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 predominantly use the bay, sound or estuary 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 to bays in both the eastern and western Gulf of Mexico led to the delineation of 33 bay, sound and estuary stocks, including Barataria Bay, with the first stock assessment reports published in 1995.

More recently, genetic data also support the concept of relatively discrete bay, sound and estuary stocks (Duffield and Wells 2002; Sellas *et al.* 2005). Sellas *et al.* (2005) examined population subdivision among dolphins sampled in Sarasota Bay, Tampa Bay, Charlotte Harbor, 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 bay, sound and estuary 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

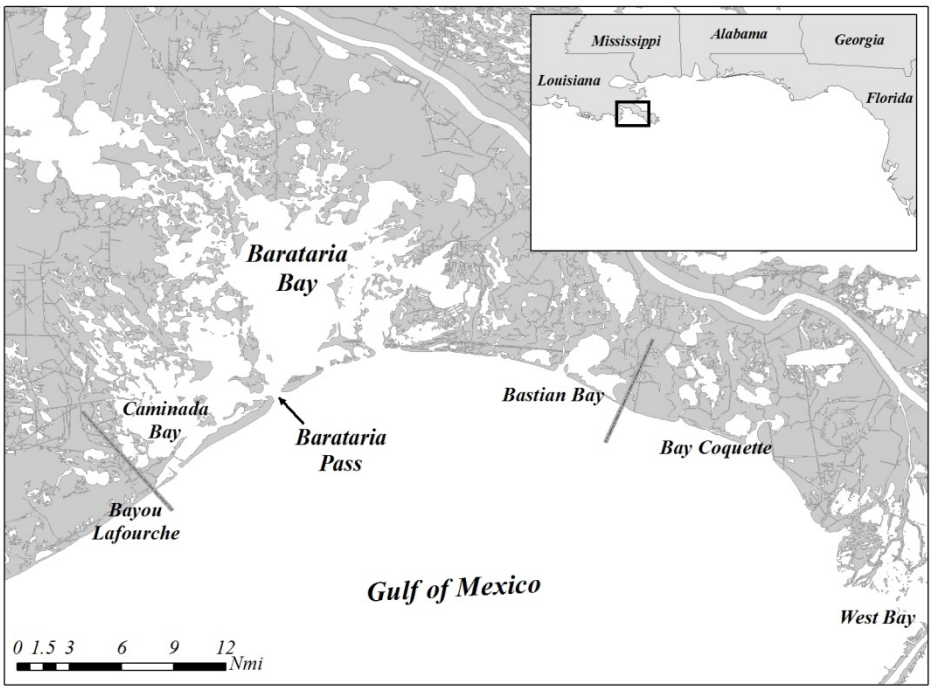

Figure 1. *Geographic extent of the Barataria Bay Estuarine System (BBES) Stock, located on the coast of Louisiana. The borders are denoted by solid lines.*

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 (Connor 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, as well as for migratory birds (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. 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 (Connor and Day 1987; Barras *et al*. 2003).

The Barataria Bay Estuarine System (BBES) Stock area includes Caminada Bay, Barataria Bay and Bastian Bay (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 25 bottlenose dolphins tagged with satellite-linked transmitters in and around Barataria Bay in August 2011 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 (Bay Coquette and 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 2008-2012, 1 bottlenose dolphin was reported stranded. It could not be determined if there was evidence of human interactions for this stranding. This stranding was considered to be part of the ongoing Unusual Mortality Event (see Other Mortality).

POPULATION SIZE

The total number of 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 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, her estimate is considered negatively biased. Also, these data are considered expired due to being more than 8 years old.

Minimum Population Estimate

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

Current Population Trend

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

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 bottlenose dolphins is unknown. 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 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 of the BBES bottlenose dolphin stock during 2008-2012 is unknown. During 2008-2012, 1 mortality was documented involving the Atlantic Ocean, Gulf of Mexico, Caribbean commercial passenger fishing vessel (hook and line) fishery, and 1 mortality was documented in the Gulf of Mexico blue crab trap/pot fishery. In addition, 2 bottlenose dolphins observed at-sea entangled in fishing gear (monofilament line) were considered seriously injured. It is not possible to estimate the total number of mortalities or serious injuries associated with hook and line or blue crab 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.

