

CUVIER'S BEAKED WHALE (*Ziphius cavirostris*): Northern Gulf of Mexico Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Cuvier's beaked whales are distributed throughout the world's oceans except for the polar regions (Leatherwood and Reeves 1983; Heyning 1989). Strandings have occurred in all months along the east coast of the U.S. (Schmidly 1981) and throughout the year in the Gulf of Mexico (Würsig *et al.* 2000). Beaked whales were seen in all seasons during GulfCet aerial surveys of the northern Gulf of Mexico (Hansen *et al.* 1996; Mullin and Hoggard 2000). Some of the aerial survey sightings may have included Cuvier's beaked whale, but identification of beaked whale species from aerial surveys is problematic.

Strandings of Cuvier's beaked whales along the west coast of North America, based on skull characteristics, are thought to represent members of a panmictic population (Mitchell 1968), but there is no information on stock differentiation in the Gulf of Mexico and nearby waters. In the absence of adequate information on stock structure, a species' range within an ocean should be divided into defensible management units, and such management units include distinct oceanographic regions (Wade and Angliss 1997). 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.

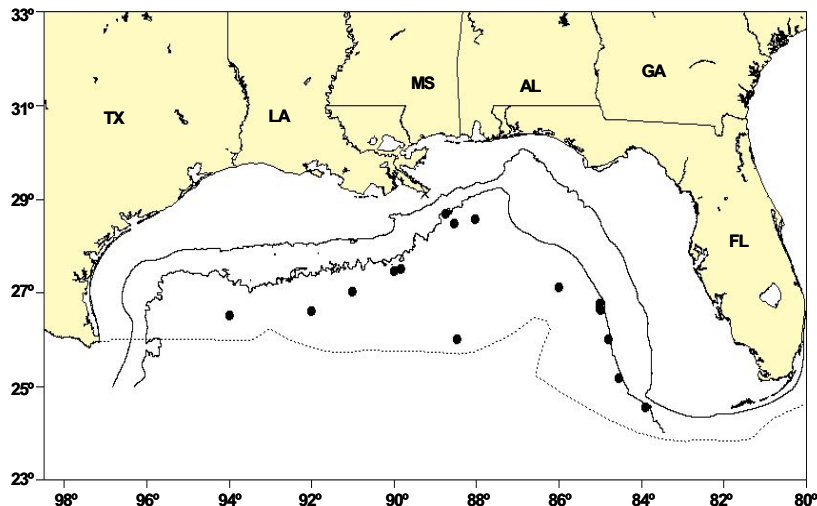


Figure 1. Distribution of Cuvier's beaked whale sightings from SEFSC shipboard spring vessel surveys during 1996-2001. All the on-effort sightings are shown, though not all were used to estimate abundance. Solid lines indicate the 100m and 1,000m isobaths and the dotted line indicates the offshore extent of the U.S. EEZ.

POPULATION SIZE

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 during spring in the northern Gulf of Mexico from the 200m isobath to the seaward extent of the U.S. Exclusive Economic Zone (EEZ) (Hansen *et al.* 1995). Survey effort-weighted estimated average abundance of Cuvier's beaked whales for all surveys combined was 30 (CV=0.50). 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.

Similar surveys were conducted during April/May from 1996 to 2001 (excluding 1998) in oceanic waters of the northern Gulf of Mexico, using NOAA ships *Oregon II* (1996, 1997, 1999) and *Gordon Gunter* (2000, 2001). Estimates for all oceanic strata were summed, as survey effort was not uniformly distributed, to calculate a total estimate for the entire northern Gulf of Mexico oceanic waters (Figure 1; Mullin and Fulling 2004). 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 Cuvier's beaked whales in oceanic waters, pooled from 1996 to 2001, is 95 (CV=0.47) (Mullin and Fulling 2004), which is the best available abundance estimate for this species in the northern Gulf of Mexico. The estimated abundance of Cuvier's beaked whales is negatively biased because only sightings of beaked whales which could be positively identified to species were used. The estimate for the same time period for unidentified Ziphiidae is 146 (CV=0.46) which may include an unknown number of *Mesoplodon* spp.

