Revised 1/15/2011

PANTROPICAL SPOTTED DOLPHIN (*Stenella attenuata attenuata*): Hawaiian Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Pantropical spotted dolphins are primarily found in tropical and subtropical waters worldwide (Perrin et al. 2009). Much of what is known about the species in the North Pacific has been learned from specimens obtained in the large directed fishery in Japan and in the eastern tropical Pacific (ETP) tuna purse-seine fishery (Perrin et al. 2009). These dolphins are common and abundant throughout the Hawaiian archipelago, particularly in channels between islands, over offshore banks (e.g. Penguin Banks), and off the lee shores of the islands (see Shallenberger 1981). Recent sighting locations from a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands are shown in Figure 1 (Barlow 2006). Twelve strandings of this species have been documented in Hawaii (Nitta 1991, Maldini et al. 2005). Morphological differences and distribution patterns have been used to establish that the spotted dolphins around Hawaii belong to a stock that is distinct from those in the ETP (Perrin 1975; Dizon et al. 1994; Perrin et al. 1994b). Their possible affinities with other stocks elsewhere in the Pacific have not been investigated.

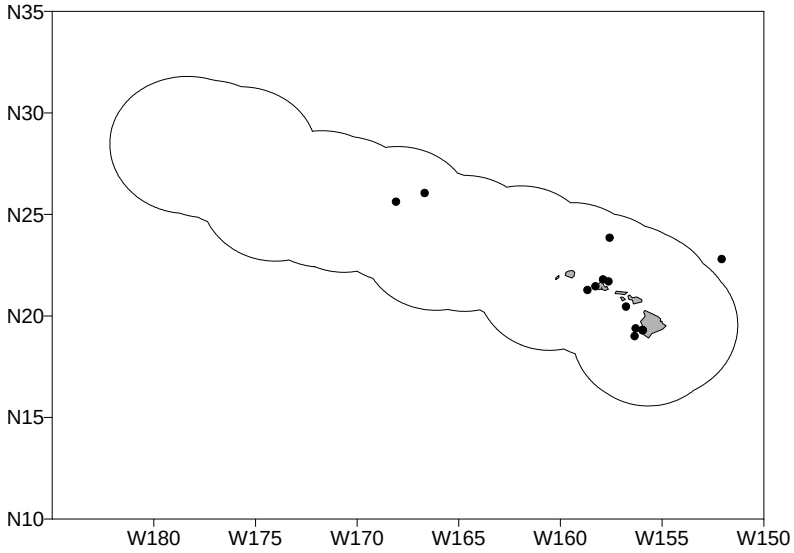

Figure 1. Pantropical spotted dolphin sighting locations during the 2002 shipboard survey of U.S. EEZ waters surrounding the Hawaiian Islands (Barlow 2006; see Appendix 2 for details on timing and location of survey effort). Outer line represents approximate boundary of survey area and U.S. EEZ.

Fishery interactions with pantropical spotted dolphins demonstrate that this species also occurs in U.S. EEZ waters around Palmyra Island, but it is not known whether these animals are part of the Hawaiian stock or a separate stock of pantropical spotted dolphins. Based on patterns of movement and population structure observed in other island-associated cetaceans (Norris and Dohl 1980; Norris et al.1994; Baird et al. 2008a, 2008b, 2009, Chivers et al 2007, McSweeney et al. 2007, 2009), the animals around Palmyra Island may represent a separate stock. Efforts are currently underway to obtain additional tissue samples of pantropical spotted dolphins for further studies of population structure in the North Pacific Ocean. Analysis of 177 genetic samples collected throughout the main Hawaiian Islands suggests that spotted dolphins are not mating randomly across the main Hawaiian Islands, and there is clustering of genotypes, into Hawaii, Oahu, and 4-islands area regions, suggesting that individual island-associated stocks may exist (Courbis et al., in prep.). Hawaiian spotted dolphins may be split into separate island-associated stocks pending the outcome of on-going genetic analysis of these samples. For the Marine Mammal Protection Act (MMPA) stock assessment reports, there is a single Pacific management 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 this stock is evaluated based on data from U.S. EEZ waters of the Hawaiian Islands (NMFS 2005). Spotted dolphins involved in eastern tropical Pacific tuna purse-seine fisheries are managed separately under the MMPA. Information on pantropical spotted dolphins around Palmyra Island will provisionally be included with this stock assessment report, recognizing that separate stock status may be warranted for these animals in the future. Estimates of abundance, potential biological removals, and status determinations will be presented separately for U.S. EEZ waters of the Hawaiian Islands and Palmyra Island.