Fishery Information

The commercial fisheries which potentially could interact with this stock are the Category II Southeastern U.S. Atlantic, Gulf of Mexico shrimp trawl, Gulf of Mexico menhaden purse seine 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. There have been no documented interactions between BBES bottlenose dolphins and the shrimp trawl fishery. However, observer coverage of the shrimp trawl fishery does not extend into bay, sound and estuary waters. 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 the BBES Stock that use nearshore coastal waters. There is no systematic observer coverage of crab trap/pot fisheries; therefore, it is not possible to quantify total mortality.

Hook and Line Fisheries

During 2008-2012 there was 1 mortality for which hook and line gear entanglement or ingestion was documented. In addition, 1 animal was released alive without serious injury (Maze-Foley and Garrison in prep a,b). The mortality and live release both occurred during 2011 and 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 totals presented in Table 1.

Blue Crab Trap/Pot Fishery

During 2008-2012 there was 1 documented mortality of a bottlenose dolphin in commercial blue crab trap/pot gear. The mortality occurred during 2011 and was included in the stranding database (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 13 September 2012 and 15 April 2013) 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.

Other Mortality

From 2008 to 2012, 75 bottlenose dolphins were reported stranded within the BBES (Table 1; 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]). Evidence of human interactions was detected for 12 stranded dolphins, 8 of which stranded visibly oiled. In addition, there was 1 entanglement with commercial blue crab pot gear, 2 entanglements with recreational hook and line gear, and 1 gunshot wound (see Table 1). Stranding data probably underestimate the extent of human-caused mortality and serious injury because not all of the marine mammals that die or are seriously injured in human interactions are discovered, reported or investigated, nor will all of those that are found necessarily show signs of entanglement or other human interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of human interactions.

In addition to animals included in the stranding database, during 2008-2012, 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).

An Unusual Mortality Event (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, 23 stranded dolphins from this stock were considered to be part of the UME; during 2011, 33 dolphins, and during 2012, 15 dolphins. One earlier mortality event that occurred from January through May 1990 and included 367 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).

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. Bottlenose dolphin strandings occurring in the Barataria Bay Estuarine System Stock area 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 human interaction. 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
Barataria Bay Estuarine System Stock	Total Stranded	4	0	23[a]	33[a]	15[a]	75
	Human Interaction						
	---Yes	0	0	1[b]	10[c]	1[d]	12
	---No	2	0	1	3	2	8
	---CBD	2	0	21	20	12	55

[a] All strandings were part of the ongoing UME event in the northern Gulf of Mexico.
[b] This mortality stranded visibly oiled.
[c] Six HIs were animals stranded visibly oiled (mortalities); 1HI was an entanglement in commercial blue crab pot gear (mortality); and 2 HIs were entanglement interactions with the recreational hook and line fishery (1 mortality and 1 animal disentangled and released alive without serious injury).
[d] This mortality had a gunshot wound and was visibly oiled.

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).

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 of marine mammals and sea turtles relative to oil from DWH spill; assessment of sublethal and chronic health impacts on coastal and estuarine bottlenose dolphins in Barataria Bay, Louisiana, 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 live capture and release bottlenose dolphin health assessment was conducted 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. However, because an 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 considers this stock to be strategic under the MMPA. 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.

REFERENCES CITED

Andersen, M.S., K.A. Forney, T.V.N. Cole, T. Eagle, R. Angliss, K. Long, L. Barre, L. Van Atta, D. Borggaard, T. Rowles, B. Norberg, J. Whaley and L. Engleby. 2008. Differentiating serious and non-serious injury of marine mammals: Report of the serious injury technical workshop, 10-13 September 2007, Seattle, WA. NOAA Tech. Memo. NMFS-OPR-39, 94 pp.

Angliss, R.P. and D.P. DeMaster. 1998. Differentiating serious and non-serious injury of marine mammals taken incidental to commercial fishing operations: Report of the serious injury workshop, 1-2 April 1997, Silver Spring, MD. NOAA Tech. Memo. NMFS-OPR-13, 48 pp.

