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 inshore areas of the southeastern United States (Caldwell 2001; Gubbins 2002a; Zolman 2002; Gubbins *et al.* 2003; 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 (Wells *et al.* 1987; Sellas *et al.* 2005; Balmer *et al.* 2008; Rosel *et al.* 2017).

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 regularly surveyed. Occasional surveys were made around 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 four seasons whereas transients were seen only in one or two seasons. Resident dolphins were observed from 10 to 116 times, whereas transients were observed fewer than nine 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 two 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.

Griffin *et al.* (2021) used genetic and photo-ID data to examine fine-scale population structure of common bottlenose dolphins in northern Georgia, from the southern Savannah River channel to northern Ossabaw Sound, which encompassed the southernmost portion of the Northern Georgia/Southern South Carolina Estuarine System (NGSSCES) Stock and a small portion of the northernmost section of the Central Georgia Estuarine System (CGES) Stock. No significant genetic differentiation was found among three a priori defined regions within the study area when the full sample set was utilized, but after using photo-ID data to identify dolphins with ≥ 10 sightings and assigning them to the region they utilized most, a significant genetic difference was found between the north region and the other two regions. Further work is necessary to evaluate whether multiple demographically independent populations exist within the NGSSCES Stock.

The 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 (Table 1).

Earlier abundance estimates (>8 years old)

Data collected by Gubbins (2002b) were incorporated into a larger study that used mark-recapture analyses to calculate abundance in four 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 could not be considered a reliable estimate of abundance for this stock.

Minimum Population Estimate

No current information on abundance is available to calculate a minimum population estimate for the NGSSCES Stock of common 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 (Table 1).

Table 1. Best and minimum abundance estimates (Nest and Nmin) for the Northern Georgia/Southern South Carolina Estuarine System Stock of common bottlenose dolphins with Maximum Productivity Rate (Rmax), Recovery Factor (Fr) and PBR.

Nest	CV Nest	Nmin	Fr	Rmax	PBR
Unknown	-	Unknown	0.5	0.04	Unknown

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the NGSSCES 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 was 1.3. Additional mean annual mortality and serious injury during 2016–2020 due to other human-caused sources was 0.2 (vessel strike). The minimum total mean annual human-caused mortality and serious injury for this stock during 2016–2020 was therefore 1.5 (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 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, and 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).

Fishery Information

There are two commercial fisheries that interact, or potentially interact, with this stock. These include 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. 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 six documented entanglement interactions of common bottlenose dolphins in the NGSSCES Stock area with crab trap/pot gear. For five of the six cases, the gear was confirmed to be commercial blue crab trap/pot gear, and for the remaining case, the gear was unidentified trap/pot gear. During 2016, there was one mortality, and during 2017, there were two mortalities. During 2018, there was one mortality and one animal released alive, and it could not be determined (CBD) whether the live animal was seriously injured following mitigation efforts (the initial determination was seriously injured; Maze-Foley and Garrison 2022). During 2020, there was one mortality (unidentified gear). The five mortalities and one CBD for serious injury (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), and all six cases were documented within the stranding database (Table 3; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 15 June 2021).

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

Hook and Line (Rod and Reel)

During 2016–2020, within the NGSSCES area, there was one documented interaction within the stranding data of a common bottlenose dolphin entangled in hook and line fishing gear. The interaction occurred during 2020, and the live animal was considered seriously injured (Maze-Foley and Garrison 2022). This serious injury is included in the annual human-caused mortality and serious injury total for this stock (Table 2), and the case was 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).

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 interaction in this gear represents a minimum known count of interactions in the last five years.

Other Mortality

During 2016–2020 within the NGSSCES area, there was one common bottlenose dolphin released alive in 2016 considered not seriously injured following entanglement in research gillnet gear (bonnethead shark research; Maze-Foley and Garrison 2022), and one documented mortality in 2020 of a common bottlenose dolphin with evidence of a vessel strike (series of propeller wounds). Both of these interactions were included within the stranding database (Table 3; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 15 June 2021). The 2020 vessel strike mortality was 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 NGSSCES Stock are summarized in Table 2.