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 Cuvier's beaked whales is 95 (CV=0.47). The minimum population estimate for the northern Gulf of Mexico is 65 Cuvier's beaked whales.

Current Population Trend

There are insufficient data to determine the population trends for this species. The pooled abundance estimate for 1996-2001 of 95 (CV=0.47) and that for 1991-1994 of 30 (CV=0.50) are not significantly different ($P>0.05$), but due to the precision of the estimates, the power to detect a difference is low.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

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 for the Cuvier's beaked whale is 65 (CV=0.47). The maximum productivity rate is 0.04, the default value for cetaceans. The recovery factor for this stock is 0.5 because the stock is of unknown status. PBR for the northern Gulf of Mexico Cuvier's beaked whale is 0.7.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

There has been no reported fishing-related mortality of a Cuvier's beaked whale during 1998-2003 (Yeung 1999; Yeung 2001; Garrison 2003; Garrison and Richards 2004).

Fisheries Information

The level of past or current, direct, human-caused mortality of Cuvier's beaked whales in the northern Gulf of Mexico is unknown. Pelagic swordfish, tunas and billfish are the targets of the longline fishery operating in the U.S. Gulf of Mexico. There were no reports of mortality or serious injury to Cuvier's beaked whales by this fishery.

Other Mortality

Cuvier's beaked whales were taken occasionally in a small, directed fishery for cetaceans that operated out of the Lesser Antilles (Caldwell and Caldwell 1971). There were no reported strandings of Cuvier's beaked whales in the Gulf of Mexico during 1999-2003. Two unidentified beaked whales mass stranded in Florida in December 1999. 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.

Several unusual mass strandings of beaked whales in North Atlantic marine environments have been associated with military naval activities. During the mid- to late 1980's multiple mass strandings of Cuvier's beaked whales (4 to about 20 per event) and small numbers of Gervais' beaked whales and Blainville's beaked whales occurred in the Canary Islands (Simmonds and Lopez-Jurado (1991). Twelve Cuvier's beaked whales that live stranded and subsequently died in the Mediterranean Sea on 12-13 May 1996 were associated with low frequency acoustic sonar tests conducted by the North Atlantic Treaty Organization (Frantzis 1998). In March 2000, 14 beaked whales live stranded in the Bahamas; 6 beaked whales (5 Cuvier's and 1 Blainville's) died (Evans and England 2001; Balcomb and Claridge 2001; Cox *et al.*, in review). Four Cuvier's, 2 Blainville's, and 2 unidentified beaked whales were returned to sea. The fate of the animals returned to sea is unknown. Necropsies of 6 dead beaked whales revealed evidence of tissue trauma associated with an acoustic or impulse injury that caused the animals to strand. Subsequently, the animals died due to extreme physiologic stress associated with the physical stranding (i.e., hyperthermia, high endogenous catecholamine release) (Evans and England 2001; Cox *et al.*, in review).

STATUS OF STOCK

The status of Cuvier's beaked 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. The total fishery-related mortality and serious injury for this stock is unknown, but

assumed to be less than 10% of the calculated PBR and can be considered to be insignificant and approaching zero mortality and serious injury rate. This is a strategic stock because of evidence of human induced mortality and serious injury associated with acoustic activities.

Disturbance by anthropogenic noise may prove to be an important habitat issue in some areas of this population's range, notably in areas of oil and gas activities or where shipping or naval activities are high. Limited studies are currently being conducted to address this issue and its impact, if any, on this and other marine species.

