COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*) Florida Bay Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Common bottlenose dolphins are distributed throughout the bays, sounds, and estuaries (BSE) 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 estuarine 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; Wells *et al.* 2017; Balmer *et al.* 2018). In many cases, residents occur predominantly within estuarine waters, with limited movements through passes to the Gulf of Mexico (Shane 1977; 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; Wells *et al.* 2017).

Genetic data also support the concept of relatively discrete, demographically independent BSE populations in the Gulf of Mexico (Duffield and Wells 2002; Sellas *et al.* 2005; Rosel *et al.* 2017). 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 genetic population differentiation among all areas. Genetic data also indicate restricted genetic exchange between and demographic independence of BSE populations and those occurring in adjacent Gulf coastal waters (Sellas *et al.* 2005; Rosel *et al.* 2017). Photo-ID and genetic data from several inshore areas of the southeastern United States Atlantic coast also support the existence of resident estuarine animals and 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).

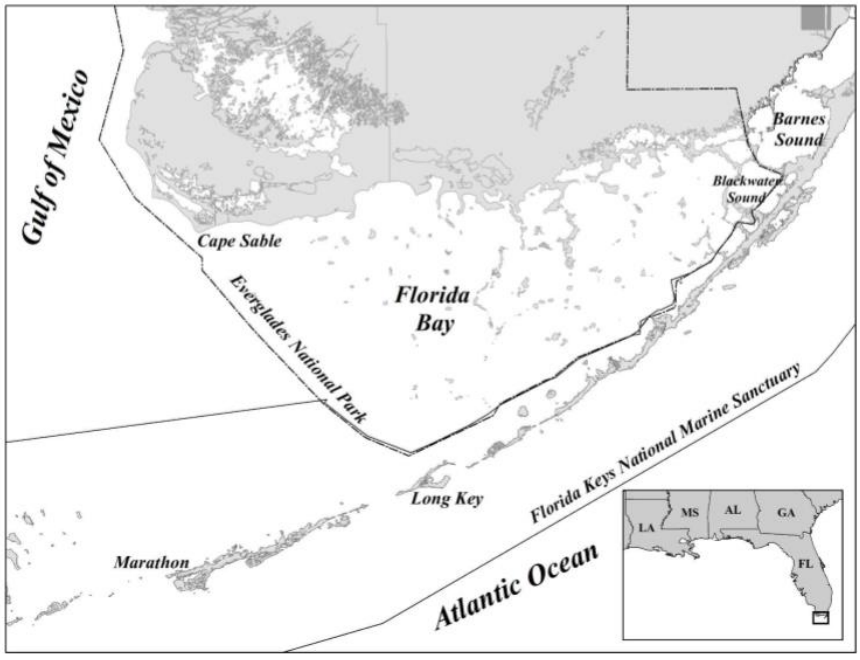

Figure 1. ***Geographic extent of the Florida Bay Stock. The boundaries of Everglades National Park and Florida Keys National Marine Sanctuary are shown.***

Florida Bay is a shallow estuarine system that encompasses 2,200 km2 of interconnected basins, grassy mud banks and mangrove islands. Florida Bay is bordered by the Florida mainland to the north, by the Florida Keys and Atlantic Ocean to the southeast, and by the Gulf of Mexico to the west. The western boundary of the Everglades National Park is generally considered to be the boundary between Florida Bay and the Gulf of Mexico. Here, Barnes Sound is not considered to be part of Florida Bay (Figure 1). Florida Bay was historically fed by runoff from the Everglades through marsh-like prairies called sloughs and a number of nearby creeks or inlets. The Bay connects through smaller inlets to Biscayne Bay, between Blackwater Sound and Barnes

Sound. Freshwater flow from the Everglades is a major influence on the conditions within the Bay, particularly since tides have little effect on water levels due to mud banks that restrict water flow (Fourqurean and Robblee 1999).

During 1995–1997, aerial surveys were conducted in Florida Bay to census bird populations, and opportunistic sightings of common bottlenose dolphins were recorded. While these surveys did not estimate the abundance of common bottlenose dolphins, the surveys documented the presence of dolphins in Florida Bay throughout the year (McClellan *et al.* 2000). Engleby *et al.* (2002) also recorded dolphins year round in a photo-ID study performed during 1999–2000 with the majority of sightings in the southern portion of the bay. Torres (2007) conducted surveys during summers (June–August) from 2002 to 2005 and found that dolphins were present in all areas of the Bay. Sarabia *et al.* (2018) recorded dolphins in northern Florida Bay from Cape Sable to Flamingo, Florida. Biopsy sampling was conducted in 1998 and 2002 for contaminant analyses (Fair *et al.* 2003). Sub-samples were later used for genetic analysis which revealed significant genetic differentiation between Florida Bay and Biscayne Bay to the northeast (Litz *et al.* 2012). There is insufficient information to determine whether the Florida Bay stock comprises multiple demographically independent populations.

