COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Northern Gulf of Mexico Bay, Sound, and Estuary Stocks

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 northern Gulf of Mexico. To date, five stocks have individual reports completed (Terrebonne-Timbalier Bay Estuarine System, Barataria Bay Estuarine System, Mississippi Sound/Lake Borgne/Bay Boudreau, Choctawhatchee Bay, and St. Joseph Bay), and the remaining 26 stocks are assessed in this report.

STOCK DEFINITION AND GEOGRAPHIC RANGE

Common bottlenose dolphins are distributed throughout the bays, sounds and estuaries of the Gulf of Mexico (Mullin 1988). The identification of biologically-meaningful "stocks" of common bottlenose dolphins in these waters is complicated by the high degree of behavioral variability exhibited by this species (Shane *et al.* 1986; Wells and Scott 1999; Wells 2003), and by the lack of requisite information for much of the region.

Distinct stocks are delineated in each of 31 areas of contiguous, enclosed or semi-enclosed bodies of water adjacent to the northern Gulf of Mexico (i.e., U.S. Gulf of Mexico; Table 1; Figure 1). The genesis of the delineation of these stocks was work initiated in the 1970s in Sarasota Bay, Florida (Irvine and Wells 1972; Irvine *et al.* 1981), and in bays in Texas (Shane 1977; Gruber 1981). These studies documented year-round residency of individual common bottlenose dolphins in estuarine waters. As a result, the expectation of year-round resident populations was extended to bay, sound and estuary (BSE) waters across the northern Gulf of Mexico when the first stock assessment reports were published in 1995 (Blaylock *et al*. 1995). Since these early studies, long-term (year-round, multi-year) residency has been reported from nearly every site where photographic identification (photo-ID) or tagging studies have been conducted in the Gulf of Mexico. In Texas, long-term resident dolphins have been reported in the Matagorda-Espiritu Santo Bay area (Gruber 1981; Lynn and Würsig 2002), Aransas Pass (Shane 1977; Weller 1998), San Luis Pass (Maze and Würsig 1999; Irwin and Würsig 2004), and Galveston Bay (Bräger 1993; Bräger *et al.* 1994; Fertl 1994). In Louisiana, Miller (2003) concluded the common bottlenose dolphin population in the Barataria Basin was relatively closed, and Wells *et al*. (2017) documented long-term, year-round residency in Barataria Bay based on telemetry data. Hubard *et al.* (2004) reported sightings of dolphins in Mississippi Sound that were known from tagging efforts there 12–15 years prior. In Florida, long-term residency has been reported from Tampa Bay (Wells 1986; Wells et al. 1996b; Urian et al. 2009), Sarasota Bay (Irvine and Wells 1972; Irvine *et al.* 1981; Wells 1986; 1991; 2003; 2014; Wells *et al.* 1987; Scott *et al.* 1990), Lemon Bay (Wells *et al.* 1996a; Bassos-Hull *et al*. 2013), Charlotte Harbor/Pine Island Sound (Shane 1990; Wells *et al.* 1996a; 1997; Shane 2004; Bassos-Hull *et al.* 2013) and Gasparilla Sound (Bassos-Hull *et al.* 2013). In Sarasota Bay, which has the longest research history, up to five concurrent generations of identifiable residents have been identified, including individuals identified through more than four decades (Wells 2014). Maximum immigration and emigration rates of about 2–3% have been estimated (Wells and Scott 1990).

Genetic data also support the concept of relatively discrete BSE stocks. Analyses of mitochondrial DNA haplotype distributions indicate the existence of clinal variations along the Gulf of Mexico coastline (Duffield and Wells 2002). Differences in reproductive seasonality from site to site also suggest genetic-based distinctions between communities (Urian *et al.* 1996). Mitochondrial DNA analyses suggest finer-scale structural levels as well. For example, dolphins in Matagorda Bay, Texas, appear to be a localized population, and differences in haplotype frequencies distinguish among adjacent communities in Tampa Bay, Sarasota Bay, and Charlotte Harbor/Pine Island Sound, along the central west coast of Florida (Duffield and Wells 1991; 2002). Additionally, Sellas *et al.* (2005) examined population subdivision among dolphins sampled in Sarasota Bay, Tampa Bay, Charlotte Harbor, Matagorda Bay, and the coastal Gulf of Mexico (1–12 km offshore) from just outside Tampa Bay to the southern end of Lemon Bay, and found evidence of significant population structure among all areas on the basis of both mitochondrial DNA control region sequence data and 9 nuclear microsatellite loci. Rosel *et al.* (2017) also identified significant population differentiation between estuarine residents of Barataria Bay and the adjacent coastal stock.

The Sellas *et al.* (2005) and Rosel *et al.* (2017) findings support the separate identification of BSE populations from those occurring in adjacent Gulf coastal waters.

In many cases, residents occur primarily in BSE waters, with limited movements through passes to the Gulf of Mexico (Shane 1977; 1990; Gruber 1981; Irvine *et al.* 1981; Maze and Würsig 1999; Lynn and Würsig 2002; Fazioli *et al*. 2006). These habitat use patterns are reflected in the ecology of the dolphins in some areas; for example, residents of Sarasota Bay, Florida, lacked squid in their diet, unlike non-resident dolphins stranded on nearby Gulf beaches (Barros and Wells 1998). However, in some areas year-round residents may co-occur with non-resident dolphins. For example, about 14–17% of group sightings involving resident Sarasota Bay dolphins include at least one non-resident as well (Wells *et al.* 1987; Fazioli *et al.* 2006). Mixing of inshore residents and non-residents has been seen at San Luis Pass, Texas (Maze and Würsig 1999), Cedar Keys, Florida (Quintana-Rizzo and Wells 2001), and Pine Island Sound, Florida (Shane 2004). Non-residents exhibit a variety of movement patterns, ranging from apparent nomadism recorded as transience to a given area, to apparent seasonal or non-seasonal migrations. Passes, especially the mouths of the larger estuaries, serve as mixing areas. For example, dolphins from several different areas were documented at the mouth of Tampa Bay, Florida (Wells 1986), and most of the dolphins identified in the mouths of Galveston Bay and Aransas Pass, Texas, were considered transients (Henningsen 1991; Bräger 1993; Weller 1998).

Seasonal movements of dolphins into and out of some of the bays, sounds and estuaries have also been documented. In Sarasota Bay, Florida, and San Luis Pass, Texas, residents have been documented moving into Gulf coastal waters in fall/winter, and returning inshore in spring/summer (Irvine *et al.* 1981; Maze and Würsig 1999). Fall/winter increases in abundance have been noted for Tampa Bay (Scott *et al.* 1989) and are thought to occur in Matagorda Bay (Gruber 1981; Lynn and Würsig 2002) and Aransas Pass (Shane 1977; Weller 1998). Spring/summer increases in abundance occur in Mississippi Sound (Hubard *et al.* 2004) and are thought to occur in Galveston Bay (Henningsen 1991; Bräger 1993; Fertl 1994).

Spring and fall increases in abundance have been reported for St. Joseph Bay, Florida. Mark-recapture abundance estimates were highest in spring and fall and lowest in summer and winter (Table 1; Balmer *et al.* 2008). Individuals with low site-fidelity indices were sighted more often in spring and fall, whereas individuals sighted during summer and winter displayed higher site-fidelity indices. In conjunction with health assessments, 23 dolphins were radio tagged during April 2005 and July 2006. Dolphins tagged in spring 2005 displayed variable utilization areas and variable site fidelity patterns. In contrast, during summer 2006 the majority of radio-tagged individuals displayed similar utilization areas and moderate to high site-fidelity patterns. The results of the studies suggest that during summer and winter St. Joseph Bay hosts dolphins that spend most of their time within this region, and these may represent a resident community. In spring and fall, St. Joseph Bay is visited by dolphins that range outside of this area (Balmer *et al.* 2008).

