COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*) Indian River Lagoon 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 (e.g., Caldwell 2001; Gubbins 2002; Zolman 2002; Mazzoil *et al.* 2005; Rosel *et al.* 2009; 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; Sellas *et al.* 2005; Balmer *et al.* 2008; Rosel *et al.* 2017).

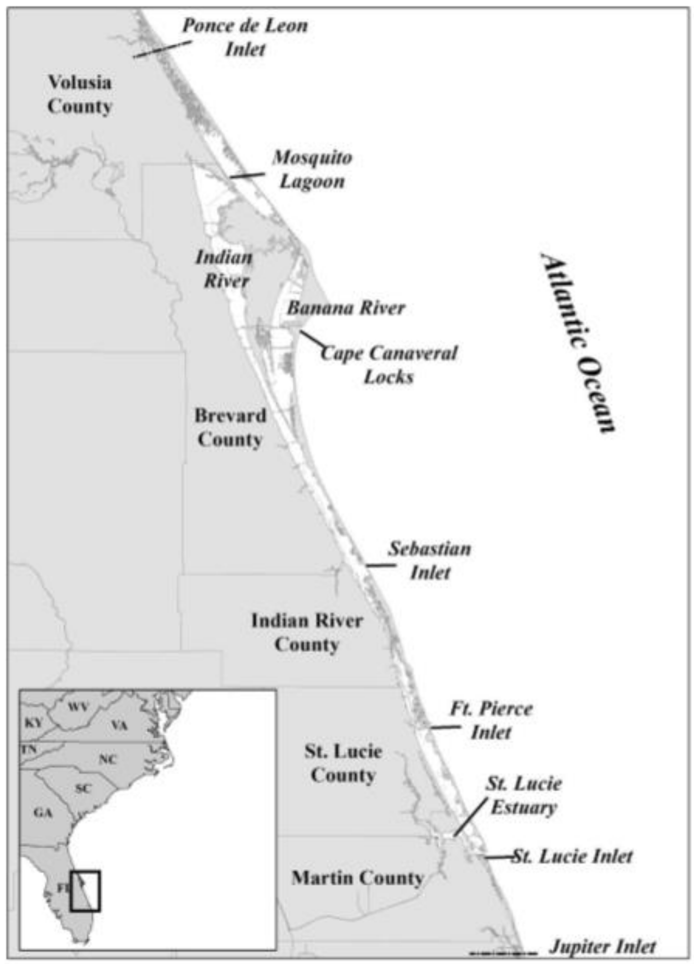

Figure 1. ***Geographic extent of the Indian River Lagoon Estuarine System (IRLES) Stock. Dashed lines denote the boundaries.***

Multiple studies utilizing varying methods such as photo-ID, radio telemetry, and genetics support the designation of common bottlenose dolphins in the Indian River Lagoon (IRL) as a distinct stock with long-term site fidelity to the region (Odell and Asper 1990; Mazzoil *et al.* 2005; Mazzoil *et al.* 2008a; Mazzoil *et al.* 2008b; Richards *et al.* 2013; Titcomb *et al.* 2015). Odell and Asper (1990) reported that none of the 133 freeze-branded dolphins from the IRL were observed outside of the system during their four-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. Mazzoil *et al.* (2005) identified some of these freeze-branded animals in their 1996–2001 photo-ID study, with some dolphins being seen in the IRL over twenty years. Several photo-ID studies have provided evidence for spatial separation and minimal 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; Mazzoil *et al.* 2011). However, two studies identified movement of some dolphins between the IRL and adjacent estuarine and/or coastal waters (Durden *et al.* 2011; Hartel *et al.* 2020; Mazzoil *et al.* 2020). Finally, within the IRL estuarine system, photo-ID and genetic data suggest multiple communities are present (Mazzoil *et al.* 2008a; Titcomb *et al.* 2015; Mazzoil *et al.* 2020). There is still a need to better understand movement patterns between the IRL and adjacent estuarine waters. Mazzoil *et al.* (2020) have suggested splitting the Mosquito Lagoon area out of the IRL estuarine system; further work to determine whether demographically independent populations inhabit these two areas will help determine whether this change should be made.

