PYGMY KILLER WHALE (*Feresa attenuata*):
Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The pygmy killer whale is distributed worldwide in tropical and subtropical waters (Ross and Leatherwood 1994). Sightings of these animals in the northern Gulf of Mexico (i.e., U.S. Gulf of Mexico) occur in oceanic waters (Figure 1; Mullin and Fulling 2004; Maze-Foley and Mullin 2006). Sightings of pygmy killer whales were documented in all seasons during GulfCet aerial surveys of the northern Gulf of Mexico between 1992 and 1998 (Hansen *et al.* 1996; Mullin and Hoggard 2000).

The Gulf of Mexico population is provisionally being considered a separate stock for management purposes, although there is currently no information to differentiate this stock from the Atlantic Ocean stock(s). Additional morphological, genetic and/or behavioral data are needed to provide further information on stock delineation.

POPULATION SIZE

The best abundance estimate available for northern Gulf of Mexico pygmy killer whales is 323 (CV=0.60) (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. Exclusive Economic Zone (EEZ).

Figure 1. *Distribution of pygmy killer whale sightings from SEFSC spring vessel surveys during 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 100-m and 1,000-m 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. From 1991 through 1994, line-transect vessel surveys were conducted in conjunction with bluefin tuna ichthyoplankton surveys during spring in the northern Gulf of Mexico from the 200-m isobath to the seaward extent of the U.S. EEZ (Hansen *et al.* 1995). Annual cetacean surveys were conducted along a fixed plankton sampling trackline. Survey effort-weighted estimated average abundance of pygmy killer whales for all surveys combined was 518 (CV=0.81) (Hansen *et al.* 1995; Table 1). Similar surveys were conducted during spring from 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico. 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 pygmy killer whales in oceanic waters, pooled from 1996 to 2001, was 408 (CV=0.60) (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 most of the data for estimates
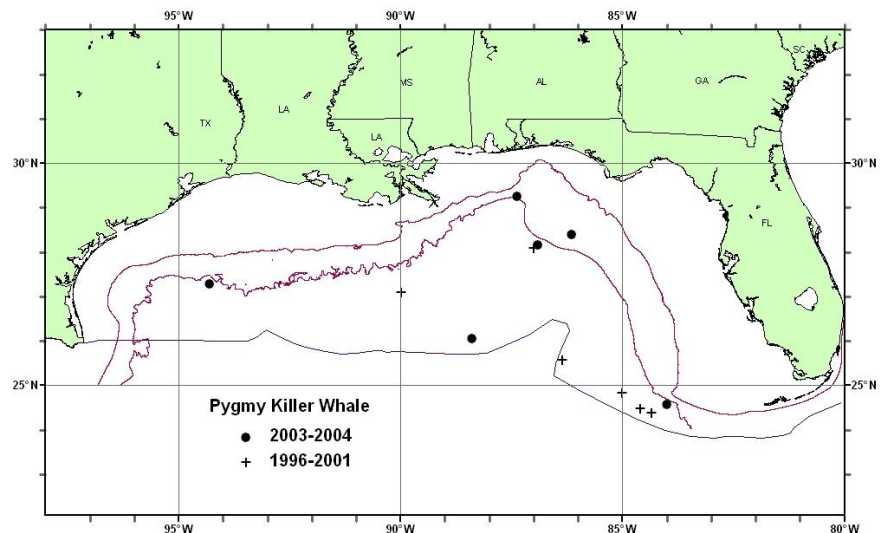
prior to 2003 were older than this 8-year limit and due to the different sampling strategies, estimates from the 2003 and 2004 surveys were considered most reliable. The estimate of abundance for pygmy killer whales in oceanic waters, pooled from 2003 to 2004, was 323 (CV=0.60) (Mullin 2007; Table 1), which is the best available abundance estimate for this species in the northern Gulf of Mexico.

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 pygmy killer whales is 323 (CV=0.60). The minimum population estimate for the northern Gulf of Mexico is 203 pygmy killer whales.

Table 1. Summary of abundance estimates for northern Gulf of Mexico pygmy killer whales. Month, year and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).			
Month/Year	Area	N_{best}	CV
Apr-Jun 1991-1994	Oceanic waters	518	0.81
Apr-Jun 1996-2001 (excluding 1998)	Oceanic waters	408	0.60
Jun-Aug 2003, Apr-Jun 2004	Oceanic waters	323	0.60

Current Population Trend

There are insufficient data to determine the population trends for this species. The pooled abundance estimate for 2003-2004 of 323 (CV=0.60) and that for 1996-2001 of 408 (CV=0.60) are not significantly different (P>0.05), but due to the precision of the estimates, the power to detect a difference is low. These estimates are generally similar to that for 1991-1994 of 518 (CV=0.81). These temporal abundance estimates are difficult to interpret without a Gulf of Mexico-wide understanding of pygmy killer whale abundance. 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 net productivity rates are unknown for this stock. For purposes of this assessment, 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 history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal level (PBR) is the product of the minimum population size, one half the maximum net productivity rate and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is 203. 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 northern Gulf of Mexico pygmy killer whale is 2.0.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

There has been no reported fishing-related mortality of a pygmy killer whale during 1998-2007 (Yeung 1999; 2001; Garrison 2003; Garrison and Richards 2004; Garrison 2005; Fairfield Walsh and Garrison 2006; Fairfield-Walsh and Garrison 2007; Fairfield and Garrison 2008).

