COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Gulf of Mexico Eastern Coastal Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Common bottlenose dolphins inhabit coastal waters throughout the northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) (Mullin *et al.* 1990). As a working hypothesis, it is assumed that the dolphins occupying habitats with dissimilar climatic, coastal and oceanographic characteristics might be restricted in their movements between habitats, and thus constitute separate stocks. Therefore, northern Gulf of Mexico coastal waters have been divided for management purposes into 3 stock areas: eastern, northern and western, with coastal waters defined as waters between the shore, barrier islands or presumed outer bay boundaries out to the 20-m isobath (Figure 1). The 20-m depth seaward boundary corresponds to survey strata (Scott 1990; Blaylock and Hoggard 1994; Fulling *et al.* 2003), and thus represents a management boundary rather than an ecological boundary. The Eastern Coastal bottlenose dolphin stock area extends from 84^{o}W longitude to Key West, Florida. The region is temperate to subtropical in climate, is bordered by a mixture of coastal marshes, sand beaches, marsh and mangrove islands, and has an intermediate level of freshwater input. It is bordered on the north by an extensive area of coastal marsh and marsh islands typical of Florida's Apalachee Bay. Dolphins belonging to this stock are all expected to be of the coastal ecotype (Vollmer 2011).

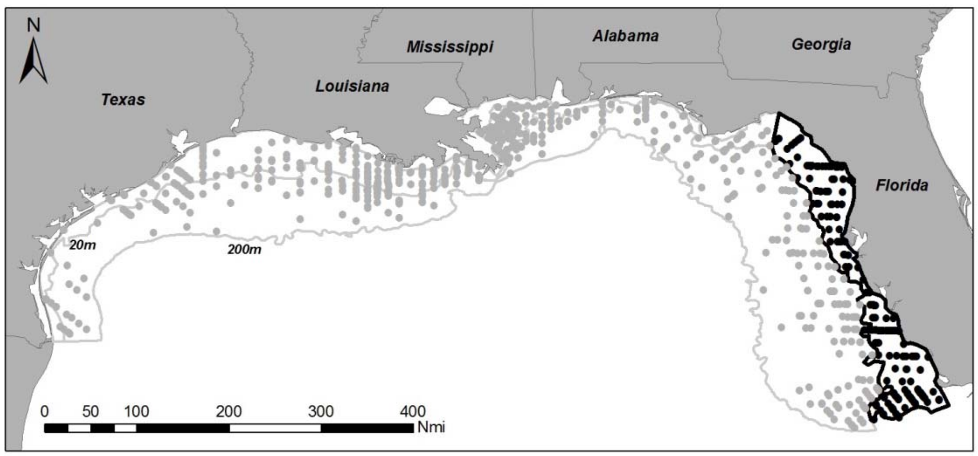

Figure 1. *Locations (circles) of common bottlenose dolphin groups sighted in coastal and continental shelf waters during aerial surveys conducted in spring, summer and fall of 2011 and in winter of 2012. Dark circles indicate groups within the boundaries of the Eastern Coastal Stock. The 20-m and 200-m isobaths are shown.*

This stock's boundaries abut other bottlenose dolphin stocks, namely the Continental Shelf Stock, the Northern Coastal Stock and several bay, sound and estuary stocks, and while individuals from different stocks may occasionally overlap, it is not thought that significant mixing or interbreeding occurs between them. Fazioli *et al.* (2006) conducted photo-identification surveys of coastal waters off Tampa Bay, Sarasota Bay and Lemon Bay, Florida, over 14 months. They found both 'inshore' and 'Gulf' dolphins inhabited coastal waters but the 2 types used coastal waters differently. Dolphins from the inshore communities were observed occasionally in Gulf near-shore waters adjacent to their inshore range, whereas 'Gulf' dolphins were found primarily in open Gulf of Mexico waters with some displaying seasonal variations in their use of the study area. The 'Gulf' dolphins did not show a preference for waters near passes as was seen for 'inshore' dolphins, but moved throughout the study area and made greater use of waters offshore of waters used by 'inshore' dolphins. During winter months abundance of 'Gulf' groups decreased while abundance for 'inshore' groups increased. These findings support an earlier report by Irvine *et al.* (1981) of increased use of pass and coastal waters by Sarasota Bay dolphins in winter. Seasonal movements of identified individuals and abundance indices suggested that part of the 'Gulf" dolphin community moved out of the study area during winter, but their destination is unknown (Fazioli *et al.* 2006). In a follow-up study, Sellas *et al.* (2005) examined genetic population subdivision in the study area of Fazioli *et al.* (2006), 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 separate identification of bay, sound and estuary stocks from those occurring in adjacent Gulf coastal waters, as suggested by Wells (1986).

