	0	0	na	na	0	0	1179	0.21	na	na
1996	na	na	na	na	0	0	na	na	0	0	911	0.27	na	na
1997	na	na	0	0	0	0	na	na	0	0	598	0.26	na	na
1998	na	na	0	0	11	0.77	na	na	0	0	332	0.33	na	na
1999	na	na	0	0	0	0	na	na	0	0	1446	0.34	0	0
2000	na	na	0	0	0	0	0	0	0	0	917	0.43	0	0
2001	na	na	0	0	0	0	0	0	0	0	1471	0.38	0	0
2002	na	na	0	0	0	0	0	0	0	0	787	0.32	0	0
2003	0	0	0	0	0	0	0	0	0	0	542	0.28	0	0
2004	0	0	0	0	15	0.86	0	0	0	0	792	0.34	0	0
2005	0	0	0	0	63	0.67	0	0	0	0	719	0.2	0	0
2006	na	na	0	0	26	0.98	0	0	0	0	87	0.58	0	0
2007	0	0	0	0	0	0	0	0	0	0	92	0.49	0	0
2008	0	0	0	0	88	0.74	0	0	0	0	242	0.41	0	0
2009	0	0	24	0.92	47	0.68	0	0	0	0	513	0.28	1.3	0.81
2010	0	0	11	1.1	89	0.39	1[a]	0	0	0	540	0.25	2	0
2011	1[a]	0	0	0	21	0.67	0	0	9	0.58	343	0.19	0	0
2012	0	0	23	1	0	0	0	0	3	1	252	0.26	1	0
2013	0	0	11	0.96	0	0	0	0	4	0.89	147	0.3	0	0

Note: this table only includes observed bycatch. [a] Unextrapolated mortalities
na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

Gray Seal

	Herring Purse Seine		Mid-Atlantic Bottom Trawl		Mid-Atlantic Gillnet		Mid-Atlantic Midwater Trawl		Northeast Bottom Trawl		NE Sink Gilllnet		Northeast Midwater Trawl	
Year	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV	SI&M_est	CV
1994	na	na	na	na	0	0	0	0	0	0	19	0.95	0	0
1995	na	na	na	na	0	0	0	0	0	0	117	0.42	0	0
1996	na	na	na	na	0	0	0	0	0	0	49	0.49	0	0
1997	na	na	0	0	0	0	0	0	0	0	131	0.5	0	0
1998	na	na	0	0	0	0	0	0	0	0	61	0.98	0	0
1999	na	na	0	0	0	0	0	0	0	0	155	0.51	0	0
2000	na	na	0	0	0	0	0	0	0	0	193	0.55	0	0
2001	na	na	0	0	0	0	0	0	0	0	117	0.59	0	0
2002	na	na	0	0	0	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	0	0	0	0	0	242	0.47	0	0
2004	0	0	0	0	69	0.92	0	0	0	0	504	0.34	0	0
2005	0	0	0	0	0	0	0	0	unk	unk	574	0.44	0	0
2006	na	na	0	0	0	0	0	0	0	0	248	0.47	0	0
2007	0	0	0	0	0	0	0	0	unk	unk	886	0.24	0	0
2008	0	0	0	0	0	0	0	0	16	0.52	618	0.23	0	0
2009	0	0	38	0.7	0	0	0	0	22	0.46	1063	0.26	0	0
2010	0	0	0	0	267	0.75	1[a]	0	30	0.34	1155	0.28	0	0
2011	0	0	25	0.57	19	0.6	0	0	58	0.25	1491	0.22	0	0
2012	0	0	30	1.1	14	0.98	0	0	37	0.49	542	0.19	1[a]	na
2013	0	0	29	0.67	0	0	0	0	20	0.37	1127	0.2	1[a]	na

Note: this table only includes observed bycatch. [a] Unextrapolated mortalities
na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

Harp Seal

	Mid-Atlantic Gillnet		Northeast Bottom Trawl		NE Sink Gilllnet	
Year	**SI&M_est**	**CV**	**SI&M_est**	**CV**	**SI&M_est**	**CV**
1994	0	0	0	0	861	0.58
1995	0	0	0	0	694	0.27
1996	0	0	0	0	89	0.55
1997	0	0	0	0	269	0.5
1998	17	1.02	0	0	78	0.48
1999	0	0	0	0	81	0.78
2000	0	0	0	0	24	1.57
2001	0	0	49	1.1	26	1.04
2002	0	0	0	0	0	0
2003	0	0	*	*	0	0
2004	0	0	0	0	303	0.3
2005	0	0	0	0	35	0.68
2006	0	0	0	0	65	0.66
2007	38	0.9	0	0	119	0.35
2008	176	0.74	0	0	238	0.38
2009	0	0	5	1.02	415	0.27
2010	0	0	0	0	253	0.61
2011	0	0	3	1.02	14	0.46
2012	0	0	0	0	0	0
2013	0	0	0	0	22	0.75

