

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

### **STOCK DEFINITION AND GEOGRAPHIC RANGE**

Thirty-seven stocks have been provisionally identified for northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) bottlenose dolphins (Waring *et al.* 2001). Northern Gulf of Mexico inshore habitat has been separated into 32 bay, sound and estuarine stocks. Three northern Gulf of Mexico coastal stocks include nearshore waters from the shore to the 20m isobath. The northern Gulf of Mexico Continental Shelf Stock encompasses waters from 20 to 200m deep. The northern Gulf of Mexico Oceanic Stock encompasses the waters from the 200m isobath to the seaward extent of the U.S. Exclusive Economic Zone (EEZ; Figure 1).

Both “coastal” and “offshore” ecotypes of bottlenose dolphins (Mead and Potter 1995) occur in the Gulf of Mexico (Vollmer 2011), but the distribution of each is not known. The offshore and coastal ecotypes are genetically distinct based on both mitochondrial and nuclear markers (Hoelzel *et al.* 1998; Vollmer 2011). In the northwestern Atlantic Ocean, Torres *et al.* (2003) found a statistically significant break in the distribution of the ecotypes at 34km from shore. The offshore ecotype was found exclusively seaward of 34km and in waters deeper than 34m. The continental shelf is much wider in the Gulf of Mexico and these results may not apply. Ongoing research is aimed at better defining stock boundaries in coastal, continental shelf and oceanic waters of the Gulf of Mexico. Although the boundaries are not certain, the Oceanic Stock as currently defined is thought to be composed entirely of bottlenose dolphins of the offshore ecotype.

Because there are many confirmed records from Gulf of Mexico waters beyond U.S. boundaries (e.g., Ortega Ortiz 2002), bottlenose dolphins almost certainly occur throughout the oceanic Gulf of Mexico (Jefferson *et al.* 2008), which is also composed of waters belonging to Mexico and Cuba where there is currently little information on cetacean species abundance and distribution. U.S. waters only comprise about 40% of the entire Gulf of Mexico, and 65% of oceanic waters are south of the U.S. EEZ.

The northern Gulf of Mexico Oceanic Stock of bottlenose dolphins is provisionally being considered separate from the Atlantic Ocean stocks of bottlenose dolphins for management purposes. One line of evidence to support this decision comes from Baron *et al.* (2008), who found that Gulf of Mexico bottlenose dolphin whistles (collected from oceanic waters) were significantly different from those in the western North Atlantic Ocean (collected from continental shelf and oceanic waters) in duration, number of inflection points and number of steps.

### **POPULATION SIZE**

The best abundance estimate available for the northern Gulf of Mexico Oceanic Stock of bottlenose dolphins is 5,806 (CV=0.39; Table 1). This estimate is from a summer 2009 oceanic survey covering waters from the 200m