The Florida Bay resident stock of common bottlenose dolphins is considered to occur both within the bounds of Florida Bay and within the Gulf of Mexico-side portion of the Florida Keys National Marine Sanctuary (FKNMS) southwest to Marathon, Florida (Figure 1). The western boundary of the stock area follows the COLREGs line from Cape Sable in the north to the west side of Long Key in the south. The range of the resident animals is unknown. There is evidence that transient animals occur within the Florida Bay boundaries, including offshore morphotype animals that move onshore from nearby oceanic waters (Litz *et al.* 2012), although the frequency of this occurrence is unknown. The boundaries for the Florida Bay Stock are subject to change upon further study of dolphin home ranges within the Florida Bay estuarine system.

POPULATION SIZE

The total number of common bottlenose dolphins residing within the Florida Bay Stock is unknown (Table 1).

Earlier abundance estimates (>8 years old)

From November 1998 to June 2002, year-round surveys were conducted in Florida Bay, documenting 230 unique individuals (Engleby and Powell 2019). Torres (2007) conducted surveys of Florida Bay in the summers of 2002 through 2005 and documented 437 unique individuals. However, neither of these counts distinguished resident from non-resident animals in the Bay and so may be overestimates of the number of resident animals.

Minimum Population Estimate

No current information on abundance is available to calculate a minimum population estimate for the Florida Bay 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 Florida Bay Stock of common bottlenose dolphins is unknown. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP), is assumed to be 0.5 because this stock is of unknown status. PBR for the Florida Bay Stock of common bottlenose dolphins is undetermined.

Table 1. Best and minimum abundance estimates (Nest and Nmin) for the Florida Bay 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 Florida Bay 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 0.2. No additional mortality or serious injury was documented from other human-caused sources. The minimum total mean annual human-caused mortality and serious injury for this stock during 2016–2020 was therefore 0.2 (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 used as an indicator of fishery-related interactions and not all dead animals are recovered by the stranding network, especially in an area such as Florida Bay where human inhabitation of the shoreline is sparse (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).

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.

Fishery Information

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

Most of Florida Bay lies within the boundaries of the Everglades National Park with a smaller portion that lies within the FKNMS. Commercial fishing in the Everglades National Park is prohibited. The majority of recreational fishing is hook and line, although cast nets are also used.

Trap/Pot

During 2016–2020, there were two documented entanglement interactions of common bottlenose dolphins in Florida Bay associated with trap/pot fisheries. In 2017, one animal was disentangled from both commercial stone crab trap/pot gear and commercial spiny lobster trap/pot gear and released alive. In 2020, one animal was disentangled from commercial stone crab trap/pot gear and released alive. For both cases, it could not be determined (CBD) if the animals were seriously injured following mitigation efforts (the initial determinations were seriously injured for both (Maze-Foley and Garrison 2022). The two CBD cases were prorated based on previous assignable injury events (NMFS 2012; Maze-Foley and Garrison 2022) and are included in the annual human-caused mortality and serious injury total for this stock (Table 2), and were also 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 these crab and lobster 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, there were no documented mortalities or serious injuries of common bottlenose dolphins involving hook and line gear entanglement or ingestion. The most recent documented interaction with this fishery was a serious injury that occurred in 2011. It is not possible to estimate the total number of interactions with hook and line gear because there is no observer program.

Other Mortality

There were no additional documented mortalities or serious injuries besides those described in the crab and lobster pots section above. All mortalities and serious injuries from known sources for the Florida Bay Stock are summarized in Table 2.

Table 2. Summary of the incidental mortality and serious injury of common bottlenose dolphins (*Tursiops *truncatus) of the Florida Bay 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 Stone Crab and Commercial Spiny Lobster Trap/Pot (both gear types)	2016–2020	Stranding Data and At-Sea Observations	NA	0.5*[a]
Commercial Stone Crab Trap/Pot	2016–2020	Stranding Data and At-Sea Observations	NA	0.5*[a]
Hook and Line	2016–2020	Stranding Data and At-Sea Observations	NA	0
Mean Annual Mortality due to commercial fisheries (2016–2020)			**0.2**	
Mean Annual Mortality due to other takes (2016–2020)			**0**	
Minimum Total Mean Annual Human-Caused Mortality and Serious Injury (2016–2020)			**0.2**	

a. Includes 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 post-mitigation determination was CBD. The CBD was prorated as 0.46 serious injury (rounded to 0.5).