Balmer, B.C., R.S. Wells, S.M. Nowacek, D.P. Nowacek, L.H. Schwacke, W.A. McLellan, F.S. Scharf, T.K. Rowles, L.J. Hansen, T.R. Spradlin and D.A. Pabst. 2008. Seasonal abundance and distribution patterns of common bottlenose dolphins (*Tursiops truncatus*) near St. Joseph Bay, Florida, USA. J. Cetacean Res. Manage. 10(2): 157-167.

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.

Barras, J., S. Beville, D. Britsch, S. Hartley, S. Hawes, J. Johnston, P. Kemp, Q. Kinler, A. Martucci, J. Porthouse, D. Reed, K. Roy, S. Sapkota and J. Suhayda. 2003. Historical and projected coastal Louisiana land changes: 1978-2050: USGS Open File Report 03-334, 39 pp. (Revised January 2004).

Bassos-Hull, K., R.M. Perrtree, C.C. Shepard, S. Schilling, A.A. Barleycorn, J.B. Allen, B.C. Balmer, W.E. Pine and R.S. Wells. 2013. Long-term site fidelity and seasonal abundance estimates of common bottlenose dolphins (*Tursiops truncatus*) along the southwest coast of Florida and responses to natural perturbations. J. Cetacean Res. Manage. 13(1):19-30.

Bräger, S. 1993. Diurnal and seasonal behavior patterns of bottlenose dolphins (*Tursiops truncatus*). Mar. Mamm. Sci. 9: 434-440.

Bräger, S., B. Würsig, A. Acevedo and T. Henningsen. 1994. Association patterns of bottlenose dolphins (*Tursiops truncatus*) in Galveston Bay, Texas. J. Mamm. 75(2): 431-437.

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

Caldwell, M. 2001. Social and genetic structure of bottlenose dolphin (*Tursiops truncatus*) in Jacksonville, Florida. Ph.D. dissertation from University of Miami, 143 pp.

Committee on the Future of Coastal Louisiana. 2002. Saving Coastal Louisiana: Recommendations for Implementing an Expanded Coastal Restoration Program. BatonRouge, LA: Governor's Office of Coastal Activities. February. Available from: http://lacoast.gov/cwppra/reports/saving_coastal_louisiana.pdf

Conner, W.H. and J.W. Day, Jr., eds. 1987. The ecology of Barataria Basin, Louisiana: An estuarine profile. U.S. Fish Wildl. Serv. Biol. Rep. 85 (7.13), 165 pp.

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.

Duffield, D.A. and R.S. Wells. 2002. The molecular profile of a resident community of bottlenose dolphins, *Tursiops truncatus*. Pages 3-11. *In*: C. J. Pfeiffer, (ed.) Cell and Molecular Biology of Marine Mammals. Krieger Publishing, Melbourne, FL.

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.

Fertl, D.C. 1994. Occurrence patterns and behavior of bottlenose dolphins (*Tursiops truncatus*) in the Galveston ship channel. Texas J. Sci. 46: 299-317.

Geraci, J.R. 1990. Physiologic and toxic effects on cetaceans. Pages 167-197. *In:* J. R. Geraci and D. J. St. Aubin

