COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Barataria Bay Estuarine System Stock

NOTE – NMFS is in the process of writing individual stock assessment reports for each of the 31 bay, sound and estuary stocks of common bottlenose dolphins in the Gulf of Mexico. Until this effort is completed and 31 individual reports are available, some of the basic information presented in this report will also be included in the report: "Northern Gulf of Mexico Bay, Sound and Estuary Stocks."

STOCK DEFINITION AND GEOGRAPHIC RANGE

Common bottlenose dolphins are distributed throughout the bays, sounds, and estuaries (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 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, 1996b; Wells *et al.* 1997; Weller 1998; Maze and Würsig 1999; Lynn and Würsig 2002; Wells 2003; Hubard *et al.* 2004; Irwin and Würsig 2004; Shane 2004; Balmer *et al.* 2008; Urian *et al.* 2009; Bassos-Hull *et al.* 2013). In many cases, residents occur predominantly within estuarine waters, with limited movements through passes to the Gulf of Mexico (Shane 1977; Shane 1990; Gruber 1981; Irvine *et al.* 1981; Shane 1990; Maze and Würsig 1999; Lynn and Würsig 2002; Fazioli *et al.* 2006; Bassos-Hull *et al.* 2013; Wells *et al*. 2017). Genetic data also support the presence of relatively discrete BSE stocks (Duffield and Wells 2002; Sellas *et al.* 2005). Sellas *et al.* (2005) examined population subdivision among dolphins sampled in Sarasota Bay, Tampa Bay, and Charlotte Harbor, Florida; Matagorda Bay, Texas; and the coastal Gulf of Mexico (1–12 km offshore) from just outside Tampa Bay to the south end of Lemon Bay, and found evidence of significant genetic population differentiation among all areas. The Sellas *et al.* (2005) findings support the identification of BSE populations distinct from those occurring in adjacent Gulf coastal waters. Rosel *et al.* (2017) also identified significant population differentiation between estuarine residents of Barataria Bay and the adjacent coastal stock. Differences in reproductive seasonality from site to site also suggest genetic-based distinctions among areas (Urian *et al.* 1996). Photo-ID and genetic data from several inshore areas of the southeastern United States also support the existence of resident estuarine animals and 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).

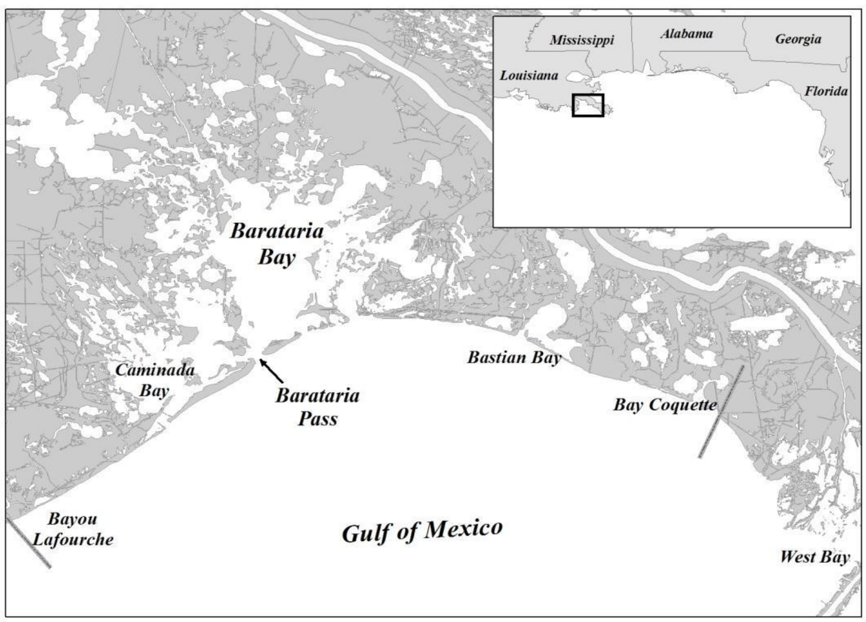

Figure 1. Geographic extent of the Barataria Bay Estuarine System Stock, located on the coast of Louisiana. The borders are denoted by solid lines.

