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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*) Mississippi Sound, Lake Borgne, Bay Boudreau 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 of the northern 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,b; Wells *et al.* 1997; Weller 1998; Maze and Würsig 1999; Lynn and Würsig 2002; Wells 2003; Hubard *et al.* 2004; Irwin and Würsig 2004; Shane 2004; Balmer *et al.* 2008; Urian *et al.* 2009; Bassos-Hull *et al.* 2013). 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). Early studies indicating year-round residency in bays in both the eastern and western Gulf of Mexico led to the delineation of 33 bay, sound and estuary (BSE) stocks, including Mississippi Sound, Lake Borgne, Bay Boudreau, with the first stock assessment reports published in 1995.

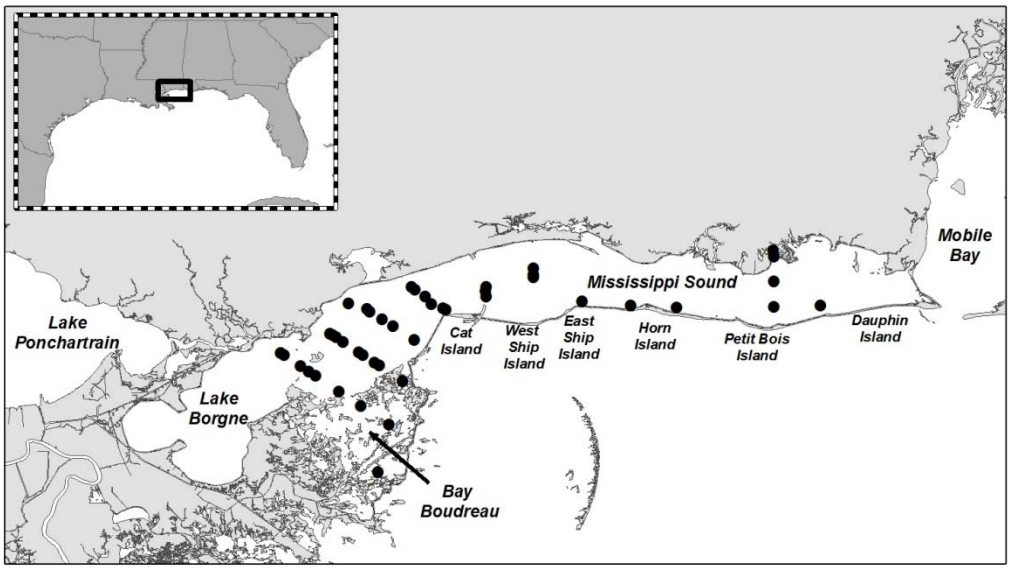

Figure 1. *Geographic extent of the Mississippi Sound, Lake Borgne, Bay Boudreau Stock, located on the coasts of Alabama, Mississippi and Louisiana. Dark circles indicate sightings of common bottlenose dolphins during aerial surveys conducted in spring, summer and fall of 2011 and in winter of 2012.*

More recently, genetic data also support the concept of relatively discrete, demographically independent BSE stocks (Duffield and Wells 2002; Sellas *et al.* 2005). Sellas *et al.* (2005) examined population subdivision among 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 population structure among all areas on the basis of both mitochondrial DNA control region sequence data and 9 nuclear microsatellite loci. The Sellas *et al.* (2005) findings support the identification of BSE populations distinct from those occurring in adjacent Gulf coastal waters. 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 a 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; NMFS unpublished).