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; Durden *et al.* 2021).

Dolphins residing within estuaries north and south of this stock are currently not included in any Stock Assessment Report. It is unknown whether animals in estuarine waters south of the IRLES exhibit affiliation to the Biscayne Bay Stock or are simply transient animals associated with coastal stocks. Similarly, it is not known 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 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 2016–2020, there were 29 stranded common bottlenose dolphins in the region north of the IRLES in estuarine waters. There was evidence of human interaction for four of the strandings, including two interactions with hook and line fishing gear, one entanglement in commercial blue crab trap/pot gear, and one entanglement in unidentified rope/line. The two interactions with hook and line gear were both mortalities for which evidence suggested the hook and line gear contributed to cause of death. The entanglement in commercial blue crab trap/pot gear was a live release for which it could not be determined if the animal was seriously injured following mitigation efforts (initial determination was seriously injured; Maze-Foley and Garrison 2022). The entanglement in unidentified rope/line involved a live animal that shed the gear on its own and was considered not seriously injured (Maze-Foley and Garrison 2022). During 2016–2020 there was one estuarine stranding south of the IRLES for which evidence indicated interaction with an unknown fishery (healed scars). In addition to animals included in the stranding database, in estuarine waters north of the IRLES there was one at-sea observation of a dolphin entangled in commercial blue crab trap/pot gear. The dolphin shed the gear on its own and was considered not seriously injured (Maze-Foley and Garrison 2022).

POPULATION SIZE

The best available abundance estimate for the IRLES Stock of common bottlenose dolphins is 1,032 (95% CI:969–1,098; CV=0.03; Table 1). This is the mean estimate from four seasonal vessel-based capture-recapture photo-ID surveys conducted from summer 2016 to spring 2017 (Durden *et al.* 2021).

Earlier abundance estimates (>8 years old)

During photo-ID studies conducted in the IRLES for three years from 2002 to 2005, 615 common bottlenose dolphins with distinct dorsal fins were identified (Mazzoil *et al.* 2008a). This number of dolphins is comparable to abundances previously estimated (506–816 dolphins) based on small boat surveys (Mullin *et al.* 1990) and a mark-recapture study (Burn *et al.* 1987). 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 1,316 (CV=0.24) for winter 2002–2003 with an overall mean abundance of 662 (CV=0.09). 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. Further aerial surveys were conducted from fall 2005 to winter 2010–2011, and as in the prior aerial surveys, estimates varied seasonally and differences were most pronounced in the Mosquito Lagoon and southern Indian River (Durden *et al.* 2017). Estimates ranged from 483 (95% CI:345–672) in summer 2008 to 1,947 dolphins (95% CI:1,198–2,590) in winter 2009– 2010, with an overall mean abundance of 1,032 dolphins (95% CI:809–1,255) (Durden *et al.* 2017).

Recent surveys and abundance estimates

Durden *et al.* (2021) conducted four seasonal vessel-based capture-recapture photo-ID surveys between August 2016 and May 2017 to estimate abundance of common bottlenose dolphins of the IRLES Stock. A robust design was used, with four seasonal primary periods, each with three secondary sessions. Surveys extended from Ponce Inlet in the north to Jupiter Inlet in the south and encompassed all estuarine waters in between. Coastal waters were not surveyed. The survey design included both alternating saw-tooth transects and depth-contour lines (~743 km in total length). Data were analyzed using program MARK via the RMark package in R. Estimates ranged from 981 (95% CI:882–1,090; CV=0.05) in winter to 1,078 (95% CI:968–1,201; CV=0.05) in summer. These estimates were corrected for the proportion of unmarked individuals. As there was little evidence for temporary emigration or transience for the IRLES Stock as a whole and the four seasonal estimates were similar, the best estimate for the IRLES Stock was the mean of the four seasonal estimates, 1,032 (95% CI:969–1,098; CV=0.03; Table 1).

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 IRLES Stock is 1,032 (CV=0.03). The resulting minimum population estimate is 1,004 (Table 1).

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 1,004. 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 10.

Table 1. Best and minimum abundance estimates (Nest and Nmin) for the Indian River Lagoon Estuarine System Stock of common bottlenose dolphins with Maximum Productivity Rate (Rmax), Recovery Factor (Fr) and PBR.