Barataria Bay is a shallow (mean depth = 2 m) estuarine system located in central Louisiana. It is bounded in the west by Bayou Lafourche, in the east by the Mississippi River delta and in the south by the Grand Terre barrier islands. Barataria Bay is approximately 110 km in length and 50 km in width at its widest point where it opens into the Gulf of Mexico (Conner and Day 1987). This estuarine system is connected to the Gulf of Mexico by a series of passes: Caminada Pass, Barataria Pass, Pass Abel, and Quatre Bayou Pass. The margins of Barataria Bay include marshes, canals, small embayments, and channels. Bay waters are turbid, and salinity varies widely from south to north with the more saline, tidally influenced portions in the south and freshwater lakes in the north (U.S. EPA 1999; Moretzsohn *et al*. 2010). Barataria Bay, together with the Timbalier-Terrebonne Bay system (referred to as the Barataria-Terrebonne National Estuary Program), has been selected as an estuary of national significance by the Environmental Protection Agency National Estuary Program (see http://www.btnep.org/BTNEP/home.aspx). The marshes and swamp forests which characterize Barataria Bay supply breeding and nursery grounds for an assortment of commercial and recreational species of consequence, such as finfish, shellfish, alligators, songbirds, geese, and ducks (U.S. EPA 1999; Moretzsohn *et al*. 2010).

The Barataria Bay Estuarine System (BBES) Stock was designated in the first stock assessment reports published in 1995 (Blaylock *et al*. 1995). The stock area includes Caminada Bay, Barataria Bay east to Bastian Bay, Bay Coquette, and Gulf coastal waters extending 1 km from the shoreline (Figure 1). During June 1999–May 2002, Miller (2003) conducted 44 boat-based, photo-ID surveys in lower Barataria and Caminada Bays. Dolphins were present year-round, and 133 individual dolphins were identified. One individual was sighted six times, 42% were sighted two to six times, and 58% were sighted only once. More recently, Wells *et al.* (2017) deployed satellite-linked transmitters on 44 bottlenose dolphins captured within Barataria Bay during capture-release health assessments in August 2011, June 2013, and June 2014. It should be noted that the majority of tags were placed on animals captured in western Barataria Bay (see Wells *et al.* 2017 for tag deployment locations). Dolphins are known to inhabit eastern Barataria Bay (e.g., see Figure 1 in Rosel *et al.* 2017), but were not captured for tagging in far eastern waters due to logistical reasons. The tracking data found that the tagged dolphins remained within Barataria Bay, with a few animals occasionally entering coastal waters but venturing, on average, only out to approximately 1.7 km from shore (Wells *et al.* 2017). Telemetry data revealed three distinct ranging patterns for dolphins within the Bay, referred to as Island, West, and East. Island dolphins typically ranged near the western barrier islands of Grand Terre and Grande Isle and the nearby passes and Gulf waters within a few kilometers from the shoreline. West dolphins typically ranged in estuarine waters in the western portion of the Bay, such as Caminada Bay, West Champagne Bay, and Bassa Bassa Bay, as well as estuarine waters near Grand Isle and nearby Gulf waters within a few kilometers from the shoreline. East dolphins typically ranged in estuarine waters near the eastern barrier islands of East Grand Terre and Grand Pierre and in coastal marshes in eastern Barataria Bay. Tagged dolphins had relatively small home ranges (mean <70 km^2, Wells *et al.* 2017) within the BBES Stock area and displayed year-round, multi-year site fidelity to these home ranges, providing strong evidence of a year-round resident population in Barataria Bay. Molecular genetic analysis of population structure supported the telemetry data. Significant genetic differentiation was found at nuclear microsatellite DNA markers between dolphins sampled in Barataria Bay and those representing the Western Coastal Stock of common bottlenose dolphins that were sampled in coastal waters >2.5 km from shore outside of Barataria Bay (Rosel *et al.* 2017). In addition, the genetic analysis also suggested that there may be further partitioning within Barataria Bay (Rosel *et al.* 2017) similar to what was described from the telemetry data of Wells *et al*. (2017). Together the movement and genetic data provide strong evidence that the dolphins within Barataria Bay represent a demographically independent population separate from the dolphins inhabiting coastal waters. Both datasets also suggest it is plausible the BBES Stock contains multiple demographically independent populations, but further work is needed to better understand how the habitat is partitioned within the bay.

Dolphins residing in the estuaries southeast of this stock between BBES and the Mississippi River mouth (West Bay) are not currently covered in any stock assessment report. There are insufficient data to determine whether animals in this region exhibit affiliation to the BBES Stock or should be designated as their own stock. Further research is needed to establish affinities of dolphins in this region and could result in revision to the eastern and/or western BBES Stock boundary. During 2015–2019, no bottlenose dolphins were reported stranded to the southeast of BBES.

