

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/nearshore” and “offshore” ecotypes of bottlenose dolphins (Mead and Potter 1995) occur in the Gulf of Mexico (LeDuc and Curry 1996) but the distribution of each is not known. The offshore and nearshore ecotypes are genetically distinct based on both mitochondrial and nuclear markers (Hoelzel *et al.* 1998). In the northwestern Atlantic Ocean, Torres *et al.* (2003) found a statistically significant break in the distribution of the ecotypes at 34km from shore. The offshore ecotype was found exclusively seaward of 34 km and in waters deeper than 34 m. The continental shelf is much wider in the Gulf of Mexico and these results may not apply. Ongoing research is aimed at defining these boundaries in the Gulf of Mexico.

Based on research currently being conducted on bottlenose dolphins in the northern Gulf of Mexico, as well as the western North Atlantic Ocean, the structure of these stocks is uncertain, but appears to be complex. The multi-disciplinary research programs conducted over the last 40 years (e.g., Wells 1994; Wells 2009) are beginning to shed light on stock structures of bottlenose dolphins, although additional analyses are needed before stock structures can be elaborated on in the northern Gulf of Mexico. As research is completed, it may be necessary to revise stocks of bottlenose dolphins in the northern Gulf of Mexico.

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 3,708 (CV=0.42) (Mullin 2007; Table 1). This estimate is pooled from summer 2003 and spring 2004 oceanic surveys covering waters from the 200-m isobath to the seaward extent of the U.S. EEZ.

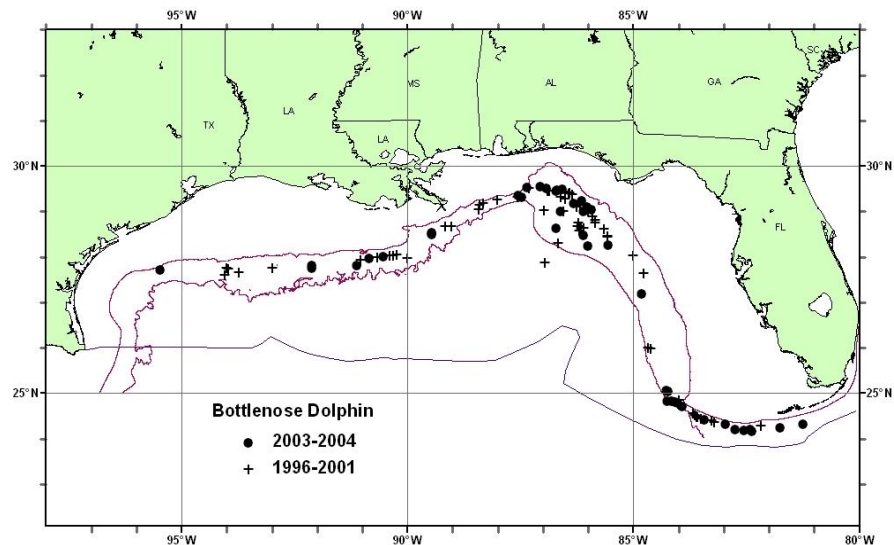


Figure 1. Distribution of bottlenose dolphin sightings from SEFSC shipboard surveys during spring 1996-2001 and from summer 2003 and spring 2004 surveys. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 100m and 1,000m isobaths and the offshore extent of the U.S. EEZ.

Earlier abundance estimates

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 sighting data. Surveys were conducted in conjunction with bluefin tuna ichthyoplankton surveys during spring from 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico. Tracklines, which were perpendicular to the bathymetry, covered the waters from 200m to the offshore extent of the U.S. EEZ. Due to limited survey effort in any given year, survey effort was pooled across all years to develop an average abundance estimate. The estimate of abundance for bottlenose dolphins in oceanic waters, pooled from 1996 to 2001, was 2,239 (CV=0.41) (Mullin and Fulling 2004; Table 1).

