FALSE KILLER WHALE (*Pseudorca crassidens*): Hawaiian Islands Stock Complex – Main Hawaiian Islands Insular, Northwestern Hawaiian Islands, and Hawaii Pelagic Stocks

STOCK DEFINITION AND GEOGRAPHIC RANGE

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 et al. 2005). One on-effort sighting of false killer whales was made during a 2002 shipboard survey, and six during a 2010 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands (Figure 1; Barlow 2006, Bradford et al. 2012). Smaller-scale surveys conducted around the main Hawaiian Islands (Figure 2) show that false killer whales are also encountered in nearshore waters (Baird et al. 2005, Mobley et al. 2000), and a single on-effort and three off-effort sightings during a 2010 shipboard survey reveal that the species also occurs near shore in the Northwestern Hawaiian Islands (Baird et al. 2012). This species also occurs in U.S. EEZ waters around Palmyra and Johnston Atolls (NMFS/PIR/PSD unpublished data), and American Samoa (Johnston et al. 2008, Oleson 2009).

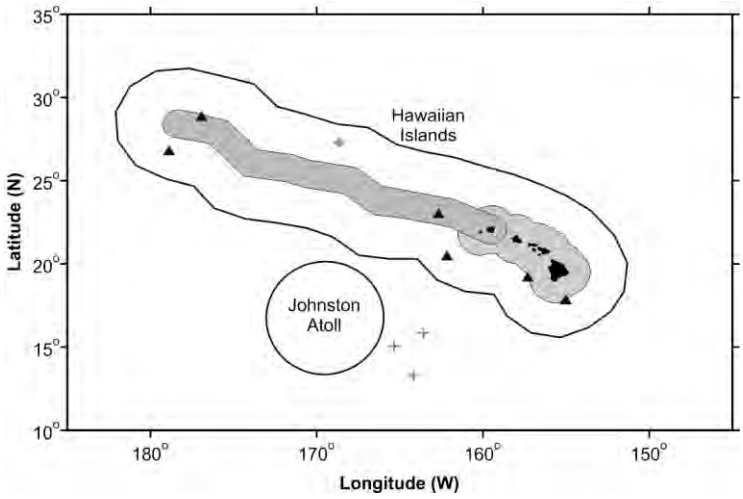

Figure 1. False killer whale on-effort sighting locations during standardized shipboard surveys of the Hawaiian U.S. EEZ (2002, gray diamond, Barlow 2006; 2010, black triangles, Bradford et al. 2012, the Johnston Atoll EEZ and pelagic waters of the central Pacific south of the Hawaiian Islands (2005), gray crosses, Barlow and Rankin 2007). Outer lines represent approximate boundary of U.S. EEZs; light shaded gray area is the main Hawaiian Islands insular false killer whale stock area, including overlap zone between MHI insular and pelagic false killer whale stocks; dark shaded gray area is the Northwestern Hawaiian Islands stock area, which overlaps the pelagic false killer whale stock area and part of the MHI insular false killer whale stock area.

Genetic, photo-identification, and telemetry studies indicate there are three demographically-independent populations of false killer whales in Hawaiian waters. Genetic analyses indicate restricted gene flow between false killer whales sampled near the main Hawaiian Islands (MHI), the Northwestern Hawaiian Islands (NWHI), and in pelagic waters of the Eastern (ENP) and Central North Pacific (CNP) (Chivers et al. 2007, 2010; Martien et al. 2011). Chivers et al. (2010) expanded previous analyses with additional samples and analysis of 8 nuclear DNA (nDNA) microsatellites, revealing strong phylogeographic patterns consistent with local evolution of haplotypes nearly unique to false killer whales occurring nearshore within the Hawaiian Archipelago. Analysis of 21 additional samples collected during a 2010 shipboard survey in Hawaiian waters reveals significant differentiation in both mitochondrial DNA (mtDNA) and nDNA between false killer whales found near the MHI and the NWHI (Martien et al. 2011). Photographic–identification of individuals seen near the NWHI confirms that they do not associate with individuals near the MHI (Baird et al. in press). Two false killer whales previously photographed near Kauai were seen in groups observed near Nihoa in the NWHI, and are not known to associate with animals from the MHI, suggesting geographic overlap of MHI and NWHI false killer whale populations near Kauai. Further evaluation of photographic and genetic data from individuals seen near the MHI suggest the occurrence of three separate social clusters (Baird et al. in press, Martien et al. 2011), where mating primarily occurs within clusters, though some mating is known to occur between males and females of different social clusters (Martien et al. 2011).