POPULATION SIZE

The best available abundance estimate for the BBES Stock of common bottlenose dolphins is 2,071 (CV=0.06; 95%CI: 1,832–2,309; Table 1), which is from vessel-based capture-recapture photo-ID surveys conducted during March and April 2019 (Garrison *et al.* 2020).

Earlier Abundance Estimates (>8 years old)

Miller (2003) conducted boat-based, photo-ID surveys in lower Barataria and Caminada Bays from June 1999 to May 2002. Miller (2003) identified 133 individual dolphins, and using closed-population unequal catchability models in the program CAPTURE, produced an abundance estimate of 138–238 (95%CI: 128–297) for the study area. Miller's (2003) estimate covered only a portion of the area of the BBES Stock and did not include a correction for the unmarked portion of the population. Therefore, the estimate is considered negatively biased.

McDonald *et al.* (2017) conducted vessel-based capture-mark-recapture (CMR) photo-ID surveys from June 2010 to May 2014 to estimate density and abundance of common bottlenose dolphins within Barataria Bay during and after the *Deepwater Horizon* (DWH) oil spill. The study area included ~27% of the stock's area including the estuarine waters from the barrier islands of Grand Isle and Grande Terre, Louisiana, north and west into the main waters of Barataria Bay (McDonald *et al.* 2017). A spatially-explicit robust-design CMR model was used to estimate survival and density for each of 10 primary survey periods, and density and abundance estimates were adjusted for the proportion of the population that had non-distinctive fins. Suitable common bottlenose dolphin habitat (defined as average salinity >7.89 ppt) within the stock area was defined based upon a combined analysis of tag telemetry data (Wells *et al.* 2017) and average salinity maps (Hornsby *et al.* 2017). Common bottlenose dolphin density differed significantly among habitats near barrier islands, the eastern portion of the bay, and the western portion of the bay during the CMR study. Therefore, three habitat-specific densities from the surveyed area were estimated and these were then each appropriately expanded to the entire available suitable dolphin habitat in Barataria Bay (McDonald *et al.* 2017). Extrapolation of density estimates was therefore informed by habitat preferences of dolphins within Barataria Bay and did not include areas dominated by fresh water or shallow marsh habitats that are not suitable dolphin habitats. Primary period abundances ranged from 1,303 dolphins (95% CI: 1,164–1,424) in June 2010 to 3,150 dolphins (95%CI: 2,759–3,559) in April 2014. The mean abundance for the BBES Stock estimated across the 10 CMR surveys was 2,306 dolphins (95%CI: 2,014–2,603; CV=0.09; McDonald *et al.* 2017). There were no clear seasonal or interannual temporal patterns in abundance. Key uncertainties in this abundance estimate include use of extrapolation from the surveyed area to a total stock abundance based on a preferred habitat model (McDonald *et al.* 2017; Hornsby *et al.* 2017). Also, the surveys for this abundance estimate were conducted during the DWH oil spill event and therefore may not accurately represent the post oil-spill abundance as it does not account for mortality that occurred after 2014 due to the spill.

Recent Surveys and Abundance Estimates

Vessel-based CMR photo-ID surveys were conducted from 14 March to 1 April 2019 (Garrison *et al.* 2020). The surveyed area was expanded from that covered by DWH NRDA surveys (McDonald *et al.* 2017) to include the eastern and northern portions of the Bay. Data were analyzed with MARK version 9.0 software (White and Burnham 1999) using closed population CMR methods. Models were analyzed using the Full-Likelihood (Otis *et al.* 1978) and conditional (Huggins 1989) approaches, with similar results for both methods. The results of the Full-Likelihood approach are reported here. Abundance estimates were adjusted for the proportion of the population that had non-distinctive fins (see Garrison *et al.* 2020), and the resulting best estimate was 2,071 (CV=0.06; 95%CI: 1,832–2,309; 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 of abundance for this stock of common bottlenose dolphins is 2,071 (CV=0.06). The minimum population estimate for the BBES Stock is 1,971 bottlenose dolphins (Table 1).

Current Population Trend

There are insufficient data to assess population trends for this stock. The surveyed areas and methodology between the two available estimates are too different to allow a reliable evaluation of 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 likely do not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995). The current productivity rate may be compromised by the DWH oil spill as Lane *et al.* (2015) and Kellar *et al.* (2017) reported negative reproductive impacts (see Habitat Issues section).

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; Wade 1998). The minimum population size of the BBES Stock of common bottlenose dolphins is 1,971. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.45 because the CV of the shrimp trawl mortality estimate for Louisiana BSE stocks is greater than 0.6 (Wade and Angliss 1997). PBR for this stock of common bottlenose dolphins is 18 (Table 1).

