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COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*) Barataria Bay Estuarine System Stock

NOTE – NMFS is in the process of writing individual stock assessment reports for each of the 31 bay, sound and estuary stocks of common bottlenose dolphins in the Gulf of Mexico. Until this effort is completed and 31 individual reports are available, some of the basic information presented in this report will also be included in the report: "Northern Gulf of Mexico Bay, Sound and Estuary Stocks".

STOCK DEFINITION AND GEOGRAPHIC RANGE

Common bottlenose dolphins are distributed throughout the bays, sounds and estuaries of the Gulf of Mexico (Mullin 1988). Long-term (year-round, multi-year) residency by at least some individuals has been reported from nearly every site where photographic identification (photo-ID) or tagging studies have been conducted in the Gulf of Mexico (e.g., Irvine and Wells 1972; Shane 1977; Gruber 1981; Irvine *et al.* 1981; Wells 1986; Wells *et al.* 1987; Scott *et al.* 1990; Shane 1990; Wells 1991; Bräger 1993; Bräger *et al.* 1994; Fertl 1994; Wells *et al.* 1996a,b; Wells *et al.* 1997; Weller 1998; Maze and Würsig 1999; Lynn and Würsig 2002; Wells 2003; Hubard *et al.* 2004; Irwin and Würsig 2004; Shane 2004; Balmer *et al.* 2008; Urian *et al.* 2009; Bassos-Hull *et al.* 2013). In many cases, residents occur predominantly within estuarine waters, with limited movements through passes to the Gulf of Mexico (Shane 1977; Shane 1990; Gruber 1981; Irvine *et al.* 1981; Shane 1990; Maze and Würsig 1999; Lynn and Würsig 2002; Fazioli *et al.* 2006; Bassos-Hull *et al.* 2013). Early studies indicating year-round residency in bays in both the eastern and western Gulf of Mexico led to the delineation of 33 bay, sound and estuary (BSE) stocks, including Barataria Bay, with the first stock assessment reports published in 1995.

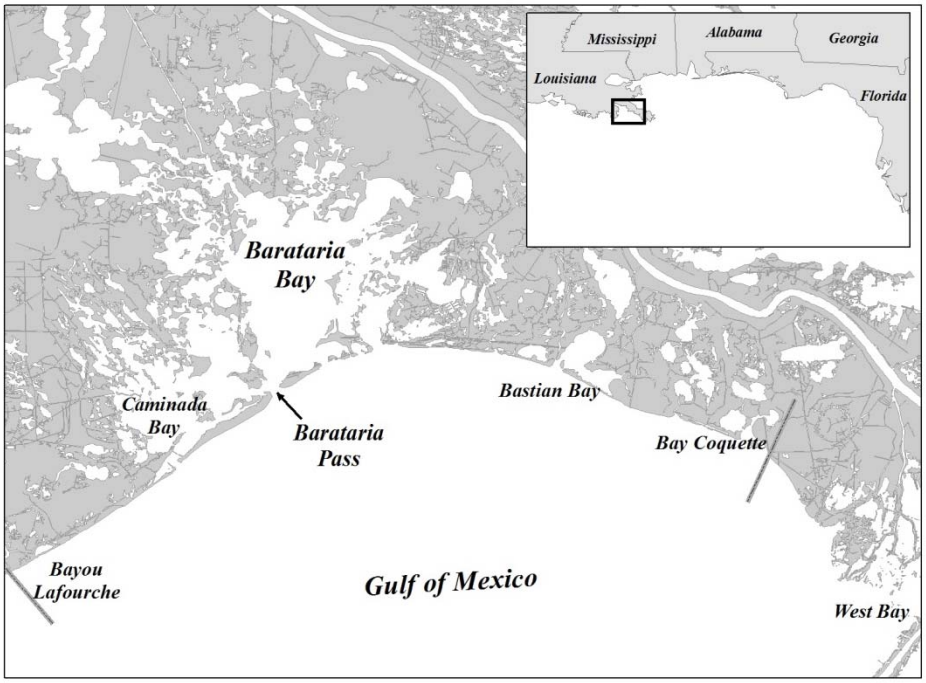

Figure 1. *Geographic extent of the Barataria Bay Estuarine System (BBES) Stock, located on the coast of Louisiana. The borders are denoted by solid lines.*