The current BSE stocks are delineated as described in Table 1. There are some estuarine areas that are not currently part of any stock's range. Many of these are areas that dolphins cannot readily access. For example, the marshlands between Galveston Bay and Sabine Lake and between Sabine Lake and Calcasieu Lake are fronted by long, sandy beaches that prohibit dolphins from entering the marshes. The region between the Calcasieu Lake and Vermilion Bay/Atchafalaya Bay stocks has some access, but these marshes are predominantly freshwater rather than saltwater marshes, making them unsuitable for long-term survival of a viable population of common bottlenose dolphins. In other regions, there is insufficient estuarine habitat to harbor a demographically independent population, for instance between the Matagorda Bay and West Bay Stocks in Texas, and/or sufficient isolation of the estuarine habitat from coastal waters. The regions between the south end of the Estero Bay Stock area to just south of Naples and between Little Sarasota Bay and Lemon Bay are highly developed and contain little appropriate habitat. South of Naples to Marco Island and Gullivan Bay is also not currently covered within a stock boundary. This region contains common bottlenose dolphins, but the relationship of any dolphins in this region to other BSE stocks is unknown. They may be members of the Gullivan to Chokoloskee Bay stock as there is passage behind Marco Island that would allow dolphins to move north. The regions between Apalachee Bay and Cedar Key/Waccasassa Bay, between Crystal Bay and St. Joseph Sound, and between Chokoloskee Bay and Whitewater Bay are comprised of thin strips of marshland with no barriers to adjacent coastal waters. Further work is necessary to determine whether year-round resident dolphins use these thin marshes or whether dolphins in these areas are members of the coastal stock that use the fringing marshland as well. Finally, the region between the eastern border of the Barataria Bay Estuarine System Stock and the Mississippi River Delta Stock to the east may harbor dolphins, but the area is small and work is necessary to determine whether any dolphins utilizing this habitat come from an adjacent BSE stock.

As more information becomes available, combination or division of these stocks, or alterations to stock boundaries, may be warranted. Recent research based on photo-ID data collected by Bassos-Hull *et al*. (2013)

recommended combining Lemon Bay with Gasparilla Sound/Charlotte Harbor/Pine Island Sound. Therefore, these stocks have been combined (see Table 1). However, it should be noted this change was made in the absence of genetic data and could be revised again in the future when genetic data are available. Additionally, a number of geographically and socially distinct subgroupings of dolphins in regions such as Tampa Bay, Charlotte Harbor, Pine Island Sound, Barataria Bay, Aransas Pass, and Matagorda Bay have been identified (Shane 1977; Gruber 1981; Wells *et al.* 1996a; 1996b; 1997; 2017; Lynn and Würsig 2002; Urian 2002). For Tampa Bay, Urian *et al*. (2009) described five discrete communities (including the adjacent Sarasota Bay community) that differed in their social interactions and ranging patterns. Structure was found despite a lack of physiographic barriers to movement within this large, open embayment. Urian *et al*. (2009) further suggested that fine-scale structure may be a common element among common bottlenose dolphins in the southeastern U.S. and recommended that management should account for fine-scale structure that exists within current stock designations. These results indicate that it is plausible some of these estuarine stocks, particularly those in larger bays and estuaries, comprise multiple demographically-independent populations.

Table 1. Most recent common bottlenose dolphin abundance (NBEST), coefficient of variation (CV), minimum population estimate (NMIN), Potential Biological Removal (PBR), year of the most recent abundance estimate and associated publication (Year), and minimum counts of annual human-caused mortality and serious injury (HCMSI) in northern Gulf of Mexico bays, sounds and estuaries. Because they are based on data collected more than eight years ago, most abundance estimates are considered unknown or undetermined for management purposes. Blocks refer to aerial survey blocks illustrated in Figure 1. UNK – unknown; UND – undetermined. For each stock denoted with a † symbol, please refer to the stand-alone report for this stock.

Blocks	Gulf of Mexico Estuary	NBEST	CV	NMIN	PBR	Year (Reference)	Minimum Annual HCMSI, 2012–2016
B51	Laguna Madre	80	1.57	UNK	UND	1992 (A)	0.4
B52	Nueces Bay/Corpus Christi Bay	58	0.61	UNK	UND	1992 (A)	0
B50	Copano Bay/Aransas Bay/San Antonio Bay/Redfish Bay/Espiritu Santo Bay	55	0.82	UNK	UND	1992 (A)	0.2
B54	Matagorda Bay/Tres Palacios Bay/Lavaca Bay	61	0.45	UNK	UND	1992 (A)	0.4
B55	West Bay	32	0.15	UNK	UND	2001 (B)	0.2
B56	Galveston Bay/East Bay/Trinity Bay	152	0.43	UNK	UND	1992 (A)	0.4
B57	Sabine Lake	0[a]	-	-	UND	1992 (A)	0.2
B58	Calcasieu Lake	0[a]	-	-	UND	1992 (A)	0.2
B59	Vermilion Bay/West Cote Blanche Bay/Atchafalaya Bay	0[a]	-	-	UND	1992 (A)	0
B60	Terrebonne-Timbalier Bay Estuarine System†						
B61	Barataria Bay Estuarine System†						
B30	Mississippi River Delta	332	0.93	170	1.4	2011–12 (C)	32.7[c]
B02–05, 29, 31	Mississippi Sound/Lake Borgne/Bay Boudreau†						
B06	Mobile Bay/Bonsecour Bay	122	0.34	UNK	UND	1993 (A)	36.6[c]
B07	Perdido Bay	0[a]	-		UND	1993 (A)	0.6
B08	Pensacola Bay/East Bay	33	0.80	UNK	UND	1993 (A)	0.2
B09	Choctawhatchee Bay†						
B10	St. Andrew Bay	124	0.57	UNK	UND	1993 (A)	0.2
B11	St. Joseph Bay†						
B12–13	St. Vincent Sound/Apalachicola Bay/St. George Sound	439	0.14	UNK	UND	2007 (D)	0

Blocks	Gulf of Mexico Estuary	NBEST	CV	NMIN	PBR	Year (Reference)	Minimum Annual HCMSI, 2012–2016
B14–15	Apalachee Bay	491	0.39	UNK	UND	1993 (A)	0
B16	Waccasassa Bay/Withlacoochee Bay/Crystal Bay	UNK	-	UNK	UND	-	0
B17	St. Joseph Sound/Clearwater Harbor	UNK	-	UNK	UND	-	0.4
B32–34	Tampa Bay	UNK	-	UNK	UND	-	0.6
B20, 35	Sarasota Bay/Little Sarasota Bay	158	0.27	126	1.0	2015 (E)	0.6
B21–23	Pine Island Sound/Charlotte Harbor/Gasparilla Sound/Lemon Bay	826	0.09	UNK	UND	2006 (F)	1.6
B36	Caloosahatchee River	0[a,b]	-	-	UND	1985 (G)	0.4
B24	Estero Bay	UNK	-	UNK	UND	-	0.2
B25	Chokoloskee Bay/Ten Thousand Islands/Gullivan Bay	UNK	-	UNK	UND	-	0
B27	Whitewater Bay	UNK	-	UNK	UND	-	0
B28	Florida Keys (southwest Marathon Key to Marquesas Keys)	UNK	-	UNK	UND	-	0

References: A – Blaylock and Hoggard 1994; B – Irwin and Würsig 2004; C – Garrison 2017; D – Tyson *et al.* 2011; E – Tyson and Wells 2016; F – Bassos-Hull *et al.* 2013; G –Scott *et al.* 1989

Notes:

a During earlier surveys (Scott *et al.* 1989), the range of seasonal abundances was as follows: Sabine Lake, 0–2 (CV=0.38); Calcasieu Lake, 0–6 (0.34); Vermilion Bay/West Cote Blanche Bay/Atchafalaya Bay, 0–0; Mississippi River Delta, 0–182 (0.14); Perdido Bay, 0–0; Lemon Bay, 0–15 (0.43); and Caloosahatchee River, 0–0.

b Area not surveyed during surveys reported in Blaylock and Hoggard (1994).

c This minimum count includes projected mortality estimates for 2012–2016 due to the DWH oil spill (see DWH MMIQT 2015).

