Revised 01/15/2011

SHORT-FINNED PILOT WHALE (*Globicephala macrorhynchus*): Hawaiian Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Short-finned pilot whales are found in all oceans, primarily in tropical and warm-temperate waters. They are commonly observed around the main Hawaiian Islands and are also present around the Northwestern Hawaiian Islands (Shallenberger 1981; Barlow 2006). During a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands, 25 sightings of short-finned pilot whales were made (Figure 1; Barlow 2006). Fourteen strandings of short-finned pilot whales have been documented from the main Hawaiian Islands, including five mass strandings (Tomich 1986; Nitta 1991; Maldini et al. 2005). Stock structure of short-finned pilot whales has not been adequately studied in the North Pacific, except in Japanese waters, where two forms have been identified based on pigmentation patterns and differences in the shape of the heads of adult males (Kasuya et al. 1988). The pilot whales in Hawaiian waters are similar morphologically to the Japanese "southern form." Preliminary photo-identification work with pilot whales in Hawaii indicated a high degree of site fidelity around the main island of Hawaii (Shane and McSweeney 1990) and around Kauai and Niihau (Baird et al. 2006).

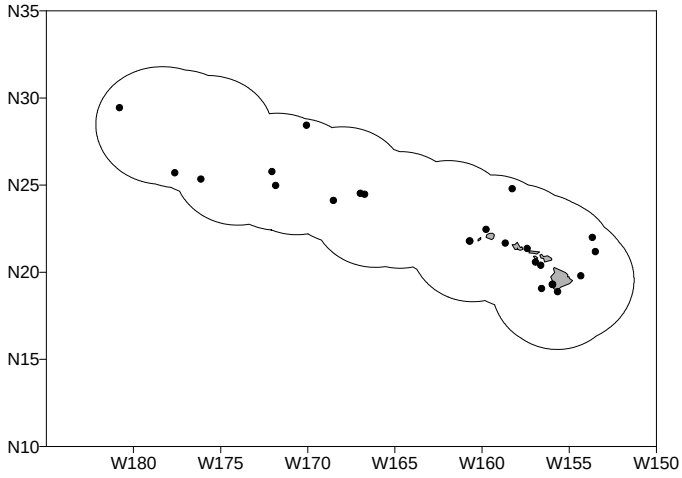

Figure 1. Short-finned pilot whale sighting locations during the 2002 shipboard survey of U.S. EEZ waters surrounding the Hawaiian Islands (Barlow 2006); see Appendix 2 for details on timing and location of survey effort). Outer line represents approximate boundary of survey area and U.S. EEZ.

Genetic analyses of tissue samples collected near the main Hawaiian Islands indicate that Hawaiian short-finned pilot whales are reproductively isolated from short-finned pilot whales found in the eastern Pacific Ocean (S. Chivers, NMFS/SWFSC, unpublished data); however, the offshore range of this Hawaiian population is unknown. Fishery interactions with short-finned pilot whales demonstrate that this species also occurs in U.S. EEZ waters of Palmyra Atoll and Johnston Atoll (Figure 2), but it is not known whether these animals are part of the Hawaiian stock or whether they represent separate stocks of short-finned pilot whales. 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), it is possible that the animals around Palmyra Atoll and Johnston Atoll are one or more separate stocks. Efforts are currently underway to obtain additional samples of short-finned pilot whales for further studies of population structure in the North Pacific Ocean. For the Marine Mammal Protection Act (MMPA) stock assessment reports, short-finned pilot whales within the Pacific U.S. EEZ are divided into two discrete, non-contiguous areas: 1) Hawaiian waters (this report), and 2) waters off California, Oregon and Washington. Information on short-finned pilot whales around Palmyra Atoll and Johnston Atoll 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. waters of the Hawaiian Islands, Palmyra Atoll, and Johnston Atoll. The Hawaii, Johnston, and Palmyra stocks each include animals found both within the Hawaiian Islands EEZ and in adjacent international waters; however, because data on abundance, distribution, and human-caused impacts are largely lacking for international waters, the status of each stock is evaluated based on data from U.S. EEZ waters (NMFS 2005).