REFERENCES

- Balcomb, K. C. III and D. E. Claridge. 2001. A mass stranding of cetaceans caused by naval sonar in the Bahamas. *Bahamas J. Sci.* 2: 2-12.
- 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. U.S. Dep. Commer., 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. *Florida Acad. Sci. Q. J.* 34: 157-160.
- Cox, T. M., T. J. Ragen, A. J. Read, E. Vos, R. W. Baird, K. Balcomb, J. Barlow, J. Caldwell, T. Cranford, L. Crum, A. D'Amico, G. D'Spain, A. Fernandez, J. Finneran, R. Gentry, W. Gerth, F. Gulland, J. Hildebrand, D. Houser, T. Hullar, P. D. Jepson, D. Ketten, C. D. MacLeod, P. Miller, S. Moore, D. Mountain, D. Palka, P. Ponganis, S. Rommel, T. Rowles, B. Taylor, P. Tyack, D. Wartzok, R. Gisiner, J. Mead, and L. Benner. (in review) Report of a workshop to understand the impacts of anthropogenic sound on beaked whales. Submitted to J. Cetacean Res. Manage. 33 pp. Available from: U.S. Marine Mammal Commission, 4340 East-West Highway, Rm. 905, Bethesda, MD 20814.
- Evans, D.L. and G. R. England. 2001. Joint interim report - Bahamas Marine Mammal Stranding - event of 15-16 March 2000. U.S. Department of Commerce; Secretary of the Navy, vi + 59 pp. Available at: http://www.nmfs.noaa.gov/pr/acoustics/acoustics_reports.htm.
- Frantzis, A. 1998. Does acoustic testing strand whales? *Nature* 392:29.
- 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. 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 and C. L. Roden. 1995. Estimates of cetacean abundance in the northern Gulf of Mexico from vessel surveys. Southeast Fisheries Science Center, Miami Laboratory, Contribution No. MIA-94/95-25, 9 pp. Available from: NMFS, Southeast Fisheries Science Center, 75 Virginia Beach Dr., Miami, FL 33149.
- Hansen, L. J., K. D. Mullin, T. A. Jefferson and G. P. Scott. 1996. Visual surveys aboard ships and aircraft. pp. 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.
- Heyning, J. E. 1989. Cuvier's beaked whale *Ziphius cavirostris* G. Cuvier, 1923. pp. 289-308. *In:* S. H. Ridgway and R. Harrison (eds.) Handbook of marine mammals, Vol. 4: River dolphins and the larger toothed whales. Academic Press, London. 442 pp.
- Leatherwood, S. and R. R. Reeves. 1983. The Sierra Club handbook of whales and dolphins. Sierra Club Books, San Francisco, 302 pp.
- Mitchell, E. 1968. Northeast Pacific stranding distribution and seasonality of Cuvier's beaked whale, *Ziphius cavirostris*. *Can. J. Zool.* 46: 265-279.
- Mullin, K. D. and W. Hoggard. 2000. Visual surveys of cetaceans and sea turtles from aircraft and ships. pp. 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. OCS Study MMS 96-0027. Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA.
- 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.
- Schmidly, D. J. 1981. Marine mammals of the southeastern United States and the Gulf of Mexico. U.S. Fish and Wildlife Service, Office of Biological Services, Washington, DC, FWS/OBS-80/41, 165 pp.
- Simmonds, M. P. and L. F. Lopez-Jurado. 1991. Whales and the military. *Nature* 351: 448.
- 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, WA. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-12, 93 pp.
- Würsig, B., T. A. Jefferson and D. J. Schmidly. 2000. The marine mammals of the Gulf of Mexico. Texas A&M University Press, College Station.
- Yeung, C. 1999. Estimates of marine mammal and marine turtle bycatch by the U.S. Atlantic pelagic longline fleet in 1998. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SEFSC-430, 26 pp. Available from: NMFS, Southeast Fisheries Science Center, 75 Virginia Beach Dr., Miami, FL 33149.
- Yeung, C. 2001. Estimates of marine mammal and marine turtle bycatch by the U.S. Atlantic pelagic longline fleet in 1999-2000. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-SEFSC-467, 43 pp. Available from: NMFS, Southeast Fisheries Science Center, 75 Virginia Beach Dr., Miami, FL 33149.