Strandings

During 2016–2020, 14 common bottlenose dolphins were reported stranded within the boundaries of the Florida Bay Stock (Table 3; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 15 June 2021). Evidence of human interaction was found for two animals. For the remaining 12 animals, it could not be determined if there was evidence of human interactions. The two human interactions were from entanglements with trap/pot gear as described above. 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.

The majority of stranding reports came from the portion of Florida Bay contained within the FKNMS, likely associated with the higher human population in this area and thus, a higher likelihood of a stranding being discovered and reported. 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 Florida Bay 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
Florida Bay Stock	Total Stranded	4	2	2	4	2	14
	HI--Yes	0	1[a]	0	0	1[b]	2
	HI--No	0	0	0	0	0	0
	HI--CBD	4	1	2	4	1	12

a. An entanglement interaction with commercial stone crab and commercial spiny lobster trap/pot gear (released alive, CBD if seriously injured).

b. An entanglement interaction with commercial stone crab trap/pot gear (released alive, CBD if seriously injured).

HABITAT ISSUES

Over the past several decades, large areas of the Everglades ecosystem have been significantly altered by engineered flood control and water distribution for urban and agricultural development. These alterations of freshwater flow into Florida Bay have resulted in increased algal blooms, mangrove and seagrass die-offs, trophic community shifts and changes in salinity. In response, multiple federal, state, county and local agencies are working on a Comprehensive Everglades Restoration Program with the objective of restoring the natural flows of water, water quality and more natural hydro-periods within the ecosystem. As one of the largest ecosystem restoration efforts in the United States, projects are on-going and will likely impact physical and biotic parameters in Florida Bay. While it is unknown how alterations in water flow historically affected common bottlenose dolphin abundance and distribution, it is known that common bottlenose dolphins are a good indicator species to monitor the future health of this ecosystem due to the overlap between dolphin foraging behavior and abundant fish populations (see Torres and Urban 2005).

There is some concern about the potential effect of contaminants on the health of common bottlenose dolphins in Florida Bay, due to their proximity to large agricultural and industrial operations. Contaminants of concern include persistent organic pollutants and heavy metals such as mercury. The agricultural pesticide endosulfan is of particular concern, with the majority (76%) of endosulfan used in the southeast discharging into the Everglades and Florida Bay watershed (Pait *et al.* 1992). A study in 2003 collected remote biopsy samples and provided the first baseline data on levels of exposure to toxic persistent organic contaminants for dolphins in Florida Bay. Pesticides such as endosulfan were found at low or non-detectable concentrations (Fair *et al.* 2003). A review of available organochlorine exposure data from both dart biopsy and live-capture health assessment studies along the southeast U.S. coast indicate that contaminant levels were lowest for dolphins sampled in Florida Bay when compared to all other sites in the southeast U.S. Measured concentrations of total DDTs were lowest for dolphins sampled in Florida Bay. Reported total PCB concentrations were also lowest in Florida Bay and this was the only location in the southeast where samples fell below the toxic threshold value for total PCBs (Schwacke *et al.* 2004). Damseaux *et al.* (2017) confirmed persistent organic pollutant levels in common bottlenose dolphins from the Florida Coastal Everglades (FCE) were low compared to other populations of common bottlenose dolphins in the southeast U.S. However, the total mercury concentrations from male dolphins in the FCE were higher than other locations in Florida, such as the Florida Keys, Sarasota Bay, and the Indian River Lagoon (Damseaux *et al.* 2017). Although the effects of mercury on dolphins are unknown (see Kershaw and Hall 2019 for a review), high mercury concentrations from the FCE including Florida Bay

raise concerns about potential health impacts on common bottlenose dolphins (Damseaux *et al.* 2017). There are no estimates of indirect human-caused mortality from pollution or habitat degradation.

STATUS OF STOCK

Common bottlenose dolphins in the northern Gulf of Mexico are not listed as threatened or endangered under the Endangered Species Act, and the Florida Bay Stock is not considered strategic under the MMPA. The documented mean annual human-caused mortality for this stock for 2016–2020 was 0.2. However, it is likely the estimate of annual human-caused, including 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 it is a less developed area with a complex habitat. When annual human-caused mortality and serious injury is corrected for unrecovered carcasses using the 0.16 recovery rate (n=1.3), it does not exceed the previous PBR for this stock based on a minimum abundance estimate of 447. 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 optimum sustainable population is unknown. There are insufficient data to determine the population trends for this stock.

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