Off Galveston, Texas, Beier (2001) reported an open population of individual dolphins in coastal waters, but several individual dolphins had been sighted previously by other researchers over a 10-year period. Some coastal animals may move relatively long distances alongshore. Two bottlenose dolphins previously seen in the South Padre Island area in Texas were seen in Matagorda Bay, 285km north, in May 1992 and May 1993 (Lynn and Würsig 2002).

POPULATION SIZE

The best abundance estimate available for the northern Gulf of Mexico Eastern Coastal Stock of common bottlenose dolphins is 12,388 (CV=0.13; Table 1). This estimate is from an inverse-variance weighted average of seasonal abundance estimates from aerial surveys conducted during spring 2011, summer 2011, fall 2011 and winter 2012.

Earlier abundance estimates

Please see Appendix IV for a summary of abundance estimates, including earlier estimates and survey descriptions.

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 (sea state, glare, water color, etc.) was developed using data across all 4 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 Eastern Coastal Stock of bottlenose dolphins were based upon tracklines and sightings in waters from the shoreline to the 20-m isobath and between 84°W longitude and the Florida Keys. The seasonal abundance estimates for this stock were: spring – 13,770 (CV=0.22), summer – 8,458 (CV=0.23), fall – 10,019 (CV=0.36) and winter – 16,669 (CV=0.25). Due to the uncertainty in stock movements and apparent seasonal variability in the abundance of the stock, a weighted average of these seasonal estimates was taken where the weighting was the inverse of the CV. This approach weights estimates with higher precision more heavily in the final weighted mean. The resulting weighted mean and best estimate of abundance for the Eastern Coastal Stock of common bottlenose dolphins was 12,388 (CV=0.13).

Previous abundance estimates for the Northern and Eastern Coastal Stocks were derived from aerial surveys conducted during 17 July to 8 August 2007. Survey effort covered waters from the shoreline to 200 m depth and was stratified such that the majority of effort was expended in the 0-20m depth range of the coastal stocks. The survey team consisted of an observer stationed at each of two forward bubble windows and a third observer stationed at a belly window that monitored the trackline. Surveys were typically flown during favorable sighting conditions at Beaufort sea state less than or equal to 3 (surface winds <10 knots). Abundance estimates were derived using distance analysis including environmental covariates that had a significant influence on sighting probability (Buckland *et al.* 2001), but these estimates were not corrected for *g(0)* and are thus negatively biased. The resulting abundance estimate for the Eastern Coastal Stock was 7,702 animals (CV=0.19).

Table 1. Summary of recent abundance estimates for the Eastern Coastal Stock of common bottlenose dolphins. Month, year and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).			
Month/Year	Area	N_{best}	CV
July-Aug 2007	shoreline to 20 m, Eastern Coastal Stock waters (84°W longitude to Florida Keys)	7,702	0.19
Spring, summer and fall 2011, winter 2012	shoreline to 20 m, Eastern Coastal Stock waters (84°W longitude to Florida Keys)	12,388	0.13

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for the Eastern Coastal Stock of common bottlenose dolphins is 12,388 (CV=0.13). The minimum population estimate for the northern Gulf of Mexico Eastern Coastal Stock is 11,110 common bottlenose dolphins.