Table 1. Best and minimum abundance estimates for the Barataria Bay Estuarine System Stock of common bottlenose dolphins with Maximum Productivity Rate (R_{max}), Recovery Factor (F_r) and PBR.

N_{est}	N_{est} CV	N_{min}	F_r	R_{max}	PBR
2,071	0.06	1,971	0.45	0.04	18

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the BBES Stock of common bottlenose dolphins during 2015–2019 is unknown. Across Louisiana BSE stocks (from Sabine Lake east to Barataria Bay), the total annual estimated mortality for the shrimp trawl fishery was 45 (CV=0.65), but the portion of this attributed to the BBES Stock is unknown (see Shrimp Trawl section). The mean annual fishery-related mortality and serious injury during 2015–2019 for strandings and at-sea observations identified as fishery-related was 0. Additional mean annual mortality and serious injury during 2015–2019 due to other human-caused sources (fishery research, at-sea entanglements, gunshot wounds, and DWH oil spill) was 41. The minimum total mean annual human-caused mortality and serious injury for this stock during 2015–2019 was therefore 41 (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), 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), 5) the estimate does not include shrimp trawl bycatch (see Shrimp Trawl section), and 6) various assumptions were made in the population model used to estimate population decline for the northern Gulf of Mexico BSE stocks impacted by the DWH oil spill.

Fishery Information

There are four 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 shrimp trawl; and Gulf of Mexico menhaden purse seine); and two Category III fisheries (Gulf of Mexico blue crab trap/pot; and 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.

Shrimp Trawl

During 2015–2019, based on limited observer coverage in Louisiana BSE waters under the NMFS MARFIN program, there was one observed mortality and no observed serious injuries of common bottlenose dolphins from Gulf of Mexico BSE stocks by commercial shrimp trawls. Between 1997 and 2019, 13 common bottlenose dolphins and nine unidentified dolphins, which could have been either common bottlenose dolphins or Atlantic spotted dolphins, became entangled in the net, lazy line, turtle excluder device, or tickler chain gear in observed trips of the commercial shrimp trawl fishery in the Gulf of Mexico (Soldevilla *et al.* 2021). All dolphin bycatch interactions resulted in mortalities except for one unidentified dolphin that was released alive without serious injury in 2009 (Maze-Foley and

Garrison 2016). Soldevilla *et al.* (2015; 2016; 2021) provided mortality estimates calculated from analysis of shrimp fishery effort data and NMFS's Observer Program bycatch data. Limited observer program coverage of Louisiana BSE waters started in 2015, but has not yet reached sufficient levels for estimating BSE bycatch rates; therefore time-area stratified bycatch rates were extrapolated into inshore waters to estimate a five-year unweighted mean mortality estimate for 2015–2019 based on inshore fishing effort (Soldevilla *et al.* 2021). Because the spatial resolution at which fishery effort is modeled is aggregated into four state areas (e.g., Nance *et al.* 2008), the mortality estimate covers inshore waters of Louisiana from Sabine Lake east to Barataria Bay, not just the BBES Stock. The mean annual mortality estimate for Louisiana BSE stocks for the years 2015–2019 was 45 (CV=0.65; Soldevilla *et al.* 2021). If all of the mortality occurred in Barataria Bay, the mortality estimate would exceed PBR for this stock; however, because bycatch for the BBES Stock alone cannot be quantified at this time, the mortality estimate is not included in the annual human-caused mortality and serious injury total for this stock. It should also be noted that this mortality estimate does not include skimmer trawl effort, which accounts for 61% of shrimp fishery effort in western Louisiana inshore waters, because Observer Program coverage of skimmer trawls is limited. Limitations and biases of annual bycatch mortality estimates are described in detail in Soldevilla *et al.* (2015; 2016; 2021).

In addition, chaffing gear from a commercial shrimp trawl was recovered in a dolphin carcass that stranded during 2015. It is likely the animal ingested the gear while removing gilled fish that were caught in the trawl net. This animal was ascribed to both the BBES and Western Coastal stocks, and it was included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 25 August 2020; Table 3).

Menhaden Purse Seine

During 2015–2019 there were no documented interactions between the menhaden purse seine fishery and the BBES Stock. The menhaden purse seine fishery operates in Gulf of Mexico coastal waters just outside the barrier islands of Barataria Bay (Smith *et al.* 2002). It has the potential to interact with dolphins of this stock that use nearshore coastal waters. Interactions have been reported for nearby coastal and estuarine stocks (Waring *et al.* 2015). Without an ongoing observer program, it is not possible to obtain statistically reliable information for this fishery on the number of sets annually, the incidental take and mortality rates, and the stocks from which bottlenose dolphins are being taken.

