

BOTTLENOSE DOLPHIN (*Tursiops truncatus*): Hawaiian Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Bottlenose dolphins are widely distributed throughout the world in tropical and warm-temperate waters. The species is primarily coastal in much of its range, but there are populations in some offshore deepwater areas as well. Separate offshore and coastal forms have been identified along continental coasts in several areas (Ross and Cockcroft 1990; Van Waerebeek et al. 1990), and similar onshore-offshore forms may exist in Hawaiian waters.

Bottlenose dolphins are common throughout the Hawaiian Islands, from the island of Hawaii to Kure Atoll (Shallenberger 1981). Twelve strandings have been reported within the main Hawaiian Islands (Nitta 1991, Maldini 2005). Recent sighting locations based on a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands are shown in Figure 1. In the Hawaiian Islands, they are found in shallow inshore waters and deep

water, but relative to survey effort, occur primarily inshore of 500 m (Baird et al. 2003). Off the islands of Kauai and Ni'ihau, they are found out to at least 900 m depth. Despite extensive survey effort in waters deeper than 1500 m around the main islands, there are no sightings of bottlenose dolphins (Baird et al. 2003).

Photographic identification surveys have shown that there is no movement of animals between the island groups of 1) Hawaii, 2) Maui, Molokai, Lanai and Kahoolawe, 3) Oahu and 4) Kauai and Niihau (Baird et al. 2003). There is also a bimodal depth distribution in sightings off Kauai and Niihau, suggesting separate shallow and deep water populations. In their analysis of sightings of bottlenose dolphins in the eastern tropical Pacific (ETP), Scott and Chivers (1990) noted that there was a large hiatus between the westernmost sightings and the Hawaiian Islands. These data suggest that bottlenose dolphins in Hawaiian waters belong to a separate stock from those in the ETP. An analysis of genetic samples collected around the Hawaiian islands is ongoing and this analysis will provide additional information on stock structure around the islands (NMFS, unpublished data). For the Marine Mammal Protection Act (MMPA) stock assessment reports, bottlenose dolphins within the Pacific U.S. EEZ are divided into three stocks: 1) Hawaiian Stock (this report), 2) California, Oregon and Washington offshore stock, and 3) California coastal stock.

POPULATION SIZE

Population estimates have been made in Japanese waters (Miyashita 1993) and the eastern tropical Pacific (Wade and Gerrodette 1993), but it is not known whether these animals are part of the same population that occurs around the Hawaiian Islands. Photographic mark-recapture studies off Maui and Lanai estimated 134 (95% C.I. 107- 180) bottlenose dolphins inhabiting that area (Baird et al. 2002). More recently, a minimum of 219 distinct bottlenose dolphins were identified around all the main Hawaiian Islands (Baird et al. 2003). As part of the Marine Mammal Research Program of the Acoustic Thermometry of Ocean Climate (ATOC) study, a total of twelve aerial surveys were conducted within about 25 nmi of the main Hawaiian Islands in 1993, 1995 and 1998. An abundance estimate of 743 (CV=0.56) bottlenose dolphins was calculated from the combined survey data (Mobley et al. 2000). This abundance underestimates the total number of bottlenose dolphins within the U.S. EEZ off Hawaii, because areas around the Northwestern Hawaiian Islands (NWHI) and beyond 25 nautical miles from the main islands were not surveyed. Furthermore, the data on which this estimate was based are now over 5 years old. A 2002 shipboard

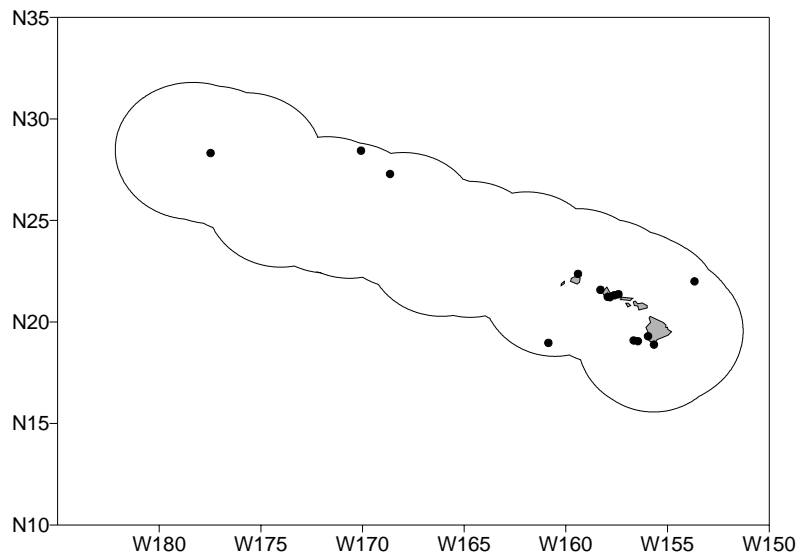


Figure 1. Bottlenose dolphin sighting locations during the 2002 shipboard cetacean survey of U.S. EEZ waters surrounding the Hawaiian Islands (Barlow 2003; see Appendix 2 for details on timing and location of survey effort). Outer line represents approximate boundary of survey area and U.S. EEZ.

line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 3,263 (CV=0.60) bottlenose dolphins (Barlow 2003). This is currently the best available abundance estimate for this stock.