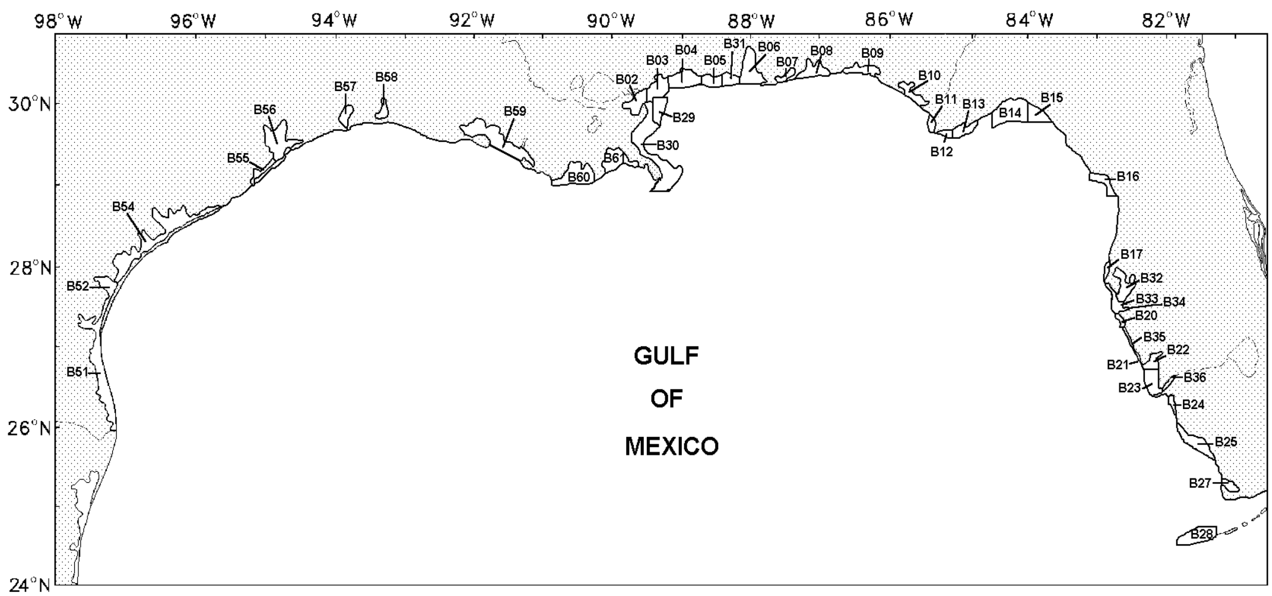

Figure 1. Northern Gulf of Mexico bays, sounds, and estuaries. Each of the alpha-numerically designated blocks corresponds to one of the NMFS Southeast Fisheries Science Center logistical aerial survey areas listed in Table 1. The common bottlenose dolphins inhabiting each bay, sound, or estuary are considered to comprise a unique stock for purposes of this assessment. Five stocks have their own stock assessment report (see Table 1).

POPULATION SIZE

Population size estimates for most of these stocks are more than eight years old and therefore the current population sizes for all but two are considered unknown (Wade and Angliss 1997). However, a capture-mark-recapture population size estimate is available for Sarasota Bay/Little Sarasota Bay for 2015 (Tyson and Wells 2016). Recent aerial survey line-transect population size estimates are available for Mississippi River Delta for 2011–2012 (Garrison 2017; Table 1). Population size estimates for many stocks were generated from preliminary analyses of line-transect data collected during aerial surveys conducted in September–October 1992 in Texas and Louisiana and in September–October 1993 in Louisiana, Mississippi, Alabama, and the Florida Panhandle (Blaylock and Hoggard 1994; Table 1). Standard line-transect perpendicular sighting distance analytical methods (Buckland *et al.* 1993) and the computer program DISTANCE (Laake *et al*. 1993) were used.

Minimum Population Estimate

The population sizes for all but two stocks are currently unknown and the minimum population estimates are given for those two stocks in Table 1. The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The minimum population estimate was calculated for each block from the estimated population size and its associated coefficient of variation.

Current Population Trend

The data are insufficient to determine population trends for most of the Gulf of Mexico BSE common bottlenose dolphin stocks.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known for these stocks. 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 minimum population size, one-half the maximum productivity rate and a recovery factor (Wade and Angliss 1997). The recovery factor is 0.5 for Texas BSE stocks because these stocks are of unknown status. The recovery factor is 0.4 for Louisiana, Mississippi, Alabama, and Florida BSE stocks because the CV of the shrimp trawl mortality estimate for those stocks is greater than 0.8 (Wade and Angliss 1997). PBR is undetermined for all but two stocks because the population size estimates are more than eight years old. PBR for those stocks with population size estimates less than eight years old is given in Table 1.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for these stocks of common bottlenose dolphins during 2012–2016 is unknown. Minimum estimates of human-caused mortality and serious injury for each stock are given in Table 1; however these estimates are biased because: 1) not all fisheries that could interact with these stocks 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 because estimates are not available for individual BSE stocks (see Shrimp Trawl section), and 6) various assumptions were made in the population model used to estimate population decline for northern Gulf of Mexico BSE stocks impacted by the Deepwater Horizon (DWH) oil spill.

Fishery Information

There are seven commercial fisheries that interact, or that potentially could interact, with these stocks in the Gulf of Mexico. These include four Category II fisheries (Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl; Gulf of Mexico menhaden purse seine; Southeastern U.S. Atlantic, Gulf of Mexico stone crab trap/pot; and Gulf of Mexico gillnet fisheries); and three Category III fisheries (Gulf of Mexico blue crab trap/pot; Florida spiny lobster trap/pot; and Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel [hook and line] fisheries). Detailed fishery information is presented in Appendix III.

In the following sections the number of documented interactions of common bottlenose dolphins with each of these fisheries during 2012–2016 is reported. The likely stock(s) of origin for each interaction has been inferred based on the location of the interaction and distribution of the fishery.