Blue Crab Trap/Pot

During 2015–2019 there were no documented interactions in commercial blue crab trap/pot gear for the BBES Stock. There is no observer coverage of crab trap/pot fisheries, so it is not possible to quantify total mortality.

Hook and Line (Rod and Reel)

During 2015–2019, two interactions with hook and line gear were documented within the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 25 August 2020; Table 3). In 2017, hook and line gear entanglement or ingestion were documented for one mortality and one animal released alive. For the live animal, it was initially seriously injured, but due to mitigation efforts, was released without serious injury (Maze-Foley and Garrison 2020). For the mortality, available evidence from the stranding data suggested the hook and line gear interaction did not contribute to the cause of death, and this animal was not included in the annual human-caused mortality and serious injury total for this stock (Table 2).

It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no observer program. The documented interactions in this gear represent a minimum known count of interactions in the last five years.

Other Mortality

A population model was developed to estimate long-term injury to stocks affected by the DWH oil spill (see Habitat Issues section), taking into account long-term effects resulting from mortality, reproductive failure, and reduced survival rates (DWH MMIQT 2015; Schwacke *et al.* 2017). For the BBES Stock, the model predicted the stock experienced a 51% (95%CI: 32–72) maximum reduction in population size due to the oil spill (DWH MMIQT 2015; DWH NRDAT 2016; Schwacke *et al.* 2017), and for the years 2015–2019, the model projected 204 mortalities (Table 2). This population model has a number of sources of uncertainty. The baseline population size was estimated from studies initiated after initial exposure to DWH oil occurred. Therefore, it is possible that the pre-spill population size was larger than this baseline level and some mortality occurring early in the event was not quantified. The duration of elevated mortality and reduced reproductive success after exposure is unknown, and expert opinion was used to predict the rate at which these parameters would return to baseline levels. Where possible, uncertainty in model parameters was included in the estimates of excess mortality by re-sampling from statistical distributions of the parameters (DWH MMIQT 2015; DWH NRDAT 2016; Schwacke *et al*. 2017).

During 2015–2019, one mortality was documented in Barataria Bay (in 2015) as a result of entanglement in a fishery research gillnet, and this animal was included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 25 August 2020) and in the totals presented in Table 3, as well as in the annual human-caused mortality and serious injury total for this stock (Table 2).

During 2015–2019, there was one at-sea observation during 2015 in Barataria Bay of a dolphin entangled around the head by a constricting strap. This animal was considered seriously injured (Maze-Foley and Garrison 2020) and was included in the annual human-caused mortality and serious injury total for this stock (Table 2).

NOAA's Office of Law Enforcement has been investigating increased reports from along the northern Gulf of Mexico coast of violence against bottlenose dolphins, including shootings via guns and bows and arrows, throwing pipe bombs and cherry bombs, and stabbings (Vail 2016). During 2015–2019, for one mortality, gunshot pellets were found during the necropsy. The gunshot occurred pre-mortem but was not believed to be the cause of death. This animal was included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 25 August 2020) and in the totals presented in Table 3, but was not included within the annual human-caused mortality and serious injury total for this stock (Table 2). From recent cases that have been prosecuted, it has been shown that fishermen became frustrated and retaliated against dolphins for removing bait or catch, or depredating, their fishing gear. It is unknown whether the 2019 shooting involved depredation.

Depredation of fishing catch and/or bait is a growing problem in Gulf of Mexico coastal and estuary waters and globally, and can lead to serious injury or mortality via ingestion of or entanglement in gear (e.g., Zollett and Read 2006; Read 2008; Powell and Wells 2011; Vail 2016), as well as changes to the dolphin's activity patterns, such as decreases in natural foraging (Powell and Wells 2011). It has been suggested that provisioning, or the illegal feeding, of wild common bottlenose dolphins, may encourage depredation because provisioning conditions dolphins to approach humans and vessels, where they then may prey on bait and catches (Vail 2016). Such conditioning increases risks of subsequent injury and mortality (Christiansen *et al.* 2016). Provisioning has been documented in the literature in Florida and Texas (Bryant 1994; Samuels and Bejder 2004; Cunningham-Smith *et al.* 2006; Powell and Wells 2011). To date, there are no records within the literature of provisioning for this stock area.