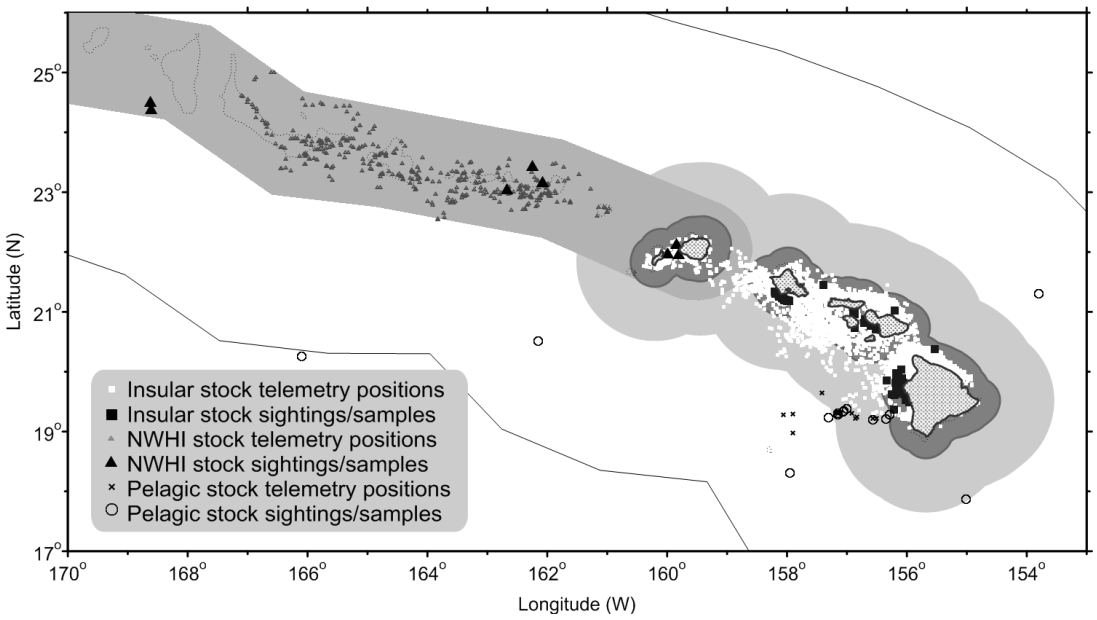

Figure 2. Sighting, biopsy, and telemetry records of false killer whale identified as being part of the MHI insular (square symbols), NWHI (triangle symbols), or pelagic (open and cross symbols) stocks. The dark gray area is the 40-km MHI insular core area; light gray area is the 40-km to 140-km MHI insular-pelagic overlap zone (Baird et al. 2010, Baird unpublished data; reproduced from Forney et al. 2010); medium gray area is the 50-nmi (93-km) Monument boundary extended to the east to encompass Kauai, representing the NWHI stock boundary. The MHI insular, pelagic, and NWHI stocks overlap in the vicinity of Kauai.