Shrimp Trawl

During 2012–2016, there were no observed mortalities or serious injuries of common bottlenose dolphins from Gulf of Mexico BSE stocks by commercial shrimp trawls because observer coverage of this fishery did not include BSE waters. Between 1997 and 2014, seven common bottlenose dolphins and seven 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 the commercial shrimp trawl fishery in the Gulf of Mexico (Soldevilla *et al.* 2016). 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) provided mortality estimates calculated from analysis of shrimp fishery effort data and NMFS's Observer Program bycatch data. Observer program coverage did not extend into BSE waters, therefore time-area stratified bycatch rates were extrapolated into inshore waters to estimate the most recent five-year unweighted mean mortality estimate for 2010–2014 based on inshore fishing effort (Soldevilla *et al.* 2016). The 4-area (Texas, Louisiana, Mississippi/Alabama, Florida) stratification method was chosen because it best approximates how fisheries operate (Soldevilla *et al*. 2015; 2016). The BSE stock mortality estimates were aggregated at the state level as this was the spatial resolution at which fishery effort is modeled (e.g., Nance *et al.* 2008). The mean annual mortality estimates for the BSE stocks were as follows: Texas BSE (from Galveston Bay/East Bay/Trinity Bay south to Laguna Madre): 0; Louisiana BSE (from Sabine Lake east to Barataria Bay): 61 (CV=1.4); Mississippi/Alabama BSE (from Mississippi River Delta east to Mobile Bay/Bonsecour Bay): 27 (CV=1.1); and Florida BSE (from Perdido Bay east and south to the Florida Keys): 2.4 (CV=1.6). These estimates do not include skimmer trawl effort, which accounts for >48% of shrimp fishery effort in Louisiana, Alabama, and Mississippi 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). It should be noted that because bycatch for individual BSE stocks cannot be quantified at this time, shrimp trawl bycatch is not being included in the annual human-caused mortality and serious injury total for any BSE stock.

During 2012–2016, stranding data documented two mortalities of common bottlenose dolphins associated with entanglement in shrimp trawl gear. Both mortalities occurred in 2016—one in Pensacola Bay and one in Perdido Bay. And in 2012, one dolphin was released alive without serious injury in Perdido Bay during non-commercial shrimp trawling (see Other Mortality section for details).

During 2016 the Marine Mammal Authorization Program (MMAP) documented a self-reported incidental take (mortality) of a common bottlenose dolphin by a commercial fisherman trawling in Mobile Bay. The dolphin was entangled in the lazy line of the gear.

Menhaden Purse Seine

During 2012–2016, there were no documented mortalities or serious injuries associated with the menhaden purse seine fishery except for those involving the Mississippi Sound/Lake Borgne/Bay Boudreau Stock (please see that SAR). However, it should be noted that there is currently no observer program for the Gulf of Mexico menhaden purse seine fishery. Despite the lack of an observer program, incidental takes have been reported via two sources for common bottlenose dolphin BSE and coastal stocks. First, in 2011, a pilot observer program operated from May through September, and observers documented three dolphins trapped within purse seine nets. All three were released alive without serious injury (Maze-Foley and Garrison 2016). Two of the three dolphins were trapped within a single purse seine within waters of the Western Coastal Stock. The third animal was trapped in waters of the Mississippi Sound/Lake Borgne/Bay Boudreau Stock. Second, the Marine Mammal Authorization Program (MMAP) has documented 13 self-reported incidental takes (all mortalities) of common bottlenose dolphins in northern Gulf of Mexico coastal and estuarine waters by the menhaden purse seine fishery during 2000–2016. Specific self-reported takes under the MMAP likely involving BSE stocks are as follows: two dolphins were reported taken in a single purse seine during 2012 in Mississippi Sound (Mississippi Sound/Lake Borgne/Bay Boudreau Stock); one take of a single dolphin was reported in Louisiana waters during 2004 that likely belonged to the Mississippi River Delta Stock; one take of a single unidentified dolphin reported during 2002 likely belonged to the Mississippi Sound/Lake Borgne/Bay Boudreau Stock; one take of a single dolphin was reported in Louisiana waters during 2001 which likely belonged to Mississippi River Delta Stock or Northern Coastal Stock; during 2000, one take of a single dolphin was reported in Louisiana waters which likely belonged to Mississippi River Delta Stock or Northern Coastal Stock; and also in 2000, three dolphins were reported taken in a single purse seine in Mississippi waters which likely belonged to Mississippi Sound/Lake Borgne/Bay Boudreau Stock.

Without an ongoing observer program, it is not possible to obtain statistically reliable information for this fishery on the incidental take and mortality rates, and the stocks from which common bottlenose dolphins are being taken.

Blue Crab, Stone Crab and Florida Spiny Lobster Trap/Pot

During 2012–2016 there were five documented interactions between trap/pot fisheries and BSE stocks. During 2016 one animal was partially disentangled from trap/pot gear and released alive seriously injured. This animal likely belonged to the Pine Island Sound/Charlotte Harbor/Gasparilla Sound/Lemon Bay Stock. Also in 2016, an animal was disentangled from commercial stone crab trap/pot gear and released alive not seriously injured following mitigation (disentanglement) efforts (the initial determination [pre-mitigation] was seriously injured). This animal likely belonged to the Sarasota Bay/Little Sarasota Bay Stock. During 2015 one mortality occurred due to entanglement in blue crab trap/pot gear. This animal likely belonged to the Mobile Bay/Bonsecour Bay Stock. Also in 2015, one animal was disentangled and released alive from crab trap/pot gear (it could not be determined if the animal was seriously injured following mitigation efforts; the initial determination was seriously injured [Maze-Foley and Garrison 2018]). This animal likely belonged to the Sarasota Bay/Little Sarasota Bay Stock. During 2013, one animal was disentangled and released alive from Florida spiny lobster trap/pot gear (it could not be determined if the animal was seriously injured following mitigation efforts; the initial determination was seriously injured [Maze-Foley and Garrison 2018]). This animal likely belonged to the Florida Keys Stock. The specific fishery could not be identified for the trap/pot gear involved in the 2015 and one of the 2016 live releases. The mortality and the animals released alive were all included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 28 April 2017) and are included in the stranding totals in Table 2. Because there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab traps/pots.

Gillnet

No marine mammal mortalities associated with gillnet fisheries have been reported or observed in recent years, but stranding data suggest that gillnet and marine mammal interactions do occur, causing mortality and serious injury. During 2012–2016, 11 entanglements in research-related gillnets were reported in BSE stocks: seven dolphins in Texas, two in Louisiana and two in Florida. Two of the 11 entanglements resulted in mortalities, and three in serious injuries (see Other Mortality section and Table 4 for details on recent research-related entanglements).

There has been no observer coverage of this fishery in federal waters. Beginning in November 2012, NMFS began placing observers on commercial vessels in the coastal waters of Alabama, Mississippi, and Louisiana (state waters only). No takes have been observed to date, however dolphins have been observed during haul back and observed feeding from gillnets and sometimes swimming into the circle of a strike net to feed (Mathers *et al*. 2016). When this occurred, fishermen opened the strike net to allow the dolphins to escape capture, but it was suggested inexperienced fishermen may not be able to safely execute such measures (Mathers *et al*. 2016). In 1995, a Florida state constitutional amendment banned gillnets and large nets from bays, sounds, estuaries, and other inshore waters. Commercial and recreational gillnet fishing is also prohibited in Texas state waters.

Hook and Line (Rod and Reel)

During 2012–2016 there were 29 documented interactions (entanglements or ingestions) between hook and line gear and BSE stocks—20 mortalities and 9 live animals (disentanglement efforts were made for 8 of the 9). The stranding data indicate that, for 10 of these mortalities, the hook and line gear interaction contributed to the cause of death. For six mortalities, evidence suggested the hook and line gear interaction was incidental and was not a contributing factor to cause of death. For four mortalities, it could not be determined if the hook and line gear interaction contributed to cause of death. One live animal was considered seriously injured and no disentanglement efforts were made. Attempts were made to disentangle the remaining eight live animals from hook and line gear, one of which was considered seriously injured by the gear based on observations during mitigation (disentanglement) efforts. Three live animals were considered seriously injured by the gear prior to mitigation efforts, but based on observations during mitigations, they were considered not seriously injured post-mitigation. One live animal was considered seriously injured by the gear prior to mitigation efforts, but following mitigation it could not be determined if the animal was seriously injured. For the remaining three live animals, it could not be determined if the animals were seriously injured (Maze Foley and Garrison 2018). In summary, the evidence available from stranding data suggested that at least 10 mortalities and three serious injuries to animals from BSE stocks resulted from interactions with rod and reel hook and line gear.