POPULATION SIZE

Population estimates are available for Japanese waters (Miyashita 1993) and the eastern tropical Pacific

(Wade and Gerrodette 1993). A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance estimate of 8,978 (CV=0.48) pantropical spotted dolphins (Barlow 2006). This is currently the best available abundance estimate for pantropical spotted dolphins within the Hawaiian Islands EEZ.

No abundance estimates are currently available for pantropical spotted dolphins in U.S. EEZ waters of Palmyra Island; however, density estimates for pantropical spotted dolphins in other Pacific regions can provide a range of likely abundance estimates in this unsurveyed region. Published estimates of pantropical spotted dolphins (animals per km^2) in the Pacific are: 0.0040 (CV=0.48) for the U.S. EEZ of the Hawaiian Islands (Barlow 2006); 0.0407 (CV=0.45) for nearshore waters surrounding the main Hawaiian Islands (Mobley et al. 2000), 0.0678 (CV=0.15) and 0.1064 (CV=0.09) for the eastern tropical Pacific Ocean (Wade and Gerrodette 1993; Ferguson and Barlow 2003), and 0.0731 (CV=0.33) for the eastern tropical Pacific Ocean west of 120°W and north of 5°N (Ferguson and Barlow 2003). Applying the lowest and highest of these density estimates to U.S. EEZ waters surrounding Palmyra Island (area size = 352,821 km^2) yields a range of plausible abundance estimates of 1,414 - 37,525 pantropical spotted dolphins.

Minimum Population Estimate

The log-normal 20th percentile of the 2002 abundance estimate for the Hawaiian Islands EEZ (Barlow 2006) is 6,701 pantropical spotted dolphins. No minimum population estimate is currently available for waters surrounding Palmyra Island, but the pantropical spotted dolphin density estimates from other Pacific regions (Barlow 2006, Mobley et al. 2000, Wade and Gerrodette 1993, Ferguson and Barlow 2003; see above) can provide a range of likely values. The lognormal 20^{th} percentiles of plausible abundance estimates for the Palmyra Island EEZ, based on the densities observed elsewhere, range from 964 - 34,792 pantropical spotted 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.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for the Hawaiian pantropical spotted dolphin stock is calculated as the minimum population size within the U.S. EEZ of the Hawaiian Islands (6,701) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.50 (for a species of unknown status with no known fishery mortality within the U.S. EEZ of the Hawaiian Islands; Wade and Angliss 1997), resulting in a PBR of 61 pantropical spotted dolphins per year. No separate PBR can presently be calculated for pantropical spotted dolphins within the Palmyra Island EEZ, but based on the range of plausible minimum abundance estimates (964 - 34,792), a recovery factor of 0.50 (for a species of unknown status with no documented mortality and serious injury within the Palmyra Islands EEZ during the past five years; Wade and Angliss 1997), and the default growth rate (½ of 4%), the PBR would likely fall between 9.6 and 347 pantropical spotted dolphins per year.

