

CUVIER'S BEAKED WHALE (*Ziphius cavirostris*): Puerto Rico and U.S. Virgin Islands Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Cuvier's beaked whales are distributed throughout offshore waters of the world's oceans except for the polar regions (Leatherwood and Reeves 1983; Heyning 1989; Jefferson *et al.* 2008). Cuvier's beaked whales have been sighted in Puerto Rico and the U.S. Virgin Islands and throughout the Caribbean Sea. For example, strandings or sightings have been reported from Cuba (Erdman 1970), Dominican Republic (Romero *et al.* 2001), St. Martin (van Bree 1975), Dominica (Gordon *et al.* 1998), Martinique (J r mie *et al.* 2006), St. Vincent (Caldwell *et al.* 1971a), Barbados (Caldwell *et al.* 1971b), Venezuela (Romero *et al.* 2001), Colombia (Romero *et al.* 2001), and Aruba, Bonaire and Curacao of the Leeward Netherlands Antilles (van Bree 1975; Debrot and Barros 1994; Debrot *et al.* 1998; Romero *et al.* 2001). In the northeastern Caribbean including Puerto Rico, strandings were reported by Erdman (1970), and strandings and probable sightings by Erdman *et al.* (1973). Mignucci-Giannoni (1998) found 8 sighting records of Cuvier's beaked whales from published and unpublished data between 1954 and 1989 for waters of Puerto Rico and the U.S. and British Virgin Islands. Upon examination of stranding records from 1867 through 1995, 30 Cuvier's beaked whales were reported stranded in waters of Puerto Rico and the Virgin Islands, making it the most commonly stranded species by number of individuals (Mignucci-Giannoni *et al.* 1999). It is referred to as one of the most frequently stranded cetaceans in the northeastern Caribbean by P rez-Zayas *et al.* (2002).

The Puerto Rico and U.S. Virgin Islands Cuvier's beaked whale 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 and Gulf of Mexico stocks. Additional morphological, genetic and/or behavioral data are needed to provide further information on stock delineation. Cuvier's beaked whales of this stock are likely trans-boundary with, at a minimum, waters near adjacent Caribbean islands and are not likely to occur exclusively within the bounds of the U.S. EEZ.

POPULATION SIZE

The best abundance estimate available for the Puerto Rico and U.S. Virgin Islands stock of Cuvier's beaked whales is unknown. A line-transect survey was conducted during January-March 1995 on NOAA Ship *Oregon II*, and was designed to cover a wide range of water depths surrounding Puerto Rico and the Virgin Islands. Due to the bottom topography of the region and the size of the vessel, most waters surveyed were >200 m deep. No Cuvier's