The Mississippi Sound, Lake Borgne, Bay Boudreau Stock area (Figure 1) is complex with an estimated surface area of 3,711 km^2 (Scott *et al*. 1989). Mississippi Sound itself has a surface area of about 2,100 km^2 (Eleuterius 1978a,b) and is bounded by Mobile Bay in the east, Lake Borgne in the west, and the opening to Bay Boudreau in the southwest. It is bordered to the north by the mainlands of Louisiana, Mississippi and Alabama and to the south by six barrier islands: Cat, West Ship, East Ship, Horn, Petit Bois and Dauphin Islands (Eleuterius 1978b), and in the extreme west, Louisiana marshes. Mississippi Sound is an open embayment with large passes between the barrier islands allowing broad access to the Gulf of Mexico, including two dredged shipping channels. Average depth at mean low water is 2.98 m, and tides are diurnal with an average range of 0.57 m (Eleuterius 1978b). Sea surface temperature ranges seasonally from 9˚C to 32˚C and salinity from 0 to 33 ppt from winter to summer, respectively (Christmas 1973). The bottom type is soft substrate consisting of mud and/or sand (Moncreiff 2007). Lake Borgne and Bay Boudreau are part of the Pontchartrain Basin and are remnants of the Saint Bernard lobe of Mississippi River Delta that existed until about 2000 years ago when the Mississippi River changed course (Roberts 1997; Penland *et al.* 2013). Lake Borgne has an average depth of 3 m and an average salinity of 7 ppt (USEPA 1999). Bay Boudreau is a large shallow complex in the Saint Bernard marshes and consists of marshes, bayou, shallow bays and points (Penland *et al*. 2013).

The Mississippi Sound, Lake Borgne, Bay Boudreau Stock area ("MS Sound Region") configuration is in part a result of the management of the live-capture fishery for bottlenose dolphins (Scott 1990). Mississippi Sound was once the site of the largest live-capture fishery of bottlenose dolphins in North America (Reeves and Leatherwood 1984). Between 1973 and 1988, of the 533 bottlenose dolphins removed from Southeastern U.S. waters, 202 were removed from Mississippi Sound and adjacent waters (Scott 1990). In 1989, the Alliance of Marine Mammal Parks and Aquariums declared a self-imposed moratorium on the capture of bottlenose dolphins in the Gulf of Mexico (Corkeron 2009).

Passage of the Marine Mammal Protection Act in 1972 and the concomitant need to manage the live-capture fishery for bottlenose dolphins was the impetus for much of the earliest bottlenose dolphin research in the MS Sound Region. This work focused on estimating the abundance of bottlenose dolphins (see below) and, to a lesser extent, on stock structure research primarily to provide live-capture quota recommendations (Scott 1990). To gather baseline biological data and study dolphin ranging patterns, 57 bottlenose dolphins were captured from Mississippi Sound, freeze-branded and released during 1982-1983 (Solangi and Dukes 1983; Lohoefener *et al*. 1990*a*). Re-sighting efforts for these dolphins conducted from 1982-1985 by Lohoefener *et al.* (1990a) suggested at least some individual dolphins exhibited fidelity for specific areas within Mississippi Sound.

The first dedicated photo-ID effort in the area undertaken by Hubard *et al.* (2004) during 1995-1996 established a working photo-ID catalog for Mississippi Sound. Photo-ID data suggested that some individual dolphins, seen multiple times, displayed spatial and temporal patterns of site fidelity, and some dolphins showed preferences to different habitats, particularly barrier islands, channels or mainland coasts (Hubard *et al.* 2004). Some individuals were seen in the same seasons both years, while others were seen in multiple seasons with a gap during winter months (Hubard *et al.* 2004). During photo-ID/line transect surveys in 1995 and 1996, several animals photographed in 1991 (Mullin and Hoggard 1992a,b) were re-sighted (Hubard *et al.* 2004). Also, two dolphins freeze branded during the live capture performed by Solangi and Dukes (1983) were re-sighted by Hubard *et al.* (2004).

Mackey (2010) also examined site fidelity as well as residency patterns of bottlenose dolphins in a portion of Mississippi Sound using photo-ID data. During 2004-2007, Mackey (2010) primarily followed dolphins near and on both the Gulf and sound sides the barrier islands and along the Gulfport Shipping Channel and identified three different residency patterns. Of the 687 dolphins identified in those surveys, 71 (10%) were classified as year-round residents, 109 (16%) as seasonal residents, and 498 (73.5%) as transients. These patterns may not be representative of the MS Sound Region. Dolphins sighted near the barrier islands adjacent to or within the range of the Northern Coastal Stock of bottlenose dolphins may have a higher probability of being transient. Outside of the ship channel, a small proportion of the dolphins sighted by Mackey (2010) were from the interior two-thirds of Mississippi Sound (adjacent to the mainland) where dolphins may have quite different residency patterns. Mackey (2010) also identified two animals that were freeze-branded during the live captures 20 years earlier (Solangi and Dukes 1983). Both Mackey (2010) and Hubard *et al.* (2004) noted low re-sighting rates of dolphins with a high percentage of dolphins seen only on one occasion. Both studies also suggested dolphins move out of the Sound into deeper Gulf of Mexico waters during winter months (Hubard *et al.* 2004; Mackey 2010). Definitive conclusions on bottlenose

