

## 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 32 bay, sound and estuary stocks of bottlenose dolphins in the Gulf of Mexico. Until this effort is completed and 32 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

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). 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). 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 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 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 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

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 *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

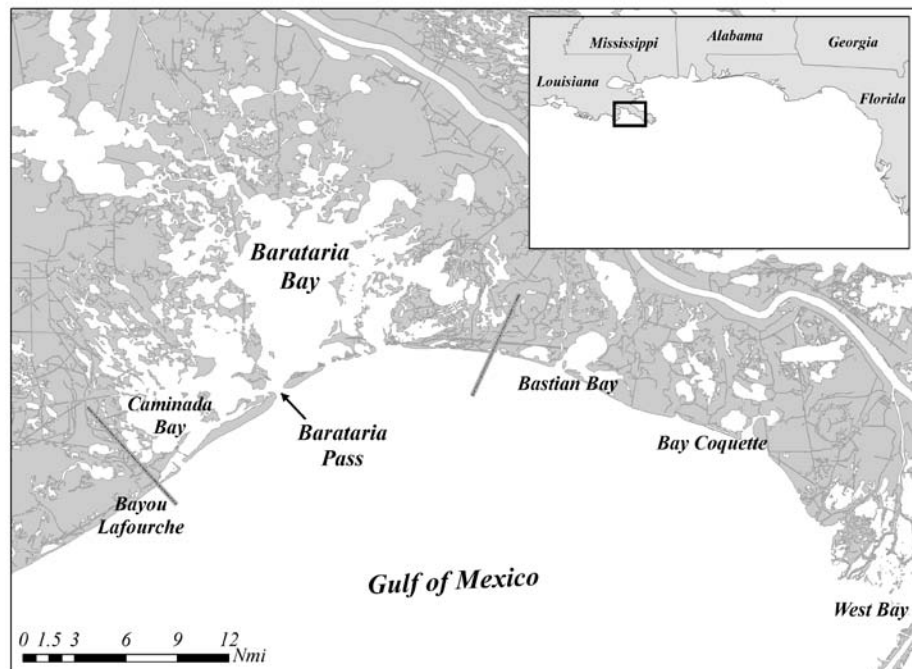


Figure 1. Geographic extent of the Barataria Bay Estuarine System (BBES) Stock, located on the coast of Louisiana. The borders are denoted by solid lines.

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=2m) 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 110km in length and 50km 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. It is fringed by a complex system of canals, bayous, 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 lakes in the north (U.S. EPA 1999; Moretzsohn *et al.* 2010). Miller and Baltz (2009) reported salinity varied seasonally and averaged 22.77psu (practical salinity unit) in lower Barataria and Caminada Bays (data collected during dolphin sightings). Barataria Bay, in conjunction with the Timbalier-Terrebonne Bay system, has been selected as an estuary of national significance by the Environmental Protection Agency National Estuary Program. The bay is characterized by marshes and swamp forests which supply a nursery and breeding ground for migratory birds and a variety of commercially and recreationally important species, 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. 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 and Barataria 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 200-500m from shore in 4-6m depth and at salinity values of approximately 20psu. 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 (Bastian Bay, 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 2006–2010, 2 bottlenose dolphins were reported stranded in the Bastian Bay area. It could not be determined if there was evidence of human interactions for these 2 strandings. Both strandings were 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 covers a large portion of the area covered by the BBES stock; however, 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 2006–2010 is unknown.

### **Fishery Information**

The commercial fisheries which potentially could interact with this stock are the shrimp trawl, menhaden purse seine, blue crab trap/pot, and Atlantic Ocean commercial passenger fishing vessel (hook and line) fisheries (Appendix III). During 2005-2009, menhaden, brown shrimp, white shrimp and blue crab fisheries were all important commercial fisheries in Barataria Bay, comprising 4 of the top 5 commercial fisheries each year, both by weight and value of landings (based on data from the Louisiana Department of Wildlife and Fisheries Trip Ticket Program, M. Harden, pers. comm.). There have been no documented interactions between BBES bottlenose dolphins and the shrimp trawl fishery, nor any documented interactions with hook and line fisheries. There have been no documented mortalities of BBES bottlenose dolphins in crab trap/pot fisheries. There is no systematic observer coverage of crab trap/pot fisheries; therefore, it is not possible to quantify total mortality.

### **Menhaden Purse Seine Fishery**

The menhaden purse seine fishery was the top commercial fishery for Barataria Bay in terms of landings by weight for each year from 2005 to 2009 (M. Harden, pers. comm.). 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, 1 of which occurred in Barataria Bay during 2002 and was a single “unidentified” dolphin (assumed to be a bottlenose dolphin). 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.

### **Other Mortality**

From 2006 to 2010, 25 bottlenose dolphins were reported stranded within the BBES (Table 1; NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 16 November 2011). Evidence of human interactions was detected for 1 stranded dolphin, which stranded alive visibly oiled during December 2010. 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.