Nest	CV Nest	Nmin	Fr	Rmax	PBR
1,032	0.03	1,004	0.5	0.04	10

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the IRLES Stock during 2016–2020 is unknown. The mean annual fishery-related mortality and serious injury during 2016–2020 based on strandings and at-sea observations identified as fishery-related (crab trap/pot and hook and line gear) was 3.9. Additional mean annual mortality and serious injury during 2016–2020 due to other human-caused sources was 1.8 (e.g., vessel strikes; see Other Mortality below). The minimum total mean annual human-caused mortality and serious injury for this stock during 2016–2020 was therefore 5.7 (Table 2). This is considered a minimum because 1) not all fisheries that could interact with this stock are observed and/or observer coverage is very low, 2) stranding data are the only data used as an indicator of fishery-related interactions and not all dead animals are recovered by the stranding network (Peltier *et al.* 2012; Wells *et al.* 2015; Carretta *et al.* 2016), 3) cause of death is not (or cannot be) routinely determined for stranded carcasses, 4) the estimate of fishery-related interactions includes an actual count of verified fishery-caused deaths and serious injuries and should be considered a minimum (NMFS 2016), and 5) strandings with evidence of fishery-related interactions occurred in waters north and south of the IRLES Stock boundary that are not included within any stock, and some or all of those strandings could have been part of this stock (see Stock Definition and Geographic Range section).

Fishery Information

There are three commercial fisheries that interact, or that potentially could interact, with this stock. These include two Category II fisheries (Southeastern U.S. Atlantic, Gulf of Mexico stone crab trap/pot and Atlantic blue crab trap/pot) and one Category III fishery (Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line)). Detailed fishery information is presented in Appendix III.

Note: Animals reported in the sections to follow were ascribed to a stock or stocks of origin following methods described in Maze-Foley et al. (2019). These include strandings, observed takes (through an observer program), fisherman self-reported takes (through the Marine Mammal Authorization Program), research takes, and opportunistic at-sea observations.

Trap/Pot

During 2016–2020 there were five documented entanglement interactions of common bottlenose dolphins in the IRLES area with trap/pot fisheries. During 2016 there was one mortality and one live animal disentangled from commercial blue crab trap/pot gear and released alive. It could not be determined (CBD) whether the animal was seriously injured following mitigation efforts (the initial determination was seriously injured (Maze-Foley and Garrison 2022). During 2017 there was one mortality in commercial blue crab trap/pot gear (the animal was also entangled in hook and line gear). Also in 2017, there was one animal entangled in unidentified trap/pot gear, and this animal was considered not seriously injured following mitigation efforts (initial determination was seriously injured; Maze-Foley and Garrison 2022). During 2020 there was one live animal disentangled from commercial blue crab trap/pot gear, and it could not be determined whether the animal was seriously injured following mitigation efforts (the initial determination was seriously injured (Maze-Foley and Garrison 2022). All of these entanglement interactions were documented within the stranding database (Table 3; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 15 June 2021). The two mortalities and two live entanglements that were CBD for serious injury (CBD cases were prorated based on previous assignable injury events; NMFS 2012; Maze-Foley and Garrison 2022) are included in the annual human-caused mortality and serious injury total for this stock (Table 2).

Since there is no observer program, it is not possible to estimate the total number of interactions or mortalities associated with these crab trap/pot fisheries. The documented interactions in this gear represent a minimum known count of interactions in the last five years.

Previous interactions between common bottlenose dolphins and the blue crab fishery in the IRLES were examined by Noke and Odell (2002), who observed behaviors that included dolphins closely approaching crab boats, begging, feeding on discarded bait and crab pot tipping to remove bait from the pot. See Noke and Odell (2002) for further information.