dolphin site fidelity and residency patterns in the MS Sound Region are difficult to make based on available research. Establishing residency patterns in the MS Sound Region using photo-ID studies that cover large study areas (e.g., Hubard *et al*. 2004) will be difficult because of the large number of dolphins that inhabit the area and its open geography. Nevertheless, studies to date indicate that, similar to other Gulf of Mexico areas, some individuals are long-term inhabitants of the MS Sound Region. The current stock boundary does not include any coastal waters outside of the barrier islands. Further research is needed to determine the degree to which dolphins of this stock utilize nearshore coastal waters outside the MS Sound Region. The stock boundaries are subject to change upon further study of dolphin residency patterns in estuarine waters of Alabama, Mississippi and Louisiana. Information on the use of coastal waters will be important when considering exposure to coastal fisheries as estuarine animals that make use of nearshore coastal waters would be at risk of entanglement in fishing gear while moving along the coast. Ongoing NOAA photo-ID surveys initiated in 2010, as well as data from tracking of 19 bottlenose dolphins tagged with satellite-linked transmitters in and around Mississippi Sound in July 2013, will address some of these issues as the data become available.

POPULATION SIZE

The best available abundance estimate for the Mississippi Sound, Lake Borgne, Bay Boudreau Stock of common bottlenose dolphins is 901 (CV=0.63) based on a winter 2012 aerial survey.

Earlier abundance estimates

Aerial and small boat surveys conducted in the MS Sound Region covered different portions of the region and yielded a wide range of abundance estimates for common bottlenose dolphins. Because of the differences in techniques and areas surveyed, it is very difficult to compare results. Aerial strip transect surveys conducted by Leatherwood *et al.* (1978) compared aerial survey techniques for bottlenose dolphins, but the study also produced population estimates for common bottlenose dolphins in Mississippi Sound and the adjacent Gulf of Mexico (to about 10 km south of the barrier islands) of 1,342±847 in 1974 and 879±368 in 1975. Thompson (1982) surveyed central Mississippi Sound ("off Pascagoula") in 1980 using aerial line-transect sampling methods, and abundance estimates ranged from 93 dolphins (SE=22) in December 1980 to 140 dolphins (SE=86) in September 1980. While line-transect is a rigorous and repeatable survey method, this study produced negatively biased estimates of density and abundance (Thompson 1982) due to the fact that the strip of transect directly under the aircraft was not observed. Scott *et al.* (1989) attempted to correct this bias by utilizing an aircraft with a glass bubble nose and placing an observer in it to observe the track-line at all times. Their estimates for the MS Sound Region ranged from 205 in winter to 858 in summer. (Abundances for Mississippi Sound only ranged from 136 dolphins in winter to 719 dolphins in summer.) Boat-based mark-recapture surveys using dolphins freeze-branded during a previous live-capture study were performed by Lohoefener *et al.* (1990a) to assess the impacts of removing 30 dolphins from the population for captivity. The pre-removal estimate was 2,392 dolphins, and the post-removal estimate was 7,052 dolphins (Lohoefener *et al.* 1990a), but these were probably not accurate estimates, as too many assumptions of mark-recapture analysis were likely violated in this study (Lohoefener *et al.* 1990a). Boat-based line-transect abundance surveys of Mississippi Sound (about 55% of the MS Sound Region) were carried out by Lohoefener *et al*. (1990b) in 1984 and 1985, yielding much higher abundance estimates than aerial strip- or line-transect surveys and suggesting a seasonal shift in bottlenose dolphin abundance. For the entire Sound, abundance estimates were 2,400 and 500 dolphins for summer and winter, respectively. Another series of line-transect aerial surveys were performed in fall of 1992 by Blaylock and Hoggard (1994), where the abundance was reported as 1,401 for the MS Sound Region. The two most recent abundance estimates from Mississippi Sound were boat-based line-transect surveys and only covered a portion of Mississippi Sound. Hubard *et al.* (2004) surveyed an area bounded by the western end of Horn Island and the eastern end of Petit Bois Island that was roughly one-quarter the size of the entire Sound. Again, abundances were found to fluctuate seasonally with higher abundances observed in summer months in 1995 (584 dolphins) and 1996 (555 dolphins) versus winter 1995-1996 months (268 dolphins). Miller *et al.* (2013) reported abundance estimates for a study area in eastern Mississippi Sound roughly 2,104 km^2 in size that included areas up to 15 km south of the barrier islands. Abundance estimates were 2,255 dolphins in summer 2007 and 1,413 dolphins in winter 2007-2008 (Miller *et al.* 2013).