(eds.) Sea mammals and oil: Confronting the risks. Academic Press, New York. 259 pp.
Gruber, J.A. 1981. Ecology of the Atlantic bottlenosed dolphin (*Tursiops truncatus*) in the Pass Cavallo area of Matagorda Bay, Texas. M. Sc. thesis from Texas A&M University, College Station. 182 pp.
Gubbins, C. 2002. Association patterns of resident bottlenose dolphins (*Tursiops truncatus*) in a South Carolina estuary. Aquat. Mamm. 28: 24-31.
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.
Hubard, C.W., K. Maze-Foley, K.D. Mullin and W.W. Schroeder. 2004. Seasonal abundance and site fidelity of bottlenose dolphins (*Tursiops truncatus*) in Mississippi Sound. Aquat. Mamm. 30: 299-310.
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. 79: 671-688.
Irvine, B. and R.S. Wells. 1972. Results of attempts to tag Atlantic bottlenose dolphins (*Tursiops truncatus*). Cetology 13: 1-5.
Irwin, L.J. and B. Würsig. 2004. A small resident community of bottlenose dolphins, *Tursiops truncatus*, in Texas: Monitoring recommendations. G. Mex. Sci. 22(1): 13-21.
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. 2007. Social structure, genetic structure, and persistent organohalogen pollutants in bottlenose dolphins (*Tursiops truncatus*) in Biscayne Bay, Florida. Ph.D. dissertation from University of Miami, 140 pp.
Louisiana Coastal Wetlands Conservation and Restoration Task Force. 2012. The 2012 Evaluation Report to the U.S. Congress on the Effectiveness of Coastal Wetlands Planning, Protection and Restoration Act Projects. Available from: http://lacoast.gov/reports/rtc/RTC_2012_1-18-13.pdf
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, K.S. and B. Würsig. 1999. Bottlenose dolphins of San Luis Pass, Texas: Occurrence patterns, site fidelity, and habitat use. Aquat. Mamm. 25: 91-103.
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.
Mazzoil, M., S.D. McCulloch and R.H. Defran. 2005. Observations on the site fidelity of bottlenose dolphins (*Tursiops truncatus*) in the Indian River Lagoon, Florida. Fla. Sci. 68: 217-226.
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.
Michel, J., E.H. Owens, S. Zengel, A. Graham, Z. Nixon, T. Allard, W. Holton, P.D. Reimer, A. Lamarche, M. White, N. Rutherford, C. Childs, G. Mauseth, G. Challenger and E. Taylor. 2013. Extent and degree of shoreline oiling: *Deepwater Horizon* oil spill, Gulf of Mexico, USA. PLOS ONE 8(6): e65087.
Miller, C. 2003. Abundance trends and environmental habitat usage patterns of bottlenose dolphins (*Tursiops truncatus*) in lower Barataria and Caminada Bays, Louisiana. Ph.D. thesis from Louisiana State University, Baton Rouge. 125 pp.
Miller, C.E. and D.M. Baltz. 2009. Environmental characterization of seasonal trends and foraging habitat of bottlenose dolphins (*Tursiops truncatus*) in northern Gulf of Mexico bays. Fish. Bull. 108: 79-86.
Moretzsohn, F., J.A. Sanchez Chavez and J.W. Tunnell, Jr., eds. 2010. GulfBase: Resource database for Gulf of Mexico research. World Wide Web electronic publication. Available at: http://www.gulfbase.org.
Mullin, K.D. 1988. Comparative seasonal abundance and ecology of bottlenose dolphins (*Tursiops truncatus*) in three habitats of the north-central Gulf of Mexico. Ph.D. thesis. Mississippi State University, Starkville. 135 pp.
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
NOAA. 2012. Federal Register 77:3233. National policy for distinguishing serious from non-serious injuries of marine mammals. Available from: http://www.nmfs.noaa.gov/op/pds/documents/02/238/02-238-01.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

Operational Science Advisory Team (OSAT-2). 2011. Summary report for fate and effects of remnant oil remaining in the beach environment. Annex B: Spatial oil distribution. Available from: http://www.restorethegulf.gov/release/2011/03/01/osat-2-fate-and-effects-oil-beaches

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.

Rosel, P.E., L. Hansen and A.A. Hohn. 2009. Restricted dispersal in a continuously distributed marine species: Common bottlenose dolphins *Tursiops truncatus* in coastal waters of the western North Atlantic. Mol. Ecol. 18: 5030–5045.

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.

Schwacke , L.H., C.R. Smith, F.I. Townsend, R.S. Wells, L.B. Hart, B.C. Balmer, T.K. Collier, S. De Guise, M.M. Fry, L.J. Guillette, S.V. Lamb, S.M. Lane, W.E. McFee, N.J. Place, M.C. Tumlin, G.M. Ylitalo, E.S. Zolman and T.K. Rowles. 2014. Health of bottlenose dolphins (*Tursiops truncatus*) in Barataria Bay, Louisiana following the *Deepwater Horizon* oil spill. Environ. Sci. Technol. 48(1): 93-103.

Scott, M.D., R.S. Wells and A.B. Irvine 1990. A long-term study of bottlenose dolphins on the west coast of Florida. Pages 235-244 *in*: S. Leatherwood and R.R. Reeves, (eds.) The bottlenose dolphin. Academic Press, San Diego, CA.

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(5): 715-728.

Shane, S.H. 1977. The population biology of the Atlantic bottlenose dolphin, *Tursiops truncatus*, in the Aransas Pass area of Texas. M. Sc. thesis from Texas A&M University, College Station. 238 pp.