Interactions by year with hook and line gear were as follows: During 2012 there were nine mortalities, and two live animals were disentangled from hook and line gear (one considered not seriously injured, one could not be determined if it was seriously injured) (Maze-Foley and Garrison 2018). During 2013 there were three mortalities and three live animals disentangled from hook and line gear. One of the live animals was considered not seriously injured and for the other two, it could not be determined whether they were seriously injured (Maze-Foley and Garrison 2018). During 2014 there were four mortalities and one live animal disentangled from hook and line gear considered not seriously injured (Maze-Foley and Garrison 2018). During 2015 there was one mortality. Finally, during 2016 there were three mortalities, two live animals considered seriously injured, and one live animal for which it could not be determined if it was seriously injured (for two of the three live animals, disentanglement efforts were made) (Maze-Foley and Garrison 2018).

The mortalities and serious injuries likely involved animals from the following BSE stocks: Neuces Bay/Corpus Christi Bay, West Bay, Galveston Bay/East Bay/Trinity Bay, Mobile Bay/Bonsecour Bay, Perdido Bay, Pensacola Bay/East Bay, St. Andrew Bay, Waccasassa Bay/Withlacoochee Bay/Crystal Bay, Tampa Bay, Sarasota Bay/Little Sarasota Bay, Pine Island Sound/Charlotte Harbor/Gasparilla Sound/Lemon Bay, Caloosahatchee River, Estero Bay, and Chokoloskee Bay/Ten Thousand Islands/Gullivan Bay.

All mortalities and live entanglements were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 28 April 2017) and are included in the stranding totals presented in Table 2. 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 or 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 systematic observer program.

Strandings

A total of 530 common bottlenose dolphins was found stranded within bays, sounds and estuaries of the northern Gulf of Mexico from 2012 through 2016 (Table 2; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 28 April 2017). It could not be determined if there was evidence of human interaction for 416 of these strandings. For 21 dolphins, no evidence of human interaction was detected. Evidence of human interaction was detected for 93 of these dolphins. Human interactions were from numerous sources, including 29 entanglements with hook and line gear, 5 entanglements with trap/pot gear, 10 entanglements in research gillnet gear, 1 stabbing with a screwdriver, 2 animals shot by arrow, 2 entanglements in commercial shrimp trawls, 1 entanglement in a non-commercial shrimp trawl, 1 entanglement in research longline gear, 1 entrapment between oil booms, and 23 animals with evidence of a boat strike (see Table 2). Strandings with evidence of fishery-related interactions are reported above in the respective gear sections. Bottlenose dolphins are known to become entangled in, or ingest recreational and commercial fishing gear (Gorzelany 1998; Wells *et al.* 1998; 2008), and some are struck by vessels (Wells and Scott 1997; Wells *et al.* 2008).

There are a number of difficulties associated with the interpretation of stranding data. Except in rare cases, such as Sarasota Bay, Florida, where residency can be determined, it is possible that some or all of the stranded dolphins may have been from a nearby coastal stock. However, the proportion of stranded dolphins belonging to another stock cannot be determined because of the difficulty of determining from where the stranded carcasses originated. Stranding data probably 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). 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.

Since 1990, there have been 13 common bottlenose dolphin die-offs or Unusual Mortality Events (UMEs) in the northern Gulf of Mexico (Litz *et al.* 2014; http://www.nmfs.noaa.gov/pr/health/mmume/events.html, accessed 11 January 2016).

1) From January through May 1990, 344 common bottlenose dolphins stranded in the northern Gulf of Mexico. Overall this represented a two-fold increase in the prior maximum recorded number of strandings for the same period, but in some locations (i.e., Alabama) strandings were 10 times the average number. 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 Sarasota Bay, Florida, in 1991 involving 31 common bottlenose dolphins. The cause was not determined, but it is believed biotoxins may have contributed to this event (Litz *et al.* 2014).

3) In March and April 1992, 119 common bottlenose dolphins stranded in Texas - about nine times the average number. The cause of this event was not determined, but low salinity due to record rainfall combined with pesticide

runoff and exposure to morbillivirus were suggested as potential contributing factors (Duignan et al. 1996; Colbert *et al.* 1999; Litz *et al.* 2014).

4) In 1993–1994 a UME of common bottlenose dolphins caused by morbillivirus started in the Florida Panhandle and spread west with most of the mortalities occurring in Texas (Lipscomb *et al*. 1994; Litz *et al*. 2014). From February through April 1994, 236 common bottlenose dolphins were found dead on Texas beaches, of which 67 occurred in a single 10-day period.

5) In 1996 a UME was declared for common bottlenose dolphins in Mississippi when 31 common bottlenose dolphins stranded during November and December. The cause was not determined, but a Karenia brevis (red tide) bloom was suspected to be responsible (Litz *et al*. 2014).

6) Between August 1999 and May 2000, 150 common bottlenose dolphins died coincident with K. brevis blooms and fish kills in the Florida Panhandle (additional strandings included three Atlantic spotted dolphins, Stenella frontalis, one Risso's dolphin, Grampus griseus, two Blainville's beaked whales, Mesoplodon densirostris, and four unidentified dolphins. Brevetoxin was determined to be the cause of this event (Twiner *et al*. 2012; Litz *et al*. 2014).

7) In March and April 2004, in another Florida Panhandle UME attributed to K. brevis blooms, 105 common bottlenose dolphins and two unidentified dolphins stranded dead (Litz *et al*. 2014). Although there was no indication of a K. brevis bloom at the time, high levels of brevetoxin were found in the stomach contents of the stranded dolphins (Flewelling *et al*. 2005; Twiner *et al.* 2012).

8) In 2005, a particularly destructive red tide (K. brevis) bloom occurred off central west Florida. Manatee, sea turtle, bird and fish mortalities were reported in the area in early 2005 and a manatee UME had been declared. Dolphin mortalities began to rise above the historical averages by late July 2005, continued to increase through October 2005, and were then declared to be part of a multi-species UME. The multi-species UME extended into 2006, and ended in November 2006. In total, 190 dolphins were involved, primarily common bottlenose dolphins (plus strandings of one Atlantic spotted dolphin and 23 unidentified dolphins). The evidence suggests a red tide bloom contributed to the cause of this event (Litz *et al*. 2014).

9) A separate UME was declared in the Florida Panhandle after elevated numbers of dolphin strandings occurred in association with a K. brevis bloom in September 2005. Dolphin strandings remained elevated through the spring of 2006 and brevetoxin was again detected in the tissues of most of the stranded dolphins and determined to be the cause of the event (Twiner e*t al.* 2012; Litz *et al*. 2014). Between September 2005 and April 2006 when the event was officially declared over, a total of 88 common bottlenose dolphin strandings occurred (plus strandings of five unidentified dolphins).

10) During February and March of 2007 an event was declared for northeast Texas and western Louisiana involving 64 common bottlenose dolphins and two unidentified dolphins. Decomposition prevented conclusive analyses on most carcasses (Litz *et al*. 2014).

11) During February and March of 2008 an additional event was declared in Texas involving 111 common bottlenose dolphin strandings (plus strandings of one unidentified dolphin and one melon-headed whale, Peponocephala electra). Most of the animals recovered were in a decomposed state. The investigation is closed and a direct cause could not be identified. However, there were numerous, co-occurring harmful algal bloom toxins detected during the time period of this UME which may have contributed to the mortalities (Fire *et al*. 2011).

