

FALSE KILLER WHALE (*Pseudorca crassidens*): Pacific Islands Region Stock Complex - Hawaii Insular, Hawaii Pelagic, and Palmyra Atoll Stocks

STOCK DEFINITIONS AND GEOGRAPHIC RANGES

False killer whales are found worldwide mainly in tropical and warm-temperate waters (Stacey et al. 1994). In the North Pacific, this species is well known from southern Japan, Hawaii, and the eastern tropical Pacific. There are six stranding records from Hawaiian waters (Nitta 1991; Maldini 2005). One on-effort sighting of false killer whales was made during a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands (Figure 1; Barlow 2006). Smaller-scale surveys conducted around the Main Hawaiian Islands (Figure 2) show that false killer whales are also commonly encountered in nearshore waters (Baird et al. 2005, Mobley et al. 2000, Mobley 2001, 2002, 2003, 2004). This species also occurs in U.S. EEZ waters around Palmyra Atoll (Figure 1) and sightings of false killer whales have been recently confirmed within the Johnston Atoll EEZ (NMFS/PIR/PSD unpublished data) and the U.S. EEZ waters of American Samoa (Johnston et al. in Press).

Genetic analyses of tissue samples collected within the Eastern North Pacific (ENP) indicate restricted gene flow between false killer whales sampled near the main Hawaiian Islands and false killer whales sampled in all other regions of the ENP (Chivers et al. 2007). Since 2003, observers of the Hawaii-based longline fishery have also been collecting tissue samples of caught cetaceans for genetic analysis whenever possible. Four false killer whale samples, two collected outside the Hawaiian EEZ and two collected more than 100 nautical miles from the main Hawaiian Islands (See Figure 3) were determined to have ENP-like haplotypes. This indicates that false killer whales within the Hawaiian EEZ belong to two different genetic populations, with a boundary somewhere within the Hawaiian EEZ. Based on sighting locations and genetic analyses of tissue samples (Chivers et al. 2008), this stock assessment report applies a stock boundary corresponding to the 25-75 nmi longline exclusion zone around the main Hawaiian Islands, to recognize the insular false killer whale population as a separate stock for management. This boundary may be revised in the future as additional information becomes available.

Comparisons amongst false killer whales sampled at Palmyra Atoll and those sampled in the waters of the pelagic ENP, Panama and Mexico also reveal some level of restricted gene flow, although the sample size remains low for robust comparisons (Chivers et

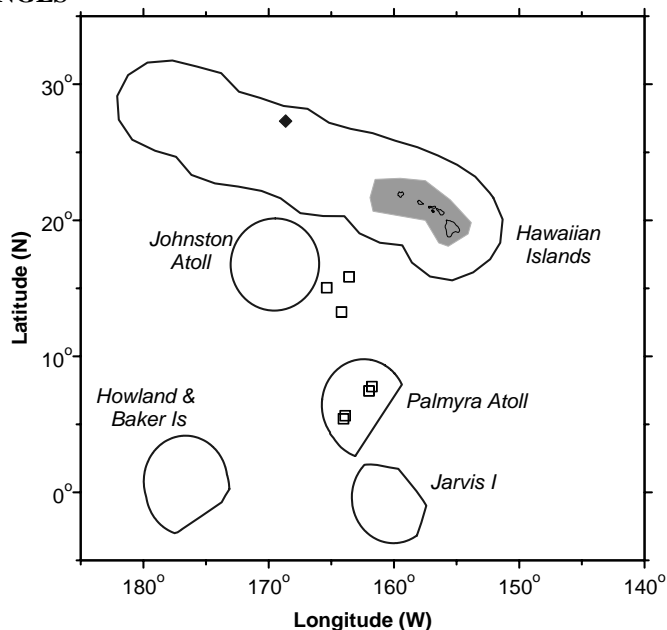


Figure 1. False killer whale sighting locations during standardized shipboard surveys of the Hawaiian U.S. EEZ (2002, black diamond, Barlow 2006), the Palmyra U.S. EEZ and pelagic waters of the central Pacific south of the Hawaiian Islands (2005, open squares, Barlow and Rankin 2007). Outer lines represent approximate boundary of U.S. EEZs; shaded gray area is the 25-75nmi longline exclusion zone around the Main Hawaiian Islands, proposed as a