Current Population Trend

A trend analysis has not been conducted for this stock. There are 3 abundance estimates from: 1) fall 1994 (9,912; CV=0.12); 2) summer 2007 (7,702; CV=0.19); and 3) year-round, seasonal 2011-2012 (12,388; CV=0.13). Methodological differences among the estimates need to be evaluated to quantify trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known 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 minimum population size, one-half the maximum productivity rate and a recovery factor (Wade and Angliss 1997). The minimum population size is 11,110. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor is 0.5 because the stock is of unknown status. PBR for the northern Gulf of Mexico Eastern Coastal Stock of common bottlenose dolphins is 111.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the Eastern Coastal Stock of common bottlenose dolphins 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. The mean annual fishery-related mortality and serious injury during 2009–2013 for strandings and at-sea observations identified as fishery-caused was 1.6. No additional mortality or serious injury was documented from other human-caused actions. The minimum total mean annual human-caused mortality and serious injury for this stock during 2009–2013 was 1.6. This does not include an estimate for the commercial shrimp trawl fishery. The 5-year unweighted mean annual mortality estimate for 2007-2011 for the commercial shrimp trawl fishery was 2.3 (CV=0.99) (see Shrimp Trawl section below).

Fisheries Information

This stock interacts with 2 Category II commercial fisheries: Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl and Southeastern U.S. Atlantic, Gulf of Mexico stone crab trap/pot. This stock also interacts, or has the potential to interact, with 5 Category III commercial fisheries: Southeastern U.S. Atlantic, Gulf of Mexico shark bottom longline/hook-and-line; FL spiny lobster trap/pot; Gulf of Mexico blue crab trap/pot; FL West Coast sardine purse seine; and Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) (Appendix III). There have been no documented interactions between common bottlenose dolphins of the Eastern Coastal Stock and the FL West Coast sardine purse seine fishery; however, it should be noted there is no observer coverage of the sardine purse seine fishery.

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. 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 (TX, LA, MS/AL, FL) stratification method was chosen because it best approximates how fisheries operate (Soldevilla *et al.* 2015). The mean annual mortality estimate for the Eastern Coastal Stock of common bottlenose dolphins is 2.3 (CV=0.99). Limitations and biases of annual bycatch mortality estimates are described in detail in Soldevilla *et al.* (2015). However, this estimate is not included in the annual human-caused mortality and serious injury for this stock because estimates for 2012 and 2013 are not available.

Blue Crab, Stone Crab and Spiny Lobster Trap/Pot

During 2009–2013, 5 entanglements associated with trap/pot fisheries were documented for the Eastern Coastal Stock: 2 mortalities, 1 live release with serious injury, 1 live release without serious injury, and 1 live release in unknown condition. In 2013, 1 animal was disentangled from trap/pot gear and released alive, considered seriously injured (Maze-Foley and Garrison in prep c). In 2012, 1 mortality was documented in which an animal was entangled in stone crab trap/pot gear. In 2010, 2 dolphins were disentangled and released alive. One animal was entangled in stone crab trap/pot gear and its condition upon release could not be determined (Maze-Foley and Garrison in prep a). The second animal was entangled in commercial stone crab trap/pot gear and was released alive without serious injury (Maze-Foley and Garrison in prep a). Also during 2010, 1 mortality was documented in which an animal was entangled in unidentified commercial trap/pot gear. The mortalities and live entanglements were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and are included in the stranding totals presented in Table 2. Since there is no systematic observer program, it is not possible to estimate the total number of interactions or mortalities associated with crab traps/pots.

Shark Bottom Longline

During 2009–2013, no interactions between common bottlenose dolphins and this fishery were observed. The shark bottom longline fishery has been observed since 1994, and 3 interactions with bottlenose dolphins have been recorded, 1 of which likely involved the Eastern Coastal Stock: in 1999, a hooked dolphin escaped at the vessel (Burgess and Morgan 2003). No interactions were observed during 2004-2013 (Hale and Carlson 2007; Hale *et al.* 2007; Richards 2007; Hale *et al.* 2009; 2010; 2011; 2012; Gulak *et al.* 2013; 2014). For the shark bottom longline fishery in the Gulf of Mexico, Richards (2007) estimated bottlenose dolphin mortalities of 58 (CV=0.99), 0 and 0 for 2003, 2004 and 2005, respectively.