Shane, S.H. 1990. Behavior and ecology of the bottlenose dolphin at Sanibel Island, Florida. Pages 245-265 *in*: S. Leatherwood and R.R. Reeves, (eds.) The bottlenose dolphin. Academic Press, San Diego, CA.

Shane, S.H. 2004. Residence patterns, group characteristics, and association patterns of bottlenose dolphins near Sanibel Island, Florida. G. Mex. Sci. 22(1): 1-12.

Urian, K.W., D.A. Duffield, A.J. Read, R.S. Wells and D.D. Shell. 1996. Seasonality of reproduction in bottlenose dolphins, *Tursiops truncatus*. J. Mamm. 77: 394-403.

Urian, K.W., S. Hofmann, R.S. Wells and A.J. Read. 2009. Fine-scale population structure of bottlenose dolphins (*Tursiops truncatus*) in Tampa Bay, Florida. Mar. Mamm. Sci. 25(9): 619-638.

U.S. EPA. 1999. Ecological condition of estuaries in the Gulf of Mexico. EPA 620-R-98-004. U.S. Environmental Protection Agency, Office of Research and Development, National Health and Environmental Effects Research Laboratory, Gulf Ecology Division, Gulf Breeze, Florida. 80pp.

Wade, P.R. and R.P. Angliss. 1997. Guidelines for assessing marine mammal stocks: Report of the GAMMS Workshop April 3-5, 1996, Seattle, Washington. NOAA Tech. Memo. NMFS-OPR-12, 93 pp.

Weller, D.W. 1998. Global and regional variation in the biology and behavior of bottlenose dolphins. Ph. D. thesis from Texas A&M University, College Station. 142 pp.

Wells, R.S. 1986. Population structure of bottlenose dolphins: Behavioral studies along the central west coast of Florida. Contract report to NMFS, SEFSC. Contract No. 45-WCNF-5-00366. Available from: NMFS, Southeast Fisheries Science Center, 75 Virginia Beach Dr., Miami, FL 33149. 58 pp.

Wells, R.S. 1991. The role of long-term study in understanding the social structure of a bottlenose dolphin community. Pages 199-225 *in*: K. Pryor and K. S. Norris, (eds.) Dolphin societies: Discoveries and puzzles. University of California Press, Berkeley.

Wells, R.S. 2003. Dolphin social complexity: Lessons from long-term study and life history. Pages 32-56 *in*: F. B. M. de Waal and P. L. Tyack, (eds.) Animal social complexity: Intelligence, culture, and individualized societies. Harvard University Press, Cambridge, MA.

Wells, R.S., M.K. Bassos, K.W. Urian, W.J. Carr and M.D. Scott 1996a. Low-level monitoring of bottlenose dolphins, *Tursiops truncatus*, in Charlotte Harbor, Florida: 1990-1994. NOAA Tech. Memo. NMFS-SEFSC-384. 36 pp.

Wells, R.S., M.K. Bassos, K.W. Urian, S.H. Shane, E.C.G. Owen, C.F. Weiss, W.J. Carr and M.D. Scott. 1997. Low-level monitoring of bottlenose dolphins, *Tursiops truncatus*, in Pine Island Sound, Florida: 1996. Contract report to National Marine Fisheries Service, Southeast Fisheries Center Contribution No. 40-

WCNF601958. Available from: NMFS, Southeast Fisheries Science Center, 75 Virginia Beach Dr., Miami, FL 33149.

Wells, R.S., M.D. Scott and A.B. Irvine. 1987. The social structure of free ranging bottlenose dolphins. Pages 247-305 *in*: H. Genoways, (ed.) Current Mammalogy, Vol. 1. Plenum Press, New York.

Wells, R.S., K.W. Urian, A.J. Read, M.K. Bassos, W.J. Carr and M.D. Scott. 1996b. Low-level monitoring of bottlenose dolphins, *Tursiops truncatus*, in Tampa Bay, Florida: 1988-1993. NOAA Tech. Memo. NMFS-SEFSC-385, 25 pp.

Zolman, E.S. 2002. Residence patterns of bottlenose dolphins (*Tursiops truncatus*) in the Stono River estuary, Charleston County, South Carolina, U.S.A. Mar. Mamm. Sci. 18: 879-892.