

SHORT-FINNED PILOT WHALE (*Globicephala macrorhynchus*): Hawaii 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, Baird et al. 2013, Bradford et al. 2013). Summer/fall shipboard surveys of the waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands resulted in 25 sightings in 2002 and 36 in 2010, including more encounters near shore within the Northwestern Hawaiian Islands (Figure 1; Barlow 2006, Bradford et al. 2013). Twenty-three strandings of short-finned pilot whales have been documented from the Hawaiian Islands since 1957, including five mass strandings in May and October of 1958 and 1959 (Tomich 1986; Nitta 1991; Maldini et al. 2005, NMFS-PIR Marine Mammal Response Network database). There have been four strandings since 2007. Two forms of short-finned pilot whales have been identified in Japanese waters 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." Phylogeographic analysis of short-finned pilot whale samples off Hawaii versus those in the eastern tropical Pacific and western Pacific suggest long-term isolation of those animals found in Hawaiian waters (Chivers et al. 2003).

Photo-identification and telemetry studies suggest there may be inshore and pelagic populations of short-finned pilot whales in Hawaiian waters. Resighting and social network analyses of individuals photographed off Hawaii Island suggest the occurrence of one large and several smaller social clusters that use those waters, with some individuals within the smaller social clusters commonly resighted off Hawaii Island (Mahaffy 2012). Further, two groups of 14 individuals have been seen at Hawaii and elsewhere in the main Hawaiian Islands, one off Oahu and the other off Kauai. Satellite telemetry data from over 60 individuals tagged throughout the main Hawaiian Islands also support the occurrence of at least two populations (Oleson et al. 2013). Genetic analyses are underway to evaluate differentiation between island-associated versus pelagic short-finned pilot whales. Oleson et al. (2013) suggested formal stock division would be more robust following conclusion of genetics analyses and updating of the social network with more recent sightings data.

Fishery interactions with short-finned pilot whales demonstrate that this species also occurs in U.S. EEZ waters of Palmyra Atoll and Johnston Atoll, but it is not known whether these animals are part of the Hawaii stock or whether they represent separate stocks of short-finned pilot whales. 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 areas: 1) Hawaiian waters (this report), and 2) waters off California, Oregon and Washington. The Hawaii stock includes animals found both within the Hawaiian Islands EEZ and in adjacent high seas waters. The status of the Hawaii stock is evaluated based on abundance, distribution, and human-caused impacts within the Hawaiian Islands EEZ, as such datasets are largely lacking for high seas waters (NMFS 2005).

POPULATION SIZE

A 2002 shipboard line-transect survey of the entire Hawaiian Islands EEZ resulted in an abundance

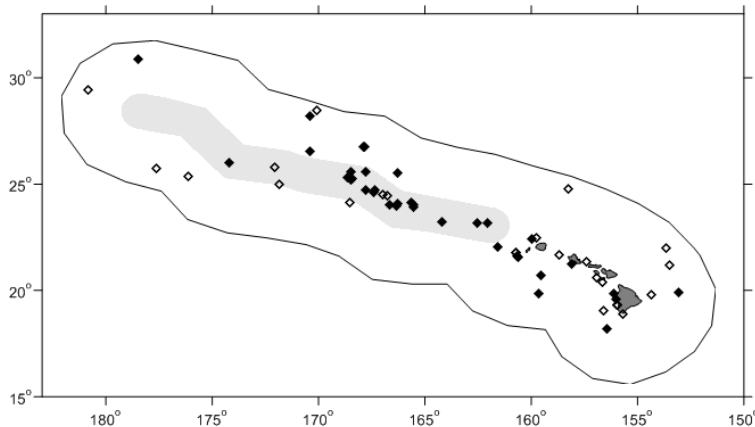


Figure 1. Short-finned pilot whale sighting locations during the 2002 (open diamonds) and 2010 (black diamonds) shipboard surveys of U.S. EEZ waters surrounding the Hawaiian Islands (Barlow 2006, Bradford et al. 2013); see Appendix 2 for details on timing and location of survey effort). Outer solid line represents approximate boundary of survey area and U.S. EEZ. Gray shading indicates area of Papahānaumokuākea Marine National Monument.

estimate of 8,846 (CV=0.49) short-finned pilot whales (Barlow 2006). The recent 2010 shipboard line-transect survey of the Hawaiian Islands EEZ resulted in an abundance estimate of 12,422 (CV = 0.43) short-finned pilot whales (Bradford et al. 2013). This is currently the best available abundance estimate for short-finned pilot whales within the Hawaiian Islands EEZ.