Hook and Line

During 2009–2013, 2 mortalities and 1 serious injury involving hook and line gear entanglement or ingestion were documented. The mortalities occurred in 2009 and 2011. During 2010 an attempt was made to disentangle 1 live animal from hook and line gear and an anchor line, and this animal was considered seriously injured (Maze-Foley and Garrison in prep a). The mortality and live entanglement were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and are included in the stranding totals presented in Table 2. It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Strandings

A total of 63 common bottlenose dolphins were found stranded in Eastern Coastal waters of the northern Gulf of Mexico from 2009 through 2013 (Table 2; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014). It could not be determined if there was evidence of human interaction for 45 of these strandings. For 9 dolphins, no evidence of human interaction was detected. Evidence of human interactions was detected for the remaining 9 dolphins, and included entanglement interactions with trap/pot and hook and line fishing gear (see Table 2). Bottlenose dolphins are known to become entangled in, or ingest recreational and commercial fishing gear (Wells and Scott 1994; Gorzelany 1998; Wells *et al.* 1998; Wells *et al.* 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. It is possible that some or all of the stranded dolphins may have been from a nearby bay, sound and estuary stock; however, the proportion of stranded dolphins belonging to another stock cannot be determined because of the difficulty of determining from where the stranded carcass 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 bottlenose dolphin die-offs or Unusual Mortality Events (UMEs) in the northern Gulf of Mexico, and 3 of these have occurred within the boundaries of the Eastern Coastal Stock and may have affected the stock. 1) From January through May 1990, a total of 344 bottlenose dolphins stranded in the northern Gulf of Mexico. Overall this represented a two-fold increase in the prior maximum recorded 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) An unusual mortality event was declared for Sarasota Bay, Florida, in 1991involving 31 bottlenose dolphins. The cause was not determined, but it is believed biotoxins may have contributed to this event (Litz *et al.* 2014). 3) In 2005, a particularly destructive red tide (*K. brevis*) bloom occurred off of 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. A total of 190 dolphins were involved, primarily bottlenose dolphins (plus strandings of 1 Atlantic spotted dolphin, *S. frontalis*, and 23 unidentified dolphins). The evidence suggests the effects of a red tide bloom contributed to the cause of this event (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. However, no animals from the Eastern Coastal Stock that stranded during 2010-2013 were considered to be part of this UME.

Table 2. Common bottlenose dolphin strandings occurring in Eastern Coastal Stock waters of the northern Gulf of Mexico from 2009 to 2013, as well as number of strandings for which evidence of human interaction (HI) was detected and number of strandings for which it could not be determined (CBD) if there was evidence of HI. Data are from the NOAA National Marine Mammal Health and Stranding Response Database (unpublished data, accessed 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**
Eastern Coastal Stock	Total Stranded	13	11	16	13	10	63
	Human Interaction						
	---Yes	1[a]	4[b]	1[c]	1[d]	2[e]	9
	---No	5	1	1	1	1	9
	---CBD	7	6	14	11	7	45

[a] This was an entanglement interaction with hook and line gear (mortality).
[b] This total includes 3 entanglement interactions with trap/pot gear (1 mortality and 2 animals released alive, 1 without serious injury and 1 that could not be determined if seriously injured or not) and 1 entanglement interaction with hook and line gear (released alive seriously injured).
[c] This was an entanglement interaction with hook and line gear (mortality).
[d] This includes 1 entanglement interaction with stone crab trap/pot gear (mortality)
[e] This includes 1 entanglement interaction with trap/pot gear (released alive seriously injured).

Other Mortality

In addition to animals included in the stranding database, during 2009–2013 in the Eastern Coastal Stock area, there was 1 at-sea observation in 2011 of a common bottlenose dolphin entangled in crab-pot type line, and this dolphin was considered seriously injured (Maze-Foley and Garrison in prep a,b). There were also 3 at-sea observations in 2013 of bottlenose dolphins entangled by a rope/buoy (considered seriously injured), and unidentified gear (2 animals, could not be determined if seriously injured or not) (Maze-Foley and Garrison in prep c).

The problem of dolphin depredation of fishing gear is increasing in the Gulf of Mexico. To date, there are no records of depredation for this stock area however.

Feeding or provisioning of wild bottlenose dolphins has been documented in Florida, particularly near Panama City Beach in the Panhandle (Samuels and Bejder 2004) and south of 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. 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, an estimated 2% of the long-term resident dolphins of Sarasota Bay, immediately inshore of the Eastern Coastal Stock, died from ingestion of recreational fishing gear (Powell and Wells 2011).

Swimming with wild bottlenose dolphins has also been documented in Florida, including Key West (Samuels and Engleby 2007) and Panama City Beach (Samuels and Bejder 2004), but to date, there are no records for this stock area.

