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 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).

The estuarine habitat within and around the Charleston, South Carolina, area comprises 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.

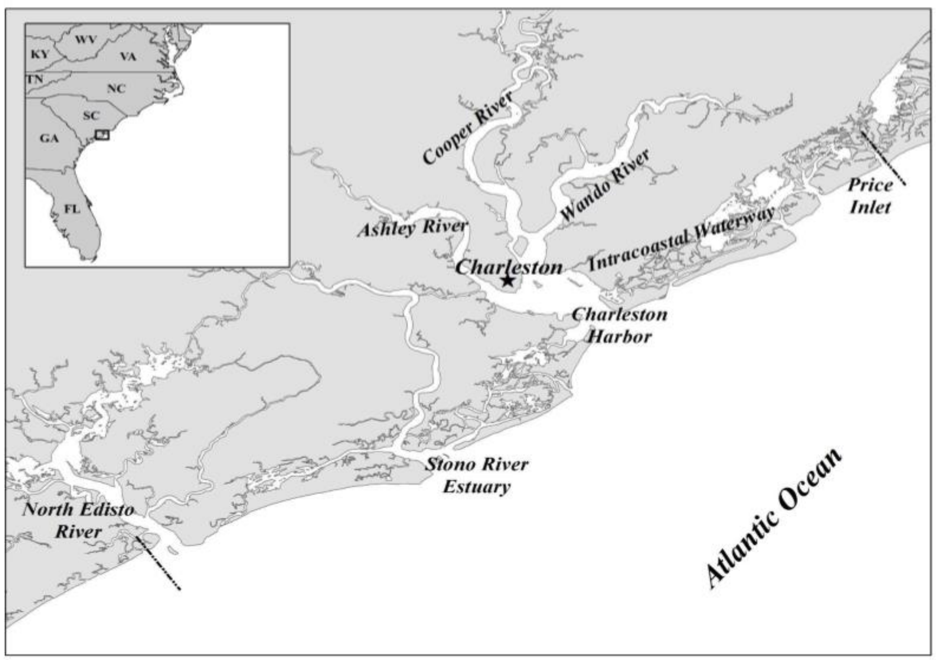

Figure 1. ***Geographic extent of the Charleston Estuarine System (CES) stock. Dashed lines denote the boundaries.***

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 the photo-ID findings of Zolman (2002) and illustrated the limited range of these dolphins between adjacent estuarine areas and the connective nature of the areas within the Charleston region (Speakman *et al.* 2006). 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 (Speakman *et al.* 2006), underscoring the resident nature of dolphins in this region. Finally, three adult males resident to the Stono River Estuary and Charleston Harbor areas (based on long-term sighting histories) were fitted with satellite transmitters within the Stono River Estuary in 2013, and telemetry results demonstrated use of nearshore coastal waters by these residents (Balmer *et al.* 2021).

Speakman *et al.* (2006) summarized photo-ID studies carried out from 1994 to 2003 on common 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 five 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 within the CES and 97% of the dolphins had high sighting frequencies in at least two areas, supporting the inclusion of the entire area as a single stock (Speakman *et al.* 2006). Charleston Harbor was identified as 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. Most (69%) 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 bounded to the north by Price Inlet and includes a stretch of the ICW approximately 13 km east-northeast of Charleston Harbor (Figure 1). 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 20 km 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. There are insufficient data to determine whether multiple demographically-independent stocks exist within the CES area as there have been no directed studies to address this question; however, photo-ID data indicate movement of individual dolphins throughout the region (Speakman *et al.* 2006).

POPULATION SIZE

The total number of common bottlenose dolphins residing within the CES Stock is unknown because previous estimates are more than 8 years old (Table 1; NMFS 2016).

Earlier abundance estimates (>8 years old)

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

No current information on abundance is available to calculate a minimum population estimate for the CES Stock of common bottlenose dolphins.

Current Population Trend

There are insufficient data to determine the population trends for this stock.

