

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

STOCK DEFINITION AND GEOGRAPHIC RANGE

Bottlenose dolphins inhabit coastal waters throughout the northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) (Mullin *et al.* 1990). Northern Gulf of Mexico coastal waters have been divided for management purposes into 3 bottlenose dolphin stocks: eastern, northern and western. 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. Coastal waters are defined as those from shore, barrier islands or presumed bay boundaries to the 20-m isobath (Figure 1). The Eastern Coastal bottlenose dolphin stock area extends from 84°W longitude to Key West, Florida; the Northern Coastal bottlenose dolphin stock area from 84°W longitude to the Mississippi River Delta; and the Western Coastal bottlenose dolphin stock area from the Mississippi River Delta to the Texas-Mexico border. The Eastern Coastal stock area 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. The Northern Coastal stock area is characterized by a temperate climate, barrier islands, sand beaches, coastal marshes and marsh islands, and has a relatively high level of freshwater input.

It is bordered on the east by an extensive area of coastal marsh and marsh islands typical of Florida's Apalachee Bay. The Western Coastal stock area is characterized by an arid to temperate climate, sand beaches in southern Texas, extensive coastal marshes in northern Texas and Louisiana, and low to high levels of freshwater input.

Portions of the coastal stocks may co-occur with the northern Gulf of Mexico continental shelf stock and bay, sound and estuarine stocks, and the Western Coastal stock is trans-boundary with Mexico. The seaward boundary for coastal stocks, the 20-m isobath, generally 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. Both "coastal/nearshore" and "offshore" ecotypes of bottlenose dolphins (Hersh and Duffield 1990) occur in the Gulf of Mexico (LeDuc and Curry 1998), and both could potentially occur in coastal waters. The offshore and coastal ecotypes are genetically distinct using both mitochondrial and nuclear markers (Hoelzel *et al.* 1998). In the northwestern Atlantic Ocean, Torres *et al.* (2003) found a statistically significant break in the distribution of the ecotypes at 34 km from shore. The offshore ecotype was found exclusively seaward of 34 km and in waters deeper than 34 m. Within 7.5 km of shore, all animals were of the coastal ecotype. The distance of the 20-m isobath ranges from 4 to 90 km from shore in the northern Gulf. Because the continental shelf is much wider in the Gulf, results from the Atlantic may not apply.

Research on coastal stocks is limited. Fazioli *et al.* (2006) conducted photo-identification surveys of coastal waters off Tampa Bay, Sarasota Bay and Charlotte Harbor/Pine Island Sound over 14 months. They found coastal waters were inhabited by both 'inshore' and 'Gulf' dolphins but that the two 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

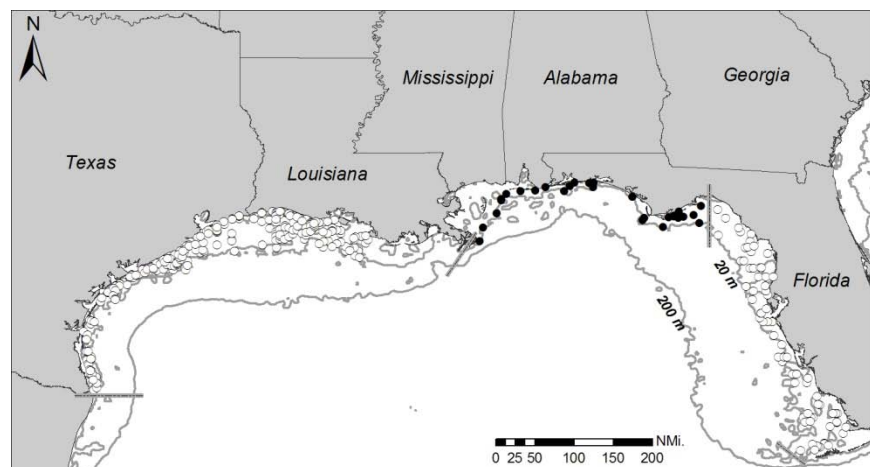


Figure 1. Locations (circles) of bottlenose dolphin groups sighted in coastal waters during aerial surveys conducted in the Western Coastal stock area in 1992 and 1996, and in the Northern Coastal stock and Eastern Coastal stock areas in 2007. Dark circles indicate groups within the boundaries of the Northern Coastal Stock. The 20- and 200-m isobaths are shown.

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. Sellas *et al.* (2005) examined population subdivision among Sarasota Bay, Tampa Bay, Charlotte Harbor, 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 separate identification of bay, sound and estuarine 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, 285 km north, in May 1992 and May 1993 (Lynn and Würsig 2002).