Observers have collected tissue samples for genetic analysis from cetaceans incidentally caught in the Hawaii-based longline fishery since 2003. Between 2003 and 2010, eight false killer whale samples, four collected outside the Hawaiian EEZ and four collected within the EEZ but more than 100 nautical miles (185km) from the main Hawaiian Islands (see Figure 3), were determined to have Pacific pelagic haplotypes (Chivers et al. 2010). At the broadest scale, significant differences in both mtDNA and nDNA are evident between pelagic false killer whales in the ENP and CNP strata (Chivers et al. 2010), although the sample distribution to the east and west of Hawaii is insufficient to determine whether the sampled strata represent one or more stocks, and where pelagic stock boundaries would be drawn.

Genetic, photographic, and telemetry data collected from Hawaiian false killer whales demonstrates the existence of a previously unknown stock of island-associated false killer whales in the NHWI, and supports the current recognized boundaries of the MHI insular and pelagic stocks. The three stocks have overlapping ranges. MHI insular false killer whales have been seen as far as 112 km from the main Hawaiian Islands, while pelagic stock animals have been seen within 42 km of the main Hawaiian Islands (Baird et al. 2008, Baird 2009, Baird et al. 2010, Forney et al. 2010). NWHI false killer whales have been seen as far as 93 km from the NWHI and near Kauai (Baird et al. 2012, Bradford et al. 2012, Martien et al. 2011). Animals seen within 40 km of the main Hawaiian Islands between Hawaii Island and Oahu are considered to belong to the MHI insular stock. Waters within 40 km of Kauai and Niihau are an overlap zone between the MHI insular and NWHI stock, as individuals from both populations have been seen here. Animals seen within 93 km of the NWHI, inside the Papahānaumokuākea Marine National Monument may belong to either the NWHI or pelagic stock, as animals from both stocks have been seen inside the Monument. Animals beyond 140 km of the MHI and beyond 93 km of the NWHI are considered to belong to the pelagic stock. The MHI insular and pelagic stocks overlap between 40 km and 140 km from shore between Oahu and Hawaii Island. All three stocks overlap within 40 km and 93 km around Kauai and Niihau, and the MHI insular and pelagic stocks overlap from 93 km to 140 km around these islands (Figure 2).

The pelagic stock includes animals found within the Hawaiian Islands EEZ and in adjacent international waters; however, because data on false killer whale 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). The Palmyra Atoll stock of false killer whales remains a separate stock, because comparisons amongst false killer whales sampled at Palmyra Atoll and those sampled from the MHI insular stock and the pelagic ENP reveal restricted gene flow, although the sample size remains low for robust comparisons (Chivers et al. 2007, 2010). NMFS will obtain and analyze additional samples for genetic studies of stock structure, and will evaluate new information on stock ranges as it becomes available.

For the Marine Mammal Protection Act (MMPA) stock assessment reports, there are currently five Pacific Islands Region management stocks (Forney et al. 2011, Martien et al. 2011): 1) the Main Hawaiian Islands insular stock, which includes animals inhabiting waters within 140 km (approx. 75 nmi) of the main Hawaiian Islands, 2) the Northwestern Hawaiian Islands stock, which includes animals inhabiting waters within 93 km (50 nmi) of the NWHI and Kauai, 3) the Hawaii pelagic stock, which includes false killer whales inhabiting waters greater than 40 km (22 nmi) from the main Hawaiian Islands, 4) the Palmyra Atoll stock, which includes animals found within the U.S. EEZ of Palmyra Atoll, and 5) the American Samoa stock, which includes animals found within the U.S. EEZ of American Samoa. Estimates of abundance, potential biological removal, and status determinations for the first three stocks are presented below; the Palmyra Atoll and American Samoa Stocks are covered in separate reports.

HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Interactions with false killer whales, including depredation of catch, have been identified in logbooks and NMFS observer records from Hawaii pelagic longlines (Nitta and Henderson 1993, NMFS/PIR unpublished data). False killer whales have been observed feeding on mahi mahi, *Coryphaena hippurus*, and yellowfin tuna, *Thunnus albacares* (Baird 2009), and they have been reported to take large fish from the trolling lines of commercial and recreational fishermen (Shallenberger 1981). There are anecdotal reports of marine mammal interactions in the commercial Hawaii shortline fishery which sets gear at Cross Seamount and possibly around the main Hawaiian Islands. The shortline fishery is permitted through the State of Hawaii Commercial Marine License program, and until recently, no reporting systems existed to document marine mammal interactions. This fishery was added to the 2010 List of Fisheries as a Category II fishery (Federal Register Vol. 74, No. 219, p. 58859-58901, November 16, 2009), and efforts are underway to obtain data on interactions between shortlines and marine mammals. Baird and Gorgone (2005) documented high rates of dorsal fin disfigurements consistent with injuries from unidentified fishing line for false killer whales belonging to the MHI insular stock. It is unknown whether these injuries might have been caused by longline gear, shortline gear, or other hook-and-line gear used around the main Hawaiian Islands.

There are 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, within the ranges of both MHI insular and pelagic stocks. Between 2006 and 2010, two false killer whales were observed hooked or entangled in the SSLL fishery (100% observer coverage) within the U.S. EEZ of the Hawaiian Islands, and 24 false killer whales were observed taken in the DSLL fishery (≥20% observer coverage) within Hawaiian waters or adjacent high-seas waters (excluding Palmyra Atoll) (Forney 2011). One false killer whale take in the DSLL fishery resulted in the death of the animal in international waters. Based on an evaluation of the observer's description of each interaction and following the most recently developed criteria for assessing serious injury in marine mammals (Andersen et al. 2008), one animal taken in the SSLL fishery was considered not seriously injured and one was considered seriously injured, both within the Hawaii EEZ. In the DSLL fishery, one false killer whale taken within the overlap zone of the MHI insular and pelagic stocks, two taken in Hawaiian waters within the range of the pelagic stock, and one taken in international waters were considered not seriously injured. The level of injury could not be determined

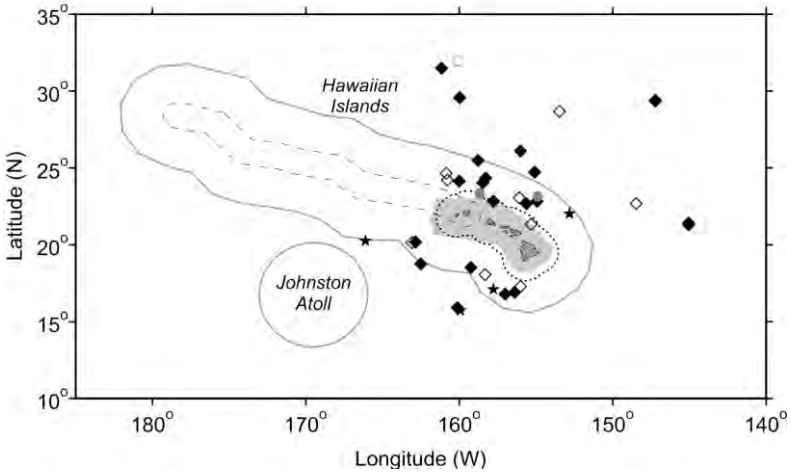

Figure 3. Locations of observed false killer whale takes (filled symbols) and possible takes ("blackfish") of this species (open symbols) in the Hawaii-based longline fisheries, 2006-2010. Deep-set fishery takes are shown in black; shallow-set fishery takes are shown in gray. Stars are locations of genetic samples from fishery-caught false killer whales. Solid gray lines represent the U.S. EEZ; the dotted line is the outer (140-km) boundary of the overlap zone between MHI insular and pelagic false killer whale stocks; the dashed line is the 93-km boundary of the NWHI stock; the gray shaded area is the February-September longline exclusion zone. Fishery descriptions are provided in Appendix 1.

based on the observer descriptions for one false killer whale taken in the DSLL, within the range of the pelagic stock. The remaining 18 false killer whales taken in the DSLL fishery (nine in international waters, nine in the Hawaiian Islands EEZ pelagic stock range were considered seriously injured (Forney 2011). Seven additional unidentified "blackfish" (unidentified cetaceans known to be either false killer whales or short-finned pilot whales) that may have been false killer whales were also seriously injured during 2006-2010 (Forney 2011; see McCracken 2011 for description of short-finned pilot whale takes within the deep and shallow set fisheries). Six of these were taken in the DSLL fishery within U.S. EEZ waters, including one animal within the MHI insular stock range, and one was taken in the SSLL fishery in international waters (Figure 3).