Note: this table only includes observed bycatch. [a] Unextrapolated mortalities
na=not applicable; unk= observer coverage was absent or too low to detect bycatch, or no estimate generated; tbd= to be determined

APPENDIX VI: Reports not updated in 2015

Species	Stock	Updated
Blue whale	Western North Atlantic	2010
Sperm whale	North Atlantic	2014
Killer whale	Western North Atlantic	2014
Dwarf sperm whale	Western North Atlantic	2013
Pygmy sperm whale	Western North Atlantic	2013
Pygmy killer whale	Western North Atlantic	2007
False killer whale	Western North Atlantic	2014
Northern bottlenose whale	Western North Atlantic	2014
Sowerby’s beaked whale	Western North Atlantic	2014
Cuvier's beaked whale	Western North Atlantic	2013
Blainville's beaked whale	Western North Atlantic	2013
Gervais' beaked whale	Western North Atlantic	2013
True's beaked whale	Western North Atlantic	2013
Melon-headed whale	Western North Atlantic	2007
White-beaked dolphin	Western North Atlantic	2007
Atlantic spotted dolphin	Western North Atlantic	2013
Pantropical spotted dolphin	Western North Atlantic	2013
Striped dolphin	Western North Atlantic	2013
Fraser's dolphin	Western North Atlantic	2007
Rough-toothed dolphin	Western North Atlantic	2013
Clymene dolphin	Western North Atlantic	2013
Spinner dolphin	Western North Atlantic	2013
Common bottlenose dolphin	Biscayne Bay	2013
Common bottlenose dolphin	Florida Bay	2013
Harp seal	Western North Atlantic	2013
Hooded seal	Western North Atlantic	2007
Cuvier's beaked whale	Gulf of Mexico Oceanic	2012
Blainville's beaked whale	Gulf of Mexico Oceanic	2012
Gervais' beaked whale	Gulf of Mexico Oceanic	2012
Common bottlenose dolphin	Gulf of Mexico Oceanic	2014
Striped dolphin	Gulf of Mexico Oceanic	2012
Spinner dolphin	Gulf of Mexico Oceanic	2012
Rough-toothed dolphin	Gulf of Mexico (Outer continental shelf and Oceanic)	2012
Clymene dolphin	Gulf of Mexico Oceanic	2012
Fraser's dolphin	Gulf of Mexico Oceanic	2012
Killer whale	Gulf of Mexico Oceanic	2012
False killer whale	Gulf of Mexico Oceanic	2012
Pygmy killer whale	Gulf of Mexico Oceanic	2012
Dwarf sperm whale	Gulf of Mexico Oceanic	2012
Pygmy sperm whale	Gulf of Mexico Oceanic	2012
Melon-headed whale	Gulf of Mexico Oceanic	2012
Sperm whale	Puerto Rico and US Virgin Islands stock	2010

Common bottlenose dolphin	Puerto Rico and US Virgin Islands stock	2011
Cuvier's beaked whale	Puerto Rico and US Virgin Islands stock	2011
Pilot whale, short-finned	Puerto Rico and US Virgin Islands stock	2011
Spinner dolphin	Puerto Rico and US Virgin Islands stock	2011
Atlantic spotted dolphin	Puerto Rico and US Virgin Islands stock	2011

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The mission of NOAA's National Marine Fisheries Service (NMFS) is "stewardship of living marine resources for the benefit of the nation through their science-based conservation and management and promotion of the health of their environment." As the research arm of the NMFS's Northeast Region, the Northeast Fisheries Science Center (NEFSC) supports the NMFS mission by "conducting ecosystem-based research and assessments of living marine resources, with a focus on the Northeast Shelf, to promote the recovery and long-term sustainability of these resources and to generate social and economic opportunities and benefits from their use." Results of NEFSC research are largely reported in primary scientific media (*e.g.*, anonymously-peer-reviewed scientific journals). However, to assist itself in providing data, information, and advice to its constituents, the NEFSC occasionally releases its results in its own media. Currently, there are three such media:

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