Minimum Population Estimate

The log-normal 20th percentile of the 2002 abundance estimate is 2,046 bottlenose dolphins.

Current Population Trend

No data are available on current population trend.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

No data are available on current or maximum net productivity rate for this species in Hawaiian waters.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for this stock is calculated as the minimum population size (2,046) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.50 (for a stock of unknown status with no estimated fishery mortality or serious injury within the U.S. EEZ of the Hawaiian Islands; Wade and Angliss 1997), resulting in a PBR of 20 bottlenose dolphins per year.

HUMAN CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Information on fishery-related mortality of cetaceans in Hawaiian waters is limited, but the gear types used in Hawaiian fisheries are responsible for marine mammal mortality and serious injury in other fisheries throughout U.S. waters. Gillnets appear to capture marine mammals wherever they are used, and float lines from lobster traps and longlines can be expected to occasionally entangle whales (Perrin et al. 1994). In Hawaii, some mortality of bottlenose dolphins has been observed in inshore gillnets (including an entangled dolphin that stranded in 1998; NMFS/PIR, unpublished data), but no estimate of annual human-caused mortality and serious injury is available, because these fisheries are not observed or monitored.

Interactions with cetaceans have been reported for all Hawaiian pelagic fisheries, and some of these interactions involved bottlenose dolphins (Nitta and Henderson 1993). Between 1994 and 2002 two bottlenose dolphins were observed hooked or entangled in the Hawaii-based longline fishery outside of U.S. EEZ waters, with approximately 4-25% of all effort observed (Table 1; Forney 2004). During the 905 observed trips with 11,014 sets, the average interaction rate of bottlenose dolphins was one animal per 905 fishing trips, or one animal per 11,014 sets. Both animals caught were considered seriously injured (Forney 2004), based on an evaluation of the observer's description of the interaction and following established guidelines for assessing serious injury in marine mammals (Angliss and Demaster 1998). Average 5-yr estimates of annual mortality and serious injury for 1998-2002 are 5.8 (CV = 1.00) bottlenose dolphins outside of U.S. EEZs, and none within U.S. EEZs. Several additional unidentified cetaceans, which may have been bottlenose

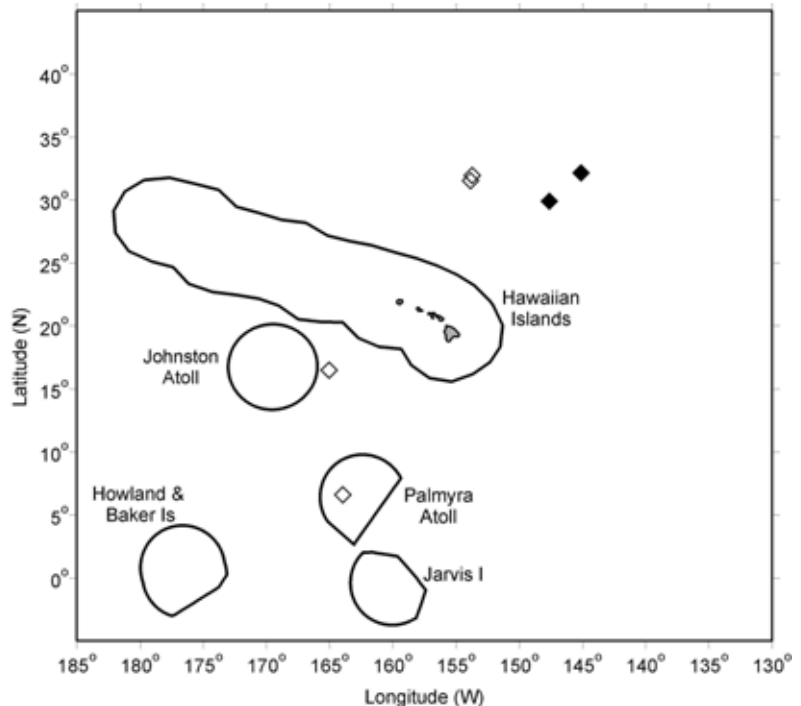


Figure 2. Locations of bottlenose dolphin takes (filled diamonds) in the Hawaii-based longline fishery, 1994-2002. Solid lines represent the U.S. EEZ. Set locations in this fishery are summarized in Appendix 1.

dolphins, were also taken in this fishery (Figure 2, Forney 2004). Since 2001, the Hawaii-based longline fishery has undergone a series of regulatory changes, primarily to protect sea turtles (NMFS 2001). Potential impacts of these regulatory changes on the rate of bottlenose dolphin takes are unknown.