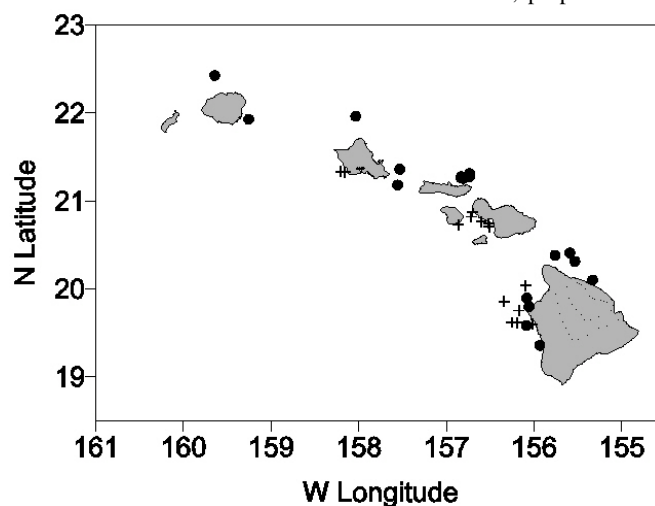


Figure 2. False killer whale sighting locations during 2000-2004 boat-based surveys (+) (Baird et al. 2005) and 1993-2003 aerial surveys (•) (Mobley et al. 2000, Mobley 2001, 2002, 2003, 2004) around the Main Hawaiian Islands. See Appendix 2 for details on timing and location of survey effort.

al. 2007). Efforts are currently underway to obtain and analyze additional tissue samples of false killer whales for further studies of population structure in the North Pacific Ocean.

For the Marine Mammal Protection Act (MMPA) stock assessment reports, there are currently three Pacific Islands Region management stocks (Chivers et al. 2008): 1) the Hawaii Insular Stock, which includes animals inhabiting waters within the 25-75 nmi longline exclusion zone around the main Hawaiian Islands, and 2) the Hawaii Pelagic Stock, which includes false killer whales inhabiting the waters of the U.S. EEZ of Hawaii outside of the 25-75 nmi longline exclusion zone around the main Hawaiian Islands and 3) the Palmyra Stock, which includes false killer whales found within the U.S. EEZ of Palmyra Atoll. Estimates of abundance, potential biological removal, and status determinations for these three stocks are presented separately below.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Interactions with cetaceans have been reported for Hawaiian pelagic fisheries, and false killer whales have been identified in fishermen's logs and NMFS observer records as taking catches from pelagic longlines (Nitta and Henderson 1993, NMFS/PIR unpublished data). They have also been observed feeding on mahi mahi, *Coryphaena hippurus*, and yellowfin tuna, *Thunnus albacares*, and they have been reported to take large fish (up to 70 pounds) from the trolling lines of both commercial and recreational fishermen (Shallenberger 1981).

Between 1994 and 2006, 24 false killer whales were observed hooked or entangled in the Hawaii-based longline fisheries, with approximately 4-34% of all effort observed (Forney and Kobayashi 2007, Forney and McCracken 2008). Fifteen additional unidentified cetaceans, which may have been false killer whales based on the observer's descriptions, were also taken (hooked or entangled) in this fishery, but were not included in this analysis (Figure 3; Forney and Kobayashi 2007, Forney and McCracken 2008). During 28,542 observed sets, the average interaction rate of false killer whales was 0.83 false killer whales per 1,000 sets. Two of the false killer whales were killed, two were considered not seriously injured, and all others caught were considered seriously injured, based on an evaluation of the observer's description of the interaction (Forney and Kobayashi, 2007, Forney and McCracken 2008) and following established guidelines for assessing serious injury in marine mammals (Angliss and DeMaster 1998). Average 5-yr estimates of annual mortality and serious injury for 2002-2006 are 7.6 (CV = 0.43) false killer whales outside of U.S. EEZs, 5.7 (CV = 0.64) within the Hawaiian Islands EEZ, and 1.2 (CV = 0.67) within the EEZ of Palmyra Atoll (Table 1). Total estimated annual mortality and serious injury for all U.S. EEZs combined averaged 7.0 (CV = 0.54) between 2002 and 2006. Since 2001, the Hawaii-based longline fishery has undergone a series of regulatory changes, primarily to protect sea turtles (NMFS 2001). Potential impacts of these regulatory changes on the rate of false killer whale interactions are unknown.