Table 1. Summary of available information on incidental mortality and serious injury of false killer whales (Hawaiian Islands Stock Complex) and unidentified blackfish in commercial fisheries, by stock and EEZ area, as applicable (McCracken 2010). Mean annual takes are based on 2006-2010 estimates 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 pro-rated as either false killer whales or short-finned pilot whales according to their distance from shore (McCracken 2010). CVs are estimated based on the methods of McCracken and Forney (2010) and do not yet incorporate additional uncertainty introduced by prorating false killer whales in the overlap zone and 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 false killer whales by stock / EEZ region							
				Hawaii Pelagic Stock				**Main Hawaiian Islands Insular Stock**		**Northwestern Hawaiian Islands Stock**	
				Outside of U.S. EEZs		Hawaiian Islands EEZ					
				Obs. FKW T/MSI Obs. UB T/MSI	Estimated M&SI (CV)	Obs. FKW T/MSI Obs. UB T/MSI	Estimated M&SI (CV)	Obs. FKW T/MSI Obs. UB T/MSI	Estimated M&SI (CV)	Obs. FKW T/MSI Obs. UB T/MSI	Estimated M&SI (CV)
Hawaii-based deep-set longline fishery	2006	Observer data	22%	2/2 0/0	8 (0.7)	2/1* 2/2*	13 (1.7)	1/0* 1/1*	2.2 (0.7)	0/0	0 (-)
	2007		20%	1/0 0/0	2 (3.7)	2/1 0/0	8 (0.8)	0/0 0/0	0 (-)	0/0	0 (-)
	2008		22%	0/0 0/0	0 (-)	4/3 3/3	17 (0.4)	0/0 0/0	0 (-)	0/0	0 (-)
	2009		20%	7/7 0/0	39 (0.2)	2/2 0/0	12 (0.5)	0/0 0/0	0 (-)	0/0	0 (-)
	2010		21%	1/1 0/0	6 (1.3)	2/3 1/1	14 (0.5)	0/0 0/0	0 (-)	0/0	0 (-)
Mean Estimated Annual Takes (CV)					**11.2 (0.3)**		**13.6 (0.3)**		**0.5 (1.7)**		**0 (-)**
Hawaii-based shallow-set longline fishery	2006	Observer data	100%	0/0 0/0	0	0/0 0/0	0	0/0 0/0	0	0/0	0
	2007		100%	0/0 0/0	0	0/0 0/0	0	0/0 0/0	0	0/0	0
	2008		100%	0/0 1/1	0.5	1/0 0/0	0	0/0 0/0	0	0/0	0
	2009		100%	0/0 0/0	0	1/1 0/0	1	0/0 0/0	0	0/0	0
	2010		100%	0/0 0/0	0	0/0 0/0	0	0/0 0/0	0	0/0	0
Mean Annual Takes (100% coverage)					**0.1**		**0.2**		**0**		**0**
Minimum total annual takes within U.S. EEZ							**13.8 (0.3)**		**0.5 (1.7)**		**0 (-)**

* False killer whale and unidentified blackfish takes within the MHI insular/pelagic stock overlap zone are shown once for each stock, but total estimates derived from these takes are prorated among potentially affected stocks based on the distance from shore of the take location (see text above, and McCracken 2010).

