

COMMON BOTTLENOSE DOLPHIN (*Tursiops truncatus truncatus*): Hawaiian Islands Stock Complex- Kauai/Niihau, Oahu, 4-island, Hawaii Island, Hawaii Pelagic

STOCK DEFINITION AND GEOGRAPHIC RANGE

Common bottlenose dolphins are widely distributed throughout the world in tropical and warm-temperate waters (Perrin et al. 2009). The species is primarily coastal in much of its range, but there are populations in some offshore deepwater areas as well. 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 et al. 2005). Recent sighting locations based on a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands (Barlow 2006) are shown in Figure 1. In the Hawaiian Islands, they are found in shallow inshore waters and deep water (Baird et al. 2009).

Separate offshore and coastal forms of bottlenose dolphins 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. 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. Furthermore, recent photo-identification and genetic studies off Oahu, Maui, Lanai, Kauai, Niihau, and Hawaii suggest limited movement of bottlenose dolphins between islands and into offshore waters (Baird et al. 2009; Martien et al. in review). These data suggest the existence of demographically distinct resident populations at each of the four main Hawaiian Island groups – Kauai & Niihau, Oahu, the ‘4-island Region (Molokai, Lanai, Maui, Kahoolawe), and Hawaii. In addition, the genetic data indicate that the deeper waters surrounding the main Hawaiian Islands are utilized by a larger pelagic population.

Over 99% of the bottlenose dolphins known to be part of one of the insular populations photo-identified around the main Hawaiian Islands (Baird et al. 2009) have been documented in waters of 1000 m or less (Martien et al. 2009). Based on these data, Martien et al. (2009) suggested that the boundaries between the insular stocks and the Hawaii Pelagic stock be placed along the 1000 m isobath. Since that isobath does not separate Oahu from the 4-Islands Region, the boundary between those stocks would run approximately equidistant between the 500 m isobaths around Oahu and the 4-Islands Region, through the middle of Kaiwi Channel. These boundaries

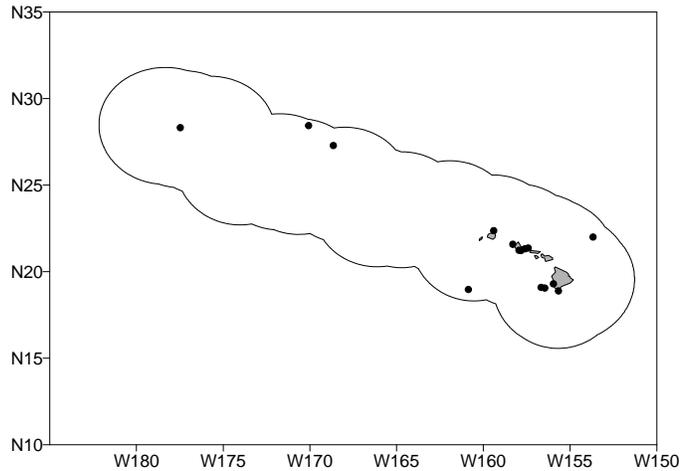


Figure 1. Bottlenose dolphin sighting locations during the 2002 shipboard cetacean survey of U.S. EEZ waters surrounding the Hawaiian Islands (Barlow 2006; see Appendix 2 for details on timing and location of survey effort). Outer line represents approximate boundary of survey area and U.S. EEZ.

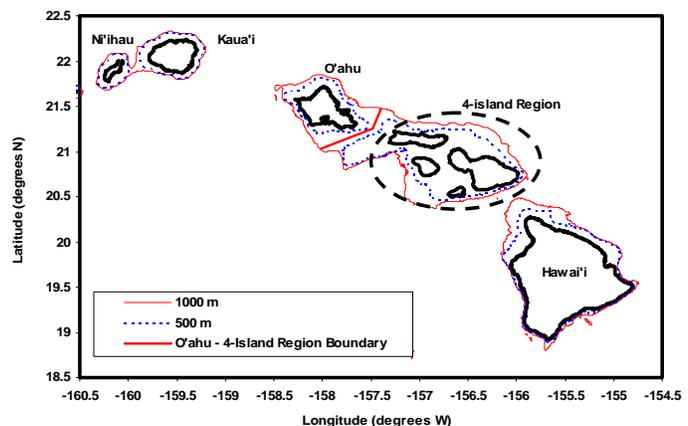


Figure 2. Insular bottlenose dolphin stock boundaries (red lines). Areas beyond the 1000 m isobath represent the pelagic stock range.