Minimum Population Estimate

The minimum population size is calculated as the lower 20th percentile of the log-normal distribution (Barlow et al. 1995) of the 2010 abundance estimate for the Hawaiian Islands EEZ or 8,782 short-finned pilot whales.

Current Population Trend

The broad and overlapping confidence intervals around the 2002 and 2010 estimates preclude assessment of trend with the available data.

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 Hawaii short-finned pilot whale stock is calculated as the minimum population estimate (8,782) 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 70 short-finned pilot whales.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

New Serious Injury Guidelines

NMFS updated its serious injury designation and reporting process, which uses guidance from previous serious injury workshops, expert opinion, and analysis of historic injury cases to develop new criteria for distinguishing serious from non-serious injury (Angliss and DeMaster 1998, Andersen *et al.* 2008, NMFS 2012). NMFS defines serious injury as an “*injury that is more likely than not to result in mortality*”. Injury determinations for stock assessments revised in 2013 or later incorporate the new serious injury guidelines, based on the most recent 5-year period for which data are available.

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. Entanglement in gillnets and hooking or entanglement in various hook and line fisheries have been reported for small cetaceans in Hawaii (Nitta & Henderson, 1993). No estimates of human-caused mortality or serious injury are currently available for nearshore hook and line or gillnet fisheries because these

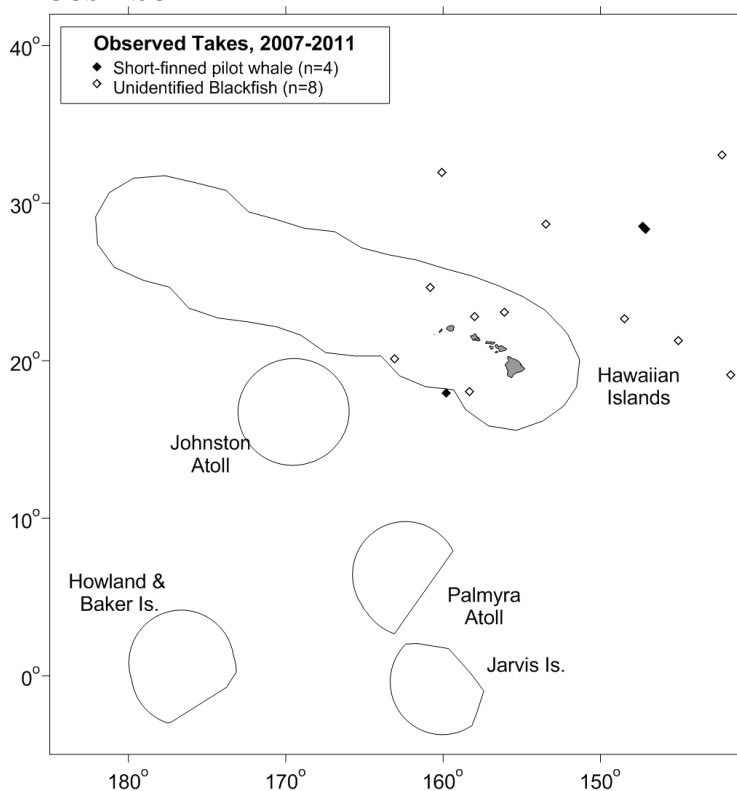


Figure 2. Locations of short-finned pilot whale takes (filled diamonds) and possible takes of this species (open diamonds) in Hawaii-based longline fisheries, 2007-2011. Some take locations overlap. Solid lines represent the U. S. EEZ. Fishery descriptions are provided in Appendix 1.

fisheries are not observed or monitored for protected species bycatch.