POPULATION SIZE

Estimates of short-finned pilot whale populations have been made off Japan (Miyashita 1993) and in the eastern tropical Pacific (Wade and Gerrodette 1993), but it is not known whether any of 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 8,846 (CV=0.49) short-finned pilot whales (Barlow

2006). This is currently the best available abundance estimate for short-finned pilot whales within the Hawaiian Islands EEZ.

No abundance estimates are currently available for short-finned pilot whales in U.S. EEZ waters of Palmyra Atoll; however, density estimates for short-finned pilot whales in other Pacific regions can provide a range of likely abundance estimates in this unsurveyed region. Published estimates of short-finned pilot whale density (animals per km^2) in the Pacific are: 0.0040 (CV=0.38) for the U.S. EEZ of the Hawaiian Islands (Barlow 2006); 0.0237 (CV=0.32) for nearshore waters surrounding the main Hawaiian Islands (Mobley et al. 2000), 0.0084 (CV=0.14) and 0.0040 (CV=0.23) for the eastern tropical Pacific Ocean (Wade and Gerrodette 1993; Ferguson and Barlow 2003), and 0.0025 (CV=0.29) 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 Atoll (area size = 352,821 km^2) yields a range of plausible abundance estimates of 891-8,362 short-finned pilot whales. Similarly, there are no abundance estimates for short-finned pilot whales in U.S. EEZ waters of Johnston Atoll. Applying the lowest and highest of the above density estimates to U.S. EEZ waters surrounding Johnston Atoll (area size = 443,586 km^2) yields a range of plausible abundance estimates of 1,121-10,513 short-finned pilot whales.

Minimum Population Estimate

The log-normal 20th percentile of the 2002 abundance estimate for the Hawaiian Islands EEZ (Barlow 2006) is 5,986 short-finned pilot whales. No minimum population estimate is currently available for waters surrounding Palmyra Atoll or Johnston Atoll, but the short-finned pilot whale 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 Atoll EEZ, based on the densities observed elsewhere, range from 701 to 6,429 short-finned pilot whales. The lognormal 20th percentiles of plausible abundance estimates for the Johnston Atoll EEZ, based on the densities observed elsewhere, range from 882 to 8,083 short-finned pilot whales.

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 short-finned pilot whale stock is calculated as the minimum population size (5,986) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.40 (for a species 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 48 short-finned pilot whales per year. No separate PBR can presently be calculated for Palmyra Atoll waters, but based on the range of plausible minimum abundance estimates (701-6,429), a recovery factor of 0.50 (for a species of unknown status with no known fishery mortality and serious injury within the Palmyra Atoll EEZ; Wade and Angliss 1997), and the default growth rate (½ of 4%), the PBR would likely fall between 7.0 and 64 short-finned pilot whales per year. Similarly, based on the range of plausible minimum abundance estimates for Johnston Atoll (882-8,083), a recovery factor of 0.40 (for a species of unknown status with a fishery mortality and serious injury rate CV>0.80 within the Johnston Atoll EEZ; Wade and Angliss 1997), and the default growth rate (½ of 4%), the PBR would likely fall between 7.1 and 65 short-finned pilot whales 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 cetaceans (Perrin et al. 1994).

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 short-finned pilot whales were observed hooked or entangled in the SSLL fishery (100% observer coverage), and eight short-finned pilot whales were observed taken in the DSLL fishery (20-28% observer coverage) (Forney 2009, McCracken 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), two short-finned pilot whales taken in international waters were considered not seriously injured, and the remaining six (four in international waters, one in the Hawaiian Islands EEZ, and one in the EEZ of Johnston Atoll) were considered seriously injured (Forney 2009). Average 5-yr estimates of annual mortality and serious injury for 2004-2008 are 2.0 (CV = 0.5) short-finned pilot whales outside of U.S. EEZs, 0.7 (CV=1.4) within the Hawaiian Islands EEZ, and 0.5 (CV=0.8) within the Johnston Atoll EEZ (McCracken & Forney 2010). Eight additional unidentified cetaceans, which may have been short-finned-pilot whales, were also taken during 2004-2008. Six of these were taken in the DSLL fishery in Hawaiian Islands EEZ waters, one was taken in the DSLL fishery in international waters, and one was taken in the SSLL fishery in international waters (Figure 2). 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 short-finned pilot whales are involved.