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 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. PBR for the CES Stock of common bottlenose dolphins is undetermined (Table 1).

Table 1. Best and minimum abundance estimates (Nest and Nmin) for the Charleston 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	Undetermined

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the CES 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 1.8. Additional mean annual mortality and serious injury during 2016–2020 due to other human-caused sources was 0.4 (entanglement in unidentified gear and vessel strike). The minimum total mean annual human-caused mortality and serious injury for this stock during 2016–2020 was therefore 2.2 (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) and not every recovered carcass with evidence of entanglement can be assigned to a fishery, 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 11 documented entanglement interactions of common bottlenose dolphins in the CES Stock area with crab trap/pot gear within the stranding data. For 10 of the 11 cases, the gear was confirmed to be commercial blue crab trap/pot gear, and for the remaining case, the identity of the gear was not confirmed. During 2016, there was one mortality. During 2017, 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 2018, there were two mortalities and two animals released alive, and it could not be determined whether the live animals were seriously injured following mitigation efforts (the initial determinations were seriously injured; Maze-Foley and Garrison 2022). During 2019, there was one mortality, one animal released alive considered seriously injured following mitigation efforts, and one animal released alive considered not seriously injured (no mitigation, the animal became disentangled on its own; Maze-Foley and Garrison 2022). During 2020 one animal was released alive (unidentified crab trap/pot gear case), 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). The five mortalities, one serious injury, and four CBD cases (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), and all 11 cases were documented within the stranding database (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, one live common bottlenose dolphin was observed at sea in 2018 entangled in unidentified trap/pot gear. It could not be determined whether the animal was seriously injured. This animal was included (prorated) 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.

Hook and Line (Rod and Reel)

During 2016–2020 within the CES area, there was one documented interaction of a common bottlenose dolphin with hook and line fishing gear. During 2017, there was one mortality for which monofilament line was found during the necropsy; however, it could not be determined whether the hook and line gear interaction contributed to cause of death. Thus, this case was not included in the annual human-caused mortality and serious injury total for this stock (Table 2), but it was included within the stranding database (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 CES area, there were two common bottlenose dolphins documented with evidence of vessel strikes, and two animals entangled in unidentified gear. During 2017, there was one mortality documented with propeller wounds including deep penetrating wounds. During 2019, an additional animal was documented with propeller wounds but the wounds were believed to be obtained post-mortem. During 2018, an animal was entangled in rope but disentangled itself and was considered not seriously injured (Maze-Foley and Garrison 2022). Also in 2018, an animal was entangled in unidentified buoy line (either a crab pot buoy or a dredge buoy) and was considered seriously injured (Maze-Foley and Garrison 2022). All four 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 2017 vessel strike mortality and 2018 unidentified buoy entanglement serious injury were 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 CES Stock are summarized in Table 2.

Table 2. Summary of the incidental mortality and serious injury of common bottlenose dolphins (**Tursiops truncatus*****) of the Charleston 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	7.8*a
Unidentified Trap/Pot	2016–2020	Stranding Data and At-Sea Observations	NA	1b
Hook and Line	2016–2020	Stranding Data and At-Sea Observations	NA	0
Mean Annual Mortality due to commercial fisheries (2016–2020)			**1.8**	
Mean Annual Mortality due to other takes (2016–2020) (unid gear entanglement and vessel strike)			**0.4**	
Minimum Total Mean Annual Human-Caused Mortality and Serious Injury (2016–2020)			**2.2**	

a. Includes four cases of CBD which were prorated based on previous assignable injury events (NMFS 2012; Maze-Foley and Garrison 2022). There were four cases of non-calf entanglements in which the post-mitigation determinations were CBD. The CBDs were prorated as 0.46 serious injuries for each (1.84 total, rounded to 1.8 serious injuries).

b. One case of CBD which was prorated based on previous assignable injury events (NMFS 2012; Maze-Foley and Garrison 2022). There was one non-calf entanglement in which the initial determination was a CBD (no mitigation), and this case was prorated as a serious injury.

