

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 there is some evidence that similar onshore-offshore forms may exist in Hawaiian waters (Martien et al 2005; Baird et al, in prep).

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 2003). 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 (Baird et al. 2003).

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. Recent nearshore photo-identification studies off Oahu, Maui, Lanai, Kauai, Niihau, and Hawaii suggest limited movement of bottlenose dolphins between islands and into offshore waters (Baird et al. 2002; 2003). Further analyses of these data (Baird et al., in prep), along with recent genetic analyses (Martien et al. 2005) suggest that up to five different stocks of bottlenose dolphins may exist in Hawaiian EEZ waters: 1) the "4-Island Region" (Moloka'i, Lana'i, Maui, Kaho'olawe) 2) Oahu, 3) Kauai, Niihau & Hawaii, 4) Offshore Kauai & Niihau and 5) Offshore Oahu. However, the limited number of bottlenose dolphin groups sampled in these studies preclude any strong inference regarding stock structure within the Hawaiian EEZ at this time. Estimates of abundance and potential biological removals will be presented separately for the 4-Island Region, which currently is the only region with detailed information. 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 235 distinct bottlenose dolphins were identified around all the main Hawaiian Islands (Baird et al. 2006). 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 line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 3,215 (CV= 0.59) bottlenose dolphins (Barlow 2006). This is currently the best available abundance estimate for the Hawaiian Islands EEZ stock. If the bottlenose dolphins in the 4-Island Region comprise a distinct stock, the most recent available

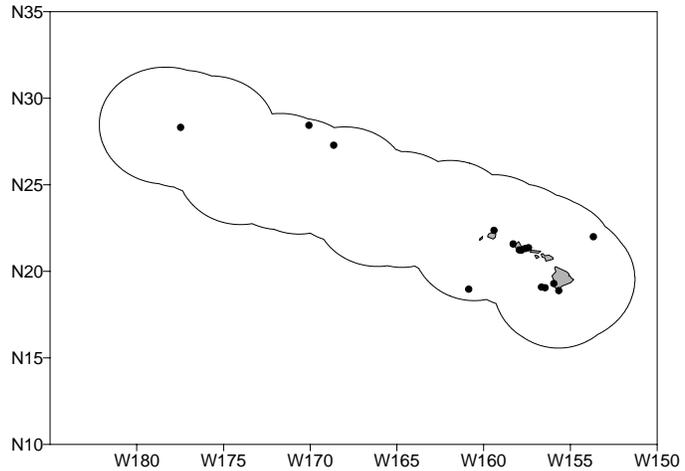


Figure 1. Bottlenose dolphin sighting locations during the 2002 shipboard cetacean survey of U.S. EEZ waters surrounding the Hawaiian Islands (Barlow 2006; see Appendix 2 for details on timing and location of survey effort). Outer line represents approximate boundary of survey area and U.S. EEZ.

estimate is the number of individuals identified during photo-identification studies between 1999 and 2003, 141 dolphins (Baird et al., in prep).

Minimum Population Estimate

The log-normal 20th percentile of the 2002 abundance estimate is 2,029 bottlenose dolphins. The minimum population estimate for bottlenose dolphins in the Four-Island Region, based on photo-identification methods, is 68 dolphins (the number of unique individuals identified between 1999 and 2003; Baird et al. 2003).

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 (2,029) times one half the default maximum net growth rate for cetaceans ($\frac{1}{2}$ of 4%) times a recovery factor of 0.40 (for a stock of unknown status with a Hawaiian Islands EEZ fishery mortality and serious injury rate $CV > 0.80$; Wade and Angliss 1997), resulting in a PBR of 16 bottlenose dolphins per year. If bottlenose dolphins in the 4-Island Region comprise a separate stock, the PBR would be the minimum population estimate (141) times one half the default maximum net growth rate for cetaceans ($\frac{1}{2}$ of 4%) times a recovery factor of 0.50 (for a stock of unknown status with no reported fishery mortality during the last five years; Wade and Angliss 1997), resulting in a PBR of 1.4 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, 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 three bottlenose dolphins were observed hooked or entangled in the Hawaii-based longline fishery, with approximately 4-26% of all effort observed (Table 1; Forney and Kobayashi 2005). During 18,353 observed sets, the average interaction rate of bottlenose dolphins was 0.16 animals per 1,000 sets. One of the bottlenose dolphins was killed, and the other two were considered seriously injured (Forney and Kobayashi 2005), 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 2000-2004 are 0.8 ($CV = 1.00$) bottlenose dolphins within the Hawaiian Islands EEZ, and none outside of U.S. EEZs. Six additional unidentified

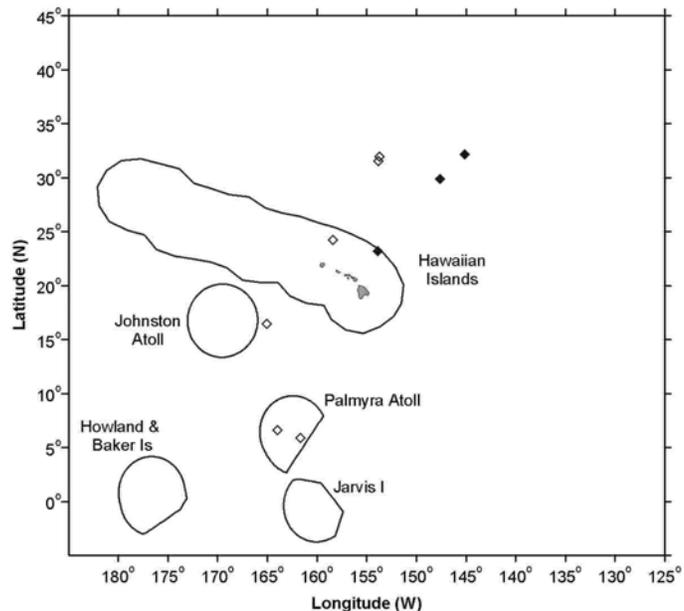


Figure 2. Locations of observed bottlenose dolphin takes (filled diamonds) and possible takes of this species (open diamonds) in the Hawaii-based longline fishery, 1994-2004. Solid lines represent the U. S. EEZ. Set locations in this fishery are summarized in Appendix 1.

cetaceans, which may have been bottlenose dolphins, were also taken in this fishery (Figure 2, Forney and Kobayashi 2005). 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.

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 Island and on several banks of the Northwestern Hawaiian Islands. Fishermen claim interactions with dolphins that 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. One bottlenose dolphin entangled in a gillnet was reported stranded on Maui in 1998 (NMFS/PIR, unpublished data; Maldini 2003).

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 and Kobayashi 2005; NMFS/PIR unpublished data). Mean annual takes are based on 2000-2004 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	2000	observer data	11.0%	0	0 (-)	0 (-)	0	0 (-)	0.8 (1.0)
	2001		23.0%	0	0 (-)		0	0 (-)	
	2002		24.8%	0	0 (-)		0	0 (-)	
	2003		21.9%	0	0 (-)		1	4 (1.0)	
	2004		25.7%	0	0 (-)		0	0 (-)	
Minimum total annual takes within U.S. EEZ waters									0.8 (1.0)

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 (0.8 animals per year) is less than the PBR (16). 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.

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