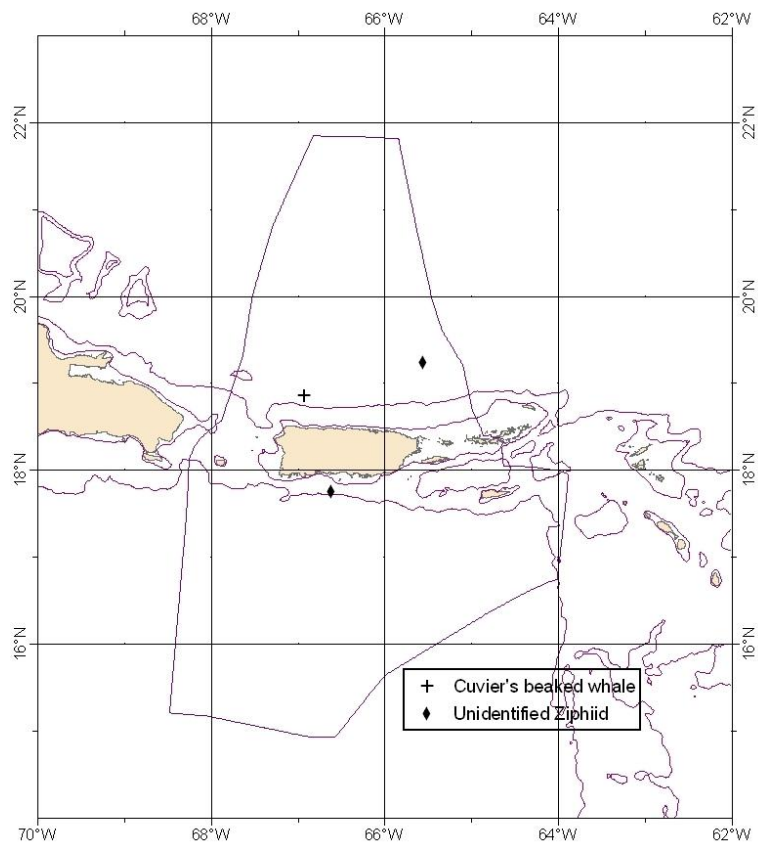


Figure 1. Location of Cuvier's beaked whale sighting and unidentified beaked whale sightings from a SEFSC vessel survey during winter of 2001. The solid lines indicate the 200m and 2,000m isobaths and the boundary of the U.S. EEZ.

beaked whales were sighted (Roden and Mullin 2000). Another line-transect survey for humpback whales was conducted during February-March 2000 aboard NOAA Ship *Gordon Gunter* in the eastern and southern Caribbean Sea. A portion of the survey effort occurred in U.S. waters during transit, but no Cuvier's beaked whales were sighted in U.S. waters. However, 1 sighting of 3 Cuvier's beaked whales was made south of Martinique at about 1500 m depth (Swartz and Burks 2000). During February-March 2001 a line-transect survey was conducted in waters of the eastern Bahamas, eastern Dominican Republic, Puerto Rico and Virgin Islands. One sighting of 3 Cuvier's beaked whales was made in U.S. waters north of Puerto Rico at a depth of 2872m. Two additional sightings were made in U.S. waters of unidentified beaked whales (Figure 1; Swartz *et al.* 2002). It was not possible to estimate abundance from these surveys using line-transect methods due to so few sightings.

Minimum Population Estimate

Present data are insufficient to calculate a minimum population estimate for this stock of Cuvier's beaked whales.

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 is 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 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 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 the stock is of unknown status. PBR for this stock of Cuvier's beaked whales is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Estimates of annual human-caused mortality and serious injury are unknown for this stock.

Fisheries Information

The level of past or current, direct, human-caused mortality of Cuvier's beaked whales in Puerto Rico and the U.S. Virgin Islands is unknown. Pelagic swordfish, tunas and billfish are the targets of the longline fishery operating in the Caribbean Sea. There has been no reported fishing-related mortality of a Cuvier's beaked whale during recent years (2001-2009) in waters surrounding Puerto Rico or the U.S. Virgin Islands; however, interactions with unidentified beaked whales and the longline fishery have occurred in the Caribbean region between Cuba and Haiti (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; Garrison and Stokes 2010). During 2003, 1 unidentified beaked whale was released alive and presumed to not be seriously injured. Estimated number of unidentified beaked whales "released alive" after an entanglement interaction with the pelagic longline fishery in the Caribbean region during quarter 1 of 2003 was 40.5 (CV=1.00; Garrison and Richards 2004). It is also important to note that for some recent years, 2006, 2008 and 2009, there has been no observer coverage of the pelagic longline fishery in the Caribbean region (Fairfield-Walsh and Garrison 2007; Garrison *et al.* 2009; Garrison and Stokes 2010).

While no whaling occurs at present in the waters of Puerto Rico and the U.S. Virgin Islands, small-scale whaling (artisanal), conducted by local whalers, is still carried out by the eastern Caribbean nations of Dominica, St. Lucia, and St. Vincent and the Grenadines (e.g., Rathjen and Sullivan 1970; Caldwell *et al.* 1971a; Adams 1975; Caldwell and Caldwell 1975; Price 1985; Reeves 1988; Hoyt and Hvenegaard 2002; Romero *et al.* 2002; Mohammed *et al.* 2003; World Council of Whalers 2008). Occasionally artisanal whalers in the Lesser Antillean islands will kill Cuvier's beaked whales, but they are not the target of a regular hunt (Reeves *et al.* 2003). Takes in the St. Vincent fishery have included Cuvier's beaked whales (Caldwell *et al.* 1971a; Caldwell and Caldwell 1975), but very limited monitoring of catches is carried out for any small whale/dolphin fishery (Price 1985).

Other Mortality

No Cuvier's beaked whales were found stranded in U.S. waters of the Caribbean Sea from 2005 through 2009 (NOAA National Marine Mammal Health and Stranding Response Database unpublished data, accessed 17 November 2010). 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.