Strandings

During 2016–2020, 101 common bottlenose dolphins were reported stranded within the CES 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 22 of the strandings. No evidence of human interaction was detected for 36 strandings, and for the remaining 43 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, unidentified trap/pot gear, hook and line gear, an unidentified buoy line, marine debris/rope, and there was also evidence of vessel strikes. 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.

Table 3. Common bottlenose dolphin strandings occurring in the Charleston 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
Charleston Estuarine System Stock	Total Stranded	19	19	18	32	13	101
	HI--Yes	3[a]	5[b]	6[c]	6[d]	2[e]	22
	HI--No	9	8	3	13	3	36
	HI--CBD	7	6	9	13	8	43

a. Includes 1 fishery interaction (FI), an entanglement interaction with commercial blue crab trap/pot gear (mortality).

b. Includes 1 mortality with evidence of a vessel strike and 3 FIs, 2 of which were entanglement interactions with commercial blue crab trap/pot gear (1 mortality; 1 released alive, CBD if seriously injured) and 1 was an entanglement interaction with hook and line gear (mortality).

c. Includes 1 entanglement interaction with an unidentified buoy (released alive, seriously injured), 1 entanglement interaction with rope (released alive, not seriously injured), and 4 FIs, consisting of 4 entanglement interactions with commercial blue crab trap/pot gear (2 mortalities; 2 released alive, CBD if seriously injured).

d. Includes 1 mortality with evidence of a vessel strike and 3 FIs, all of which were entanglement interactions with commercial blue crab trap/pot gear (1 mortality; 1 released alive seriously injured; and 1 released alive, not seriously injured).

e. Includes 1 fishery interaction (FI), an entanglement interaction with unidentified trap/pot gear (released alive, CBD if seriously injured).

The CES 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. Ten strandings assigned to the CES 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).

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. Charleston Harbor, a busy harbor containing five shipping terminals (Weinpress-Galipeau *et al.* 2021), has been identified as a core area for the stock (Bouchillon *et al.* 2019). Strandings in South Carolina were greater near urban areas and those with agricultural input (McFee and Burdett 2007).

Numerous studies have investigated chemical contaminant concentrations and potential associated health risks for common bottlenose dolphins in the CES. An early study measured blubber concentrations of persistent organic pollutants 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 five 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 and DDT in CES dolphins were more intermediate as compared to the other coastal locations (Kucklick *et al.* 2011).

Perfluoroalkyl compounds have also been measured from the plasma of common 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, perfluorodecanoic acid 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 along the U.S. Atlantic coast where the disease has resulted in UMEs. Serum samples from dolphins within the CES area have negative titers of antibodies to both dolphin morbillivirus and porpoise morbillivirus (Rowles *et al.* 2011, Bossart *et al.* 2010), indicating that sampled dolphins have not been exposed to morbillivirus in recent years. Therefore, CES dolphins likely have low levels of protective antibodies and could be vulnerable to infection if the disease were to be introduced into the stock.

During 2003–2013, Bossart *et al.* (2015) examined mucocutaneous lesions in free-ranging common bottlenose dolphins within the CES area and found the presence of orogenital sessile papillomas, nonspecific chronic to chronic-active dermatitis, and epidermal hyperplasia. The study suggested the prevalence of lesions may reflect chronic exposure to anthropogenic and environmental stressors, such as contaminants and infectious or inflammatory 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, 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 CES Stock is currently unknown, based on previous abundance estimates (Waring *et al*. 2015), 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 CES stock for 2016–2020 was 2.2, with an annual average of 1.8 primarily attributed to the blue crab trap/pot and 0.4 from other sources of human mortality (e.g., unknown fishing gear, vessel strikes). 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 river channels, tidal creeks, and salt marshes. When annual human-caused mortality and serious injury is corrected for unrecovered carcasses using the 0.16 recovery rate (n=13.8), it exceeds the previous PBR for this stock based on a minimum abundance of 281. 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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