Fisheries Information

The level of past or current, direct, human-caused mortality of pygmy killer whales in the northern Gulf of Mexico is unknown. There has historically been some take of this species in small cetacean fisheries in the Caribbean (Caldwell and Caldwell 1971). Pelagic swordfish, tunas and billfish are the targets of the longline fishery operating in the northern Gulf of Mexico. There were no reports of mortality or serious injury to pygmy killer

whales by this fishery.

Other Mortality

There were 2 reported strandings of a pygmy killer whale in the Gulf of Mexico during 1999-2007 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 16 September 2008). One pygmy killer whale stranded in Florida in 2001, and 1 stranded in Texas in 2004. No evidence of human interactions was detected for these stranded animals. Stranding data probably underestimate the extent of fishery-related mortality and serious injury because not all of the marine mammals which die or are seriously injured in fishery interactions wash ashore, not all that wash ashore are discovered, reported or investigated, nor will all of those that do wash ashore necessarily show signs of entanglement or other fishery interaction. Finally, the level of technical expertise among stranding network personnel varies widely as does the ability to recognize signs of fishery interactions.

STATUS OF STOCK

The status of pygmy killer whales in the northern Gulf of Mexico, 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 the population trends for this species. Total human-caused mortality and serious injury for this stock is not known but none has been documented. 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 assessments: Guidelines for preparation, background, and a summary of the 1995 assessments. NOAA Tech. Memo. NMFS-OPR-6. 73 pp.

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.

Caldwell, D.K. and M.C. Caldwell 1971. Beaked whales, *Ziphius cavirostris*, in the Bahamas. Quart. Jour. Florida Acad. Sci. 34(157-160).

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. NOAA NMFS-SEFSC-560. 54 pp.

Fairfield, C.P. and L.P. Garrison 2008. Estimated bycatch of marine mammals and sea turtles in the US Atlantic pelagic longline fleet during 2007. NOAA Tech. Memo. NOAA NMFS-SEFSC-572. 62 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. NOAA NMFS-SEFSC-539. 52 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.

Hansen, L.J., K.D. Mullin, T.A. Jefferson and G.P. Scott 1996. Visual surveys aboard ships and aircraft. Pages 55-132 *in*: R.W. Davis and G.S. Fargion, (eds.) Distribution and abundance of marine mammals in the north-central and western Gulf of Mexico: Final report. Volume II: Technical report. OCS Study MMS 96-0027. Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. .

Hansen, L.J., K.D. Mullin and C.L. Roden 1995. Estimates of cetacean abundance in the northern Gulf of Mexico from vessel surveys. Southeast Fisheries Science Center, Miami, FL. Contribution No. MIA-94/95-25. 9 pp.

Maze-Foley, K. and K.D. Mullin 2006. Cetaceans of the oceanic northern Gulf of Mexico: Distributions, group sizes and interspecific associations. J. Cetacean Res. Manage. 8(2): 203-213.

Mullin, K.D. 2007. Abundance of cetaceans in the oceanic Gulf of Mexico based on 2003-2004 ship surveys. Available from: NMFS, Southeast Fisheries Science Center, P.O. Drawer 1207, Pascagoula, MS 39568, 26 pp.

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.

Mullin, K.D. and W. Hoggard 2000. Visual surveys of cetaceans and sea turtles from aircraft and ships. Pages 111-172 *in*: R.W. Davis, W.E. Evans and B. Würsig, (eds.) Cetaceans, sea turtles and seabirds in the northern Gulf of Mexico: Distribution, abundance and habitat associations. Volume II: Technical report. Minerals Management Service, Gulf of Mexico OCS Region, New Orleans. OCS Study MMS 96-0027.

Ross, G.J.B. and S. Leatherwood 1994. Pygmy killer whale *Feresa attenuata* (Gray, 1874). Pages 387-404 *in*: S.H. Ridgway and R. Harrison, (eds.) Handbook of marine mammals, Vol. 5: The first book of dolphins. Academic Press, London.

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.

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.

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, Southeast Fisheries Science Center, Miami, FL. NMFS-SEFSC-467. 43 pp.