More recently, genetic data also support the concept of relatively discrete BSE stocks (Duffield and Wells 2002; Sellas *et al.* 2005). Sellas *et al.* (2005) examined population subdivision among dolphins sampled in Sarasota Bay, Tampa Bay, and Charlotte Harbor, Florida; Matagorda Bay, Texas; and the coastal Gulf of Mexico (1-12 km offshore) from just outside Tampa Bay to the south end of Lemon Bay, and found evidence of significant population differentiation among all areas on the basis of both mitochondrial DNA control region sequence data and 9 nuclear microsatellite loci. The Sellas *et al.* (2005) findings support the identification of BSE populations distinct from those occurring in adjacent Gulf coastal waters. Differences in reproductive seasonality from site to site also suggest genetic-based distinctions among areas (Urian *et al.* 1996). Photo-ID and genetic data from several inshore areas of the southeastern United States also support the existence of

resident estuarine animals and a differentiation between animals biopsied along the Atlantic coast and those biopsied within estuarine systems at the same latitude (Caldwell 2001; Gubbins 2002; Zolman 2002; Mazzoil *et al.* 2005; Litz 2007; Rosel *et al*. 2009; NMFS unpublished).

Barataria Bay is a shallow (mean depth=2 m) estuarine system located in central Louisiana. It is bounded in the west by Bayou Lafourche, in the east by the Mississippi River delta and in the south by the Grand Terre barrier islands. Barataria Bay is approximately 110 km in length and 50 km in width at its widest point where it opens into the Gulf of Mexico (Conner and Day 1987). This estuarine system is connected to the Gulf of Mexico by a series of passes: Caminada Pass, Barataria Pass, Pass Abel and Quatre Bayou Pass. The margins of Barataria Bay include marshes, canals, small embayments and channels. Bay waters are turbid, and salinity varies widely from south to north with the more saline, tidally influenced portions in the south and freshwater lakes in the north (U.S. EPA 1999; Moretzsohn *et al*. 2010). Miller and Baltz (2009) reported salinity varied seasonally and averaged 22.77 psu (practical salinity unit) in lower Barataria and Caminada Bays (data collected during dolphin sightings). Barataria Bay, together with the Timbalier-Terrebonne Bay system (referred to as the Barataria-Terrebonne National Estuary Program), has been selected as an estuary of national significance by the Environmental Protection Agency National Estuary Program (see http://www.btnep.org/BTNEP/home.aspx). The marshes and swamp forests which characterize Barataria Bay supply breeding and nursery grounds for an assortment of commercial and recreational species of consequence, such as finfish, shellfish, alligators, songbirds, geese and ducks (U.S. EPA 1999; Moretzsohn *et al*. 2010). The Barataria basin also produces a significant part of U.S. petroleum resources and is an important commercial harbor (Conner and Day 1987). High industrial and commercial use of the area and human alteration have resulted in environmental degradation and habitat loss. The most serious environmental issues facing the estuarine system include loss of coastal wetlands, eutrophication, barrier island erosion, saltwater intrusion and introduction of toxic substances (Conner and Day 1987; Barras *et al*. 2003).

The Barataria Bay Estuarine System (BBES) Stock area includes Caminada Bay, Barataria Bay, Bastian Bay and Bay Coquette (Figure 1). During June 1999 – May 2002, Miller (2003) conducted 44 boat-based, photo-ID surveys in lower Barataria and Caminada Bays. Dolphins were present year-round, and 133 individual dolphins were identified. One individual was sighted 6 times, but most individuals, 58%, were sighted only once. Using a fine-scale microhabitat approach, Miller and Baltz (2009) described foraging habitat of bottlenose dolphins in Barataria Bay. Significant differences in temperature, group size, season and turbidity differentiated foraging sites from non-foraging sites. Foraging was more often observed in waters 200-500 m from shore in 4-6 m depth and at salinity values of approximately 20 psu. Additional study is needed to further describe the population of bottlenose dolphins inhabiting the BBES. The current stock boundary does not include any coastal waters outside of the barrier islands. Further research is needed to determine the degree to which dolphins of this stock utilize nearshore coastal waters outside Barataria Bay. This stock boundary is subject to change upon further study of dolphin residency patterns in estuarine waters of Louisiana. Information on the use of coastal waters will be important when considering exposure to coastal fisheries as estuarine animals that make use of nearshore coastal waters would be at risk of entanglement in fishing gear while moving along the coast. Ongoing NOAA photo-ID surveys initiated in 2010, as well as data from tracking of 44 bottlenose dolphins tagged with satellite-linked transmitters in and around Barataria Bay in August 2011, June 2013 and June 2014 will address some of these issues as the data become available.