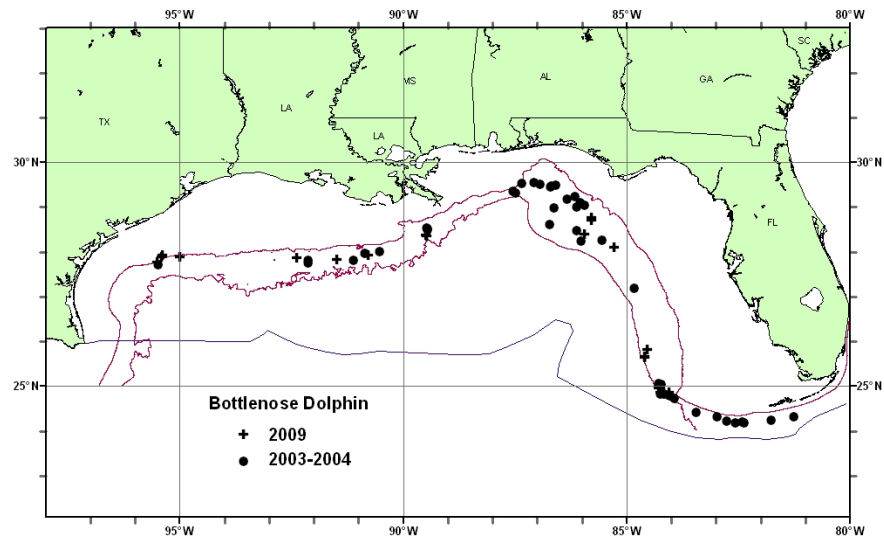


Figure 1. Distribution of bottlenose dolphin sightings from SEFSC shipboard surveys during summer 2003 and spring 2004, and during summer 2009. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 100-m and 1,000-m isobaths and the offshore extent of the U.S. EEZ.

isobath to the seaward extent of the U.S. EEZ.

### Earlier abundance estimates

All estimates of abundance were derived through the application of distance sampling analysis (Buckland *et al.* 2001) and the computer program DISTANCE (Thomas *et al.* 1998) to line-transect survey data collected from ships in the oceanic northern Gulf of Mexico (i.e., 200m isobath to seaward extent of the U.S. EEZ) and are summarized in Appendix IV.

From 1996 to 2001 (excluding 1998), annual surveys were conducted during spring along a fixed plankton-sampling trackline. Due to limited survey effort in any given year, the survey effort-weighted estimated average abundance of bottlenose dolphins for all surveys combined was estimated. For 1996 to 2001, the estimate was 2,239 (CV=0.41) (Mullin and Fulling 2004; Table 1).

During summer 2003 and spring 2004, surveys dedicated to estimating cetacean abundance were conducted along a grid of uniformly-spaced transect lines from a random start. The abundance estimate for bottlenose dolphins, pooled from 2003 to 2004, was 3,708 (CV=0.42) (Mullin 2007; Table 1).

### Recent survey and abundance estimate

During summer 2009, a line-transect survey dedicated to estimating the abundance of oceanic cetaceans was conducted in the northern Gulf of Mexico. Survey lines were stratified in relation to depth and the location of the Loop Current. The abundance estimate for bottlenose dolphins in oceanic waters during 2009 was 5,806 (CV=0.39; Table 1).

Month/Year	Area	$N_{best}$	CV
Apr-Jun 1996-2001 (excluding 1998)	Oceanic waters	2,239	0.41
Jun-Aug 2003, Apr-Jun 2004	Oceanic waters	3,708	0.42
Jun-Aug 2009	Oceanic waters	5,806	0.39

### Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normal distributed abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for bottlenose dolphins is 5,806 (CV=0.39). The minimum population estimate for the northern Gulf of Mexico oceanic stock is 4,230 bottlenose dolphins.

### Current Population Trend

Three point estimates of oceanic bottlenose dolphin abundance have been made based on data from surveys covering 1996-2009. The estimates vary by a maximum factor of more than two. To determine whether changes in abundance have occurred over this period, an analysis of all the survey data needs to be conducted which incorporates covariates (e.g., survey conditions, season) that could potentially affect estimates. Nevertheless, differences in temporal abundance estimates will still be difficult to interpret without a Gulf of Mexico-wide understanding of oceanic bottlenose dolphin abundance. The oceanography of the Gulf of Mexico is quite dynamic, and the spatial scale of the Gulf is small relative to the ability of most cetacean species to travel. Studies based on abundance and distribution surveys restricted to U.S. waters are unable to detect temporal shifts in distribution beyond U.S. waters that might account for any changes in abundance.

### CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

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

## **POTENTIAL BIOLOGICAL REMOVAL**

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 4,230. The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP), is assumed to be 0.5 because the stock is of unknown status. PBR for the Gulf of Mexico oceanic bottlenose dolphin is 42.

## **ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY**

The estimated annual average fishery-related mortality or serious injury to this stock during 2006–2010 was 0.6 bottlenose dolphins (CV=1.0; Table 2).