The potential impact of coastal pollution may be an issue for this species in portions of its habitat. The U.S. Navy and the U.S. Marine Corps used the Atlantic Fleet Weapons Training Facility operated out of Vieques Island, Puerto Rico, from 1948 to 2003, including the training of pilots for live ordnance delivery and amphibious assault landings by the Marine Corps. The U.S. Environmental Protection Agency has designated parts of Vieques Island on the Superfund National Priorities List because various parts of the island and nearby waters have become contaminated by solid and/or hazardous waste resulting from decades of military activity (EPA 2009). Identified areas of concern include ship anchoring areas north of Vieques, waters impacted by target practice on eastern Vieques and waters near western Vieques. Remnants of exploded ordnance and large amounts of unexploded ordnance have been identified in the range areas of Vieques and in the surrounding waters. Hazardous substances associated with ordnance use may include lead, mercury, lithium, magnesium, copper, perchlorate, napalm, TNT, and depleted uranium, among others. At both the eastern and western ends of Vieques, hazardous materials present may also include an assortment of chemicals such as pesticides, solvents and PCBs (EPA 2009).

The naval station at Roosevelt Roads in Puerto Rico operated from 1943 to 2004 (between 1943 and 1957 it was opened and closed multiple times). It operated as a major training site for fleet exercises, but potential impacts, if any, on Cuvier's beaked whales are unknown. 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.* 2006). 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 were performed on 5 of the dead beaked whales and 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.* 2006).

STATUS OF STOCK

The status of Cuvier's beaked whales, relative to OSP, in U.S. waters of the Caribbean Sea is unknown. The size of this stock or any population of Cuvier's beaked whales in the northeast Caribbean has never been assessed. 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. Total human-caused mortality and serious injury for this stock is not known. There is no systematic monitoring of all fisheries that may take this stock. 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. For these reasons and because the stock size is currently unknown, PBR is undetermined, and there are documented interactions between unidentified beaked whales and the pelagic longline fishery in waters between Cuba and Haiti, this stock is a strategic stock.

REFERENCES CITED

- Adams, J. E. 1975. Primitive whaling in the West Indies. *Sea Frontiers* 21: 303-313.
- 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. NOAA Tech. Memo. NMFS-OPR-6, 73 pp.

- Caldwell, D. K. and M. C. Caldwell. 1975. Dolphin and small whale fisheries of the Caribbean and West Indies: Occurrence, history, and catch statistics – with special reference to the Lesser Antillean island of St. Vincent. *J. Fish. Res. Bd. Can.* 32: 1105-1110.
- Caldwell, D. K., M. C. Caldwell, W. F. Rathjen and J. R. Sullivan. 1971a. Cetaceans from the Lesser Antillean island of St. Vincent. *Fish. Bull.* 69: 303-312.
- Caldwell, D. K., W. F. Rathjen and M. C. Caldwell. 1971b. Cuvier's beaked whale, *Ziphius cavirostris*, from Barbados. *Bulletin of the Southern California Academy of Sciences* 70: 52-53.
- 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. C. Mountain, D. Palka, P. Ponganis, S. Rommel, T. Rowles, B. Taylor, P. Tyack, D. Wartzok, R. Gisiner, J. Mead and L. Benner. 2006. Understanding the impacts of anthropogenic sound on beaked whales. *J. Cetacean Res. Manage.* 7(3): 177-187.
- Debrot, A. O. and N. B. Barros. 1994. Additional cetacean records for the Leeward Dutch Antilles. *Mar. Mamm. Sci.* 10(3): 359-368.
- Debrot, A. O., J. A. De Meyer and P. J. E. Dezentjé. 1998. Additional records and a review of the cetacean fauna of the Leeward Dutch Antilles. *Carib. J. Sci.* 34: 204-210.
- Erdman, D. S. 1970. Marine mammals from Puerto Rico to Antigua. *J. Mammal.* 51: 636-639.
- Erdman, D. S., J. Harms and M. Marcial-Flores. 1973. Cetacean records from the northeastern Caribbean region. *Cetology* 17: 1-14.
- 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.
- 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.
- 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. 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.
- Gordon, J., A. Moscrop, C. Carlson, S. Ingram, R. Leaper, J. Matthews and K. Young. 1998. Distribution, movements and residency of sperm whales off the Commonwealth of Dominica, eastern Caribbean: Implications for the development and regulation of the local whalewatching industry. *Rep. Int. Whal. Commn.* 48: 551-557.
- 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.
- Hoyt, E. and G. T. Hvenegaard. 2002. A review of whale-watching and whaling with applications for the Caribbean. *Coast. Manage.* 30: 381-399.
- Jefferson, T. A., M. A. Webber and R. L. Pitman. 2008. *Marine mammals of the world: A comprehensive guide to their identification*. Academic Press/Elsevier. Amsterdam. 573 pp.
- Jérémie, S., A. Gannier, S. Bourreau and J.-C. Nicolas. 2006. Cetaceans of Martinique Island (Lesser Antilles): Occurrence and distribution obtained from a small boat dedicated survey. Paper SC/58/SM23. 58th Annual Meeting of the International Whaling Commission, June 2006, St. Kitts and Nevis, West Indies.
- Leatherwood, S. and R. R. Reeves. 1983. *The Sierra Club handbook of whales and dolphins*. Sierra Club Books, San Francisco, CA. 302 pp.