Recent surveys and abundance estimates

The Southeast Fisheries Science Center conducted aerial surveys of continental shelf waters (shoreline to 200 m depth) along the U.S. Gulf of Mexico coast from the Florida Keys to the Texas/Mexico border during spring (March-April) 2011, summer (July-August) 2011, fall (October-November) 2011 and winter (January-February) 2012. The surveys were conducted along tracklines oriented perpendicular to the shoreline and spaced 20-30 km

apart. The total survey effort varied during each survey due to weather conditions, but ranged between 13,500 – 15,600 km. Each of these surveys was conducted using a two-team approach to develop estimates of visibility bias using the independent observer approach with Distance analysis (Laake and Borchers 2004). A model for the probability of detection on the trackline as a function of sighting conditions (seas state, glare, water color, etc.) was developed using data across all four surveys. This model was then applied to detection probability functions specific to each survey to account for the probability of detection as a function of distance from the trackline and additional environmental covariates. A bootstrap resampling approach was used to estimate the variance of the estimates. The survey data were post-stratified into spatial boundaries corresponding to the defined boundaries of common bottlenose dolphin stocks within the surveyed area. The abundance estimates for the Mississippi Sound, Lake Borgne, Bay Boudreau Stock of bottlenose dolphins were based upon tracklines and sightings in waters along the Alabama, Mississippi and Louisiana coasts inside of the barrier islands. The surveys did not include tracklines in Lake Borgne, but the estimated density was extrapolated to include the entire stock area. The seasonal abundance estimates for this stock were: spring – 2,395 (CV=0.42), summer – 1,709 (CV= 0.59), fall – 1,140 (CV=0.41) and winter – 900 (CV=0.63). As with other BSE stocks, it is possible that there is movement of transient animals from coastal waters into the MS Sound Region on a seasonal basis. In order to assure that the abundance estimate for the stock reflects primarily resident animals, the lowest seasonal estimate (winter) was used to determine N_{best} for this stock. The resulting best estimate of abundance for the Mississippi Sound, Lake Borgne, Bay Boudreau Stock of common bottlenose dolphins was 900 (CV=0.63).

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 901 (CV=0.63). The minimum population estimate for the MS Sound Region is 551 common bottlenose dolphins.

Current Population Trend

There are insufficient data to determine the population trends for this stock because of significant methodological differences in the surveys over time.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size of common bottlenose dolphins in the MS Sound Region is 551. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because this stock is of unknown status. PBR for the Mississippi Sound, Lake Borgne, Bay Boudreau Stock of common bottlenose dolphins is 5.6.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the Mississippi Sound, Lake Borgne, Bay Boudreau Stock during 2009–2013 is unknown because this stock is known to interact with unobserved fisheries (see below), and also because the most current observer data for the shrimp trawl fishery are for 2007-2011 and mortality rates were calculated at the state level (see Shrimp Trawl section below). The mean annual fishery-related mortality and serious injury during 2009–2013 for observed fisheries and strandings identified as fishery-caused was 1.6. Additional mean annual mortality and serious injury during 2009–2013 due to other human-caused actions (fishery research and sea turtle relocation trawling) was 0.6. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 2.2. This does not include an estimate for the commercial shrimp trawl fishery.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category II Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl; and Gulf of Mexico menhaden purse seine fisheries; and

the Category III Gulf of Mexico blue crab trap/pot; and Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fisheries (Appendix III).