Hook and Line

During 2016–2020, within the IRLES area, there were 24 documented interactions within the stranding data of common bottlenose dolphins entangled in or with ingested hook and line fishing gear (in 2016 [n=4], 2017 [n=9], 2018 [n=3], 2019 [n=4] and 2020 [n=4]). During 2016, there were three mortalities and one live animal considered not seriously injured following mitigation efforts (the initial determination was seriously injured (Maze-Foley and Garrison 2022)). For two of the mortalities, available evidence suggested the hook and line gear did not contribute to cause of death, and for the third mortality, evidence suggested the gear did contribute to cause of death (this animal was also entangled in a monofilament cast net). During 2017, there were six mortalities; for three of these mortalities, evidence suggested the hook and line gear contributed to cause of death (one of these animals was also entangled in commercial blue crab trap/pot gear; one mortality was described in Marks *et al.* 2020), and for the remaining three mortalities, evidence suggested the hook and line gear did not contribute to cause of death. Also in 2017, there were three live animals considered not seriously injured following mitigation efforts (the initial determinations were seriously injured (Maze-Foley and Garrison 2022). During 2018, there were three mortalities; for two of these mortalities, evidence suggested the hook and line gear contributed to cause of death, and for the remaining mortality, evidence suggested the hook and line gear did not contribute to cause of death. During 2019, there were also three mortalities; for two of these mortalities, evidence suggested the hook and line gear contributed to cause of death, and for the remaining mortality, evidence suggested the hook and line gear did not contribute to cause of death. Also in 2019, one live animal was considered seriously injured (Maze-Foley and Garrison 2022). During 2020, there were also three mortalities; for two of these mortalities, evidence suggested the hook and line gear contributed to cause of death, and for the remaining mortality, it could not be determined whether the hook and line gear contributed to cause of death. Also in 2020, there was one live animal for which it could not be determined whether the animal was seriously injured following mitigation efforts (the initial determination was seriously injured [Maze-Foley and Garrison 2022]). The 10 mortalities for which evidence suggested the hook and line gear contributed to cause of death, the one serious injury, and the one live animal for which it could not be determined (CBD) whether it was seriously injured (the CBD case was prorated based on previous assignable injury events; NMFS 2012; Maze-Foley and Garrison 2022) are included in the annual human-caused mortality and serious injury total for this stock (Table 2). All of these cases were included in the stranding database and in the stranding totals presented in Table 3 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 15 June 2021).

In addition to the interactions documented within the stranding data, seven live common bottlenose dolphins were observed at-sea (in 2016 [n=2], 2017 [n=1], 2019 [n=1] and 2020 [n=3]) entangled in hook and line fishing gear. Five dolphins were considered seriously injured and are included in the annual human-caused mortality and serious injury total for this stock (Table 2). The remaining two dolphins were considered not seriously injured (Maze-Foley and Garrison 2022).

It should be noted that, in general, it cannot be determined if rod and reel 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 observer program. The documented interactions in this gear represent a minimum known count of interactions in the last five years.

For additional information on historic interactions with hook and line gear for common bottlenose dolphins in the IRLES, see Stolen *et al.* (2012).

Other Mortality

During 2016–2020 within the IRLES area, there were six documented interactions of common bottlenose dolphins in other gear types or from other human-caused sources. There were four documented mortalities: one mortality (2016) involving an entanglement in a monofilament cast net (this animal was also entangled in hook and line gear); a second mortality (2017) had a large metal rod in its forestomach and severe lacerations to its rostrum; a third mortality (2018) resulted from entanglement in a navigational buoy; and a fourth mortality (2018) resulted from an entanglement in unknown fishing gear (this animal was also entangled in hook and line gear). In addition, there were two live animals considered not seriously injured following mitigation efforts (the initial determinations were seriously injured [Maze-Foley and Garrison 2022]). One live animal was entangled in a Hawaiian sling/spear and the other was trapped within a construction boom. All of these cases were included in the stranding database and in the stranding totals presented in Table 3 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 15 June 2021). Two of the mortalities are included in the annual human-caused mortality and serious injury total for this stock as part of "other takes" (Table 2). The two mortalities also entangled in hook and line gear are already counted under that gear type.

