

PYGMY KILLER WHALE (*Feresa attenuata*): Hawaii Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Pygmy killer whales are found in tropical and subtropical waters throughout the world (Ross and Leatherwood 1994). They are poorly known in most parts of their range. Small numbers have been taken directly and incidentally in both the western and eastern Pacific. Most knowledge of this species is from stranded or live-captured specimens. Pryor et al. (1965) stated that pygmy killer whales have been observed several times off the lee shore of Oahu, and that "they seem to be regular residents of the Hawaiian area." More recently, pygmy killer whales have also been seen off the islands of Niihau and Lanai (McSweeney et al. 2009). Summer/fall shipboard surveys of the waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands, resulted in three sightings of pygmy killer whales in 2002 and five in 2010 (Figure 1; Barlow 2006, Bradford et al 2017).

Pygmy killer whales in Hawaiian waters may comprise more than one demographically-independent population.. A

22-year study off the Hawaii Island indicates that pygmy killer whales occur there year-round and in stable social groups. Over 80% of pygmy killer whales seen off Hawaii Island have been resighted and 92% have been linked into a single social network (McSweeney et al. 2009). Movements have also been documented between Hawaii Island and Oahu and between Oahu and Lanai (Baird et al. 2011a). Satellite telemetry data from four tagged pygmy killer whales suggest this resident group remains within 20km of shore (Baird et al 2011.a,b). Encounter rates for pygmy killer whales during near shore surveys are rare, representing less only 1.7% of all cetacean encounters to since 2000 (Baird et al. 2013). Division of this population into a separate island-associated stock may be warranted in the future.

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 high seas waters. Because data on abundance, distribution, and human-caused impacts are largely lacking for high seas waters, the status of this stock is evaluated based on data from U.S. EEZ waters of the Hawaiian Islands (NMFS 2005).

POPULATION SIZE

Encounter data from a 2010 shipboard line-transect survey of the entire Hawaiian Islands EEZ was recently evaluated using Beaufort sea-state-specific trackline detection probabilities for pygmy killer whales, resulting in an abundance estimate of 10,640 (CV = 0.53) pygmy killer whales (Bradford et al. 2017) in the Hawaii stock. A 2002 shipboard line-transect survey of the same area resulted in an abundance estimate of 956 (CV=0.83) pygmy killer whales (Barlow 2006). Species abundances estimated from the 2002 HICEAS survey used pooled small dolphin, large dolphin, and large whale $g(0)$ (the probability of sighting and recording an animal directly on the track line) estimates stratified by group size (Barlow 1995). Since then, Barlow (2015) developed a more robust method for estimating species-specific $g(0)$ values that are adjusted for the Beaufort sea states that are encountered during a survey. This new method was used for analyzing the data from the 2010 survey, but has not yet been used to analyze the 2002 data. A population estimate has been made for this species 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

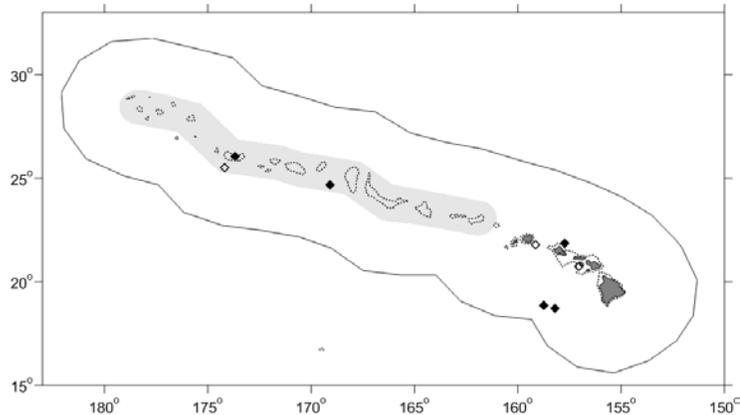


Figure 1. Pygmy killer whale sighting locations during the 2002 (open diamonds) and 2010 (black diamonds) shipboard surveys of U.S. EEZ waters surrounding the Hawaiian Islands (Barlow 2006, Bradford et al. 2017; see Appendix 2 for details on timing and location of survey effort). Outer line represents approximate boundary of survey area and U.S. EEZ. Gray shading indicates area of Papahānaumokuākea Marine National Monument. Dotted line represents the 1000 m isobath.

around the Hawaiian Islands.

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 or 6,998 pygmy killer whales within the Hawaiian EEZ.

Current Population Trend

Abundance analyses of the 2002 and 2010 datasets used different $g(0)$ values. The 2002 survey data have not been reanalyzed using this method. This change precludes evaluation of population trends at this time. Assessment of population trend will likely require additional survey data and reanalysis of all datasets using comparable methods.

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 pygmy killer whales stock is calculated as the minimum population estimate for the U.S. EEZ of the Hawaiian Islands (6,998) times one half the default maximum net growth rate for cetaceans ($\frac{1}{2}$ of 4%) times a recovery factor of 0.4 (for a stock of unknown status with Hawaiian Islands EEZ fishery mortality and serious injury rate CV greater than 0.80; Wade and Angliss 1997), resulting in a PBR of 56 pygmy killer whales per year.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Information on fishery-related mortality and serious injury of cetaceans in Hawaiian waters is limited, but the gear types used in Hawaii 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). A stranded pygmy killer whale from Oahu showed signs of hooking injury (Schofield 2007) and mouthline injuries have also been noted in some individuals (Baird unpublished data), though it is not known if these interactions result in serious injury or mortality. No estimates of human-caused mortality or serious injury are currently available for nearshore hook and line or gillnet fisheries because these 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 (SSL) fishery that targets swordfish. Both fisheries operate within U.S. waters and on the high seas. Between 2011 and 2015, no pygmy killer whales were observed hooked or entangled in the SSL fishery (100% observer coverage), and one pygmy killer whale was observed dead inside of the Hawaiian EEZ in the DSL fishery (20-21% observer coverage) (Bradford 2017, Bradford and Forney 2017, McCracken 2017). Average 5-yr estimates of annual mortality and serious injury for pygmy killer whales during 2011-2015 are 1.1 (CV = 1.1) pygmy killer whales within the Hawaiian Islands EEZ and 0 outside of U.S. EEZs