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

Table 2. Summary of the incidental mortality and serious injury of common bottlenose dolphins (Tursiops truncatus) of the Barataria Bay Estuarine System (BBES) Stock. For the shrimp trawl fishery, the bycatch mortality for the BBES Stock alone cannot be quantified at this time and the state-wide mortality estimate for Louisiana has not been included in the annual human-caused mortality and serious injury total for this stock (see Shrimp Trawl section). The remaining 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 (1 instead of 0) 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
Shrimp Trawl	2015–2019	Observer Data	Undetermined for this stock but may be non-zero (see Shrimp Trawl section)	NA

Menhaden Purse Seine	2015–2019	Pilot Observer Program (2011); MMAP fisherman self-reported takes	NA	0
Atlantic Blue Crab Trap/Pot	2015–2019	Stranding Data	NA	0
Hook and Line	2015–2019	Stranding Data and At-Sea Observations	NA	0*
Mean Annual Mortality due to commercial fisheries (2015–2019)			**0**	
Research Takes (fishery research; 5-year Count)			1	
Other Takes (at-sea entanglements, gunshot wound; 5-year Count)			1	
Mortality due to DWH (5-year Projection)			204	
Mean Annual Mortality due to research takes, other takes, and DWH (2015–2019)			**41**	
Minimum Total Mean Annual Human-Caused Mortality and Serious Injury (2015–2019)			**41**	

Strandings

During 2015–2019, 138 common bottlenose dolphins were reported stranded within the BBES area (Table 3; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 25 August 2020). There was evidence of human interaction (HI) for 10 of the strandings. No evidence of human interaction was detected for 14 strandings, and for the remaining 114 strandings, it could not be determined if there was evidence of human interaction. Human interactions were from numerous sources, including two entanglements with hook and line gear, one incidental take in a research gillnet, one mortality with evidence of gunshot wound, and one animal with evidence of a vessel strike (Table 3). It should be noted that evidence of human interaction does not necessarily mean the interaction caused the animal's stranding or death.

The assignment of animals to a single stock is impossible in some regions where stocks overlap, especially in nearshore coastal waters (Maze-Foley *et al.* 2019). Of the 138 strandings ascribed to the BBES Stock, 39 were ascribed solely to this stock. It is likely, therefore, that the counts in Table 3 include some animals from the Western Coastal Stock and the Terrebonne-Timbalier Bay Estuarine System (TTBES) Stock, and thereby overestimate the number of strandings for the BBES Stock; those strandings that could not be definitively ascribed to the BBES Stock were also included in the counts for the Western Coastal Stock or TTBES Stock as appropriate. Stranded carcasses are not routinely identified to either the offshore or coastal morphotype of common bottlenose dolphin, therefore it is possible that some of the reported strandings were of the offshore form, though that number is likely to be low (Byrd *et al.* 2014).

There are a number of other difficulties associated with the interpretation of stranding data. 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 BBES Stock has been affected by three bottlenose dolphin die-offs or Unusual Mortality Events (UME). 1)

A UME occurred from January through May 1990, included 344 bottlenose dolphin strandings in the northern Gulf of Mexico (Litz *et al.* 2014), and may have affected the BBES Stock because strandings were reported in the Barataria Bay area during the time of the event. However, there is no information available on the impact of the event on the BBES Stock. The cause of the 1990 mortality event could not be determined (Hansen 1992), however, morbillivirus may have contributed to this event (Litz *et al.* 2014). 2) A UME was declared for cetaceans in the northern Gulf of Mexico beginning 1 March 2010 and ending 31 July 2014 (Litz *et al.* 2014; http://www.nmfs.noaa.gov/pr/health/mmume/cetacean_gulfofmexico.htm, accessed 1 June 2016). This UME included cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see Habitat Issues section), during the spill, and after. Exposure to the DWH oil spill was determined to be the primary underlying cause of the elevated stranding numbers in the northern Gulf of Mexico after the spill (e.g., Schwacke *et al.* 2014; Venn-Watson *et al.* 2015a; Colegrove *et al.* 2016; DWH NRDAT 2016; see "Habitat Issues" below). During 2011–2014, nearly all stranded dolphins from this stock were considered to be part of the UME. 3) During 1 February 2019 to 30 November 2019, a UME was declared for the area from the eastern border of Taylor County, Florida, west through Alabama, Mississippi, and Louisiana (http://www.nmfs.noaa.gov/pr/health/mmume/cetacean_gulfofmexico.htm, accessed 5 November 2020). A total of 337 common bottlenose dolphins stranded during this event, with 33 of them being from the BBES Stock. The largest number of mortalities occurred in eastern Louisiana and Mississippi. An investigation concluded the event was caused by exposure to low salinity waters as a result of extreme freshwater discharge from rivers. The unprecedented amount of freshwater discharge during 2019 (e.g., Gasparini and Yuill 2020) resulted in low salinity levels across the region.