Also during 2016–2020 within the IRLES area, there were four documented mortalities of common bottlenose dolphins with evidence of a vessel strike. In two cases, evidence suggested the vessel strike contributed to cause of death, and these two mortalities are included in the annual human-caused mortality and serious injury total for this stock (Table 2). All of these cases were included in the stranding database and in the stranding totals presented in Table 3 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 15 June 2021). An earlier study by Bechdel *et al.* (2009), using data from 1996 to 2006, examined impacts of motorized vessels on common bottlenose dolphins in the IRLES suggested that continual vessel avoidance, lack of rest, and projected increases in anthropogenic impacts may result in chronic stress for dolphins inhabiting the IRLES.

In addition to the interactions documented within the stranding data and those described in the Hook and Line section above, during 2016–2020, seven live common bottlenose dolphins were observed at-sea (2017 [n=4], 2018 [n=2], and 2019 [n=1]) entangled in unidentified gear or with evidence of a vessel strike. Three animals were considered seriously injured due to entanglement in unidentified gear, and two were considered seriously injured due to a vessel strike (Maze-Foley and Garrison 2022). These five serious injuries are included in the annual human-caused mortality and serious injury total for this stock (Table 2).

All mortalities and serious injuries from known sources for the IRLES Stock are summarized in Table 2.

Table 2. Summary of the incidental mortality and serious injury of common bottlenose dolphins (**Tursiops truncatus*****) of the Indian River Lagoon Estuarine System Stock. The fisheries do not have an ongoing, federal observer program, so counts of mortality and serious injury were based on stranding data, at-sea observations, or fisherman self-reported takes via the Marine Mammal Authorization Program (MMAP). For strandings, at-sea counts, and fisherman self-reported takes, the number reported is a minimum because not all strandings, at-sea cases, or gear interactions are detected. See the Annual Human-Caused Mortality and Serious Injury section for biases and limitations of mortality estimates, and the Strandings section for limitations of stranding data. NA = not applicable. *Indicates the count would have been higher had it not been for mitigation efforts (see text for that specific fishery for further details).***

Fishery	Years	Data Type	Mean Annual Estimated Mortality	5-year Minimum Count Based on

			and Serious Injury Based on Observer Data	Stranding, At-Sea, and/or MMAP Data
Commercial Blue Crab Trap/Pot	2016–2020	Stranding Data and At-Sea Observations	NA	3.5*[a]
Unidentified Trap/Pot	2016–2020	Stranding Data and At-Sea Observations	NA	
Hook and Line	2016–2020	Stranding Data and At-Sea Observations	NA	16*[b]
Mean Annual Mortality due to commercial fisheries (2016–2020)			**3.9**	
Mean Annual Mortality due to other takes (2016–2020) (other fishing gear, unidentified gear, vessel strikes)			**1.8***	
Minimum Total Mean Annual Human-Caused Mortality and Serious Injury (2016–2020)			**5.7**	

a. Includes two cases of CBD which were prorated based on previous assignable injury events (NMFS 2012; Maze-Foley and Garrison 2022). There was one non-calf entanglement in which the post-mitigation determination was CBD, and this CBD was prorated as 0.46 (rounded to 0.5) serious injuries. There was one calf entanglement in which the post-mitigation determination was CBD, and it was prorated as a serious injury (1 serious injury). Therefore, the total for these two CBD cases was 1.5 serious injuries.

b. Includes one calf entanglement in which the post-mitigation determinations was CBD. The CBD was prorated as not seriously injured (0 serious injuries) based on previous assignable injury events (NMFS 2012; Maze-Foley and Garrison 2022).

Strandings

During 2016–2020, 187 common bottlenose dolphins were reported stranded within the IRLES Stock area (Table 3; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 15 June 2021). There was evidence of human interaction for 48 of the strandings. No evidence of human interaction was detected for 23 strandings, and for the remaining 116 strandings, it could not be determined if there was evidence of human interaction. Human interactions were from numerous sources, including entanglements with commercial blue crab trap/pot gear, hook and line gear, unidentified fishing gear, as well as a cast net, and a sling/spear. There was also a boom entrapment, an entanglement in a navigational buoy, evidence of vessel strikes for several animals, and an animal found with a metal rod in its forestomach. It should be noted that evidence of human interaction does not necessarily mean the interaction caused the animal's stranding or death. However, for any case for which it could be determined that a human interaction contributed to an animal's stranding, serious injury, or death, the case was included in the counts of mortality and serious injury in Table 2.