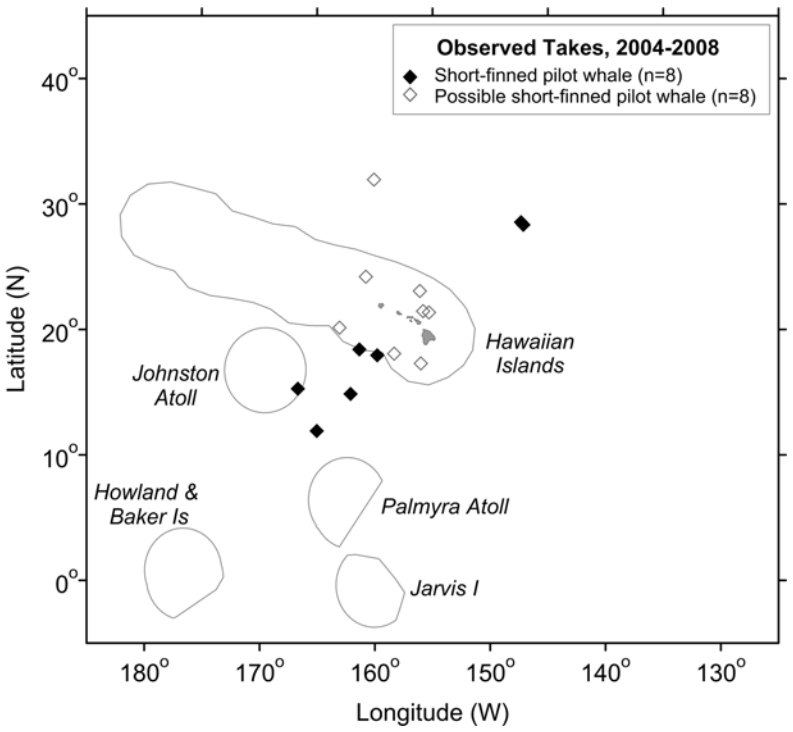

Figure 2. Locations of short-finned pilot whale takes (filled diamonds) and possible takes of this species (open diamonds) in Hawaii-based longline fisheries, 2004-2008 . Solid lines represent the U. S. EEZ. Fishery descriptions are provided in Appendix 1.

STATUS OF STOCK

The status of short-finned pilot whales 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 stock of short-finned pilot whales is not considered strategic under the 1994 amendments to the MMPA, because the estimated rate of mortality and serious injury within the Hawaiian Islands EEZ (0.7 animals per year) is less than the PBR (52). Although no estimates of abundance or PBR are currently available for short-finned pilot whales around Johnston Atoll, the estimated average rate of mortality and serious injury of short-finned pilot whales within the EEZ of Johnston Atoll (0.5 animals per year) is below the range of likely PBRs (7.1 to 65) for this region. There have been no serious injuries or mortality of short-finned pilot whales within the Palmyra Atoll EEZ. The potential effects of mortality and serious injuries of short-finned pilot whales in the Hawaii-based fishery in international waters is not known, because no abundance estimates or international bycatch estimates are available. Based on the available data, which indicate total fishery-related takes are less than 10% of PBR, the total fishery mortality and serious injury for short-finned pilot whales can be considered to be

insignificant and approaching zero.

Table 1. Summary of available information on incidental mortality and serious injury of short-finned pilot whales (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.

Fishery Name	Year	Data Type	Percent Observer Coverage	Observed and estimated mortality and serious injury of short-finned pilot whales, by EEZ region								
				Outside of U.S. EEZs			Hawaiian Islands EEZ			Johnston Atoll EEZ		
				Obs.	Estimated (CV)	Mean Annual Takes (CV)	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 (-)	2.0 (0.5)	0	0 (-)	0.7 (1.4)	1	3 (0.2)	0.5 (0.8)
	2005		28%	1	4 (0.4)		0	0 (-)		0	0 (-)	
	2006		22%	1	1 (2.1)		1	4 (0.7)		0	0 (-)	
	2007		20%	1	2 (1.5)		0	0 (-)		0	0 (-)	
	2008		22%	1	3 (0.8)		0	0 (-)		0	0 (-)	
Hawaii-based shallow-set longline fishery	2004	observer data	100%	0	Same as observed	0 (n/a)	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							1.2 (1.02)					

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