Shrimp Trawl

Between 1997 and 2011, 5 common bottlenose dolphins and 7 unidentified dolphins, which could have been either common bottlenose dolphins or Atlantic spotted dolphins, became entangled in the lazy line, turtle excluder device or tickler chain gear in the commercial shrimp trawl fishery in the Gulf of Mexico. All dolphin bycatch interactions resulted in mortalities except for 1 unidentified dolphin that was released alive in 2009. Soldevilla *et al.* (2015) provide mortality estimates calculated from analysis of shrimp fishery effort data and NMFS's Observer Program bycatch data. Observer program coverage does not extend into BSE waters; time-area stratified bycatch rates were extrapolated into inshore waters to estimate bycatch mortalities from inshore fishing effort. Annual mortality estimates were calculated for the years 1997-2011 from stratified annual fishery effort and bycatch rates, and a 5-year unweighted mean mortality estimate for 2007-2011 was calculated for Gulf of Mexico dolphin stocks. The 4-area (Texas, Louisiana, Mississippi/Alabama, Florida) stratification method was chosen because it best approximates how fisheries operate (Soldevilla *et al.* 2015). 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 estimate for Mississippi/Alabama BSE stocks (from Mississippi River Delta east to Mobile Bay, Bonsecour Bay) was 41 (CV=0.67). This estimate does not include skimmer trawl effort, which may represent up to 50% 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).

Menhaden Purse Seine

During 2009–2013, there were 2 mortalities and 1 animal released alive without serious injury documented within waters of the MS Sound Region involving the menhaden purse seine fishery.

There is currently no observer program for the Gulf of Mexico menhaden purse seine fishery; however, recent incidental takes have been reported via two sources. First, during 2011, a pilot observer program operated from May through September, and observers documented 3 dolphins trapped within purse seine nets. All 3 were released alive without serious injury (Maze-Foley and Garrison in prep a). Two of the 3 dolphins were trapped within a single purse seine within waters of the Western Coastal Stock, and the third animal was trapped in waters of the MS Sound Region. Second, through the Marine Mammal Authorization Program (MMAP), there have been 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. These takes likely affected the following stocks: Western Coastal Stock; Northern Coastal Stock; Mississippi Sound, Lake Borgne, Bay Boudreau Stock; and Mississippi River Delta Stock. Specific self-reported takes under the MMAP likely involving the MS Sound Region are as follows: two dolphins were reported taken in a single purse seine during 2012 in waters of Mississippi Sound; one take of a single unidentified dolphin was reported during 2002 in waters of Mississippi Sound; and during 2000, 3 bottlenose dolphins were reported taken in a single purse seine in waters of Mississippi Sound.

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 communities from which bottlenose dolphins are being taken.

Blue Crab Trap/Pot

During 2009–2013 there was 1 documented mortality of a common bottlenose dolphin in commercial blue crab trap/pot gear. The mortality occurred during 2011 and was included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and in the totals presented in Table 1. There is no systematic observer coverage of crab trap/pot fisheries, so it is not possible to quantify total mortality.

Hook and Line

During 2009–2013 there were 5 mortalities for which hook and line gear entanglement or ingestion were documented. Three mortalities occurred during 2011, 1 during 2012, and 1 during 2013 (in Lake Pontchartrain). These mortalities were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and in the totals presented in Table 1. 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 systematic observer program.

Other Mortality

From 2009 to 2013, 353 common bottlenose dolphins were reported stranded within the MS Sound Region (Table 1; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, 11 June 2014). Of those 353, 49 dolphins stranded within Lake Pontchartrain. It is likely the stranded animals in Lake Pontchartrain originated from the MS Sound Region. It could not be determined if there was evidence of human interaction for 317 of these strandings. For 14 dolphins, no evidence of human interaction was detected. Evidence of human interactions was detected for 22 stranded dolphins. Human interactions were from numerous sources, including 5 entanglements with hook and line gear, 1 entanglement with commercial blue crab trap/pot gear, 1 incidental take in a research gillnet, 1 incidental take during turtle relocation trawling, 1 animal entrapped during research skimmer trawling and 2 animals that were visibly oiled (see Table 1). 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.