Stranding data 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; Carretta *et al.* 2016). 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.

For more information on historic stranding data (1977–2005) from the IRLES, see Stolen *et al.* (2007), who examined spatio-temporal aspects of strandings, age/sex specific mortality patterns and human-related mortality in the IRLES.

The IRLES Stock has been experiencing Unusual Mortality Events (UMEs) since at least 1982 (Lipscomb *et al.* 1994; Duignan *et al.* 1996; Bossart *et al.* 2010; Brightwell *et al.* 2020; https://www.fisheries.noaa.gov/national/marine-life-distress/active-and-closed-unusual-mortality-events). During the past 15 years, the IRLES has experienced three UMEs. From May to August of 2008, a total of 47 common 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 cause of this UME was undetermined. An additional UME occurred during 2013–2015 along the Atlantic coast of the U.S. and was attributed to morbillivirus (Morris *et al.* 2015). The total number of stranded common bottlenose dolphins from New York through North Florida (Brevard County) during the 2013–2015 UME was 1,614 (https://www.fisheries.noaa.gov/national/marine-life-distress/2013-2015-bottlenose-dolphin-unusual-mortality-event-mid-atlantic, accessed 13 November 2019). Most strandings and morbillivirus positive animals were recovered from the ocean side beaches rather than from within the estuaries, suggesting that coastal stocks may have been more impacted by this UME than estuarine stocks (Morris *et al.* 2015). However, several confirmed morbillivirus positive animals were recovered from within the IRLES Stock area.

Table 3. Common bottlenose dolphin strandings occurring in the Indian River Lagoon Estuarine System Stock area from 2016 to 2020, including the 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 15 June 2021). Please note HI does not necessarily mean the interaction caused the animal's death.

COUNTY		2016	2017	2018	2019	2020	TOTAL
Volusia	Total Stranded	8	7	9	7	5	36
	HI--Yes	3	3	7	1	3	17
	HI--No	3	0	1	0	0	4
	HI--CBD	2	4	1	6	2	15
Seminole	Total Stranded	0	0	0	0	0	0
Brevard	Total Stranded	36	22	24	23	33	138
	HI--Yes	4	7	4	7	2	24
	HI--No	5	3	4	0	4	16
	HI--CBD	27	12	16	16	27	98
Indian River	Total Stranded	1	0	2	0	1	4
	HI--Yes	0	0	2	0	0	2
	HI--No	1	0	0	0	0	1
	HI--CBD	0	0	0	0	1	1

St. Lucie	Total Stranded	0	3	0	1	1	5
	HI--Yes	0	2	0	0	0	2
	HI--No	0	1	0	0	0	1
	HI--CBD	0	0	0	1	1	2
Martin	Total Stranded	1	2	0	0	1	4
	HI--Yes	1	1	0	0	1	3
	HI--No	0	1	0	0	0	1
	HI--CBD	0	0	0	0	0	0
TOTAL	Total Stranded	46	34	35	31	41	187
	HI--Yes	8	13	13	8	6	48
	HI--No	9	5	5	0	4	23
	HI--CBD	29	16	17	23	31	116

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 (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. Mercury levels have also been found to be high in dolphins from the IRLES, with some levels associated with toxic effects in marine mammals (Durden *et al.* 2007; Stavros *et al.* 2007; 2008; 2011). In addition, concentrations appear to be higher in the northern portion of the IRLES compared to the southern portions (Schaefer *et al.* 2015; Titcomb *et al.* 2017). 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). However, there have been no reports of mortalities in the IRLES resulting solely from contaminant concentrations.