12) A UME was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 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). The UME began a few months prior to the DWH oil spill, however most of the strandings prior to May 2010 were in Lake Pontchartrain, Louisiana, and western Mississippi and were likely a result of low salinity and cold temperatures (Venn-Watson *et al.* 2015a). The largest increase in strandings (compared to historical data) occurred after May 2010 following the DWH spill, and strandings were focused in areas exposed to DWH oil. Investigations to date have determined that the DWH oil spill is 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.* 2015b; Colegrove *et al.* 2016; DWH NRDAT 2016; see Habitat Issues section).

13) A UME occurred from November 2011 to March 2012 across five Texas counties and included 126 common bottlenose dolphin strandings. The strandings were coincident with a harmful algal bloom of K. brevis, but researchers have not determined that was the cause of the event. During 2011, six animals from BSE stocks were considered to be part of the UME; during 2012, 24 animals.

Table 2. Common bottlenose dolphin strandings occurring in bays, sounds, and estuaries in the northern Gulf of Mexico from 2012 to 2016, as well as number of strandings for which evidence of human interaction was detected and number of strandings for which evidence of human interaction was detected and number of strandings for which it could not be determined (CBD) if there was evidence of human interaction. Data are from the NOAA National Marine Mammal Health and Stranding Response Database (unpublished data, accessed 28 April 2017). Please note human interaction does not necessarily mean the interaction caused the animal's death. Please also note that this table does not include strandings from Terrebonne-Timbalier Bay Estuarine System, Barataria Bay Estuarine System, Mississippi Sound/Lake Borgne/Bay Boudreau, Choctawhatchee Bay, and St. Joseph Bay.

Category	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**
Total Stranded	120[a]	119[b]	100[b]	85	106	530
HI--Yes	23[c]	21[d]	12[e]	14[f]	23[g]	93
HI--No	4	4	6	1	6	21
HI--CBD	93	94	82	70	77	416

a This total includes animals that are part of the Northern Gulf of Mexico UME, and also includes 21 animals that were part of the 2011–2012 UME in Texas.

b This total includes animals that are part of the Northern Gulf of Mexico UME.

c Includes 11 entanglement interactions with hook and line gear (9 mortalities [1 of the mortalities also had evidence of a boat strike and 1 mortality also had a wound indicating puncture by a gaff], 1 released alive without serious injury [animal was initially seriously injured, but due to mitigation efforts, was released without serious injury], and 1 released alive that could not be determined if seriously injured or not); 4 entanglement interactions with research gillnet gear (1 released alive seriously injured, 3 released alive without serious injury); 1 entanglement in a non-commercial shrimp trawl net (released alive without serious injury); 1 stabbing (mortality); 2 entanglement interactions with unknown fishing gear by the same animal (the first time the animal was released alive without serious injury [animal was initially seriously injured, but due to mitigation efforts, was released without serious injury], and the second time the animal was released alive seriously injured); and 5 animals with evidence of a boat strike (mortalities; 1 was also a case of hook and line gear interaction).

d Includes 6 entanglement interactions with hook and line gear (3 mortalities, 1 released alive without serious injury [animal was initially seriously injured, but due to mitigation efforts, was released without serious injury], and 2 released alive that could not be determined if seriously injured or not); 4 entanglement interactions with research gillnet gear (2 mortalities, 1 released alive without serious injury, and 1 released alive that could not be determined if seriously injured or not); 1 interaction with Florida spiny lobster trap/pot gear (released alive, could not be determined if seriously injured or not [this animal was initially seriously injured, but mitigation efforts were made]); 1 entanglement interaction with research longline gear (released alive, seriously injured); and 7 mortalities with evidence of a boat strike.

e Includes 5 entanglement interactions with hook and line gear (4 mortalities, 1 released alive without serious injury [animal was initially seriously injured, but due to mitigation efforts, was released without serious injury]); 2 mortalities shot by arrow; and 2 mortalities with evidence of a boat strike.

f Includes 1 entanglement interaction with hook and line gear (mortality); 1 entanglement interaction in commercial blue crab trap/pot gear (mortality); 1 entanglement interaction with unidentified trap/pot gear (released alive, could not be determined if seriously injured or not); 1 entanglement interaction with research gillnet gear (released alive, seriously injured); 1 live release without serious injury following entrapment between oil booms (animal was initially seriously injured, but due to mitigation efforts, was released without serious injury); and 3 animals with evidence of a boat strike (2 mortalities, 1 released alive without serious injury).

g Includes 6 entanglement interactions with hook and line gear (3 mortalities [1 also had evidence of a boat strike and 1 had evidence of entanglement with shrimp trawl gear] and 3 released alive seriously injured); 7 mortalities with evidence of a boat strike (1 was also an entanglement interaction with hook and line gear); 1 entanglement interaction with trap/pot gear (released alive, seriously injured); 1 entanglement interaction with research gillnet gear (released alive, seriously injured); and 1 entanglement interaction with shrimp trawl gear (mortality, also an interaction with hook and line gear).

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 Mississippi River Delta Stock, the model predicted the stock experienced a 71% (95% CI: 40–97) maximum reduction in population size, and for the Mobile Bay/Bonsecour Bay Stock, a 31% (95% CI: 20–51) maximum reduction in population size, due to the oil spill (DWH MMIQT 2015; Schwacke *et al*. 2017). This population model has a number of sources of uncertainty. Because no current abundance estimates existed at the time of the spill, the baseline population sizes were estimated from studies initiated after initial exposure to DWH oil occurred. Therefore, it is possible that the pre-spill population sizes were 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).

There were two live dolphins during 2012–2016 that were entangled in unidentified fishing gear or unidentified gear, and both occurred in the Pine Island Sound/Charlotte Harbor/Gasparilla Sound/Lemon Bay Stock area. One animal was seriously injured in 2013. Another animal was initially considered seriously injured, but following mitigation efforts, was released alive without serious injury in 2012 (Maze-Foley and Garrison 2018). In addition, during 2012 in the Perdido Bay Stock area (Alabama), a dolphin was disentangled from a shrimp trawling net being used in a local ecotour. The animal was considered not seriously injured (Maze-Foley and Garrison 2018). During 2015 an animal in the St. Joseph Sound/Clearwater Harbor Stock area (Florida) was released alive without serious injury following entrapment behind an oil boom (Maze-Foley and Garrison 2018). All of these cases were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 28 April 2017) and are included in the stranding totals presented in Table 1. In addition to animals included in the stranding database, during 2012–2016, there were 31 at-sea observations in BSE stock areas of common bottlenose dolphins entangled in fishing gear or unidentified gear (hook and line, crab trap/pot and unidentified gear/line/rope). In 13 of these cases, the animals were seriously injured; in 4 cases the animals were not seriously injured, and for the remaining 14 cases, it could not be determined (CBD) if the animals were seriously injured (Maze-Foley and Garrison 2018; see Table 3).

Table 3. At-sea observations of common bottlenose dolphins entangled in fishing gear or unidentified gear during 20102012–20142016, including the serious injury determination (mortality, serious injury, not a serious injury [Not serious], or could not be determined [CBD] if seriously injured) and stock to which each animal likely belonged based on sighting location. Further details can be found in Maze-Foley and Garrison (2018).

