

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°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).

This stock's boundaries abut other bottlenose dolphin stocks, namely the Continental Shelf 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 coastal waters were inhabited by both 'inshore' and 'Gulf' dolphins but that 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 suggest that part of the 'Gulf' dolphin community moves out of the study area during winter, but their destination is unknown. 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).

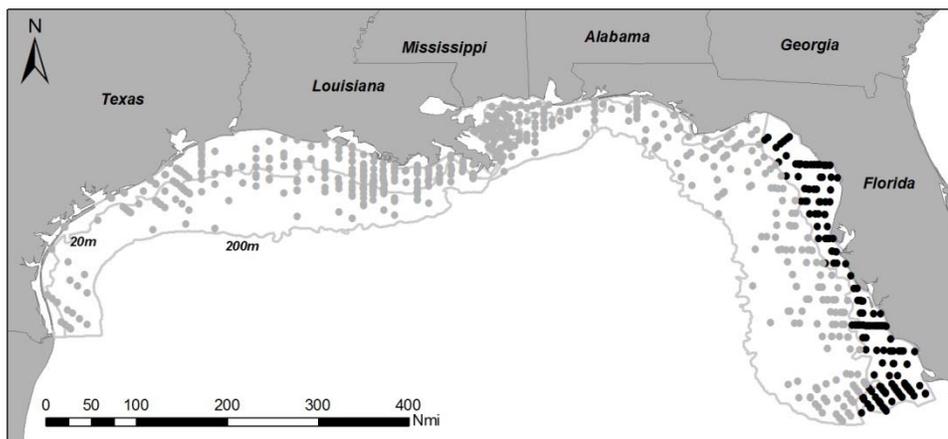


Figure 1. Locations (circles) of common bottlenose dolphin groups sighted in coastal and continental shelf waters during aerial surveys conducted in spring, summer and fall of 2011 and in winter of 2012. Dark circles indicate groups within the boundaries of the Eastern Coastal Stock. The 20-m and 200-m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

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 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 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 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 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	12,388	0.13

	Florida Keys)		
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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 bottlenose dolphins is 12,388 (CV=0.13). The minimum population estimate for the northern Gulf of Mexico Eastern Coastal Stock is 11,110 bottlenose dolphins.

Current Population Trend

There are insufficient data to determine population trends for this stock. However the abundance estimates for summer 2007 (7,702; CV=0.19) and summer 2012 (8,458; CV=0.23) are similar.

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, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP), is assumed to be 0.5 because the stock is of unknown status. PBR for the northern Gulf of Mexico Eastern Coastal Stock of bottlenose dolphins is 111.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury of the Eastern Coastal Stock of bottlenose dolphins during 2008-2012 is unknown. During 2008-2012, 2 mortalities and 1 serious injury were documented involving the Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fishery, and 1 mortality, 2 live releases without serious injury, and 1 live release in unknown condition were documented in trap/pot fisheries. In addition, a bottlenose dolphin observed at-sea entangled in crab-pot type line was considered seriously injured. It is not possible to estimate the total number of interactions or mortalities associated with hook and line or trap/pot fisheries since there are no systematic observer programs for those fisheries.

New Serious Injury Guidelines

NMFS updated its serious injury designation and reporting process, which uses guidance from previous serious injury workshops, expert opinion, and analysis of historic injury cases to develop new criteria for distinguishing serious from non-serious injury (Angliss and DeMaster 1998; Andersen *et al.* 2008; NOAA 2012). NMFS defines serious injury as an “*injury that is more likely than not to result in mortality*”. Injury determinations for stock assessments revised in 2013 or later incorporate the new serious injury guidelines, based on the most recent 5-year period for which data are available.

Fisheries Information

The commercial fisheries which potentially could interact with the Eastern Coastal Stock in the northern Gulf of Mexico are the Category II Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl, Southeastern U.S. Atlantic, Gulf of Mexico stone crab trap/pot, and the Category III 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) fisheries (Appendix III). There have been no documented interactions between 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.

Hook and Line Fisheries

During 2008-2012, 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 13 September 2012 [for 2008-2011 data] and 15 April 2013 [for 2012 data]) and are included in the stranding totals presented in Table 2.