POPULATION SIZE

The best abundance estimate available for the northern Gulf of Mexico Northern Coastal stock of bottlenose dolphins is 2,473 (CV=0.25).

Earlier abundance estimates

Previous estimates of abundance were derived using distance sampling analysis (Buckland *et al.* 1993) and the computer program DISTANCE (Laake *et al.* 1993) with sighting data collected during aerial line-transect surveys conducted during autumn from 1992-1994 (Blaylock and Hoggard 1994; NMFS unpublished data). Systematic sampling transects, placed randomly with respect to the bottlenose dolphin distribution, extended orthogonally from shore out to approximately 9 km past the 18-m isobath. Approximately 5% of the total survey area was visually searched. The previous bottlenose dolphin abundance estimate for the Northern Coastal stock based on the 1993 survey was 4,191 (CV=0.21).

Recent surveys and abundance estimates

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 0-20 m 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 Northern Coastal stock was 2,473 (CV=0.25).

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 Northern Coastal stock of bottlenose dolphins is 2,473 (CV=0.25). The minimum population estimate for the Northern Coastal stock is 2,004 bottlenose dolphins.

Current Population Trend

There are insufficient data to determine population trends for this stock.

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 level (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 2,004. 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 Northern Coastal stock of bottlenose dolphin is 20.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury of the Northern Coastal stock of bottlenose dolphins during 2004-2008 is unknown.

Fisheries Information

The commercial fisheries which potentially could interact with the Northern Coastal stock in the northern Gulf of Mexico are the shrimp trawl, blue crab trap/pot, stone crab trap/pot, menhaden purse seine, gillnet, and shark bottom longline fisheries (Appendix III).

Shrimp Trawl Fishery

Historically, there have been very low numbers of incidental mortality or injury in the stocks associated with the shrimp trawl fishery. A voluntary observer program for the shrimp trawl fishery began in 1992 and became mandatory in 2007. Three bottlenose dolphin mortalities were observed in the shrimp trawl fishery. One mortality occurred in 2008 off the coast of Texas in the vicinity of Laguna Madre, one mortality occurred in 2007 off the coast of Louisiana in the vicinity of Atchafalaya Bay, and one mortality occurred in 2003 off the coast of Alabama near Mobile Bay. The Texas 2008 mortality could have belonged to the bottlenose dolphin Western Coastal stock or continental shelf stock. The Louisiana 2007 mortality could have belonged to the Western Coastal stock or a bay, sound and estuarine stock. The Alabama 2003 mortality could have belonged to the Northern Coastal stock or a bay, sound and estuarine stock. During 1992-2008 the observer program recorded an additional six unidentified dolphins caught in a lazy line or turtle excluder device, and one or more of these animals may have belonged to the Eastern or Northern Coastal stocks, and it is likely that 3-4 of the animals belonged to the continental shelf stock or the Atlantic spotted dolphin (*Stenella frontalis*) stock. In two of the six cases, an observer report indicated the animal may have already been decomposed, but this could not be confirmed in the absence of a necropsy. In 2008, an additional dolphin carcass was caught on the tickler of a shrimp trawl; however, the animal's carcass was severely decomposed and may have been captured in this state. This cannot be confirmed without a necropsy. It is likely the unidentified carcass belonged to the bottlenose dolphin Western Coastal stock or continental shelf stock, or possibly to the Atlantic spotted dolphin stock.

Blue and Stone Crab Trap/Pot Fisheries

Bottlenose dolphins have been reported stranded with polypropylene rope around their flukes (NMFS 1991; McFee and Brooks, Jr. 1998; NMFS unpublished data), indicating the possibility of entanglement with crab pot lines. In 2002 there was a calf stranded near Clearwater, Florida, with crab trap line wrapped around its rostrum, through its mouth and looped around its tail. There was an additional unconfirmed report to the stranding network in 2002 of a dolphin entangled in a stone crab trap with the buoy still attached. The animal was reportedly cut loose from the trap and slowly swam off with line and buoy still wrapped around it (NMFS unpublished data). In 2008, a dolphin was disentangled from crab trap gear in Texas from a concerned citizen and swam away with no reported injuries. Also in 2008, a dolphin off Florida, reportedly half the size of an adult, was disentangled by a county marine officer from a crab pot line and swam away with no reported injuries (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 21 September 2009 and 18 November 2009). 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.