The total observed mortality and serious injury of cetaceans in the SSLL fishery (with 100% coverage), and the estimated annual and 5-yr average mortality and serious injury of cetaceans in the DSLL fishery (with approximately 20% coverage) are reported by McCracken (2011). A number of recent changes are reflected in the methodology. Estimated takes of false killer whales and observed takes for which injury severity is undetermined, are prorated based on the proportions of observed interactions that resulted in death or serious injury (93%) or non-serious injury (7%), between the years 2000 and 2010. Further, takes of false killer whales of unknown stock in the MHI insular/pelagic stock overlap zone are prorated assuming that densities of MHI insular stock animals decline and pelagic stock increase with distance from shore (McCracken 2010). No genetic samples are available to

establish stock identity for these takes, but both stocks are considered at risk of interacting with longline gear. The pelagic stock is known to interact with longline fisheries in waters offshore of the overlap zone, based on two genetic samples obtained by fishery observers (Chivers et al. 2008). MHI insular false killer whales have been documented via telemetry to move far enough offshore (112km) to reach longline fishing areas, and animals from this stock have a high rate of dorsal fin disfigurements consistent with injuries from unidentified fishing line (Baird and Gorgone 2005).

Finally, 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 false killer whales takes within the MHI insular-pelagic overlap zone and of unidentified blackfish takes introduces unquantified uncertainty into the bycatch estimates, but until methods of determining stock identity for animals observed taken within the overlap zone are available, and all animals taken can be identified to species (e.g., photos, tissue samples), this approach ensures that potential impacts to all stocks are assessed.

Based on these bycatch analyses, estimates of annual and 5-yr average annual mortality and serious injury of false killer whales, by stock and EEZ area, are shown in Table 1. Estimates of mortality and serious injury (M&SI) include a pro-rated portion of the animals categorized as unidentified blackfish (UB). 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.

Because of high rates of false killer whale mortality and serious injury in Hawaii-based longline fisheries, a Take Reduction Team (Team) was established in January 2010 (75 FR 2853, 19 January 2010). The Team was charged with developing recommendations to reduce incidental mortality and serious injury of the Hawaii pelagic, MHI insular, and Palmyra stocks of false killer whales in the DSLL and SSLL fisheries. The Team submitted a draft Take Reduction Plan (Plan) to NMFS (http://www.nmfs.noaa.gov/pr/pdfs/interactions/fkwtrp_draft.pdf), and NMFS published a final Plan based on the Team"s recommendations (77 FR 71260, 29 November, 2012). The Plan became effective December 31, 2012, but certain gear requirements go into effect on February 27, 2013. Take reduction measures include gear requirements, time-area closures, and measures to improve captain and crew response to hooked and entangled false killer whales. Additionally, the Plan includes non-regulatory measures that NMFS will implement to improve data quality and dissemination to the Team and the public.

MAIN HAWAIIAN ISLANDS INSULAR STOCK

POPULATION SIZE

A photographic mark-recapture study during 2000-2004 around the main Hawaiian Islands produced an estimate of 123 (CV=0.72) MHI insular false killer whales (Baird et al. 2005). This abundance estimate is based in part on data collected more than 8 years ago, and is considered outdated as a measure of current abundance (NMFS 2005). A Status Review for the MHI insular stock (Oleson et al. 2010) used recent, unpublished estimates for two time periods, 2000-2004 and 2006-2009 in a Population Viability Analysis (PVA). The new estimates were based on more recent sighting histories and open population models, yielding more precise estimates for the two time periods. The new estimate for the 2000-2004 period is 162 (CV=0.23) animals. Two separate estimates for 2006-2009 were presented in the Status Review; 151 (CV=0.20) and 170 (CV=0.21), depending on whether animals photographed near Kauai are included in the estimate (Baird unpublished data). The animals seen near Kauai included in the higher estimate have now been associated with the NWHI stock (Baird et al in press), such that the best estimate of population size is the smaller estimate of 151 animals. However, it should be noted that even this smaller estimate may be positively-biased, because missed photo-ID matches were discovered after the analyses were complete (discussed in Oleson *et al.* 2010). The best estimate will be updated when a new mark-recapture estimate accounting for the missed matches is available.