Table 3. Common bottlenose dolphin strandings occurring in the Barataria Bay Estuarine System Stock area from 2015 to 2019, 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 25 August 2020). Please note HI does not necessarily mean the interaction caused the animal's death.

Stock	Category	2015	2016	2017	2018	2019	Total
Barataria Bay Estuarine System Stock	Total Stranded	33	29	36	5	35[c]	138
	Human Interaction						
	---Yes	3[a]	1	2[b]	1	3[d]	10
	---No	2	7	4	0	1	14
	---CBD	28	21	30	4	31	114

a. Includes 1 entanglement interaction in research gillnet gear (mortality), 1 interaction with chaffing gear from a commercial shrimp trawl (mortality), and 1 animal with healed vessel strike wounds (alive).
b. Includes 2 entanglement interactions with hook and line gear (1 mortality and 1 released alive without serious injury).
c. 33 strandings were part of the UME event in the northern Gulf of Mexico.
d. Includes 1 animal with evidence of gunshot wounds (mortality).

HABITAT ISSUES

Issues Related to the DWH Oil Spill

The DWH MC252 drilling platform, located approximately 80 km southeast of the Mississippi River Delta in waters about 1500 m deep, exploded on 20 April 2010. The rig sank, and over 87 days up to ~3.2 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (DWH NRDAT 2016). A substantial number of beaches and wetlands along the Louisiana coast experienced heavy or moderate oiling (OSAT-2 2011; Michel *et al.* 2013). The heaviest oiling in Louisiana occurred on the tip of the Mississippi Delta, west of the Mississippi River in Barataria, Terrebonne and Timbalier Bays, and to the east of the river on the Chandeleur Islands (Michel *et al.* 2013).

A suite of research efforts indicate the DWH oil spill negatively affected the BBES Stock of common bottlenose dolphins. Capture-release health assessments and analysis of stranded dolphins during the oil spill both found evidence of moderate to severe lung disease and compromised adrenal function (Schwacke *et al.* 2014; Venn-Watson *et al.* 2015a). Based on data collected during a health assessment in Barataria Bay in 2011, 48% of the dolphins sampled were given a guarded or worse health prognosis, and 17% were given a poor prognosis, indicating that they would likely not survive (Schwacke *et al.* 2014). Subsequent health assessments in 2013 and 2014 revealed that the percentage of the population with a guarded or worse health prognosis decreased from levels measured in 2011 but still remained elevated when compared to the Sarasota Bay, Florida, reference site (DWH NRDAT 2016; Smith *et al.*

2017). Pulmonary abnormalities and impaired stress response were still detected four years after the DWH oil spill (Smith *et al.* 2017). De Guise *et al.* (2017) suggested immune systems were weakened due to the DWH oil exposure, most noticeably in 2011 compared to subsequent years. Stranding rates in the northern Gulf of Mexico were also higher in the years following the oil spill than previously recorded (Litz *et al.* 2014; Venn-Watson *et al.* 2015b) and a UME was declared for cetaceans in the northern Gulf of Mexico beginning 1 March 2010 and ending 31 July 2014 (Litz *et al.* 2014; http://www.nmfs.noaa.gov/pr/health/mmume/cetacean_gulfofmexico.htm, accessed 1 June 2016). Exposure to the DWH oil spill was determined to be the primary underlying cause of the elevated stranding numbers in the northern Gulf of Mexico after the spill (e.g., Schwacke *et al.* 2014; Venn-Watson *et al.* 2015a; Colegrove *et al.* 2016; DWH NRDAT 2016). During 2011–2014, 87 stranded dolphins from this stock were considered to be part of the UME. Rosel *et al.* (2017) used genetic assignment tests to estimate stock of origin for stranded dolphins recovered between 2010 and 2013 in the estuary and along the coast of Barataria Bay and found that 83–84% of the stranded dolphins sampled originated from the BBES Stock, while the rest were assigned to the adjacent Western Coastal Stock. Balmer *et al.* (2015) suggested it is unlikely that persistent organic pollutants (POPs) significantly contributed to the unusually high stranding rates following the DWH oil spill because POP concentrations from six northern Gulf sites were comparable to or lower than those previously measured by Kucklick *et al.* (2011) from southeastern U.S. sites; however, the authors cautioned that potential synergistic effects of oil exposure and POPs should be considered as the extra stress from oil exposure added to the background POP levels could have intensified toxicological effects. A subsequent study by Balmer *et al.* (2018), using both blubber and blood samples collected during health assessments in 2011, 2013, and 2014, also examined POP concentrations. In comparison to Mississippi Sound and Sarasota Bay, dolphins from Barataria Bay had the lowest contaminant levels examined. Morbillivirus infection, brucellosis, and biotoxins were also ruled out as a primary cause of the UME (Venn-Watson *et al.* 2015a).