Year	Determination	Stock
2012	Serious injury	Caloosahatchee River
2012	Serious injury	Sarasota Bay/Little Sarasota Bay
2012	CBD	Chokoloskee Bay/Ten Thousand Islands/Gullivan Bay
2012	CBD	Pine Island Sound/Charlotte Harbor/Gasparilla Sound/Lemon Bay
2012	CBD	Tampa Bay
2013	Serious injury	Pine Island Sound/Charlotte Harbor/Gasparilla Sound/Lemon Bay
2013	Serious injury	Estero Bay
2013	Not serious	Chokoloskee Bay/Ten Thousand Islands/Gullivan Bay
2013	CBD	Copano Bay/Aransas Bay/San Antonio Bay/Redfish Bay/Espiritu Santo Bay
2013	CBD	Copano Bay/Aransas Bay/San Antonio Bay/Redfish Bay/Espiritu Santo Bay
2013	CBD	Tampa Bay
2013	CBD	Pine Island Sound/Charlotte Harbor/Gasparilla Sound/Lemon Bay
2014	Serious injury	St. Joseph Sound/Clearwater Harbor
2014	CBD	Chokoloskee Bay/Ten Thousand Islands/Gullivan Bay
2014	CBD	St. Andrew Bay
2015	Serious injury	Calcasieu Lake
2015	Not serious	Tampa Bay
2015	Serious injury	St. Andrew Bay (or Northern Coastal)
2015	Serious injury	Tampa Bay
2015	Serious injury	Laguna Madre
2015	CBD	Sarasota Bay/Little Sarasota Bay
2015	Serious injury	St. Joseph Sound/Clearwater Harbor
2015	CBD	Galveston Bay/East Bay/Trinity Bay
2015	CBD	Mobile Bay/Bonsecour Bay (or Northern Coastal)
2015	Not serious	Sarasota Bay/Little Sarasota Bay
2015	CBD	Apalachee Bay
2015	Not serious	Galveston Bay/East Bay/Trinity Bay
2016	Serious injury	Galveston Bay/East Bay/Trinity Bay
2016	Serious injury	Laguna Madre
2016	CBD	St. Joseph Sound/Clearwater Harbor

Year	Determination	Stock
2016	Serious injury	Mobile Bay/Bonsecour Bay

Interactions between common bottlenose dolphins and research-fishery gear are also known to occur. During 2012–2016, a dolphin was seriously injured during a research longline survey (Maze-Foley and Garrison 2018; see Table 4) and 11 dolphins were entangled in research-related gillnets—in Texas (7), Louisiana (2) and Florida (2). Two of the 10 entanglements resulted in mortalities; three entanglements resulted in serious injuries; five entanglements were released alive without serious injury; and for one entanglement, it could not be determined if the animal was seriously injured (Maze-Foley and Garrison 2018; see Table 4). All of the interactions with research gear were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 28 April 2017).

Table 4. Research-related takes of common bottlenose dolphins during 2012–2016, including the serious injury determination for each animal (mortality, serious injury, not a serious injury [Not serious], or could not be determined ([CBD)] if seriously injured) and stock to which each animal likely belonged based on location of the interaction. All of these interactions were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 28 April 2017). Further details on injury determinations can be found in Maze-Foley and Garrison (2018).

Year	Gear Type	Determination	Stock
2013	Longline	Serious injury	Mobile Bay/Bonsecour Bay
2012	Gillnet	Serious injury	Copano Bay/Aransas Bay/San Antonio Bay/Redfish Bay/Espiritu Santo Bay
2012	Gillnet	Not serious	Neuces Bay/Corpus Christi Bay
2012	Gillnet	Not serious	Copano Bay/Aransas Bay/San Antonio Bay/Redfish Bay/Espiritu Santo Bay
2012	Gillnet	Not serious	Laguna Madre
2013	Gillnet	Not serious	Mississippi River Delta
2013	Gillnet	Mortality	Mississippi River Delta
2013	Gillnet	Mortality	Pine Island Sound/Charlotte Harbor/Gasparilla Sound/Lemon Bay
2013	Gillnet	CBD	Pine Island Sound/Charlotte Harbor/Gasparilla Sound/Lemon Bay
2015	Gillnet	Serious injury	Matagorda Bay/Tres Palacios Bay/Lavaca Bay
2016	Gillnet	Serious injury	Matagorda Bay/Tres Palacios Bay/Lavaca Bay
2016	Gillnet	Not serious	Laguna Madre

NOAA's Office of Law Enforcement has been investigating increasing numbers of reports from the northern Gulf of Mexico coast of violence against common bottlenose dolphins, including shootings using guns and bows and arrows, throwing pipe bombs and cherry bombs, and stabbings (Vail 2016). There have been several documented shootings of BSE common bottlenose dolphins in recent years, both by arrows and guns. During 2014 in Cow Bayou, Texas (Sabine Lake Stock), a dolphin was shot with a compound bow resulting in mortality. In 2014 near Orange Beach, Alabama (Perdido Bay Stock), a dolphin was shot with a hunting arrow. During 2012 a dolphin was observed swimming in Perdido Bay with a screwdriver protruding from its melon and was found dead the next day. All three of these cases were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 28 April 2017) and in Table 2.

Illegal feeding or provisioning of wild common bottlenose dolphins has been documented in Florida, particularly near Panama City Beach in the Panhandle (Samuels and Bejder 2004; Powell *et al.* 2018) and in and near Sarasota Bay (Cunningham-Smith *et al.* 2006; Powell and Wells 2011), and also in Texas near Corpus Christi

(Bryant 1994). Feeding wild dolphins is defined under the MMPA as a form of 'take' because it can alter their natural behavior and increase their risk of injury or death. Nevertheless, a high rate of provisioning was observed near Panama City Beach in 1998 (Samuels and Bejder 2004), and provisioning has been observed south of Sarasota Bay since 1990 (Cunningham-Smith *et al*. 2006; Powell and Wells 2011). There are emerging questions regarding potential linkages between provisioning and depredation of recreational fishing gear and associated entanglement and ingestion of gear, which is increasing through much of Florida. During 2006, at least 2% of the long-term resident dolphins of Sarasota Bay died from ingestion of recreational fishing gear (Powell and Wells 2011). Depredation is a growing problem in the Gulf of Mexico 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 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). Christiansen *et al*. (2017) found that via direct and indirect food provisioning, an increasing percentage of the long-term Sarasota Bay residents were becoming conditioned to human interactions. In addition, when comparing conditioned to unconditioned dolphins, Christiansen *et al.* (2017) reported it was more likely for a conditioned dolphin to be injured by human interactions.

Swimming with wild common bottlenose dolphins has also been documented in Florida in Key West (Samuels and Engleby 2007) and near Panama City Beach (Samuels and Bejder 2004). Near Panama City Beach, Samuels and Bejder (2004) concluded that dolphins were amenable to swimmers due to illegal provisioning. Swimming with wild dolphins may cause harassment, and harassment is illegal under the MMPA.

As noted previously, common bottlenose dolphins are known to be struck by vessels (Wells and Scott 1997; Wells *et al.* 2008). During 2012–2016, 23 stranded bottlenose dolphins (of 530 total strandings) showed signs of a boat collision (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 28 April 2017). It is possible some of the instances were post-mortem collisions. In addition to vessel collisions, the presence of vessels may also impact common bottlenose dolphin behavior in bays, sounds and estuaries. Nowacek *et al.* (2001) reported that boats pass within 100 m of each bottlenose dolphin in Sarasota Bay once every six minutes on average, leading to changes in dive patterns and group cohesion. Buckstaff (2004) noted changes in communication patterns of Sarasota Bay dolphins when boats approached. Miller *et al*. (2008) investigated the immediate responses of common bottlenose dolphins to "high-speed personal watercraft" (i.e., recreational boats) in Mississippi Sound. They found an immediate impact on dolphin behavior demonstrated by an increase in traveling behavior and dive duration, and a decrease in feeding behavior for non-traveling groups. The findings suggested that dolphins attempted to avoid high-speed personal watercraft. It is likely that repeated short-term effects will result in long-term consequences like reduced health and viability or habitat displacement of dolphins (Bejder *et al*. 2006). Further studies are needed to determine the impacts throughout the Gulf of Mexico.