(Figure 2) are provisionally applied in this report to recognize separate insular and pelagic bottlenose dolphin stocks for management (NMFS 2005). These boundaries may be revised in the future as additional information becomes available. To date, no data are available regarding population structure of bottlenose dolphins in the Northwest Hawaiian Islands (NWHI). However, given the existence of island resident populations in the main Hawaiian Islands, the larger distances between islands in the NWHI, and the finding of population structure with the NWHI in other dolphin species (Andrews 2010), it is likely that additional demographically independent populations of bottlenose dolphins exist in the NWHI. However, until data become available upon which to base stock designations in this area, the NWHI will remain part of the Hawaii Pelagic Stock. For the Marine Mammal Protection Act (MMPA) Pacific stock assessment reports, bottlenose dolphins within the Pacific U.S. EEZ are divided into seven stocks: 1) California, Oregon and Washington offshore stock, 2) California coastal stock, and five Pacific Islands Region management stocks (this report): 3) Kauai and Niihau, 4) Oahu, 5) the “4-Island Region” (Molokai, Lanai, Maui, Kahoolawe), 6) Hawaii Island and 7) the Hawaiian Pelagic Stock, including animals found both within the Hawaiian Islands EEZ and in adjacent international waters. Because data on abundance, distribution, and human-caused impacts are largely lacking for international waters, the status of the Hawaii pelagic stock is evaluated based on data from U.S. EEZ waters of the Hawaiian Islands (NMFS 2005). Estimates of abundance, potential biological removals, and status determinations for the five Hawaiian stocks are presented separately below.

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 (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). There are currently two distinct longline fisheries based in Hawaii: a deep-set longline (DSL) fishery that targets primarily tunas, and a shallow-set longline fishery (SSL) that targets swordfish. Both fisheries operate within U.S. waters and on the high seas. Between 2004 and 2008, four bottlenose dolphins were observed hooked or entangled in the SSL fishery (100% observer coverage), and one bottlenose dolphin was observed taken in the DSL fishery (20-28% observer coverage) (Forney 2009, McCracken 2009). Based on the locations, these takes are all considered to have been from the Pelagic Stock of bottlenose dolphins. All five dolphins were determined to have been seriously injured (Forney 2009), based on an evaluation of the observer’s description of the interaction and following the most recently developed criteria for assessing serious injury in marine mammals (Andersen et al. 2008). Average 5-yr estimates of annual mortality and serious injury for the Pelagic Stock during 2004-2008 are 0.6 (CV = 0) bottlenose dolphins outside of U.S. EEZs, and 0.4 (CV = 0.68) within the Hawaiian Islands EEZ (Table 1, McCracken 2009).

Bottlenose dolphins are one of the species commonly reported to steal bait and catch from several Hawaiian sport and commercial fisheries (Nitta and Henderson 1993; Schlais 1984). Observations of bottlenose