Dolphins residing in the estuaries southeast of this stock between BBES and the Mississippi River mouth (West Bay) are not currently covered in any stock assessment report. There are insufficient data to determine whether animals in this region exhibit affiliation to the BBES stock or should be delineated as their own stock. Further research is needed to establish affinities of dolphins in this region. It should be noted that in this region during 2009–2013, no bottlenose dolphins were reported stranded.

POPULATION SIZE

The total number of common bottlenose dolphins residing within the BBES Stock is unknown. Miller (2003) conducted boat-based, photo-ID surveys in lower Barataria and Caminada Bays from June 1999 to May 2002. Miller (2003) identified 133 individual dolphins, and using closed-population unequal catchability models in the program CAPTURE, produced an abundance estimate of 138-238 (128-297, 95% CI). Miller's (2003) estimate covered only a portion of the area of the BBES stock and did not include a correction for the unmarked portion of the population. Therefore, the estimate is considered negatively biased. Also, this estimate is considered outdated due to being more than 8 years old.

Minimum Population Estimate

Published data are insufficient to calculate a minimum population estimate for the BBES Stock of common bottlenose dolphins.

Current Population Trend

One abundance estimate is available for this stock, and therefore there are insufficient data to assess population trends.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

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

POTENTIAL BIOLOGICAL REMOVAL

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

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The total annual human-caused mortality and serious injury for the BBES 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 and mortality rates were calculated at the state level (see Shrimp Trawl section below). The mean annual fishery-related mortality and serious injury during 2009–2013 for strandings and at-sea observations identified as fishery-caused was 0.8. 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 0.8. This does not include an estimate for the commercial shrimp trawl fishery.

Fishery Information

The commercial fisheries that interact, or that potentially could interact, with this stock are the Category II Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl; and Gulf of Mexico menhaden purse seine fisheries; and the Category III Gulf of Mexico blue crab trap/pot; and Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fisheries (Appendix III). Brown shrimp, white shrimp, blue crab and menhaden fisheries are all important commercial fisheries in the Barataria Bay region. The menhaden purse seine fishery is an important fishery in Gulf of Mexico coastal waters just outside the barrier islands of Barataria Bay. It has the potential to interact with dolphins of this stock that use nearshore coastal waters.

Shrimp Trawl

Between 1997 and 2011, 5 common bottlenose dolphins and 7 unidentified dolphins, which could have been either common bottlenose dolphins or Atlantic spotted dolphins, became entangled in the lazy line, turtle excluder device or tickler chain gear in the commercial shrimp trawl fishery in the Gulf of Mexico. All dolphin bycatch interactions resulted in mortalities except for 1 unidentified dolphin that was released alive in 2009. Soldevilla *et al.* (2015) provide mortality estimates calculated from analysis of shrimp fishery effort data and NMFS's Observer Program bycatch data. Observer program coverage does not extend into BSE waters; time-area stratified bycatch rates were extrapolated into inshore waters to estimate bycatch mortalities from inshore fishing effort. Annual mortality estimates were calculated for the years 1997-2011 from stratified annual fishery effort and bycatch rates, and a 5-year unweighted mean mortality estimate for 2007-2011 was calculated for Gulf of Mexico dolphin stocks. The 4-area (Texas, Louisiana, Mississippi/Alabama, Florida) stratification method was chosen because it best approximates how fisheries operate (Soldevilla *et al.* 2015). The BSE stock mortality estimates were aggregated at the state level as this was the spatial resolution at which fishery effort is modeled (e.g., Nance *et al.* 2008). The mean annual mortality estimate for Louisiana BSE stocks (from Sabine Lake east to Barataria Bay) was 88 (CV=1.01). This estimate does not include skimmer trawl effort, which may represent up to 50% of shrimp fishery effort in Louisiana, Alabama, and Mississippi inshore waters, because Observer Program coverage of skimmer trawls is limited. Limitations and biases of annual bycatch mortality estimates are described in detail in Soldevilla *et al.* (2015).

Blue Crab Trap/Pot

During 2009–2013 there were 2 documented interactions in trap/pot gear. There was 1 documented mortality (in 2011) of a common bottlenose dolphin in commercial blue crab trap/pot gear, and 1 live animal (in 2012) was disentangled from commercial blue crab trap/pot gear and released, considered not seriously injured (Maze-Foley and Garrison in prep b). Both the mortality and live release were included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014) and in the totals presented in Table 1. There is no systematic observer coverage of crab trap/pot fisheries, so it is not possible to quantify total mortality.