Reproductive success also was compromised after the oil spill. Kellar *et al.* (2017) reported a reproductive success rate for Barataria Bay of 0.185, meaning that less than one in five detected pregnancies resulted in a viable calf. This rate was much lower than the expected rate, 0.647, based on previous work in non-oiled reference areas (Kellar *et al.* 2017). In addition, Lane *et al.* (2015) monitored 10 pregnant dolphins in Barataria Bay and determined that only 20% (95%CI: 2.50–55.6%) produced viable calves, as compared with a reported pregnancy success rate of 83% in a reference population in Sarasota Bay, Florida (Wells *et al.* 2014). The reproductive failure rates are also consistent with findings of Colegrove *et al.* (2016) who examined perinate strandings in Louisiana, Mississippi, and Alabama during 2010–2013 and found that common bottlenose dolphins were prone to late-term failed pregnancies and occurrence of *in utero* infections, including pneumonia and brucellosis.

Congruent with evidence for compromised health and poor reproductive success in Barataria Bay dolphins, McDonald *et al.* (2017) reported low survival rate estimates for these dolphins. Estimated survival rates in the first three years following the DWH oil spill using data from C-R photo-ID surveys ranged from 0.80 to 0.85 (McDonald *et al.* 2017), and are lower than those reported previously for other southeastern U.S. estuarine areas, such as Charleston, South Carolina (0.95; Speakman *et al.* 2010), or Sarasota Bay, Florida (0.96; Wells and Scott 1990).

Other Habitat Issues

Like much of coastal southeastern Louisiana, the Barataria Bay Basin has experienced significant wetland loss resulting in more open water and less marsh habitat (CPRA 2017). Subsidence, sea-level rise, storms, winds and tides, and human activities including levee construction and loss of sediment input, and channelization (navigational channels and oil and gas canals), all play a role in the habitat degradation (CPRA 2017). The impact to bottlenose dolphins from these changes to the habitat are unknown, although the marshes do serve as important nursery areas for many fish and invertebrates that may be prey species (CPRA 2017). The State of Louisiana has a wetland restoration master plan for the area to build and maintain land (CPRA 2017), which could result in additional changes to the Barataria Bay habitat, including significant and prolonged reductions in salinity levels. Bottlenose dolphins are typically found in salinities ranging from 20–35 ppt and can experience significant health impacts and/or death due to prolonged low salinity exposure (e.g., Andersen 1973; Holyoake *et al.* 2010; Garrison *et al.* 2020).

STATUS OF STOCK

Common bottlenose dolphins are not listed as threatened or endangered under the Endangered Species Act. Because the estimate of human-caused mortality and serious injury exceeds PBR, NMFS considers the Barataria Bay Estuarine System Stock a strategic stock under the MMPA. The documented mean annual human-caused mortality for this stock for 2015–2019 was 41. 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), and there are uncertainties in the population model used to estimate population decline due to the DWH oil spill, also indicated above (see Habitat Issues section). Because a UME of unprecedented size and duration (March 2010–July 2014) has impacted the northern Gulf of Mexico, including Barataria Bay, and because the health assessment findings of Schwacke *et al.* (2014) and others indicate compromised health and reproductive success of dolphins sampled within Barataria Bay as a result of the DWH oil spill, NMFS finds cause for concern about this stock. The DWH damage assessment estimated that the stock experienced a 51% (95%CI: 32–72) maximum reduction in population size due to the oil spill (DWH MMIQT 2015; Schwacke *et al.* 2017). It is therefore likely that this stock is below its optimum sustainable population (NMFS 2016). In the absence of any additional non-natural mortality or restoration efforts, the DWH damage assessment estimated this stock will take 39 years to recover to pre-spill population size (DWH MMIQT 2015). The total human-caused 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 zero mortality and serious injury rate. There are insufficient data to determine population trends for this stock.

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