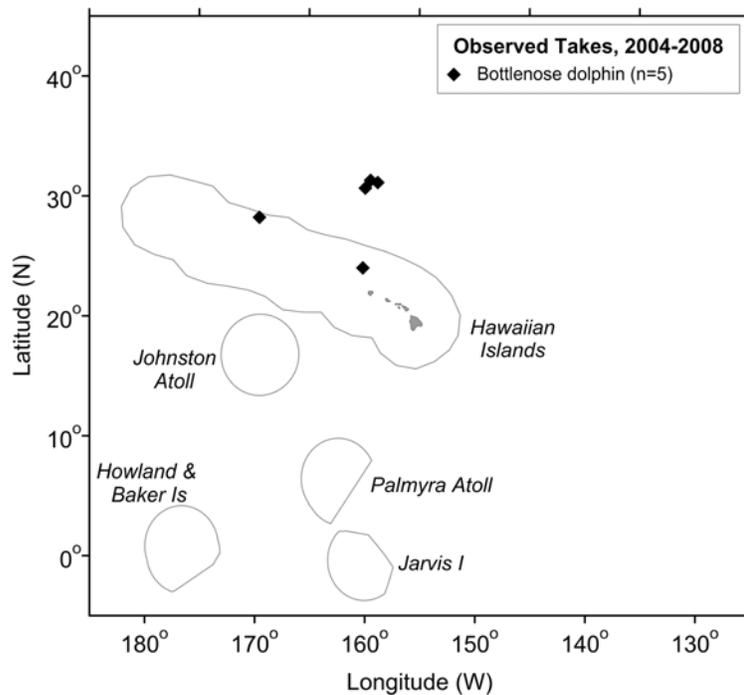


Figure 3. Locations of observed Pelagic Stock bottlenose dolphin takes (filled diamonds) in the Hawaii-based longline fishery, 2004-2008. Solid lines represent the U. S. EEZ. Fishery descriptions are provided in Appendix 1.

dolphins stealing 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, including anecdotal reports of bottlenose getting “snagged” (Rizzuto 2007). 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 stealing fish catches (Nitta and Henderson 1993). Nitta and Henderson (1993) also reported that one bottlenose dolphin calf was removed from a 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). During 2009, one bottlenose dolphin was photographed off the Kona Coast of the island of Hawaii with a hook and line trailing out of its mouth (pers. comm. Robin Baird), but the responsible fishery is not known. No estimates of human-caused serious injury and mortality are available for nearshore hook-and-line fisheries, because these fisheries and not observed or monitored.

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 (McCracken 2009, Forney 2009). Mean annual takes are based on 2004-2008 data unless otherwise indicated; n/a = not available.

Fishery Name	Year	Data Type	Percent Observer Coverage	Mortality and Serious Injury outside of U.S. EEZ			Mortality and Serious Injury within Hawaiian Islands EEZ		
				Observed	Estimated	Mean Annual Takes (CV)	Observed	Estimated (CV)	Mean Annual Takes (CV)
Hawaii-based deep-set longline fishery	2004	observer data	25%	0	0 (-)	0 (-)	0	0 (-)	0.2 (3.1)
	2005		28%	0	0 (-)		0	0 (-)	
	2006		22%	0	0 (-)		1	1 (1.6)	
	2007		20%	0	0 (-)		0	0 (-)	
	2008		22%	0	0 (-)		0	0 (-)	
Hawaii-based shallow-set longline fishery	2004	observer data	100%	0	Same as observed	0.6 (0.0)	0	Same as observed	0.2
	2005		100%	0			0		
	2006		100%	1			0		
	2007		100%	2			1		
	2008		100%	0			0		
Minimum total annual takes within U.S. EEZ waters									0.4 (0.68) ¹

¹Takes were all from the Pelagic Stock of bottlenose dolphins

KAUAI AND NIIHAU STOCK POPULATION SIZE

A photo-identification study conducted in 2003, 2004 and 2005 identified 102 individual bottlenose dolphins around Kauai and Niihau (Baird et al. 2009). A Lincoln-Peterson mark-recapture analysis of the photo-identification data resulted in an abundance estimate of 147 (CV=0.11) (Baird et al. 2009). This abundance underestimates the total number of bottlenose dolphins around Kauai and Niihau because it only represents individuals with distinguishable marks.

Minimum Population Estimate

The log-normal 20th percentile of the Baird et al. (2009) mark-recapture estimate is 134. This is greater than the number of distinct individuals (102) identified during the photo-identification study.

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 (134) 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 or serious injury during the last five years; Wade and Angliss 1997), resulting in a PBR of 1.3 bottlenose dolphins per year.

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. It is not listed as “threatened” or “endangered” under the Endangered Species Act (1973), nor as “depleted” under the MMPA. The Kauai and Niihau Stock of bottlenose dolphins is not considered strategic under the 1994 amendments to the MMPA, because there have been no reports of recent mortality or serious injuries of this stock. However, there is no systematic monitoring of near-shore fisheries that may take this species. 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.

OAHU STOCK **POPULATION SIZE**

A photo-identification study conducted in 2002, 2003 and 2006 identified 67 individual bottlenose dolphins around Oahu (Baird et al. 2009). A Lincoln-Peterson mark-recapture analysis of the photo-identification data resulted in an abundance estimate of 594 (CV=0.54) (Baird et al. 2009). The estimate only represents individuals with distinguishable marks and does not include individuals from the Northeastern (windward) side of the island. The sample size of encounters (11) was small compared to encounters off other islands; therefore, this estimate is imprecise and should be considered provisional until additional abundance studies can be completed.