In addition to contaminants, other aspects of water quality of the IRLES are a serious concern. Nonpoint source sewage pollution from septic tanks is a major contributor of eutrophication, or nutrient over-enrichment, to the system (Barile 2018; Lapointe *et al.* 2020; Greller *et al.* 2021), and has led to persistent harmful algal blooms (HABs) within the IRLES (Lapointe *et al.* 2020; Laureano-Rosario *et al.* 2021). During 2011–2017 following unprecedented HABs, the IRLES experienced a widespread loss of ~95% of seagrass (Lapointe *et al.* 2020; Greller *et al.* 2021). Severe weather events, such as hurricanes, tropical storms, and El Niño periods, can also increase nutrient loads and contribute to HABs, and there is concern that with future changes in climate, such as an increase in intensity and occurrence of hurricanes and El Niño periods, the threats for HABs will increase within the IRLES (Phlips *et al.* 2020). Common bottlenose dolphins inhabiting the IRLES are at risk from exposure to and accumulation of neurotoxins produced by HAB species. Fire *et al.* (2020) examined liver tissue samples over 10 years and demonstrated that exposure to brevetoxin and saxitoxin occurred within dolphins in the IRLES even in the absence of detectable blooms. Health impacts of the toxin exposure are unknown (Fire *et al.* 2020). It should be noted that starting in December 2020, a high number of manatee mortalities have occurred in the IRLES as part of an ongoing manatee UME along the Atlantic Coast of Florida. The UME has been attributed to starvation due to the loss of seagrass within the IRLES as a result of poor water quality (https://myfwc.com/research/manatee/rescue-mortality-response/ume/). Whether the loss of seagrass beds may impact dolphin prey species such as pinfish that are dependent on those beds is unknown.

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%) live IRLES dolphins sampled between 2003 and 2007 (Bossart *et al.* 2010). In addition, approximately 6 to 10% of common bottlenose dolphins had lacaziosis (lobomycosis), a chronic mycotic disease of the skin caused by *Lacazia loboi* (Reif *et al.* 2006; Murdoch *et al.* 2008). There are no published reports of mortalities resulting solely from this disease. Finally, Bossart *et al.* (2015) examined mucocutaneous lesions in free ranging common bottlenose dolphins within the IRLES area and found the presence of orogenital sessile papillomas, cutaneous lobomycosis, tattoo skin disease, nonspecific chronic to chronic-active dermatitis, and epidermal hyperplasia. The study suggested the high prevalence of lesions may reflect chronic exposure to anthropogenic and environmental stressors, such as contaminants and infectious or inflammatory disease.

Feeding or provisioning of wild common bottlenose dolphins has been documented in Florida, including areas of the Indian River Lagoon (Marks *et al.* 2020). 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. There are links between provisioning wild dolphins, dolphin depredation of recreational fishing gear, begging behavior, and associated entanglement and ingestion of gear (Powell and Wells 2011; Christiansen *et al.* 2016; Hazelkorn *et al.* 2016; Powell *et al.* 2018).

STATUS OF STOCK

Common bottlenose dolphins in the western North Atlantic are not listed as threatened or endangered under the Endangered Species Act. However, this stock is considered strategic under the MMPA because the documented mortalities and serious injuries are incomplete and biased low, and likely exceed PBR when corrected for unrecovered carcasses. The documented minimum mean annual human-caused mortality for the IRLES stock for 2016–2020 was 5.7, with an annual average of 3.9 carcasses showing evidence of fishery interaction (crab trap/pot and hook and line gear) and 1.8 from other sources (e.g., vessel strikes, unknown fishing gear). This represents a minimum of nearly 60% of the IRLES Stock's PBR. However, it is likely the estimate of annual fishery-caused mortality and serious injury is biased low as indicated above (see Annual Human-Caused Mortality and Serious Injury section). Wells *et al.* (2015) estimated that the proportion of common bottlenose dolphin carcasses recovered in Sarasota Bay, a relatively open and more urbanized estuarine environment, was 0.33, indicating significantly more mortalities occur than are recovered. For a less developed area consisting of a more complex salt marsh habitat, the Barataria Bay Estuarine System, the estimated proportion of common bottlenose dolphin carcasses recovered was 0.16 (DWH MMIQT 2015). The Sarasota Bay recovery rate may be most appropriate for this stock given that much of the habitat is urbanized and relatively open. When annual human-caused mortality and serious injury is corrected for unrecovered carcasses using the 0.33 recovery rate (n=17), it exceeds the PBR for this stock based on a minimum abundance of 1,004. Total U.S. fishery-related mortality and serious injury for this stock is unknown, but at a minimum is greater 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 optimum sustainable population is unknown. There are insufficient data to determine population trends for this stock.

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