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). Because the range of the Eastern Coastal Stock of common bottlenose dolphins does not extend west of 84°W longitude, this stock is not thought to have experienced oil exposure due to the DWH event.

The nearshore habitat occupied by the 3 coastal stocks is adjacent to areas of high human population and in some areas, such as Tampa Bay, Florida, Galveston, Texas, and Mobile, Alabama, is highly industrialized. Concentrations of anthropogenic chemicals such PCBs and DDT and its metabolites vary from site to site, and can reach levels of concern for bottlenose dolphin health and reproduction in the southeastern U.S. (Schwacke *et al.* 2002). PCB concentrations in 3 stranded dolphins sampled from the Eastern Coastal Stock area ranged from 16-46µg/g wet weight. Two stranded dolphins from the Northern Coastal Stock area had the highest levels of DDT derivatives of any of the bottlenose dolphin liver samples analyzed in conjunction with a 1990 mortality investigation conducted by NMFS (Varanasi *et al.* 1992). The significance of these findings is unclear, but there is some evidence that increased exposure to anthropogenic compounds may reduce immune function in bottlenose dolphins (Lahvis *et al.* 1995), or impact reproduction through increased first-born calf mortality (Wells *et al.* 2005). Concentrations of chlorinated hydrocarbons and metals were relatively low in most of the bottlenose dolphins examined in conjunction with an anomalous mortality event in Texas bays in 1990; however, some had concentrations at levels of possible toxicological concern (Varanasi *et al.* 1992). Agricultural runoff following periods of high rainfall in 1992 was implicated in a high level of bottlenose dolphin mortalities in Matagorda Bay, which is adjacent to the Western Coastal Stock area (NMFS unpublished data).

STATUS OF STOCK

The common bottlenose dolphin is not listed as threatened or endangered under the Endangered Species Act, and the Eastern Coastal Stock is not considered strategic under the MMPA. Total U.S. fishery-related mortality and serious injury for this stock is not known and there is insufficient information available to determine whether the total fishery-related mortality and serious injury is insignificant and approaching the zero mortality and serious injury rate. However, this is not a strategic stock because it is assumed that the mean annual human-caused mortality and serious injury does not exceed PBR. The status of this stock relative to OSP in the Gulf of Mexico EEZ is unknown. There are insufficient data to determine the population trends for this stock.

REFERENCES CITED

Barlow, J., S.L. Swartz, T.C. Eagle and P.R. Wade. 1995. U.S. marine mammal stock assessments: Guidelines for preparation, background and a summary of the 1995 Assessments. NOAA Tech. Memo. NMFS-OPR-6, 73 pp.

Beier, A.G. 2001. Occurrence, distribution, and movement patterns of outer coastline bottlenose dolphins off Galveston, Texas. Master's thesis from Texas A&M University. 97 pp.

Blaylock, R.A. and W. Hoggard. 1994. Preliminary estimates of bottlenose dolphin abundance in southern U.S. Atlantic and Gulf of Mexico continental shelf waters. NOAA Tech. Memo NMFS-SEFSC-356, 10 pp.

Bryant, L. 1994. Report to Congress on results of feeding wild dolphins: 1989-1994. National Marine Fisheries Service, Office of Protected Resources, 23 pp.

Buckland, S.T., D.R. Anderson, K.P. Burnham, J.L. Laake, D.L. Borchers and L. Thomas. 2001. Introduction to distance sampling: Estimating abundance of biological populations. Oxford University Press, Oxford, UK.

Burgess, G. and A. Morgan. 2003. Commercial shark fishery observer program. Renewal of an observer program to monitor the directed commercial shark fishery in the Gulf of Mexico and South Atlantic: 1999 fishing season. Final Report, U.S. National Marine Fisheries Service, Highly Migratory Species Management Division Award NA97FF0041.

Buist, I., J. McCourt, S. Potter, S. Ross and K. Trudel. 1999. In situ burning. Pure. Appl. Chem. 71(1): 43-65.

Byrd, B.L., A.A. Hohn, G.N. Lovewell, K.M. Altman, S.G. Barco, A. Friedlaender, C.A. Harms, W.A. McLellan, K.T. Moore, P.E. Rosel and V.G. Thayer. 2014. Strandings illustrate marine mammal biodiversity and human impacts off the coast of North Carolina, USA. Fish. Bull. 112: 1-23.