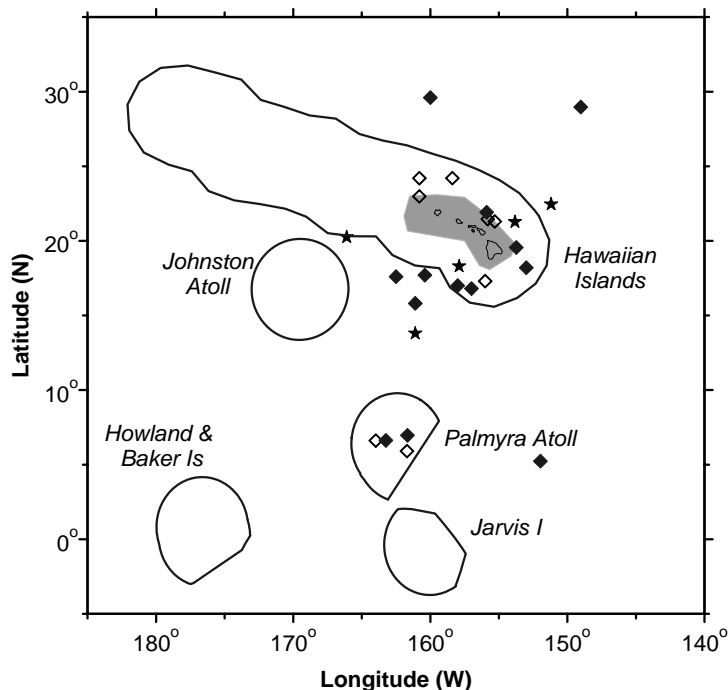


Figure 3. Locations of observed false killer whale takes (filled symbols) and possible takes of this species (open symbols) in the Hawaii-based longline fishery, 2002-2006. Stars are locations of genetic samples from fishery-caught false killer whales. Solid lines represent the U.S. EEZ; shaded gray area is the 75nmi boundary around the Main Hawaiian Islands. Set locations in this fishery are summarized in Appendix 1.

Table 1. Summary of available information on incidental mortality and serious injury of false killer whales (Pacific Islands Stock Complex) in commercial fisheries, within and outside of selected U.S. EEZs (Forney and McCracken 2008). Mean annual takes are based on 2002-2006 data unless otherwise indicated.

Fishery Name	Year	Data Type	Percent Observer Coverage	Observed and estimated mortality and serious injury of false killer whales, by EEZ region								
				Outside of U.S. EEZs			Hawaiian Islands EEZ ¹			Palmyra 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 longline fisheries²	2002	observer data	24.8%	3	14 (0.40)		0	0 (-)		2	6 (0.43)	
	2003		21.9%	0	0 (-)		2	7 (0.83)		0	0 (-)	
	2004		25.4%	3	14 (0.43)	7.6	3	12 (0.46)	5.7	0	0 (-)	1.2
	2005		34.2%	1	3 (2.76)	(0.43)	1	3 (3.16)	(0.64)	0	0 (-)	(0.67)
	2006		25.5%	1	7 (1.42)		1	7 (1.84)		0	0 (-)	
Minimum total annual takes within U.S. EEZ waters						7.0 (0.54)						

¹ All false killer whales taken within the Hawaiian EEZ were obtained >75 nmi from the Main Hawaiian Islands, and genetic analyses for the two available samples indicated these animals were part of the Hawaii Pelagic Stock. Furthermore the longline fishery is, for the most part, prohibited from operating within about 75 nmi of the Main Hawaiian Islands. Therefore, all Hawaiian Islands EEZ takes of false killer whales are considered to be from the Hawaii Pelagic Stock.

² The Hawaii-based longline fisheries include a shallow-set fishery (with 100% observer coverage since 2004) and a deep-set fishery (with about 20% observer coverage). No false killer whales were observed killed or injured in the shallow-set fishery during 2002-2006.

HAWAII INSULAR STOCK

POPULATION SIZE

A recent mark-recapture study of photo-identification data obtained during 2000-2004 around the main Hawaiian Islands produced an estimate of 123 (CV=0.72) false killer whales (Baird et al. 2005). This updates an estimate of 121 (CV=0.47) made by Mobley et al. (2000) based on 1994-1998 aerial surveys. Both estimates apply only to Hawaii Insular Stock because surveys were conducted within 75 nmi of the Main Hawaiian Islands.

Minimum Population Estimate

The minimum population estimate for the Hawaii Insular stock false killer whales is the number of distinct individuals identified in this population during the 2002-2004 photo-identification studies, 76 individuals (Baird et al. 2005). This is similar to the log-normal 20th percentile of the mark-recapture abundance estimate, 71 false killer 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 for this species in Hawaiian waters.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for the insular Hawaii false killer whale stock is calculated as the minimum population size (76) 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 documented human-caused mortality and serious injury; see Wade and Angliss 1997), resulting in a PBR of 0.8 false killer whales per year.