Table 1. Summary of available information on incidental mortality and serious injury of bottlenose dolphins (Hawaii stock) in commercial and gillnet fisheries, within and outside of the U.S. EEZs (Forney 2004; NMFS/PIR unpublished data). Mean annual takes are based on 1998-2002 data unless otherwise indicated; n/a = not available.

Fishery Name	Year	Data Type	Percent Observer Coverage	Mortality and Serious Injury outside of U.S. EEZs			Mortality and Serious Injury within Hawaiian Islands EEZ		
				Observed	Estimated (CV)	Mean Annual Takes (CV)	Observed	Estimated (CV)	Mean Annual Takes (CV)
Hawaii-based longline fishery	1998	1998-2002 observer data	4.6%	0	0 (-)	5.8 (1.0)	0	0 (-)	0 (-)
	1999		3.5%	1	29 (1.0)		0	0 (-)	
	2000		11.8%	0	0 (-)		0	0 (-)	
	2001		22.7%	0	0 (-)		0	0 (-)	
	2002		24.9%	0	0 (-)		0	0 (-)	
Unidentified gillnet fishery	1998	strandings				1	n/a	\$0.2 (n/a)	
Minimum total annual takes within U.S. EEZ waters									\$0.2 (n/a)

Bottlenose dolphins are one of the species commonly reported to take bait and catch from several Hawaiian sport and commercial fisheries (Nitta and Henderson 1993; Schlais 1984). Observations of bottlenose dolphins taking bait or catch have also been made in the day handline fishery (palu-ahi) for tuna, the handline fishery for mackerel scad, the troll fishery for billfish and tuna, and the inshore set gillnet fishery (Nitta and Henderson 1993). Nitta and Henderson (1993) indicated that bottlenose dolphins remove bait and catch from handlines used to catch bottomfish off the island of Hawaii and Kaula Rock and on several banks of the Northwestern Hawaiian Islands. Fishermen claim interactions with dolphins who steal bait and catch are increasing. Interaction rates between dolphins and the NWHI bottomfish fishery have been estimated based on studies conducted in 1990-1993, indicating that an average of 2.67 dolphin interactions, most likely involving bottlenose and rough-toothed dolphins, occurred for every 1000 fish brought on board (Kobayashi and Kawamoto 1995). It is not known whether these interactions result in serious injury or mortality of dolphins. Beginning in the early 1970s the National Marine Fisheries Service received reports of fishermen shooting at bottlenose dolphins to deter them from taking fish catches (Nitta and Henderson 1993). Nitta and Henderson (1993) also reported that one bottlenose dolphin calf was removed from small-mesh set gillnet off Maui in 1991 and expressed surprise that bottlenose dolphins are "rarely reported entangled or raiding set gill nets in Hawaii," considering that they so often remove fish from fishing lines.

STATUS OF STOCK

The status of bottlenose dolphins in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. No habitat issues are known to be of concern for this species. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA. The Hawaiian stock of bottlenose dolphins is not considered strategic under the 1994 amendments to the MMPA, because the estimated rate of fisheries related mortality or serious injury within the Hawaiian Islands EEZ (\$0.2 animals per year) is less than the PBR (20). However, there is no systematic monitoring of gillnet fisheries that may take this species, and the potential effects of interactions with the Hawaii-based longline fishery in international waters or the bottomfish fishery in the NWHI are not known. Insufficient information is available to determine whether the total fishery mortality and serious injury for bottlenose dolphins is insignificant and approaching zero mortality and serious injury rate.

REFERENCES

- Angliss, R. P. and D. P. DeMaster. 1998. Differentiating Serious and Non_Serious Injury of Marine Mammals Taken Incidental to Commercial Fishing Operations: Report of the Serious Injury Workshop 1_2 April 1997, Silver Spring, Maryland. U. S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-13. 48 pp.
- Baird, R. W., A. M. Gorgone, and D. L. Webster. 2002. An examination of movements of bottlenose dolphins between islands in the Hawaiian Island Chain. Report prepared under contract # 40JGNF110270 to the