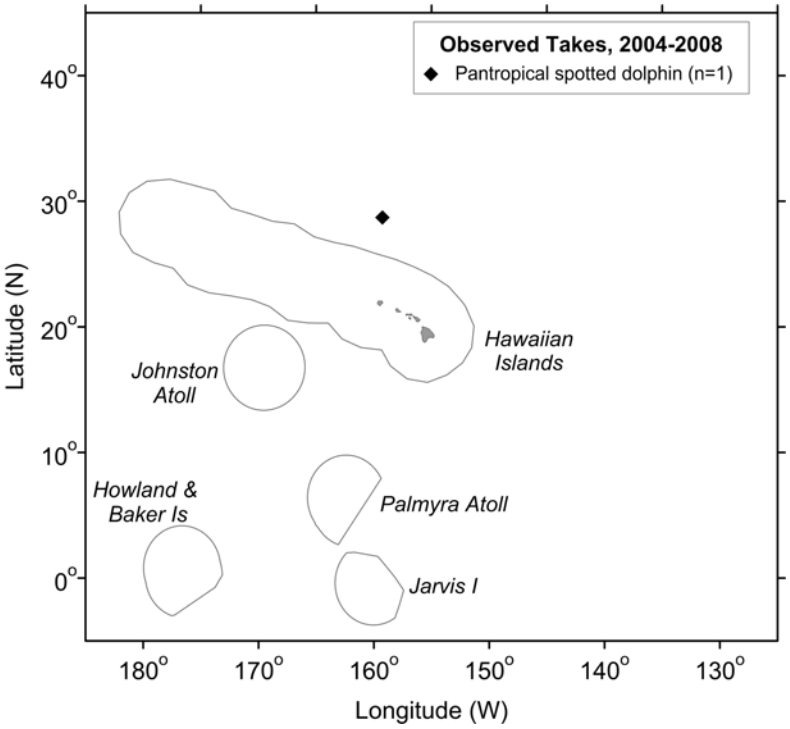

Figure 2. Locations of observed spotted dolphin takes (filled diamonds) in the Hawaii deep-set longline fishery, 2004-2008. Solid lines represent the U.S. EEZ. Set locations in this fishery are summarized in Appendix 1.

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 cetaceans (Perrin et al. 1994a). Interactions with cetaceans have been reported for all Hawaiian pelagic fisheries (Nitta and Henderson 1993). There are currently two distinct longline fisheries based in Hawaii: a deep-set longline (DSLL) fishery that targets primarily tunas, and a shallow-set longline fishery (SSLL) that targets swordfish. Both fisheries operate within U.S. waters and on the high seas. Between 2004 and 2008, no pantropical spotted dolphins were observed hooked or entangled in the SSLL fishery (100% observer coverage), and one pantropical spotted dolphin was observed incidentally killed in international waters in the DSLL fishery (20-28% observer coverage) (Forney 2009, McCracken 2009) (Figure 2). Average 5-yr estimates of annual mortality and serious injury for 2004-2008 are 0.5 (CV=0.7) spotted dolphins outside of U.S. EEZs, and none within the Hawaiian Islands EEZ (Table 1, McCracken & Forney 2010).

Commercial and recreational troll fisherman have been observed "fishing" dolphins off the island of Hawaii, including spotted dolphins, in order to catch tuna associated with the animals (Courbis et al. 2009, Rizzuto, 2007, Shallenberger 1981). Anecdotal reports from fisherman indicate that spotted dolphins are occasionally hooked (Rizzuto 1997) and photographs of dolphins suggest animals may be injured by both lines and propeller strikes (Barid unpublished data). 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). Fishermen claim interactions with dolphins that steal bait and catch are increasing. It is not known whether these interactions result in serious injury or mortality of dolphins, nor whether pantropical spotted dolphins are involved.

STATUS OF STOCK

The status of pantropical spotted 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. Given the absence of recent fishery-related mortality or serious injuries within U.S. EEZs, the Hawaiian stock of spotted dolphins is not considered strategic under the 1994 amendments to the MMPA, and the total fishery mortality and serious injury can be considered to be insignificant and approaching zero. However, the potential effect of injuries sustained by pantropical spotted dolphins in U.S. pelagic longline fisheries in international waters is not known, because no abundance estimates or international bycatch estimates are available.

Table 1. Summary of available information on incidental mortality and serious injury of pantropical spotted dolphins (Hawaiian stock) in commercial fisheries, within and outside of the U.S. EEZs (McCracken & Forney 2010). Mean annual takes are based on 2004-2008 data unless otherwise indicated.

				Observed and estimated mortality and serious injury of pantropical spotted dolphins, by EEZ region					
				Outside of U.S. EEZs			Hawaiian Islands EEZ		
Fishery Name	Year	Data Type	Percent Observer Coverage	Obs	Estimated (CV)	Mean Annual Takes (CV)	Obs	Estimated (CV)	Mean Annual Takes (CV)
Hawaii-based deep-set longline fishery	2004	observer data	25%	0	0 (-)	0.5 (0.7)	0	0 (-)	0 (-)
	2005		28%	0	0 (-)		0	0 (-)	
	2006		22%	0	0 (-)		0	0 (-)	
	2007		20%	0	0 (-)		0	0 (-)	
	2008		22%	1	2 (0.3)		0	0 (-)	
Hawaii-based shallow-set longline fishery	2004	observer data	100%	0	Same as observed	0	0	Same as observed	0
	2005		100%	0		0	0		
	2006		100%	0		0	0		
	2007		100%	0		0	0		
	2008		100%	0		0	0		
Minimum total annual takes within U.S. EEZ waters					0 (-)				

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