An Unusual Mortality Event (UME) was declared for cetaceans in the northern Gulf of Mexico beginning 1

February 2010; and, as of early 2012, 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, 20 stranded dolphins from this stock were considered to be part of the UME.

Table 1. Bottlenose dolphin strandings occurring in the Barataria Bay Estuarine System Stock area from 2006 to 2010, 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 16 November 2011). Please note human interaction does not necessarily mean the interaction caused the animal’s death.

Stock	Category	2006	2007	2008	2009	2010	Total
Barataria Bay Estuarine System Stock	Total Stranded	1	0	4	0	20 <sup>a</sup>	25
	Human Interaction						
	---Yes	0	0	0	0	1	1
	---No	0	0	2	0	1	3
	---CBD	1	0	2	0	18	21

<sup>a</sup> All strandings from 2010 are part of the ongoing UME event in the northern Gulf of Mexico.

### 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 for 87 days millions of barrels of oil and gas were discharged from the wellhead until it was capped on 15 July 2010. 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). 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 barrier islands, from Gulf Breeze to Panama City, Florida, and outside of Atchafalaya and Vermilion Bays in western Louisiana (OSAT-2 2011).

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, 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.

Coastal dolphins have been observed with tar balls attached to them and seen swimming through oil slicks close to shore and inland bays (NOAA 2010a). 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; NOAA 2010b). 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; NOAA 2010b).

## STATUS OF STOCK

The status of the BBES stock relative to OSP is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine population trends for 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. Because an UME of unprecedented size and duration (began 1 February 2010 and is ongoing) has impacted Barataria Bay, NMFS considers this stock to be strategic.

## REFERENCES CITED

- 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.
- Barros, N.B. and R.S. Wells 1998. Prey and feeding patterns of resident bottlenose dolphins (*Tursiops truncatus*) in Sarasota Bay, Florida. *J. Mamm.* 79(3): 1045-1059.
- 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.
- Caldwell, M. 2001. Social and genetic structure of bottlenose dolphin (*Tursiops truncatus*) in Jacksonville, Florida. Ph.D. dissertation from University of Miami. 143 pp.
- 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.
- Duffield, D.A. and R.S. Wells 1986. Population structure of bottlenose dolphins: Genetic studies of bottlenose dolphins along the central west coast of Florida. Contract Report to National Marine Fisheries Service, Southeast Fisheries Center. 16 pp.
- Duffield, D.A. and R.S. Wells 1991. The combined application of chromosome, protein and molecular data for the investigation of social unit structure and dynamics in *Tursiops truncatus*. Pages 155-169 in: A. R. Hoelzel, (ed.) Genetic Ecology of Whales and Dolphins. Rep. Int. Whal. Comm., Cambridge, U.K. Special Issue 13.
- 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. pp. 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.
- 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.
- Hubard, C.W. and S.L. Swartz 2002. Gulf of Mexico bottlenose dolphin stock identification workshop: 14-15 March 2000, Sarasota, Florida. NOAA Tech. Memo. NMFS-SEFSC-473. 50 pp.
- 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](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.
- 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.
- 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.
- 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. 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. 2010a. Frequently asked questions about marine mammal rescue and intervention plans in response to the Deepwater Horizon oil spill. Available from: [http://sero.nmfs.noaa.gov/sf/deepwater\\_horizon/20100726\\_FINAL\\_FAQDWH\\_NOAA\\_marine\\_mammal\\_intervention\\_and\\_rescue.pdf](http://sero.nmfs.noaa.gov/sf/deepwater_horizon/20100726_FINAL_FAQDWH_NOAA_marine_mammal_intervention_and_rescue.pdf)
- NOAA. 2010b. Effects of oil on marine mammals and sea turtles. Available from: [http://sero.nmfs.noaa.gov/sf/deepwater\\_horizon/Marine\\_mammals\\_turtles\\_FACT\\_SHEET.pdf](http://sero.nmfs.noaa.gov/sf/deepwater_horizon/Marine_mammals_turtles_FACT_SHEET.pdf).
- NOAA. 2011. Public scoping for preparation of a programmatic environmental impact statement for the Deepwater Horizon BP Oil Spill. Available from: <http://www.gulfspillrestoration.noaa.gov/wp-content/uploads/2011/04/Public-DWH-PEIS-Scoping-Review-Document1.pdf>
- Operational Science Advisory Team (OSAT). 2010. Summary report for sub-sea and sub-surface oil and dispersant detection: Sampling and monitoring. Prepared for P. F. Zukunft, RADM, U.S. Coast Guard, Federal On-Scene Coordinator, Deepwater Horizon MC252, December 17, 2010. Available from: [http://www.restorethegulf.gov/sites/default/files/documents/pdf/OSAT\\_Report\\_FINAL\\_17DEC.pdf](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>
- Reynolds, J.E., III 1985. Evaluation of the nature and magnitude of interactions between bottlenose dolphins, *Tursiops truncatus*, and fisheries and other human activities in coastal areas of the southeastern United States. National Technical Information Service PB86-162203, U.S. Department of Commerce, Springfield, VA 22161.
- 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.