Menhaden Purse Seine Fishery

There are no recent observer program data for the Gulf of Mexico menhaden purse seine fishery but incidental mortality of bottlenose dolphins has been reported for this fishery (Reynolds 1985). Through the Marine Mammal Authorization Program, there have been 11 self-reported incidental takes (all mortalities) of bottlenose dolphins in northern Gulf of Mexico coastal and estuarine waters by the menhaden purse seine fishery: 2 takes of single bottlenose dolphins were reported in Louisiana waters during 2005 (1 of the animals may have been dead prior to

capture); 1 take of a single bottlenose dolphin was reported in Louisiana waters during 2004; 2 takes of single unidentified dolphins were reported during 2002 (1 in Mississippi and 1 in Louisiana waters); 1 take of a single bottlenose dolphin was reported in Louisiana waters during 2001; and 3 takes were reported in 2000, 2 of which were for single dolphins (1 bottlenose, 1 unidentified) in Louisiana waters and the third was for 3 bottlenose dolphins in a single purse seine in Mississippi waters. The menhaden purse seine fishery was observed to take 9 bottlenose dolphins (3 fatally) between 1992 and 1995 (NMFS unpublished data). During that period, there were 1,366 sets observed out of 26,097 total sets, which if extrapolated for all years suggests that as many as 172 bottlenose dolphins could have been taken in this fishery with up to 57 animals killed. Without an 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.

Gillnet Fishery

No marine mammal mortalities associated with gillnet fisheries have been reported, but stranding data suggest that gillnet and marine mammal interaction does occur, causing mortality and serious injury. Four research-related gillnet mortalities occurred between 2003 and 2007 in Texas and Louisiana. Additionally, in 2008, 1 dolphin was entangled in a fisheries research gillnet in Texas. The floatline was wrapped around the dolphin's tail; the net released itself upon retrieval and the dolphin appeared in good condition as it swam away. All of these animals likely belonged to bay, sound and estuarine stocks. In 1995, a Florida state constitutional amendment banned gillnets and large nets from bay, sounds, estuaries and other inshore waters.

Shark Bottom Longline Fishery

The shark bottom longline fishery has been observed since 1994, and 3 interactions with bottlenose dolphins have been recorded. The incidents include 1 mortality (2003) and 2 hooked animals that escaped at the vessels (1999, 2002; Burgess and Morgan 2003a,b). Based on the water depths of the interactions (~12-60 m), they likely involved animals from the Eastern Coastal and continental shelf stocks. No interactions were observed during 2004-2008 (Hale and Carlson 2007; Hale *et al.* 2007; Richards 2007; Hale *et al.* 2009). 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.

Strandings

A total of 139 bottlenose dolphins were found stranded in Northern Coastal waters of the Gulf of Mexico from 2004 through 2008 (Table 1; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 21 September 2009 and 18 November 2009). Evidence of human interactions (e.g., gear entanglement, mutilation, gunshot wounds) was detected for 3 of these dolphins. 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 estuarine 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 which 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 11 bottlenose dolphin die-offs in the northern Gulf of Mexico. 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). An unusual mortality event was declared for Sarasota Bay, Florida, in 1991, but the cause was not determined. In March and April 1992, 111 bottlenose dolphins stranded in Texas, about 9 times the average number. The cause of this event was not determined, but carbamates were a suspected cause.

In 1992, with the enactment of the Marine Mammal Health and Stranding Response Act, the Working Group on Marine Mammal Unusual Mortality Events was created to determine when an unusual mortality event (UME) is occurring, and then to direct responses to such events. Since 1992, 8 bottlenose dolphin UMEs have been declared in the Gulf of Mexico. 1) In 1993-1994 an UME of bottlenose dolphins likely caused by morbillivirus started in the