Cunningham-Smith, P., D.E. Colbert, R.S. Wells and T. Speakman. 2006. Evaluation of human interactions with a wild bottlenose dolphin (*Tursiops truncatus*) near Sarasota Bay, Florida, and efforts to curtail the interactions. Aquat. Mamm. 32(3):346-356.

Fazioli, K.L., S. Hofmann and R.S. Wells. 2006. Use of Gulf of Mexico coastal waters by distinct assemblages of bottlenose dolphins (*Tursiops truncatus*). Aquat. Mamm. 32(2): 212-222.

Fulling, G.L., K.D. Mullin and C.W. Hubard. 2003. Abundance and distribution of cetaceans in outer continental shelf waters of the U.S. Gulf of Mexico. Fish. Bull. 101: 923-932.

Gorzelany, J.F. 1998. Unusual deaths of two free-ranging Atlantic bottlenose dolphins (*Tursiops truncatus*) related to ingestion of recreational fishing gear. Mar. Mamm. Sci. 14(3): 614-617.

Gulak, S.J.B., M.P. Enzenauer and J.K. Carlson. 2013. Characterization of the shark and reef fish bottom longline fisheries: 2012. NOAA Tech. Memo. NMFS-SEFSC-652, 42 pp.

Gulak, S.J.B., M.P. Enzenauer and J.K. Carlson. 2014. Characterization of the shark and reef fish bottom longline fisheries: 2013. NOAA Tech. Memo. NMFS-SEFSC-658, 22 pp.

Hale, L.F. and J.K. Carlson. 2007. Characterization of the shark bottom longline fishery: 2005-2006. NOAA Tech. Memo. NMFS-SEFSC-554, 28 pp.

Hale, L.F., L.D. Hollensead and J.K. Carlson. 2007. Characterization of the shark bottom longline fishery: 2007. NOAA Tech. Memo. NMFS-SEFSC-564, 25 pp.

Hale, L.F., S.J.B. Gulak and J.K. Carlson. 2009. Characterization of the shark bottom longline fishery, 2008. NOAA Tech. Memo. NMFS-SEFSC-586, 23 pp.

Hale, L.F., S.J.B. Gulak and J.K. Carlson. 2010. Characterization of the shark bottom longline fishery, 2009. NOAA Tech. Memo. NMFS-SEFSC-596, 25 pp.

Hale, L.F., S.J.B. Gulak A.M. Napier and J.K. Carlson. 2011. Characterization of the shark bottom longline fishery, 2010. NOAA Tech. Memo. NMFS-SEFSC-611, 35 pp.

Hale, L.F., S.J.B. Gulak, A.N. Mathers and J.K. Carlson. 2012. Characterization of the shark bottom longline fishery, 2011. NOAA Tech. Memo. NMFS-SEFSC-634, 27 pp.

Hansen, L.J. (ed.). 1992. Report on investigation of 1990 Gulf of Mexico bottlenose dolphin strandings. NOAA-NMFS-SEFSC Contribution MIA-92/93-21. Available from: NMFS, Southeast Fisheries Science Center, 75 Virginia Beach Dr., Miami, FL 33149.

Irvine, A.B., M.D. Scott, R.S. Wells and J.H. Kaufmann. 1981. Movements and activities of the Atlantic bottlenose dolphin, *Tursiops truncatus*, near Sarasota, Florida. Fish. Bull. U.S.79: 671-688.

Laake, J.L. and D.L. Borchers 2004. Methods for incomplete detection at distance zero. Pages 108-189 *in:* S.T. Buckland, D.R. Andersen, K.P. Burnham, J.L. Laake and L. Thomas (eds.) Advanced distance sampling. Oxford University Press, New York. 434 pp.

Lahvis, G.P., R.S. Wells, D.W. Kuehl, J.L. Stewart, H.L. Rhinehart and C.S. Via. 1995. Decreased lymphocyte responses in free-ranging bottlenose dolphins (*Tursiops truncatus*) are associated with increased concentrations of PCB's and DDT in peripheral blood. Environ. Health Perspect. 103: 67-72.