As part of its annual coastal dredging program, the Army Corps of Engineers conducts sea turtle relocation trawling during hopper dredging as a protective measure for marine turtles. No interactions have been documented during the most recent five years, 2012–2016, that fall within BSE stocks in this report; however, one interaction occurred within the boundaries of the Mississippi Sound/Lake Borgne/Bay Boudreau Stock (please see that SAR for details). In earlier years, five interactions, including four mortalities (2003, 2005, 2006, 2007), were documented in the Gulf of Mexico involving common bottlenose dolphins and relocation trawling activities. It is likely that two of these animals belonged to BSE stocks (2003, 2006).

There have been two documented mortalities of common bottlenose dolphins during health-assessment research projects in the Gulf of Mexico, but none have occurred during the most recent five years, 2012–2016.

Some of the BSE communities were the focus of a live-capture fishery for common bottlenose dolphins which supplied dolphins to the U.S. Navy and to oceanaria for research and public display for more than two decades (Reeves and Leatherwood 1984; Scott 1990). Between 1973 and 1988, 533 common bottlenose dolphins were removed from Southeastern U.S. waters (Scott 1990). The impact of these removals on the stocks is unknown. In 1989, the Alliance of Marine Mammal Parks and Aquariums declared a self-imposed moratorium on the capture of common bottlenose dolphins in the Gulf of Mexico (Corkeron 2009).

HABITAT ISSUES

Issues Related to the Deepwater Horizon (DWH) Oil Spill and the Texas City Y 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 west of the Mississippi River on the Mississippi Delta and in Barataria and Terrebonne Bays, and to the east of the river on the Chandeleur Islands. Some heavy to moderate oiling occurred on Alabama and Florida beaches, with the heaviest stretch occurring from Dauphin Island, Alabama, to Gulf Breeze, Florida. Light to trace oil was reported along the majority of Mississippi's mainland coast, from Gulf Breeze to Panama City, Florida, and outside of Atchafalaya and Vermilion Bays in western Louisiana. Heavy to light oiling occurred on Mississippi's barrier islands (Michel *et al*. 2013). Shortly after the oil spill, the Natural Resource Damage Assessment (NRDA) process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies were conducted to determine potential impacts of the spill on marine mammals.

Stranding rates in the northern Gulf of Mexico rose significantly in the years of and following the DWH oil spill to levels higher 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). The primary cause for the UME was attributed to exposure to the DWH oil spill (Venn-Watson et al. 2015a; Colegrove *et al*. 2016; DWH NRDAT 2016) as other possible causes (e.g., morbillivirus infection, brucellosis, and biotoxins) were ruled out (Venn-Watson *et al*. 2015a). Balmer *et al*. (2015) indicated it is unlikely that persistent organic pollutants (POPs) significantly contributed to the unusually high stranding rates following the DWH oil spill. POP concentrations in dolphins sampled between 2010 and 2012 at six northern Gulf sites that experienced DWH oiling 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.

The DWH NRDA Trustees quantified injuries to four BSE stocks of common bottlenose dolphins, including two stocks included in this report, the Mississippi River Delta Stock and the Mobile Bay/Bounsecour Bay Stock, as well two stocks that have their own SARs (Barataria Bay Estuarine System Stock and Mississippi Sound/Lake Borgne/Bay Bourdreau Stock). A suite of research efforts indicated the DWH oil spill negatively affected these stocks of common bottlenose dolphins (Schwacke *et al*. 2014; Venn-Watson *et al*. 2015a; Colegrove *et al*. 2016). 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). Colegrove *et al*. (2016) 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 in utero infections, including pneumonia and brucellosis.

In the absence of any additional non-natural mortality or restoration efforts, the DWH damage assessment estimated the Mississippi River Delta Stock will take 52 years to recover to pre-spill population size, and the Mobile Bay/Bonsecour Bay Stock, 31 years (DWH MMIQT 2015).

A recent oil spill in 2014, referred to as the Texas City Y incident, involved a vessel collision in Galveston Bay near Texas City and the subsequent release of ~168,000 gallons of intermediate fuel oil. Through the NRDA process, impacts of this spill are currently being evaluated and will include impacts to common bottlenose dolphins (NOAA DAARP 2018). No information is currently available on potential impacts to the Galveston Bay/East Bay/Trinity Bay Stock or other stocks in Texas.

Other Habitat Issues

The nearshore habitat occupied by many of these stocks is adjacent to areas of high human population, and in some bays, such as Mobile Bay in Alabama and Galveston Bay in Texas, is highly industrialized. The area surrounding Galveston Bay, for example, has a coastal population of over three million people. More than 50% of all chemical products manufactured in the U.S. are produced there, and 17% of the oil produced in the Gulf of Mexico is refined there (Henningsen and Würsig 1991). Many of the enclosed bays in Texas are surrounded by agricultural lands that receive periodic pesticide applications.

Concentrations of chlorinated hydrocarbons and metals were examined in conjunction with an anomalous mortality event of common bottlenose dolphins in Texas bays in 1990 and found to be relatively low in most; however, some had concentrations at levels of possible toxicological concern (Varanasi *et al*. 1992). No studies to date have determined the amount, if any, of indirect human-induced mortality resulting from pollution or habitat degradation.

Analyses of organochlorine concentrations in the tissues of common bottlenose dolphins in Sarasota Bay, Florida, have found that the concentrations in male dolphins exceeded toxic threshold values that may result in adverse effects on health or reproductive rates (Schwacke *et al*. 2002). Studies of contaminant concentrations relative to life history parameters showed higher levels of mortality in first-born offspring, and higher contaminant concentrations in these calves and in primiparous females (Wells *et al.* 2005). While there are no direct measurements of adverse effects of pollutants on estuary dolphins, the exposure to environmental pollutants and subsequent effects on population health are areas of concern and active research.

STATUS OF STOCKS

The status of these stocks relative to OSP is unknown and this species is not listed as threatened or endangered under the Endangered Species Act. The occurrence of 13 Unusual Mortality Events (UMEs) among common bottlenose dolphins along the northern Gulf of Mexico coast since 1990 (Litz *et al.* 2014; http://www.nmfs.noaa.gov/pr/health/mmume/events.html, accessed 11 January 2016) is cause for concern. Notably, stock areas in Louisiana, Mississippi, Alabama, and the western Florida panhandle have been impacted by a UME of unprecedented size and duration (began 1 February 2010 and ended 31 July 2014). However, the effects of the mortality events on stock abundance have not yet been determined, in large part because it has not been possible to assign mortalities to specific stocks due to a lack of empirical information on stock identification.

Human-caused mortality and serious injury for each of these stocks is not known. Considering the evidence from stranding data (Table 2) and the low PBRs for stocks with recent abundance estimates, the total fishery-related mortality and serious injury likely exceeds 10% of the total known PBR or previous PBR, and therefore, it is probably not insignificant and not approaching the zero mortality and serious injury rate. NMFS considers each of these stocks, except for the Sarasota Bay/Little Sarasota Bay Stock, to be strategic because most of the stock sizes are currently unknown, but are likely small such that relatively few mortalities and serious injuries would exceed PBR.

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