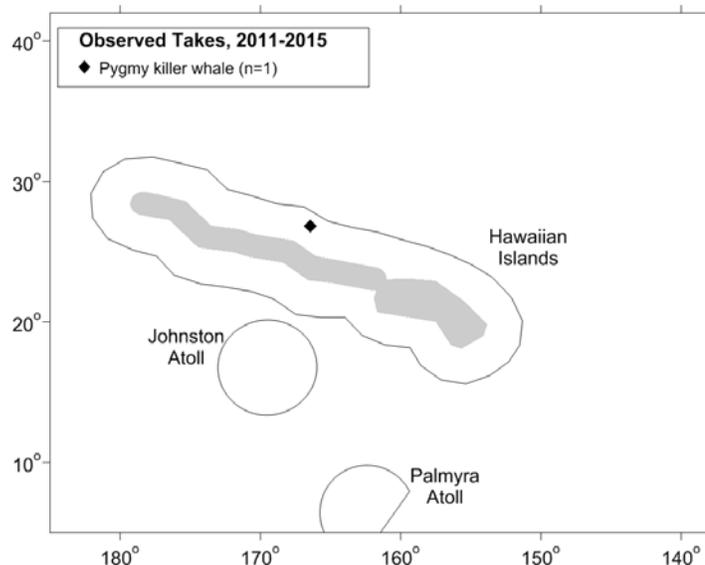


Figure 3. Location of an observed pygmy killer whale take (filled diamond) in the Hawaii-based longline fishery, 2011-2015. Solid lines represent the U. S. EEZ. Gray shading notes areas closed to longline fishing. Fishery descriptions are provided in Appendix 1.

(Table 1, McCracken 2017). In addition, four unidentified cetaceans were taken in the DSLL fishery, and one unidentified cetacean was taken in the SSSL fishery, some of which may have been pygmy killer whales.

Table 1. Summary of available information on incidental mortality and serious injury of pygmy killer whales in commercial longline fisheries, within and outside of the U.S. EEZs (McCracken 2017). Mean annual takes are based on 2011-2015 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.

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 pygmy killer whales			
				Outside U.S. EEZs		Hawaiian EEZ	
				Obs. T/MSI	Estimated M&SI (CV)	Obs. T/MSI	Estimated M&SI (CV)
Hawaii-based deep-set longline fishery	2011	Observer data	20%	0	0 (-)	0	0 (-)
	2012		20%	0	0 (-)	0	0 (-)
	2013		20%	0	0 (-)	1/1	5 (0.9)
	2014		21%	0	0 (-)	0	0 (-)
	2015		21%	0	0 (-)	0	0 (-)
Mean Estimated Annual Take (CV)					0 (-)		1.1 (1.1)
Hawaii-based shallow-set longline fishery	2011	Observer data	100%	3/3	0	0	0
	2012		100%	4/4	0	0	0
	2013		100%	3/2	0	0	0
	2014		100%	7/6	0	0	0
	2015		100%	4/3	0	0	0
Mean Annual Takes (100% coverage)					0		0
Minimum total annual takes within U.S. EEZ							1.1 (1.1)

Other Mortality

In recent years, there has been increasing concern that loud underwater sounds, such as active sonar and seismic operations, may be harmful to beaked whales (Cox et al. 2006) and other cetaceans, including melon-headed whales (Southall et al. 2006, 2013, Brownell et al. 2009) and pygmy killer whales (Wang and Yang 2006). The use of active sonar from military vessels has been implicated in mass strandings of beaked whales, and recent mass-stranding reports suggest some delphinids may be impacted as well. Two mass-strandings of pygmy killer whales occurred in the coastal areas of southwest Taiwan in February 2005, possibly associated with offshore naval training exercises (Wang and Yang 2006). A necropsy of one of the pygmy killer whales revealed hemorrhaging in the cranial tissues of the animal. Additional research on the behavioral response of delphinids in the presence of sonar transmissions is needed in order to understand the level of impact. No estimates of potential mortality or serious injury are available for U.S. waters.

STATUS OF STOCK

The Hawaii stock of pygmy killer whales is not considered strategic under the 1994 amendments to the MMPA. The status of pygmy killer whales in Hawaiian waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. Pygmy killer 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 fisheries related mortality or serious injury within the Hawaiian Islands EEZ (1.1 animals per year) is less than the PBR (56). The total fishery mortality and serious injury can be considered to be insignificant and approaching zero because mortality and serious injury is less than 10% of PBR. One pygmy killer whale stranded in the MHI has tested positive for *Morbillivirus* (Jacob et al. 2016). The presence of *morbillivirus* in 10 species of cetacean in Hawaiian waters, all identified as a unique strain of *morbillivirus*, (Jacob et al. 2016), raises concerns about the history and prevalence of this disease in Hawaii and the potential population impacts, including cumulative impacts of disease with other stressors.

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