STATUS OF STOCK

The status of false killer whales in insular Hawaiian waters (within 75 nmi) 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, although a high incidence of fin disfigurements in this stock (Baird and Gorgone 2005) indicate that interactions with fisheries may be of concern. They are not listed as “threatened” or “endangered” under the Endangered Species Act (1973), nor as “depleted” under the MMPA. This stock is not considered “strategic” under the 1994 amendments to the MMPA because there has been no documented human-caused mortality or serious injury of false killer whales belonging to the Hawaii Insular Stock.

HAWAII PELAGIC STOCK

POPULATION SIZE

Analyses of a 2002 shipboard line-transect survey of the Hawaiian Islands EEZ (HICEAS survey) resulted in an abundance estimate of 236 (CV=1.13) false killer whales (Barlow 2006) outside of 75 nm of the Main Hawaiian Islands. A recent re-analysis of the HICEAS data using improved methods and incorporating additional sighting information obtained on line-transect surveys south of the Hawaiian EEZ during 2005, resulted in a revised estimate of 484 (CV = 0.93) false killer whales within the Hawaiian Islands EEZ outside of 75 nmi of the Main Hawaiian Islands (Barlow & Rankin 2007). This is the best available abundance estimate for the Hawaii Pelagic Stock of false killer whales.

Minimum Population Estimate

The log-normal 20th percentile of the 2002 abundance estimate for the Hawaiian Islands EEZ outside of 75 nmi from the Main Hawaiian Islands (Barlow & Rankin 2007) is 249 false killer 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 for this species in Hawaiian waters.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for the Hawaii Pelagic Stock of false killer whale is calculated as the minimum population size (249) 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 mortality and serious injury rate CV >0.60 ; Wade and Angliss 1997), resulting in a PBR of 2.2 false killer whales per year.

STATUS OF STOCK

The status of the Hawaii Pelagic Stock of false killer whale 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. They are not listed as “threatened” or “endangered” under the Endangered Species Act (1973), nor as “depleted” under the MMPA. Because the rate of mortality and serious injury to false killer whales within the Hawaiian Islands EEZ and outside of 75 nmi in the Hawaii-based longline fishery (5.7 animals per year) exceeds the PBR (2.2), this stock is considered a “strategic stock” under the 1994 amendments to the MMPA. The total fishery mortality and serious injury for Hawaiian false killer whales cannot be considered to be insignificant and approaching zero, because it exceeds the PBR. Furthermore, additional injury and mortality of false killer whales is known to occur in U.S and international longline fishing operations in international waters, and the potential effect on the Hawaii Pelagic Stock stock is unknown.

PALMYRA STOCK

POPULATION SIZE

Recent line transect surveys in the U.S. EEZ waters of Palmyra Atoll produced an estimate of 1,329 (CV = 0.65) false killer whales (Barlow & Rankin 2007). This is the best available abundance estimate for false killer whales within the Palmyra Atoll EEZ.

Minimum Population Estimate

The log-normal 20th percentile of the 2002 abundance estimate for the Palmyra Atoll EEZ (Barlow & Rankin 2007) is 806 false killer 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 for this species in Palmyra Atoll waters.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for the Palmyra Atoll false killer whale stock is calculated as the minimum population size (806) times one half the default maximum net growth rate for cetaceans ($\frac{1}{2}$ of 4%) times a recovery factor of 0.45 (for a stock of unknown status with a mortality and serious injury rate $CV > 0.60$; Wade and Angliss 1997), resulting in a PBR of 7.2 false killer whales per year.

STATUS OF STOCK

The status of false killer whales in Palmyra Atoll EEZ 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. They are not listed as “threatened” or “endangered” under the Endangered Species Act (1973), nor as “depleted” under the MMPA. The rate of mortality and serious injury to false killer whales within the Palmyra Atoll EEZ in the Hawaii-based longline fishery (1.2 animals per year) does not exceed the PBR (7.2) for this stock and thus, this stock is not considered “strategic” under the 1994 amendments to the MMPA. The total fishery mortality and serious injury for Palmyra Atoll false killer whales is greater than 10% of the PBR and, therefore, cannot be considered to be insignificant and approaching zero. Additional injury and mortality of false killer whales is known to occur in U.S and international longline fishing operations in international waters, and the potential effect on the Palmyra stock is unknown.

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