Minimum Population Estimate

The log-normal 20th percentile of the Baird et al. (2009) mark-recapture estimate is 388. This is substantially greater than the number of distinct individuals (67) identified during the photo-identification study.

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 (388) 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 3.9 bottlenose dolphins per year.

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. It is not listed as “threatened” or “endangered” under the Endangered Species Act (1973), nor as “depleted” under the MMPA. The Oahu stock of bottlenose dolphins is not considered strategic under the 1994 amendments to the MMPA, because there have been no reports of recent mortality or serious injuries of this stock. However, there is no systematic monitoring of near-shore fisheries that may take this species. 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.

4-ISLANDS REGION STOCK **POPULATION SIZE**

A photo-identification study conducted from 2000-2006 identified 98 individual bottlenose dolphins around Maui and Lanai (Baird et al. 2009). A Lincoln-Peterson mark-recapture analysis of the photo-identification data resulted in an abundance estimate of 153 (CV=0.24) (Baird et al. 2009). This abundance underestimates the total number of bottlenose dolphins in the 4-islands region because it only represents individuals with distinguishable marks and does not include individuals from the Northeastern (windward) sides of Maui and Molokai.

Minimum Population Estimate

The log-normal 20th percentile of the Baird et al. (2009) mark-recapture estimate is 125. This is greater than the number of distinct individuals (98) identified during the photo-identification study.

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 (125) 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 1.3 bottlenose dolphins per year.

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. It is not listed as “threatened” or “endangered” under the Endangered Species Act (1973), nor as “depleted” under the MMPA. The 4-Islands Region Stock of bottlenose dolphins is not considered strategic under the 1994 amendments to the MMPA, there have been no reports of recent mortality or serious injuries of this stock. However, there is no systematic monitoring of near-shore fisheries that may take this species. 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.

HAWAII ISLAND STOCK **POPULATION SIZE**

A photo-identification study conducted from 2000-2006 identified 69 individual bottlenose dolphins around the island of Hawaii (Baird et al. 2009). A Lincoln-Peterson mark-recapture analysis of the photo-identification data resulted in an abundance estimate of 102 (CV=0.13) (Baird et al. 2009). This abundance underestimates the total number of bottlenose dolphins around the island of Hawaii because it only represents individuals with distinguishable marks and does not include individuals from the Northeastern (windward) side of the island.

Minimum Population Estimate

The log-normal 20th percentile of the Baird et al. (2009) mark-recapture estimate is 91. This is greater than the number of distinct individuals (69) identified during the photo-identification study.

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 (91) 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 0.9 bottlenose dolphins per year.

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. It is not listed as “threatened” or “endangered” under the Endangered Species Act (1973), nor as “depleted” under the MMPA. The Hawaii Island Stock of bottlenose dolphins is not considered strategic under the 1994 amendments to the MMPA, because there have been no reports of recent mortality or serious injuries of this stock. However, there is no systematic monitoring of gillnet fisheries that may take this species. 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.

HAWAIIAN PELAGIC 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. 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), equivalent to a density of 1.31 individuals per 1000 km². Applying this density to the 2,464,486 km² area of the Pelagic Stock between the 1000m isobath and the Hawaiian Islands EEZ boundary (see Figures 1-2), the stock-specific abundance is estimated as 3,178 (CV=0.59). This is currently the best available abundance estimate for the Hawaiian Pelagic stock.

Minimum Population Estimate

The log-normal 20th percentile of the 2002 line-transect abundance estimate for the Hawaiian Pelagic Stock is 2,006 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 within the U.S EEZ of the Hawaiian Islands (2,006) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.45 (for a stock of unknown status with a Hawaiian Islands EEZ fishery mortality and serious injury rate between 0.60 and 0.80; Wade and Angliss 1997), resulting in a PBR of 18 bottlenose dolphin per year.

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. It is not listed as “threatened” or “endangered” under the Endangered Species Act (1973), nor as “depleted” under the MMPA. The Hawaiian Pelagic 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 (0.4 animals per year) is less than the PBR (18). However, the potential effects of interactions with U.S. and international pelagic longline fisheries in international waters 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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