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, but are prohibited from operating within the Papahānaumokuākea Marine National Monument, a region that extends 50 nmi from shore around the Northwestern Hawaiian Islands, and within the Longline Exclusion Area, a region extending 25-75 nmi from shore around the main Hawaiian Islands. Between 2007 and 2011, no short-finned pilot whales were observed hooked or entangled in the SSL fishery (100% observer coverage), and four short-finned pilot whales were observed taken in the DSL fishery (20-22% observer coverage) (Bradford & Forney 2013, McCracken 2013), all in high-seas waters. 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 (NMFS 2012), two short-finned pilot whales were considered not seriously injured, and the other two were considered seriously injured (Bradford & Forney 2013). Seven additional unidentified “blackfish” (unidentified cetaceans known to be either false killer whales or short-finned pilot whales) that may have been pilot whales were also seriously injured during 2007-2011 (Bradford & Forney 2013). Additionally, one

Table 1. Summary of available information on incidental mortality and serious injury of short-finned pilot whales (Hawaii stock) and including those presumed to be short-finned pilot whales based on assignment of unidentified blackfish to this species in commercial longline fisheries, within and outside of the U.S. EEZs (McCracken 2013). Mean annual takes are based on 2007-2011 data unless otherwise indicated. Information on all observed takes (T) and combined mortality events & serious injuries (MSI) is included. Total takes were prorated to deaths, serious injuries, and non-serious injuries based on the observed proportions of each outcome. Unidentified blackfish are prorated as either false killer whales or short-finned pilot whales according to their distance from shore (McCracken 2010). CVs are estimated based on the combination of annual short-finned pilot whale and blackfish variances and do not yet incorporate additional uncertainty introduced by prorating the unidentified blackfish.

Fishery Name	Year	Data Type	Percent Observer Coverage	Observed total interactions (T) and mortality events, and serious injuries (MSI), and total estimated mortality and serious injury (M&SI) of short-finned pilot whales (GM)			
				Outside U.S. EEZs		Hawaiian EEZ	
				Obs. GM T/MSI	Estimated M&SI (CV)	Obs. GM T/MSI	Estimated M&SI (CV)
				Obs. UB T/MSI		Obs. UB T/MSI	
Hawaii-based deep-set longline fishery	2007	Observer data	20%	1/1 0	2 (2.4)	0 0	0 (-)
	2008		22%	3/1 0	2 (1.6)	0 3/3	0 (0.5)
	2009		21%	0 0	0 (-)	0 0	0 (-)
	2010		21%	0 0	0 (-)	0 1/1	0 (1.2)
	2011		20%	0 1/0	0 (1.1)	0 1/1	0 (0.9)
	Mean Estimated Annual Take (CV)					1.0 (2.1)	
Hawaii-based shallow-set longline fishery	2007	Observer data	100%	0 0	0	0 0	0
	2008		100%	0 1/1	0	0 0	0
	2009		100%	0 0	0	0 0	0
	2010		100%	0 0	0	0 0	0
	2011		100%	0 1/1	0	0 0	0
	Mean Annual Takes (100% coverage)					0.1	
Minimum total annual takes within U.S. EEZ							0.1 (7.2)

unidentified blackfish was taken on the high seas in the deep set longline fishery in 2011, but was not seriously injured (Table 1). Five of the seven serious injuries were taken in the DSLL fishery within U.S. EEZ waters and the remaining two serious injuries were taken the SSLL fishery on the high seas (Table 1 and Figure 3). Unidentified blackfish are prorated to each stock based on distance from shore (McCracken 2010). The distance-from-shore model was chosen following consultation with the Pacific Scientific Review Group, based on the model's performance and simplicity relative to a number of other more complicated models with similar output (McCracken 2010). Proration of unidentified blackfish takes introduces unquantified uncertainty into the bycatch estimates, but until all animals taken can be identified to species (e.g., photos, tissue samples), this approach ensures that potential impacts to all stocks are assessed. Average 5-yr estimates of annual mortality and serious injury for 2007-2011 are 0.7 (CV = 2.1) short-finned pilot whales outside of U.S. EEZs and 0.1 (CV = 7.2) within the Hawaiian Islands EEZ. Although M&SI estimates are shown as whole numbers of animals, the 5-yr average M&SI is calculated based on the unrounded annual estimates. Eight unidentified cetaceans were taken in the DSLL fishery, and two unidentified cetaceans were taken in the SSLL fishery, some of which may have been short-finned pilot whales.

STATUS OF STOCK

The Hawaii stock of short-finned pilot whales is not considered strategic under the 1994 amendments to the MMPA. 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 stock. Short-finned pilot whales are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor designated as "depleted" under the MMPA. The estimated rate of mortality and serious injury within the Hawaiian Islands EEZ (0.1 animals per year) is less than the PBR (70). 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.

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