Florida Panhandle and spread west with most of the mortalities occurring in Texas (Lipscomb 1993; Lipscomb *et al.* 1994). From February through April 1994, 220 bottlenose dolphins were found dead on Texas beaches, of which 67 occurred in a single 10-day period. 2) In 1996 an UME was declared for bottlenose dolphins in Mississippi when 27 bottlenose dolphins stranded during November and December. The cause was not determined, but a *Karenia brevis* (red tide) bloom was suspected to be responsible. 3) Between August 1999 and May 2000, 152 bottlenose dolphins died coincident with *K. brevis* blooms and fish kills in the Florida Panhandle (additional strandings included 3 Atlantic spotted dolphins, *Stenella frontalis*, 1 Risso's dolphin, *Grampus griseus*, 2 Blainville's beaked whales, *Mesoplodon densirostris*, and 4 unidentified dolphins). 4) In March and April 2004, in another Florida Panhandle UME possibly related to *K. brevis* blooms, 106 bottlenose dolphins and 1 unidentified dolphin stranded dead (NMFS 2004). Although there was no indication of a *K. brevis* bloom at the time, high levels of brevetoxin were found in the stomach contents of the stranded dolphins (Flewelling *et al.* 2005). 5) 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. 6) A separate UME was declared in the Florida Panhandle after elevated numbers of dolphin strandings occurred in association with a *K. brevis* bloom in September 2005. Dolphin strandings remained elevated through the spring of 2006 and brevetoxin was again detected in the tissues of some of the stranded dolphins. Between September 2005 and April 2006 when the event was officially declared over, a total of 90 bottlenose dolphin strandings occurred (plus strandings of 3 unidentified dolphins). 7) During February and March of 2007 an event was declared for northeast Texas and western Louisiana involving 66 bottlenose dolphins. Decomposition prevented conclusive analyses on most carcasses. 8) During February and March of 2008 an additional event was declared in Texas involving 113 bottlenose dolphin strandings. Most of the animals recovered were in a decomposed state. The event has been closed, however, the investigation is ongoing.

Table 1. Bottlenose dolphin strandings occurring in Northern Coastal stock waters of the northern Gulf of Mexico from 2004 to 2008, 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. Data are from the NOAA National Marine Mammal Health and Stranding Response Database (unpublished data, accessed 21 September 2009 and 18 November 2009). Please note human interaction does not necessarily mean the interaction caused the animal's death. Please also note that strandings in coastal waters have been separated by coastal stock and separated from bay, sound and estuarine stocks; therefore, the annual totals below will differ from those reported previously.

Stock	Category	2004	2005	2006	2007	2008	Total
Northern Coastal Stock	Total Stranded	59	21	32	19	8	139
	Human Interaction	0	1	1	1	0	3
	---Fishery Interaction	-	1	0	0	-	1
	---Other	-	0	1	1	-	2
	No Human Interaction	12	3	3	3	1	22
	CBD	47	17	28	15	7	114

Other Mortality

The problem of dolphin depredation of fishing gear is increasing in the Gulf of Mexico. There have been 3 recent cases of fishermen illegally "taking" dolphins due to dolphin depredation of recreational and commercial fishing gear. In 2006 a charter boat fishing captain was charged under the MMPA for shooting at a dolphin that was swimming around his catch in the Gulf of Mexico, off Panama City, Florida. In 2007 a second charter fishing boat captain was fined under the MMPA for shooting at a bottlenose dolphin that was attempting to remove a fish from his line in the Gulf of Mexico, off Orange Beach, Alabama. A commercial fisherman was indicted in November 2008 for throwing pipe bombs at dolphins off Panama City, Florida, and charged in March 2009 for "taking" dolphins with an explosive device.

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, in press), and also in Texas near Corpus Christi (Bryant 1994). Feeding wild dolphins is defined under the MMPA as a form of 'take' because it can alter their natural behavior and increase their risk of injury or death. Nevertheless, a high rate of uncontrolled provisioning was observed near Panama City Beach in 1998 (Samuels and Bejder 2004), and provisioning has been observed south of Sarasota Bay since 1990 (Cunningham-Smith *et al.* 2006; Powell and Wells, in press). 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 died from ingestion of recreational fishing gear (Powell and Wells, in press). Swimming with wild bottlenose dolphins has also been documented. Near Panama City Beach, Samuels and Bejder (2004) concluded that dolphins were amenable to swimmers due to provisioning. Swimming with wild dolphins may cause harassment, and harassment is illegal under the MMPA.

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).

The Mississippi River, which drains about two-thirds of the continental U.S., flows into the north-central Gulf of Mexico and deposits its nutrient load which is linked to the formation of one of the world's largest areas of seasonal hypoxia (Rabalais *et al.* 1999). This area is located in Louisiana coastal waters west of the Mississippi River delta. How it affects bottlenose dolphins is not known.

STATUS OF STOCK

The status of the Northern Coastal stock relative to OSP is not known and population trends cannot be determined due to insufficient data. This species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine population trends for this stock. Total human-caused 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 zero mortality and serious injury rate. Additionally, there is no systematic monitoring of all fisheries that may take this stock. The potential impact, if any, of coastal pollution may be an issue for this species in portions of its habitat, though little is known on this to date. This is not a strategic stock because it is assumed that the average annual human-related mortality and serious injury does not exceed PBR.

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