The MS Sound Region has been affected by several bottlenose dolphin die-offs or Unusual Mortality Events (UMEs). From January through May 1990, a total of 344 bottlenose dolphins stranded in the northern Gulf of Mexico including Mississippi. 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). In 1996 a UME was declared for bottlenose dolphins in Mississippi when 31 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). A UME was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010; and, as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see "Habitat Issues" below), during the spill, and after. During 2010-2013, nearly all stranded dolphins from this stock were considered to be part of the UME (see Table 1).

During 2013, 1 animal was entrapped during research skimmer trawl operations within the MS Sound Region. It could not be determined if the animal was seriously injured (Maze-Foley and Garrison in prep b). One mortality was documented in 2011 in the MS Sound Region as a result of an entanglement in a research gillnet. Both interactions were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and in the totals presented in Table 1.

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. One bottlenose dolphin mortality was documented during 2011 in MS Sound Region incidental to relocation trawling activities. This mortality was included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and in the totals presented in Table 1.

The problem of dolphin depredation of fishing gear is increasing in Gulf of Mexico coastal and estuary waters and illegal feeding or provisioning of wild bottlenose dolphins has been documented in Florida and Texas (Bryant 1994; Samuels and Bejder 2004; 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. To date there are no records of provisioning for this stock area. However, one recent case of a shrimp fisherman illegally "taking" a dolphin in Mississippi Sound occurred during summer 2012. In December 2013 the fisherman was convicted under the MMPA for knowingly shooting a dolphin with a shotgun while shrimping.

Table 1. Common bottlenose dolphin strandings occurring in the Mississippi Sound, Lake Borgne, Bay Boudreau Stock area from 2009 to 2013, as well as 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 (HI). Data are from the NOAA National Marine Mammal Health and Stranding Response Database (unpublished data, accessed 11 June 2014). Please note human interaction does not necessarily mean the interaction caused the animal's death.

Stock	Category	2009	2010	2011	2012	2013	Total
Mississippi Sound, Lake Borgne, Bay Boudreau Stock	Total Stranded	36	94[a]	114[b]	47[b]	62[c]	353
	Human Interaction						
	---Yes	1	7[d]	8[e]	3[f]	3[g]	22
	---No	3	1	7	3	0	14
	---CBD	32	86	99	41	59	317

[a] 93 strandings were part of the ongoing UME event in the northern Gulf of Mexico.
[b] All strandings were part of the ongoing UME event in the northern Gulf of Mexico.
[c] 61 strandings were part of the ongoing UME event in the northern Gulf of Mexico
[d] Includes 2 strandings that were visibly oiled.
[e] Includes 3 entanglement interactions (mortalities) with hook and line fishing gear, 1 entanglement interaction (mortality) with commercial blue crab trap/pot gear, 1 mortality incidental to sea turtle relocation trawling, and 1 entanglement interaction (mortality) with a research gillnet.
[f] Includes 1entanglement interaction (mortality) with hook and line fishing gear.
[g] Includes 1 entanglement interaction (mortality, Lake Pontchartrain) with hook and line fishing gear and 1 interaction with a research skimmer trawl (CBD if seriously injured).

HABITAT ISSUES

The *Deepwater Horizon* (DWH) MC252 drilling platform, located approximately 50 miles 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 ~4.9 million barrels of oil were discharged from the wellhead until it was capped on 15 July 2010 (McNutt *et al.* 2012). During the response effort dispersants were applied extensively at the seafloor and at the sea surface (Lehr *et al*. 2010; OSAT 2010). In-situ burning, or controlled burning of oil at the surface, was also used extensively as a response tool (Lehr *et al*. 2010). The oil, dispersant and burn residue compounds present ecological concerns (Buist *et al.* 1999; NOAA 2011). The magnitude of this oil spill was unprecedented in U.S. history, causing impacts to wildlife, natural habitats and human communities along coastal areas from western Louisiana to the Florida Panhandle (NOAA 2011). It could be years before the entire scope of damage is ascertained (NOAA 2011).