Blue and Stone Crab and Spiny Lobster Trap/Pot Fisheries

During 2008-2012, 4 entanglements associated with trap/pot fisheries were documented: 1 mortality, 2 live releases without serious injury, and 1 live release in unknown condition. In 2010, 2 dolphins belonging to the Eastern Coastal Stock were disentangled and released alive. One animal was entangled in probable stone crab trap 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 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. During 2008, another dolphin belonging to the Eastern Coastal Stock, reportedly half the size of an adult, was disentangled from a trap/pot line and released without serious injury (Maze-Foley and Garrison in prep a). The mortality and live entanglements were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 13 September 2012 and 15 April 2013) 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 Fishery

During 2008-2012, no interactions between 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 2004-2012 (Hale and Carlson 2007; Hale *et al.* 2007; Richards 2007; Hale *et al.* 2009; 2010; 2011; 2012; Gulak *et al.* 2013). 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.

Shrimp Trawl Fishery

During 2008-2012, no interactions between bottlenose dolphins of the Eastern Coastal Stock and the shrimp trawl fishery were observed. A voluntary observer program for the shrimp trawl fishery began in 1992 and became mandatory in 2007. A total of 5 bottlenose dolphin mortalities were observed during 2003, 2007, 2008, 2010 and 2011, and 1 serious injury was observed during 2012. These mortalities and serious injury likely belonged to the Western Coastal Stock, the Northern Coastal Stock, the Continental Shelf Stock and/or possibly bay, sound and estuary stocks. During 1992-2007 the observer program recorded an additional 6 unidentified dolphins caught in a lazy line or turtle excluder device, and 1 of these animals, a mortality in 2007, likely belonged to the Eastern Coastal Stock.

Strandings

A total of 61 bottlenose dolphins were found stranded in Eastern Coastal waters of the northern Gulf of Mexico from 2008 through 2012 (Table 2; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 13 September 2012 and 15 April 2013). Evidence of human interactions (e.g., gear entanglement, mutilation, gunshot wounds) was detected for 8 of these 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-related mortality and serious injury because not all of the dolphins that die or are seriously injured due to human interactions wash ashore, nor will all of those that do wash ashore necessarily show signs of fishery-interaction or other human interactions. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction, and the condition of the carcass if badly decomposed can inhibit the

interpretation of cause of death.

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 367 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). 2) An unusual mortality event was declared for Sarasota Bay, Florida, in 1991, but the cause was not determined. 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 24 unidentified dolphins). The evidence suggests the effects of a red tide bloom contributed to the cause of this event.

An UME was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010; and, as of 2013, the event is still ongoing. It includes cetaceans that stranded prior to the Deepwater Horizon oil spill (see “Habitat Issues” below), during the spill, and after. During 2010-2012, no animals from the Eastern Coastal Stock were considered to be part of this UME.

Table 2. Bottlenose dolphin strandings occurring in Eastern Coastal Stock waters of the northern Gulf of Mexico from 2008 to 2012, 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 13 September 2012 [for 2008-2011 data] and 15 April 2013 [for 2012 data]). Please note human interaction does not necessarily mean the interaction caused the animal’s death.

Stock	Category	2008	2009	2010	2011	2012	Total
Eastern Coastal Stock	Total Stranded	9	13	11	16	12	61
	Human Interaction						
	---Yes	2 ^a	1 ^b	4 ^c	1 ^d	0	8
	---No	1	5	1	1	1	9
	---CBD	6	7	6	14	11	44

^aThis total includes 1 animal disentangled and released alive without serious injury from crab trap/pot gear.

^bThis was an entanglement interaction with hook and line gear (mortality).

^cThis 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 recreational hook and line gear (released alive seriously injured).

^dThis was an entanglement interaction with recreational hook and line gear (mortality).

Other Mortality

In addition to animals included in the stranding database, during 2008-2012, there was 1 at-sea observation in 2011 in the Eastern Coastal Stock area of a bottlenose dolphin entangled in crab-pot type line, and this dolphin was considered seriously injured (Maze-Foley and Garrison in prep a,b).

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 1500m deep, exploded on 20 April 2010. The rig sank, and over 87 days ~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. 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 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 as 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 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 average annual human-related 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.

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