### **Fisheries Information**

The commercial fisheries which potentially could interact with this stock in the Gulf of Mexico are the Atlantic Ocean, Caribbean, Gulf of Mexico large pelagic longline fishery and the Gulf of Mexico butterfish trawl fishery (Appendix III). The level of past or current, direct, human-caused mortality of bottlenose dolphins in the Gulf of Mexico is unknown; however, interactions between bottlenose dolphins and fisheries have been observed in the Gulf of Mexico.

Pelagic swordfish, tunas and billfish are the targets of the longline fishery operating in the northern Gulf of Mexico. One bottlenose dolphin serious injury was observed in the pelagic longline fishery in 1998, and estimated serious injuries attributable to the pelagic longline fishery in the Gulf of Mexico region during quarter 1 of that year were 22 (CV=1.00; Yeung 1999). There were no reports of mortality or serious injury to bottlenose dolphins by this fishery in the northern Gulf of Mexico during 1999–2008 (Yeung 1999; Yeung 2001; Garrison 2003; Garrison and Richards 2004; Garrison 2005; Fairfield Walsh and Garrison 2006; Fairfield-Walsh and Garrison 2007; Fairfield and Garrison 2008; Garrison *et al.* 2009). However, during 2009, 1 serious injury of a bottlenose dolphin was observed during the second quarter and estimated serious injuries attributable to the pelagic longline fishery in the Gulf of Mexico region during quarter 2 were 3.1 (CV=1.00; Garrison and Stokes 2010). The total estimated serious injury for 2009 was 3.1 animals (CV=1.0). During 2010, 1 serious injury was observed in the second quarter during experimental fishing to test the effectiveness of “weak” hooks as a potential bycatch mitigation tool. There was 100% observer coverage of all experimental sets, and the experimental fishing is not included in extrapolated bycatch estimates because it is not representative of the normal fishing effort (Garrison and Stokes 2011). The annual average serious injury and mortality attributable to the Gulf of Mexico pelagic longline fishery for the 5-year period from 2006 to 2010 was 0.6 animals (CV=1.0; Table 2). During 2007, 1 bottlenose dolphin was observed entangled and released alive in the northern Gulf of Mexico. All gear was removed and the animal was presumed to have no serious injuries.

A trawl fishery for butterfish was monitored by NMFS observers for a short period in the 1980's with no records of incidental take of marine mammals (Burn and Scott 1988; NMFS unpublished data), although an experimental set by NMFS resulted in the death of 2 bottlenose dolphins (Burn and Scott 1988). There are no other data available with regard to this fishery.

Table 2. Summary of the incidental mortality and serious injury of northern Gulf of Mexico oceanic bottlenose dolphins by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).

Fishery	Years	Vessels <sup>a</sup>	Data Type <sup>b</sup>	Observer Coverage	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Est. CVs	Mean Annual Mortality
Pelagic Longline	06-10	47, 55, 53, 47, 46	Obs. Data Logbook	.08, .14, .25, .21, .26	0,0,0,1,0	0,0,0,0,0	0,0,0,3,2,0	0,0,0,0,0	0,0,0,3,2,0	NA, NA, NA,1.0,NA	0.6 (1.0)
TOTAL											0.6 (1.0)
<p>a. Number of vessels in the fishery is based on vessels reporting effort to the pelagic longline logbook.</p> <p>b. Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Observer Program. Mandatory logbook data were used to measure total effort for the longline fishery. These data are collected at the Southeast Fisheries Science Center (SEFSC). Observer coverage in the GOM is dominated by very high coverage rates during April-June associated with efforts to improve estimates of Bluefin Tuna bycatch.</p>											

### Other Mortality

A total of 1,340 bottlenose dolphins were found stranded in the northern Gulf of Mexico from 2006 through 2010 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 16 November 2011). Of these, 114 showed evidence of human interactions (e.g., gear entanglement, mutilation, gunshot wounds). The vast majority of stranded bottlenose dolphins are assumed to belong to one of the coastal stocks or to bay, sound and estuary stocks. Nevertheless, it is possible that some of the stranded bottlenose dolphins belonged to the continental shelf or oceanic stocks and that they were among those strandings with evidence of human interactions. (Strandings do occur for other cetacean species whose primary range in the Gulf of Mexico is outer continental shelf or oceanic waters.)