Minimum Population Estimate

The minimum population estimate for the MHI insular stock of false killer whales is the number of distinct individuals identified during 2008-2011 photo-identification studies, or 129 false killer whales (Baird, unpublished data). Recent mark-recapture estimates (Oleson et al. 2010) of abundance are known to have a positive bias of unknown magnitude, and therefore are not suitable for deriving a minimum abundance estimate.

Current Population Trend

Reeves et al. (2009) suggested that the MHI insular stock of false killer whales may have declined during the last two decades, based on sightings data collected near Hawaii using various methods between 1989 and 2007. Baird (2009) reviewed trends in sighting rates of false killer whales from aerial surveys conducted using consistent

methodology around the main Hawaiian Islands between 1994 and 2003 (Mobley et al. 2000). Sighting rates during these surveys showed a statistically significant decline that could not be attributed to any weather or methodological changes. The Status Review of Hawaiian MHI insular false killer whales (Oleson *et al.* 2010) presented a quantitative analysis of extinction risk using a Population Viability Analysis (PVA). The modeling exercise was conducted to evaluate the probability of actual or near extinction, defined as fewer than 20 animals, given measured, estimated, or inferred information on population size and trends, and varying impacts of catastrophes, environmental stochasticity and Allee effects. All plausible models indicated the probability of decline to fewer than 20 animals within 75 years is greater than 20%. Though causation was not evaluated, all plausible models indicated current declines at an average annual rate of -9% since 1989 (95% probability intervals -5% to -12.5%; Oleson *et al.* 2010).

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 MHI insular false killer whale stock is calculated as the minimum population size (129) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.1 resulting in a PBR of 0.3 false killer whales per year. The recovery factor was chosen to be 0.1 because the stock has been proposed for listing as endangered under the U.S Endangered Species Act (see below) and because of the significant recent decline experienced by this stock (Oleson et al. 2010).

STATUS OF STOCK

The status of MHI insular stock false killer whales relative to OSP is unknown, although this stock appears to have declined during the past two decades (Oleson et al. 2010, Reeves et al. 2009; Baird 2009). Ylitalo et al. (2009) documented elevated levels of polychlorinated biphenyls (PCBs) in three of nine MHI insular false killer whales sampled, and biomass of some false killer whale prey species may have declined around the main Hawaiian Islands (Oleson et al. 2010, Boggs & Ito 1993, Reeves et al. 2009). MHI insular false killer whales have been listed as "endangered" under the Endangered Species Act (1973) (77 FR 70915, 28 November, 2012). The listing follows receipt of a petition from the Natural Resources Defense Council on October 1, 2009, requesting that Hawaiian insular false killer whales be listed as endangered under the ESA. NMFS determined that the petition presented substantial scientific information indicating that a listing may be warranted and thus was required to conduct an ESA status review of the stock (75 FR 316; January 5, 2010) and established a Biological Review Team (BRT) for this purpose. The Status Review report produced by the BRT (Oleson et al. 2010) found that Hawaiian insular false killer whales are a Distinct Population Segment (DPS) of the global false killer whale taxon. The BRT evaluated risk to the population, including identification and ranking of threats to the population, quantitative assessment of extinction probability using a PVA, and an assessment of the overall risk of extinction to the population. The PVA analysis indicated the probability of near-extinction (less than 20 animals) within 75 years (3 generations) was greater than 20% for all biologically plausible models and given a wide range of input variables. Of the 29 indentified threats to the population, the BRT considered the effects of small population size, including inbreeding depression and Allee effects, exposure to environmental contaminants, competition for food with commercial fisheries, hooking, entanglement, or intentional harm by fishers to be the most substantial threats to the population. The BRT concluded that Hawaiian insular false killer whales were at high risk of extinction. Following additional information on the occurrence of another island-associated stock in the NWHI, the BRT reevaluated the DPS decision and concluded that the population still met the standard to be listed as a DPS (Oleson et al. 2012). False killer whales are not listed as "depleted" under the MMPA.