Table 2. Summary of the incidental mortality and serious injury of common bottlenose dolphins (*Tursiops truncatus*) of the Northern Georgia/Southern South Carolina 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 and Serious Injury Based on Observer Data	5-year Minimum Count Based on Stranding, At-Sea, and/or MMAP Data
Commercial Blue Crab Trap/Pot	2016–2020	Stranding Data and At-Sea Observations	NA	4.5*a
Unidentified Trap/Pot	2016–2020	Stranding Data and At-Sea Observations	NA	1
Hook and Line	2016–2020	Stranding Data and At-Sea Observations	NA	1
Mean Annual Mortality due to commercial fisheries (2016–2020)			**1.3**	
Mean Annual Mortality due to other takes (2016–2020) (vessel strike)			**0.2**	
Minimum Total Mean Annual Human-Caused Mortality and Serious Injury (2016–2020)			**1.5**	

a. Includes one non-calf entanglement in which the post-mitigation determination was CBD. The CBD was prorated as 0.46 (rounded to 0.5) serious injuries based on previous assignable injury events (NMFS 2012; Maze-Foley and Garrison 2022).

Strandings

During 2016–2020, 71 common bottlenose dolphins were reported stranded within the NGSSCES 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 14 of the strandings. No evidence of human interaction was detected for 20 strandings, and for the remaining 37 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, recreational trap/pot gear, hook and line gear, research gillnet gear, and evidence of a vessel strike. 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.

The NGSSCES Stock has been affected by two unusual mortality events (UMEs) during the past 15 years. A 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. 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).

Table 3. Common bottlenose dolphin strandings occurring in the Northern Georgia/Southern South Carolina 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.

Stock	Category	2016	2017	2018	2019	2020	Total
Northern Georgia/Southern South Carolina Estuarine System Stock	Total Stranded	18	13	19	7	14	71
	HI--Yes	4a	3b	4c	0	3d	14
	HI--No	5	6	2	1	6	20
	HI--CBD	9	4	13	6	5	37

a. Includes 1 entanglement in research gillnet gear (alive, not seriously injured) and 1 fishery interaction (FI), an entanglement interaction with commercial blue crab trap/pot gear (mortality).

b. Includes 2 FIs, both of which were entanglement interactions with commercial blue crab trap/pot gear (mortalities).

c. Includes 2 FIs, both of which were entanglement interactions with commercial blue crab trap/pot gear (1 mortality; 1 released alive, CBD if seriously injured).

d. Includes 1 mortality with evidence of a vessel strike and 2 FIs, 1 of which was entanglement interaction with hook and line gear (released alive, seriously injured) and the other was an entanglement interaction with recreational trap/pot gear (mortality).

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 Maruya 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 TBRE 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 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). Another study in the same Savannah study area by Hazelkorn *et al.* (2016) showed behavioral differences between beggar and non-beggar dolphins, and suggested a persistent behavioral shift may be taking place whereby dolphin-human interactions are increasing, which in turn could result in an increase in injuries to the dolphins. There are links between provisioning wild dolphins, dolphin depredation of recreational fishing gear, and associated entanglement and ingestion of gear (Powell and Wells 2011; Christiansen *et al.* 2016; Powell *et al.* 2018).

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 one 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, 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. While the abundance of the NGSSCES Stock is currently unknown, based on the previous abundance estimate (Gubbins *et al.* 2003), it is likely small and therefore relatively few mortalities and serious injuries would exceed PBR. The documented minimum mean annual human-caused mortality for the NGSSCES stock for 2016–2020 was 1.5, with an annual average of 1.3 primarily attributed to the blue crab trap/pot and 0.2 from other sources of human mortality (e.g., vessel strike). 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 Barataria Bay recovery rate may be most appropriate for this stock given that much of the habitat consists of tidal salt marshes. When annual human-caused mortality and serious injury is corrected for unrecovered carcasses using the 0.16 recovery rate (n=9.4), it exceeds the previous PBR based on an older minimum abundance for this stock of 117 (Gubbins *et al.* 2003). Total fishery-related mortality and serious injury for this stock is unknown, but at a minimum is greater than 10% of the previously 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 optimum sustainable population is unknown. There are insufficient data to determine population trends for this stock.

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