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, 221 bottlenose dolphins were considered to be part of the UME. The vast majority of stranded bottlenose dolphins are assumed to belong to one of the coastal stocks or to bay, sound and estuary stocks. Nevertheless, it is possible that some of the stranded bottlenose dolphins considered part of the UME belonged to the continental shelf or oceanic stocks.

### 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).

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 and likely will continue for

some time. For continental shelf and oceanic cetaceans, the NOAA-led efforts include: aerial surveys to document the distribution, abundance, species and exposure of marine mammals and turtles relative to oil from DWH spill; and ship surveys to evaluate exposure to oil and other chemicals and to assess changes in animal behavior and distribution relative to oil exposure through visual and acoustic surveys, deployment of passive acoustic monitoring systems, collection of tissue samples, and deployment of satellite tags on sperm and Bryde's whales.

Aerial surveys have observed Risso's dolphins, spinner dolphins, pantropical spotted dolphins, striped dolphins, bottlenose dolphins and sperm whales swimming in oil in offshore waters (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).

The use of explosives to remove oil rigs in portions of the continental shelf in the western Gulf of Mexico has the potential to cause serious injury or mortality to marine mammals. These activities have been closely monitored by NMFS observers since 1987 (Gitschlag and Herczeg 1994). There have been no reports of either serious injury or mortality to bottlenose dolphins in the oceanic Gulf of Mexico associated with these activities (NMFS unpublished data).

#### **STATUS OF STOCK**

The status of bottlenose dolphins, relative to OSP, in the northern Gulf of Mexico oceanic waters is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this stock. Total human-caused mortality and serious injury for this stock is not known. 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. This is not a strategic stock because it is assumed that the average annual human-related mortality and serious injury does not exceed PBR.

#### **REFERENCES CITED**

- Barlow, J., S.L. Swartz, T.C. Eagle and P.R. Wade. 1995. U.S. marine mammal stock assessment: Guidelines for preparation, background, and a summary of the 1995 assessments. NOAA Tech. Memo. NMFS-OPR-6, 73 pp.
- Baron, S. C., A. Martinez, L.P. Garrison and E. O. Keith. 2008. Differences in acoustic signals from Delphinids in the western North Atlantic and northern Gulf of Mexico. *Mar. Mamm. Sci.* 24(1): 42-56.
- Buckland, S.T., D.R. Anderson, K.P. Burnham, J.L. Laake, D L. Borchers and L. Thomas. 2001. Introduction to distance sampling: Estimating abundance of biological populations. Oxford University Press. 432 pp.
- Burn, D. and G. P. Scott. 1988. Synopsis of available information on marine mammal-fisheries interactions in the southeastern United States: Preliminary report. Contribution ML-CRG-87/88-26, National Marine Fisheries Service, Miami, FL, 37 pp.
- Fairfield Walsh, C. and L.P. Garrison. 2006. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2005. NOAA Tech. Memo. NMFS-SEFSC-539, 52 pp.
- Fairfield-Walsh, C. and L.P. Garrison. 2007. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2006. NOAA Tech. Memo. NMFS-SEFSC-560, 54 pp.
- Fairfield, C.P. and L.P. Garrison. 2008. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2007. NOAA Tech. Memo. NMFS-SEFSC-572, 62 pp.
- Garrison, L.P. 2003. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2001-2002. NOAA Tech. Memo. NMFS-SEFSC-515, 52 pp.
- Garrison, L.P. 2005. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2004. NOAA Tech. Memo. NMFS-SEFSC-531, 57 pp.
- Garrison, L.P. and P. M. Richards. 2004. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2003. NOAA Tech. Memo. NMFS-SEFSC-527, 57 pp.
- Garrison, L.P., L. Stokes and C. Fairfield. 2009. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic

- pelagic longline fleet during 2008. NOAA Tech. Memo. NMFS-SEFSC-591, 63 pp.
- Garrison, L.P. and L. Stokes. 2010. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2009. NOAA Tech. Memo. NMFS-SEFSC-607, 64 pp.
- Garrison, L.P. and L. Stokes. 2011. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2010. NOAA Tech. Memo. NMFS-SEFSC-624, 59 pp.
- 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.
- Gitschlag, G. R. and B. A. Herczeg. 1994. Sea turtle observations at explosive removals of energy structures. Mar. Fish. Rev. 56(2): 1-8.
- Hoelzel, A. R., C. W. Potter and P. B. Best. 1998. Genetic differentiation between parapatric 'nearshore' and 'offshore' populations of the bottlenose dolphin. Proc. R. Soc. Lond. B 265: 1177-1183.
- Jefferson, T.A., M.A. Webber and R.L. Pitman. 2008. Marine mammals of the world. Academic Press, London. 573 pp.
- 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)
- Mead, J. G. and C. W. Potter. 1995. Recognizing two populations of the bottlenose dolphin (*Tursiops truncatus*) off the Atlantic coast of North America: Morphological and ecological considerations. *IBI Reports* 5: 31-44.
- Mullin, K.D. 2007. Abundance of cetaceans in the oceanic Gulf of Mexico based on 2003-2004 ship surveys. 26 pp. Available from: NMFS, Southeast Fisheries Science Center, P.O. Drawer 1207, Pascagoula, MS 39568.
- Mullin, K.D. and G. L. Fulling. 2004. Abundance of cetaceans in the oceanic northern Gulf of Mexico. Mar. Mamm. Sci. 20(4): 787-807.
- 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-Documents1.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)
- Ortega Ortiz, J. G. 2002. Multiscale analysis of cetacean distribution in the Gulf of Mexico. Ph.D. dissertation. Texas A&M University, College Station. 170 pp.
- Thomas, L., J. L. Laake, J. F. Derry, S. T. Buckland, D. L. Borchers, D. R. Anderson, K. P. Burnham, S. Strindberg, S. L. Hedley, F. F. C. Marques, J. H. Pollard and R. M. Fewster. 1998. Distance 3.5. Research Unit for Wildlife Population Assessment, University of St. Andrews, St. Andrews, UK.
- Torres, L. G., P. E. Rosel, C. D'Agrosa and A. J. Read. 2003. Improving management of overlapping bottlenose dolphin ecotypes through spatial analysis and genetics. Mar. Mamm. Sci. 19(3): 502-514.
- Vollmer, N. L. 2011. Population structure of common bottlenose dolphins in coastal and offshore waters of the Gulf of Mexico revealed by genetic and environmental analyses. Ph.D. Dissertation from University of Louisiana at Lafayette. 420 pp.
- Wade, P. R. and R. P. Angliss. 1997. Guidelines for assessing marine mammal stocks: Report of the GAMMS workshop April 3-5, 1996, Seattle, WA. NOAA Tech. Memo. NMFS-OPR-12, 93 pp.
- Waring, G. T., J. M. Quintal, S. L. Swartz, P. J. Clapham, T. V. N. Cole, C. P. Fairfield, A. Hohn, D. L. Palka, M. C. Rossman, U.S. Fish and Wildlife Service and C. Yeung. 2001. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments-2001. NOAA Tech. Memo. NMFS-NE-168, 310 pp.
- Yeung, C. 1999. Estimates of marine mammal and marine turtle bycatch by the U.S. Atlantic pelagic longline fleet in 1998. NOAA Tech. Memo. NMFS-SEFSC-430, 26 pp.

Yeung, C. 2001. Estimates of marine mammal and marine turtle bycatch by the U.S. Atlantic pelagic longline fleet in 1999-2000. NOAA Tech. Memo. NMFS-SEFSC-467, 43 pp.