- Southwest Fisheries Science Center, National Marine Fisheries Service, 8604 La Jolla Shores Drive, La Jolla, CA 92037, USA. 10p.
- Baird, R.W., McSweeney D.J., Webster, D.L., Gorgone, A.M., and Ligon, A.D. 2003. Studies of odontocete population structure in Hawaiian waters: Results of a survey through the main Hawaiian Islands in May and June 2003. Report prepared under contract #AB133F-02-CN-0106 to the Southwest Fisheries Science Center, National Marine Fisheries Service, 8604 La Jolla Shores Drive, La Jolla, CA 92037, USA. 25 pp.
- Barlow, J. 2003. Cetacean abundance in Hawaiian waters during summer/fall 2002. Admin. Rep. LJ-03-13. Southwest Fisheries Science Center, National Marine Fisheries Service, 8604 La Jolla Shores Drive, La Jolla, CA 92037.
- Forney, K.A. 2004. Estimates of cetacean mortality and injury in two U.S. Pacific longline fisheries, 1994_2002. Admin. Rep. LJ-04-07. Southwest Fisheries Science Center, National Marine Fisheries Service, 8604 La Jolla Shores Drive, La Jolla, CA 92037. 17 pp.
- Kobayashi, D. R. and K. E. Kawamoto. 1995. Evaluation of shark, dolphin, and monk seal interactions with Northwestern Hawaiian Island bottomfishing activity: a comparison of two time periods and an estimate of economic impacts. Fisheries Research 23: 11-22.
- Maldini, D., L. Mazzuca, and S. Atkinson. 2005. Odontocete stranding patterns in the Main Hawaiian Islands (1937-2002): How do they compare with live animal surveys? Pacific Science 59(1):55-67.
- Miyashita, T. 1993. Abundance of dolphin stocks in the western North Pacific taken by the Japanese drive fishery. Rep. Int. Whal. Commn. 43:417-437.
- Mobley, J. R. , Jr, S. S. Spitz, K. A. Forney, R. A. Grotefendt, and P. H. Forestall. 2000. Distribution and abundance of odontocete species in Hawaiian waters: preliminary results of 1993-98 aerial surveys Admin. Rep. LJ-00-14C. Southwest Fisheries Science Center, National Marine Fisheries Service, P.O. Box 271, La Jolla, CA 92038. 26 pp.
- Nitta, E. 1991. The marine mammal stranding network for Hawaii: an overview. *In*: J.E. Reynolds III, D.K. Odell (eds.), Marine Mammal Strandings in the United States, pp.56-62. NOAA Tech. Rep. NMFS 98, 157 pp.
- Nitta, E. and J. R. Henderson. 1993. A review of interactions between Hawaii's fisheries and protected species. Mar. Fish. Rev. 55(2):83-92.
- NMFS, Pacific Islands Region, Observer Program, 1602 Kapiolani Blvd, Suite 1110, Honolulu, HI 96814.
- NMFS 2001. Western Pacific Pelagic Fisheries Biological Opinion. Available from Pacific Islands Region, 1602 Kapiolani Blvd, Suite 1110, Honolulu, HI 96814 (<http://swr.nmfs.noaa.gov/pir>).
- Perrin, W.F., G. P. Donovan and J. Barlow. 1994. Gillnets and Cetaceans. Rep. Int. Whal. Commn., Special Issue 15, 629 pp.
- Ross, G.J.B. and V. G. Cockcroft. 1990. Comments on Australian bottlenose dolphins and the taxonomic status of *Tursiops aduncus* (Ehrenberg, 1832). *In*: The Bottlenose Dolphin (eds. S. Leatherwood and R. Reeves). pp. 101-128. Academic Press, 653pp.
- Schlais, J.F. 1984. Thieving dolphins: A growing problem in Hawaii's fisheries. Sea Front. 30(5):293-298.
- Scott, M. D. and S. J. Chivers. 1990. Distribution and herd structure of bottlenose dolphins in the eastern tropical Pacific Ocean. *In*: The Bottlenose Dolphin (eds. S. Leatherwood and R. Reeves). pp. 387-402. Academic Press, 653pp.
- Shallenberger, E.W. 1981. The status of Hawaiian cetaceans. Final report to U.S. Marine Mammal Commission. MMC-77/23, 79pp.
- Van Waerebeek, K., J. C. Reyes, A. J. Read, and J. S. McKinnon. 1990. Preliminary observations of bottlenose dolphins from the Pacific coast of South America. *In*: The Bottlenose Dolphin (eds. S. Leatherwood and R. Reeves). pp. 143-154. Academic Press, 653 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, Washington. U. S. Dep. Commer., NOAA Tech. Memo. NMFS-OPR-12. 93 pp.
- Wade, P. R. and T. Gerrodette. 1993. Estimates of cetacean abundance and distribution in the eastern tropical Pacific. Rep. Int. Whal. Commn. 43:477-493.