Recent surveys and abundance estimates

During summer 2003 and spring 2004, line-transect surveys dedicated to estimating the abundance of oceanic cetaceans were conducted in the northern Gulf of Mexico. During each year, a grid of uniformly-spaced transect lines from a random start were surveyed from the 200-m isobath to the seaward extent of the U.S. EEZ using NOAA Ship *Gordon Gunter* (Mullin 2007).

As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than 8 years are deemed unreliable, and therefore should not be used for PBR determinations. Because the data for estimates prior to 2003 were older than this 8-year limit, estimates from the 2003 and 2004 surveys were used. The estimate of abundance for bottlenose dolphins in oceanic waters, pooled from 2003 to 2004, was 3,708 (CV=0.42) (Mullin 2007; Table 1), which is the best available abundance estimate for this stock in the northern Gulf of Mexico.

| 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 |

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 3,708 (CV=0.42; Mullin 2007). The minimum population estimate for the northern Gulf of Mexico oceanic stock is 2,641 bottlenose dolphins.

Current Population Trend

There are insufficient data to determine the population trends for this stock. The pooled abundance estimate for 2003 to 2004 of 3,708 (CV=0.42) and that for 1996-2001 of 2,239 (CV=0.41) are not significantly different ($P>0.05$), but due to the imprecision of the estimates, the power to detect a difference is low. These temporal abundance estimates are difficult to interpret without a Gulf of Mexico-wide understanding of bottlenose dolphin abundance and stock structure. The Gulf of Mexico is composed of waters belonging to the U.S., Mexico and Cuba. 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 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 level (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 2,641. 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 26.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

The estimated annual average fishery-related mortality or serious injury to this stock during 2005-2009 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). The annual average serious injury and mortality attributable to the Gulf of Mexico pelagic longline fishery for the 5-year period from 2005 to 2009 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. All of these interactions with the pelagic longline fishery could have included bottlenose dolphins from either the continental shelf and/or oceanic stocks.

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 Gulf of Mexico bottlenose dolphins in the Pelagic Longline fishery including the years sampled (Years), 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 | Data Type ^a | Observer Coverage | Observed Serious Injury | Observed Mortality | Estimated Serious Injury | Estimated Mortality | Estimated Combined Mortality | Estimated CVs | Mean Annual Mortality |
|------------------|-------|------------------------|-------------------------|-------------------------|--------------------|--------------------------|---------------------|------------------------------|---------------------|-----------------------|
| Pelagic Longline | 05-09 | Obs. Data Logbook | .07, .08, .15, .25, .21 | 0, 0, 0, 0, 1 | 0, 0, 0, 0, 0 | 0, 0, 0, 0, 3 | 0, 0, 0, 0, 0 | 0, 0, 0, 0, 3 | NA, NA, NA, NA, 1.0 | 0.6 (1.0) |

^a Mandatory logbook data were used to measure total effort for the longline fishery. These data are collected at the Southeast Fisheries Science Center (SEFSC).

Other Mortality

A total of 1,274 bottlenose dolphins were found stranded in the northern Gulf of Mexico from 2005 through 2009 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 17 November 2010). Of these, 88 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.)

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. U.S. Dep. Commer., 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.
- 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.
- LeDuc, R. G. and B. E. Curry. 1996. Mitochondrial DNA sequence analysis indicates need for revision of the genus *Tursiops*. Paper SC/48/SM27 presented to IWC Scientific Committee, June 1996, Aberdeen. 12 pp. Available from: NMFS, Southeast Fisheries Science Center, 3209 Frederic St., Pascagoula, MS 39568.
- 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.
- 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.
- 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.
- Wells, R. S. 1994. Determination of bottlenose dolphin stock discreteness: Application of a combined behavioral and genetic approach. pp. 16-20. *In:* K. R. Wang, P. M. Payne and V.G. Thayer (compilers) Coastal stock(s) of Atlantic bottlenose dolphin: Status review and management. Proceedings and recommendations from a workshop held in Beaufort, NC, 13-14 September 1993. NOAA Tech. Memo. NMFS-OPR-4, 120 pp.
- Wells, R.S. 2009. Learning from nature: Bottlenose dolphin care and husbandry. *Zoo Biol.* 28: 1-17.
- 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.