Hook and Line

During 2009–2013, there were 4 documented interactions with hook and line gear in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 11 June 2014; Table 1). In 2011, hook and line gear entanglement or ingestion were documented for 1 mortality and 1 animal released alive without serious injury (Maze-Foley and Garrison in prep a). In 2013, 2 live releases without serious injury involved dolphins found with hook and line gear on them during a live-capture-release health assessment (Maze-Foley and Garrison in prep c).

In addition to animals included in the stranding database, during 2009–2013, there were 2 at-sea observations in Barataria Bay of dolphins entangled in fishing gear (monofilament line). The observations occurred during 2011 and 2012, and both dolphins were considered seriously injured (Maze-Foley and Garrison in prep a,b).

It should be noted that, in general, it cannot be determined if hook and line gear originated from a commercial (i.e., charter boat and headboat) or recreational angler because the gear type used by both sources is typically the same. Also, it is not possible to estimate the total number of interactions with hook and line gear because there is no systematic observer program.

Other Mortality

From 2009 to 2013, 92 common bottlenose dolphins were reported stranded within the BBES (Table 1; 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 65 of these strandings. For 10 dolphins, no evidence of human interaction was detected. Evidence of human interactions was detected for 17 stranded dolphins, 8 of which stranded visibly oiled. In addition, there were 2 entanglements with commercial blue crab trap/pot gear, 4 entanglements with hook and line gear, and 1 gunshot wound (see Table 1). Stranding data probably underestimate the extent of human and fishery-related mortality and serious injury because not all of the dolphins that die or are seriously injured in human interactions wash ashore, or, if they do, they are not all recovered (Peltier *et al*. 2012; Wells *et al*. 2015). Additionally, not all carcasses will show evidence of human interaction, entanglement or other fishery-related interaction due to decomposition, scavenger damage, etc. (Byrd *et al*. 2014). Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interaction.

In addition to animals included in the stranding database, during 2009–2013, there was 1 at-sea observation during 2013 in Barataria Bay of a dolphin entangled around the head in a plastic packing strap that was constricting, and this animal was considered seriously injured (Maze-Foley and Garrison in prep c).

An Unusual Mortality Event (UME) was declared for cetaceans in the northern Gulf of Mexico beginning 1 February 2010; and, as of September 2014, the event is still ongoing (Litz *et al.* 2014). It includes cetaceans that stranded prior to the *Deepwater Horizon* oil spill (see "Habitat Issues" below), during the spill, and after. During 2010-2013, all 92 stranded dolphins from this stock were considered to be part of the UME. One earlier mortality event that occurred from January through May 1990 and included 344 bottlenose dolphin strandings in the northern Gulf of Mexico may have affected the BBES Stock as well. Strandings were reported in the Barataria Bay area during the time of the 1990 mortality event, but there is little information available on the impact of the event on the BBES Stock. 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).

The problem of dolphin depredation of fishing gear is increasing in Gulf of Mexico coastal and estuary waters and illegal feeding or provisioning of wild bottlenose dolphins has been documented in Florida and Texas (Bryant 1994; Samuels and Bejder 2004; Cunningham-Smith *et al.* 2006; Powell and Wells 2011). There are emerging questions regarding potential linkages between provisioning and depredation of recreational fishing gear and associated entanglement and ingestion of gear. To date there are no records of depredation or provisioning for this stock area however.

Table 1. Common bottlenose dolphin strandings occurring in the Barataria Bay Estuarine System Stock area 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 human interaction. 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
Barataria Bay Estuarine System Stock	Total Stranded	0	22[a]	36[a]	17[a]	17[a]	92
	Human Interaction						
	---Yes	0	1[b]	11[c]	2[d]	3[e]	17
	---No	0	2	6	2	0	10
	---CBD	0	19	19	13	14	65

[a] All strandings were part of the ongoing UME event in the northern Gulf of Mexico.
[b] This animal stranded visibly oiled (mortality).
[c] Includes six animals stranded visibly oiled (mortalities), 1entanglement in commercial blue crab pot gear (mortality), and 2 entanglement interactions with hook and line gear (1 mortality and 1 animal released alive without serious injury).
[d] Includes 1 animal that stranded visibly oiled and also had a gunshot wound (mortality), and 1 entanglement interaction with commercial blue crab trap/pot gear (released alive without serious injury).
[e] Includes 2 entanglement interactions with hook and line gear (both were released alive without serious injury).