Lehr, B., S. Bristol and A. Possolo, eds. 2010. Oil budget calculator: Deepwater Horizon. Technical documentation. Prepared by the Federal Interagency Solutions Group, Oil Budget Calculator Science and Engineering

Team for the National Incident Command. Available from: http://www.restorethegulf.gov/sites/default/files/documents/pdf/OilBudgetCalc_Full_HQ-Print_111110.pdf

Litz, J.A., M.A. Baran, S.R. Bowen-Stevens, R.H. Carmichael, K.M. Colegrove, L.P. Garrison, S.E. Fire, E.M. Fougeres, R. Hardy, S. Holmes, W. Jones, B.E. Mase-Guthrie, D.K. Odell, P.E. Rosel, J.T. Saliki, D.K. Shannon, S.F. Shippee, S.M. Smith, E.M. Stratton, M.C. Tumlin, H.R. Whitehead, G.A.J. Worthy and T.K. Rowles. 2014. Review of historical unusual mortality events (UMEs) in the Gulf of Mexico (1990–2009): Providing context for the complex and long-lasting northern Gulf of Mexico cetacean UME. Dis. Aquat. Organ. 112: 161-175.

Lynn, S.K. and B. Würsig. 2002. Summer movement patterns of bottlenose dolphins in a Texas bay. G. Mex. Sci. 20(1): 25-37.

Maze-Foley, K. and L.P. Garrison. in prep a. Preliminary serious injury determinations for small cetaceans off the southeast U.S. coast, 2007-2011.

Maze-Foley, K. and L.P. Garrison. in prep b. Preliminary serious injury determinations for small cetaceans off the southeast U.S. coast, 2012.

Maze-Foley, K. and L.P. Garrison. in prep c. Preliminary serious injury determinations for small cetaceans off the southeast U.S. coast, 2013.

McNutt, M.K., R. Camilli, T.J. Crone, G.D. Guthrie, P.A. Hsieh, T.B. Ryerson, O. Savas and F. Shaffer. 2012. Review of flow rate estimates of the *Deepwater Horizon* oil spill. P. Natl. Acad. Sci. USA 109 (50): 20260-20267.

Mullin, K.D., R.R. Lohoefener, W. Hoggard, C.L. Roden and C.M Rogers. 1990. Abundance of bottlenose dolphins, *Tursiops truncatus*, in the coastal Gulf of Mexico. Northeast Gulf Sci. 11(2): 113-122.

NOAA. 2011. Public scoping for preparation of a programmatic environmental impact statement for the Deepwater Horizon BP Oil Spill. Available from: http://www.gulfspillrestoration.noaa.gov/wp-content/uploads/2011/04/Public-DWH-PEIS-Scoping-Review-Document1.pdf

Operational Science Advisory Team (OSAT). 2010. Summary report for sub-sea and sub-surface oil and dispersant detection: Sampling and monitoring. Prepared for P. F. Zukunft, RADM, U.S. Coast Guard, Federal On-Scene Coordinator, Deepwater Horizon MC252, December 17, 2010. Available from: http://www.restorethegulf.gov/sites/default/files/documents/pdf/OSAT_Report_FINAL_17DEC.pdf

Peltier, H., W. Dabin, P. Daniel, O. Van Canneyt, G. Dorémus, M. Huon and V. Ridoux. 2012. The significance of stranding data as indicators of cetacean populations at sea: modelling the drift of cetacean carcasses. Ecol. Indicators 18: 278–290.

Powell, J.R. and R.S. Wells. 2011. Recreational fishing depredation and associated behaviors involving common bottlenose dolphins (*Tursiops truncatus*) in Sarasota Bay, Florida. Mar. Mamm. Sci. 27(1): 111-129.

Richards, P.M. 2007. Estimated takes of protected species in the commercial directed shark bottom longline fishery 2003, 2004, and 2005. NMFS SEFSC Contribution PRD-06/07-08, June 2007, 21 pp.

Samuels, A. and L. Bejder. 2004. Chronic interactions between humans and free-ranging bottlenose dolphins near Panama City Beach, Florida, USA. J. Cetacean Res. Manage. 6: 69-77.

Samuels, A. and L. Engleby. 2007. Evaluating impacts of tourism on free-ranging bottlenose dolphins near Key West, Florida. Final Technical Report, PWD Proposal # 2003-18. Available from: Dolphin Ecology Project, 727 11th Avenue South, St. Petersburg, FL 33701.