Given the trajectory of the surface oil during the spill and the documented oiling of shoreline (Michel *et al.* 2013), it is likely the Mississippi Sound, Lake Borgne, Bay Boudreau Stock of common bottlenose dolphins was exposed to oil during the event. 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). 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.

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 are being conducted to determine potential impacts of the spill on marine mammals. These studies have focused on identifying the type, magnitude, severity, length and impact of oil exposure to oceanic, continental shelf, coastal and estuarine marine mammals. The research is ongoing. For coastal and estuarine dolphins, the NOAA-led efforts include: active surveillance to detect stranded animals in remote locations; aerial surveys to document the distribution, abundance, species and exposure relative to oil from the DWH spill; assessment of sublethal and chronic health impacts on coastal and estuarine bottlenose dolphins in Barataria Bay, Louisiana, Mississippi Sound, and a reference site in Sarasota Bay, Florida; and assessment of injuries to dolphin stocks in Barataria Bay and Chandeleur Sound, Louisiana, Mississippi Sound, and as a reference site, St. Joseph Bay, Florida.

Coastal dolphins have been observed with tar balls attached to them and seen swimming through oil slicks close

to shore and inland bays. The effects of oil exposure on marine mammals depend on a number of factors including the type and mixture of chemicals involved, the amount, frequency and duration of exposure, the route of exposure (inhaled, ingested, absorbed, or external) and biomedical risk factors of the particular animal (Geraci 1990). In general, direct external contact with petroleum compounds or dispersants with skin may cause skin irritation, chemical burns and infections. Inhalation of volatile petroleum compounds or dispersants may irritate or injure the respiratory tract, which could lead to pneumonia or inflammation. Ingestion of petroleum compounds may cause injury to the gastrointestinal tract, which could affect an animal's ability to digest or absorb food. Absorption of petroleum compounds or dispersants may damage kidney, liver and brain function in addition to causing immune suppression and anemia. Long term chronic effects such as lowered reproductive success and decreased survival may occur (Geraci 1990).

Besides oil exposure, another habitat concern for the MS Sound Region is environmental contaminants. Persistent organic pollutant (PCBs, chlordanes, mirex, DDTs, HCB and dieldrin) and polybrominated diphenyl ether concentrations were determined from bottlenose dolphin blubber samples from 14 locations, including Mississippi Sound, along the U.S. Atlantic and Gulf coasts and Bermuda (Kucklick *et al.* 2011). Dolphins from both rural and urban estuarine and coastal waters were sampled. Dolphins sampled from Mississippi Sound had relatively high concentrations of some pollutants, like PBDEs, HCB, mirex and DDTs, and more intermediate concentrations of dieldrin, PCBs and chlordanes, when compared to dolphins sampled from the other 13 locations (Kucklick *et al.* 2011).

The presence of vessels may impact bottlenose dolphin behavior in bays, sounds and estuaries. Miller *et al.* (2008) investigated the immediate responses of bottlenose dolphins to "high-speed personal watercraft" (i.e., 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 dolphins attempted to avoid high-speed personal watercraft. It is unclear whether repeated short-term effects will result in long-term consequences like reduced health and viability of dolphins. Further studies are needed to determine the impacts throughout the Gulf of Mexico.

STATUS OF STOCK

Common bottlenose dolphins are not listed as threatened or endangered under the Endangered Species Act. Because the stock size is small and relatively few mortalities and serious injuries would exceed PBR, NMFS considers this a strategic stock. Additionally,, because a UME of unprecedented size and duration (began 1 February 2010 and is ongoing) has impacted the northern Gulf of Mexico, including the Mississippi Sound, Lake Borgne, Bay Boudreau Stock, NMFS finds cause for concern about this stock. Total fishery-related mortality and serious injury for this stock is not known, 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. The status of this stock relative to OSP is unknown. There are insufficient data to determine population trends for this stock.

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