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).

A substantial number of beaches and wetlands along the Louisiana coast experienced heavy or moderate oiling (OSAT-2 2011; Michel *et al.* 2013). The heaviest oiling in Louisiana occurred west of the Mississippi River on the Mississippi Delta and in Barataria and Terrebonne Bays, and to the east of the river on the Chandeleur Islands. Some heavy to moderate oiling occurred on Alabama and Florida beaches, with the heaviest stretch occurring from Dauphin Island, Alabama, to Gulf Breeze, Florida. Light to trace oil was reported along the majority of Mississippi's mainland coast, from Gulf Breeze to Panama City, Florida, and outside of Atchafalaya and Vermilion Bays in western Louisiana. Heavy to light oiling occurred on Mississippi's barrier islands (Michel *et al.* 2013).

Shortly after the oil spill, the Natural Resource Damage Assessment (NRDA) process was initiated under the Oil Pollution Act of 1990. A variety of NRDA research studies are being conducted to determine potential impacts of the spill on marine mammals. These studies have focused on identifying the type, magnitude, severity, length and impact of oil exposure to oceanic, continental shelf, coastal and estuarine marine mammals. The research is ongoing. For coastal and estuarine dolphins, the NOAA-led efforts include: active surveillance to detect stranded animals in remote locations; aerial surveys to document the distribution, abundance, species and exposure relative to oil from the DWH spill; assessment of sublethal and chronic health impacts on coastal and estuarine common bottlenose dolphins in Barataria Bay, Louisiana, Mississippi Sound, and a reference site in Sarasota Bay, Florida; and assessment of injuries to dolphin stocks in Barataria Bay and Chandeleur Sound, Louisiana, Mississippi Sound, and as a reference site, St. Joseph Bay, Florida.

During August 2011, a capture-and-release health assessment was conducted on bottlenose dolphins in Barataria Bay and a reference site (Sarasota Bay). Preliminary findings from the NRDA health assessment indicate the health of many of the dolphins is compromised (Schwacke *et al.* 2014). Barataria Bay dolphins were 5 times more likely to have moderate-severe lung disease and many showed evidence of compromised adrenal function. Based on the observed disease conditions, 17% of the dolphins sampled in Barataria Bay were given a poor prognosis, indicating that they would likely not survive. The disease conditions in Barataria Bay dolphins were

greater in prevalence and severity as compared to the reference site, as well as compared to disease previously reported in other wild populations (Schwacke *et al.* 2014).

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

Besides oil exposure, another habitat concern for BBES Stock dolphins is the degredation and loss of wetland habitat within the Barataria Bay Estuarine System. Wetland loss can be attributed to both natural processes and human activities (Committee on the Future of Coastal Louisiana 2002; Louisiana Coastal Wetlands Conservation and Restoration Task Force 2012). Natural erosional processes include herbivory, subsidence, sea-level rise, storms, winds and tides, and human activities include levee construction, channelization (navigational channels and oil and gas canals) and development. Critical problems contributing to wetland loss are considered to be the loss of freshwater and sediment input from the Mississippi River due to levee construction, and barrier island erosion. These problems result in land loss, changes in vegetation and increased salinity in lower Barataria Bay. As wetlands disappear, productivity and biodiversity of the Barataria Bay Estuarine System decrease (Committee on the Future of Coastal Louisiana 2002; Louisiana Coastal Wetlands Conservation and Restoration Task Force 2012).

STATUS OF STOCK

Common bottlenose dolphins are not listed as threatened or endangered under the Endangered Species Act. Because the stock size is currently unknown, but likely small and relatively few mortalities and serious injuries would exceed PBR, NMFS considers this a strategic stock. Additionally, because a UME of unprecedented size and duration (began 1 February 2010 and is ongoing) has impacted the northern Gulf of Mexico, including Barataria Bay, and because the health assessment findings of Schwacke *et al.* (2014) indicate compromised health of dolphins sampled within Barataria Bay, NMFS finds cause for concern about this stock. The total human-caused mortality and serious injury for this stock is unknown and there is insufficient information available to determine whether the total fishery-related mortality and serious injury for this stock is insignificant and approaching zero mortality and serious injury rate. The status of the BBES stock relative to OSP is unknown. There are insufficient data to determine population trends for this stock.

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