Schwacke, L.H., E.O. Voit, L.J. Hansen, R.S. Wells, G.B. Mitchum, A.A. Hohn and P.A. Fair. 2002. Probabilistic risk assessment of reproductive effects of polychlorinated biphenyls on bottlenose dolphins (*Tursiops truncatus*) from the Southeast United States coast. Environ. Toxicol. Chem. 21: 2752–2764.

Scott, G.P. 1990. Management-oriented research on bottlenose dolphins by the Southeast Fisheries Center. pp. 623-639 *in:* S. Leatherwood and R.R. Reeves (eds.) The bottlenose dolphin. Academic Press, San Diego, CA. 653 pp.

Sellas, A.B., R.S. Wells and P.E. Rosel. 2005. Mitochondrial and nuclear DNA analyses reveal fine scale geographic structure in bottlenose dolphins (*Tursiops truncatus*) in the Gulf of Mexico. Conserv. Genet. 6: 715-728.

Soldevilla, M.S., L.P. Garrison, E. Scott-Denton and J.M. Nance. 2015. Estimation of marine mammal bycatch mortality in the Gulf of Mexico shrimp otter trawl fishery. NOAA Tech. Memo. NMFS-SEFSC-672, 70 pp.

Varanasi, U., K.L. Tilbury, D.W. Brown, M.M. Krahn, C.A. Wigren, R.C. Clark and S.L. Chan. 1992. pp. 56-86. *In:* L. J. Hansen (ed.) Report on investigation of 1990 Gulf of Mexico bottlenose dolphin strandings, Southeast Fisheries Science Center Contribution MIA-92/93-21, 219 pp.

Vollmer, N.L. 2011. Population structure of common bottlenose dolphins in coastal and offshore waters of the Gulf of Mexico revealed by genetic and environmental analyses. Ph.D. Dissertation from University of

Louisiana at Lafayette. 420 pp.
Wade, P.R. and R.P. Angliss. 1997. Guidelines for assessing marine mammal stocks: Report of the GAMMS Workshop April 3-5, Seattle, WA. NOAA Tech. Memo. NMFS-OPR-12, 93 pp.
Wells, R.S. 1986. Structural aspects of dolphin societies. Ph.D. dissertation from University of California, Santa Cruz. 234 pp.
Wells, R.S. and M.D. Scott. 1994. Incidence of gear entanglement for resident inshore bottlenose dolphins near Sarasota, Florida. Page 629 *in:* W.F. Perrin, G.P. Donovan and J. Barlow (eds.) Gillnets and cetaceans. Rep. Int. Whal. Commn., Special Issue 15.
Wells, R.S. and M.D. Scott. 1997. Seasonal incidence of boat strikes on bottlenose dolphins near Sarasota, Florida. Mar. Mamm. Sci. 13(3): 475-480.
Wells, R.S., S. Hofmann and T.L. Moors. 1998. Entanglement and mortality of bottlenose dolphins, *Tursiops truncatus*, in recreational fishing gear in Florida. Fish. Bull. 96(3): 647-650.
Wells, R.S., V. Tornero, A. Borrell, A. Aguilar, T.K. Rowles, H.L. Rhinehart, S. Hofmann, W.M. Jarman, A.A. Hohn and J.C. Sweeney. 2005. Integrating life history and reproductive success data to examine potential relationships with organochlorine compounds for bottlenose dolphins (*Tursiops truncatus*) in Sarasota Bay, Florida. Sci. Total Environ. 349: 106-119.
Wells, R.S., J.B. Allen, S. Hoffman, K. Bassos-Hull, D.A. Fauquier, N.B. Barros, R.E. DeLynn, G. Sutton, V. Socha and M.D. Scott. 2008. Consequences of injuries on survival and reproduction of common bottlenose dolphins (*Tursiops truncatus*) along the west coast of Florida. Mar. Mamm. Sci. 24: 774-794.
Wells, R.S., J.B. Allen, G. Lovewell, J. Gorzelany, R.E. Delynn, D.A. Fauquier and N.B. Barros. 2015. Carcass-recovery rates for resident bottlenose dolphins in Sarasota Bay, Florida. Mar. Mamm. Sci. 31(1): 355-368.