- Mignucci-Giannoni, A. A. 1998. Zoogeography of cetaceans off Puerto Rico and the Virgin Islands. *Carib. J. Sci.* 34 (3-4): 173-190.
- Mignucci-Giannoni, A. A., B. Pinto-Rodríguez, R. A. Montoya-Ospina, N. M. Jiménez-Marrero, M. A. Rodríguez-López, E. H. Williams, Jr., and D. K. Odell. 1999. Cetacean strandings in Puerto Rico and the Virgin Islands. *J. Cetacean Res. Manage.* 1(2): 191-198.
- Mohammed, E., L. E. Straker and C. Jardine. 2003. St. Vincent and the Grenadines: Reconstructed fisheries catches and fishing effort, 1942-2001. *Fisheries Centre Research Reports* 11(6): 95-116.
- Pérez-Zayas, J. J., A. A. Mignucci-Giannoni, G. M. Toyos-González, R. J. Rosario-Delestre and E. H. Williams, Jr. 2002. Incidental predation by a largetooth cookiecutter shark on a Cuvier's beaked whale in Puerto Rico. *Aquat. Mamm.* 28(3): 308-311.
- Price, W. S. 1985. Whaling in the Caribbean: Historical perspective and update. *Rep. Int. Whal. Commn.* 35: 413-420.
- Rathjen, W. F. and J. R. Sullivan. 1970. West Indies Whaling. *Sea Frontiers* 16: 130-137.
- Reeves, R. 1988. Exploitation of cetaceans in St. Lucia, Lesser Antilles, January 1987. *Rep. Int. Whal. Commn.* 38: 445-447.
- Reeves, R. R., B. D. Smith, E. A. Crespo and G. Notarbartolo di Sciara, compilers. 2003. Dolphins, whales and porpoises. 2002-2010 Conservation Action Plan for the world's cetaceans. IUCN – The World Conservation Union. Available from: <http://data.iucn.org/dbtw-wpd/edocs/2003-009.pdf>.
- Roden, C. L. and K. D. Mullin. 2000. Sightings of cetaceans in the northern Caribbean Sea and adjacent waters, winter 1995. *Carib. J. Sci.* 36(3-4): 280-288.
- Romero, A., A. I. Agudo, S. M. Green and G. Notarbartolo di Sciara. 2001. Cetaceans of Venezuela: Their distribution and conservation status. *NOAA Tech. Rep. NMFS* 151, 60 pp.
- Romero, A., R. Baker and J. E. Creswell. 2002. Environmental history of marine mammal exploitation in Trinidad and Tobago, W.I., and its ecological impact. *Environment and History* 8: 255-274.
- Simmonds, M. P. and L. F. Lopez-Jurado. 1991. Whales and the military. *Nature* 351: 448.
- Swartz, S. L. and C. Burks. 2000. Cruise results: Windwards humpback survey. *NOAA Tech. Memo. NMFS-SEFSC-438.* 31 pp.
- Swartz, S. L., A. Martinez, J. Stamates, C. Burks and A. A. Mignucci-Giannoni. 2002. Acoustic and visual survey of cetaceans in the waters of Puerto Rico and the Virgin Islands: February-March 2001. *NOAA Tech. Memo. NMFS-SEFSC-463.* 62 pp.
- van Bree, P. J. H. 1975. Preliminary list of the cetaceans of the southern Caribbean. *Stud. Fauna Curacao Carib. Isl.* 48: 79-87.
- 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.
- World Council of Whalers. 2008. World whaling – Caribbean. http://www.worldwhalers.com/whaling_around_the_world/caribbean.htm.