Based on the best available scientific information (Oleson et al. 2010), Main Hawaiian Islands insular false killer whales are declining, therefore the stock is considered "strategic" under the MMPA. The estimated average annual human-caused mortality and serious injury for this stock (0.5 animals per year) is greater than the PBR (0.3), providing further support for the "strategic" designation.

HAWAII PELAGIC STOCK

POPULATION SIZE

Analyses of a 2002 shipboard line-transect survey of the Hawaiian Islands EEZ resulted in an abundance estimate of 484 (CV = 0.93) false killer whales within the Hawaiian Islands EEZ outside of about 75 nmi of the main Hawaiian Islands (Barlow & Rankin 2007). This abundance estimate is now more than 8 years old and therefore will no longer be used based on NMFS Guidelines for Assessing Marine Mammal Stocks (NMFS 2005). A new abundance survey was completed in 2010 within the Hawaiian Islands EEZ and resulted in five on-effort detections of false killer whales attributed to the Hawaii pelagic stock. Analysis of 2010 shipboard line-transect data

resulted in an abundance estimate of 1,503 (CV=0.66) false killer whales outside of 40 km of the main Hawaiian Islands (Bradford et al. 2012). Bradford et al. (2012) reported that most (64%) false killer whale groups seen during the 2010 HICEAS survey were seen moving toward the vessel when detected by the visual observers. Together with a significant increase in sightings close to the trackline, this behavioral data suggests vessel attraction is likely occurring and may be significant. Although Bradford et al. (2012) employed a half-normal model to minimize the effect of vessel attraction, any potential positive bias could not be entirely eliminated. The abundance estimate is presumably positively biased as a result of vessel attraction, but the extent of any bias is unknown. The acoustic data collected during the 2010 survey are still being analyzed and additional refinements to this estimate are expected. A 2005 survey (Barlow and Rankin 2007) resulted in a separate abundance estimate of 906 (CV=0.68) false killer whales in international waters south of the Hawaiian Islands EEZ and within the EEZ of Johnston Atoll, but it is unknown how many of these animals might belong to the Hawaii pelagic stock.

Minimum Population Estimate

The log-normal 20th percentile of the 2010 abundance estimate for the Hawaiian Islands EEZ outside of 40 km from the main Hawaiian Islands (Bradford et al. 2012) is 906 false killer whales. The minimum abundance estimate has not been corrected for vessel attraction and may be an over-estimate of minimum population size. The acoustic data collected during the 2010 survey are still being analyzed and additional refinements to this estimate are expected.

Current Population Trend

No data are available on current population trend. It is incorrect to interpret the increase in the abundance estimate from 2002 to 2010 as an increase in population size, given changes to the survey design in 2010 and the analytical framework specifically intended to better enumerate and account for overall group size, the low precision of each estimate, and a lack of understanding of the oceanographic processes that may drive the distribution of this stock over time. Further, only a portion of the overall range of this population has been surveyed, precluding evaluation of abundance of the entire stock.

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

Following the NMFS Guidelines for Assessing Marine Mammal Stocks (NMFS 2005), the PBR is calculated only within the U.S. EEZ of the Hawaiian Islands, because estimates of human-caused mortality and serious injury are not available from all U.S. and non-U.S. sources in international waters where this stock may occur. The potential biological removal (PBR) level for the Hawaii pelagic stock of false killer whale is thus calculated as the minimum population size within the U.S. EEZ of the Hawaiian Islands (906) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.50 (for a stock of unknown status with a Hawaiian Islands EEZ mortality and serious injury rate CV = 0.30; Wade and Angliss 1997), resulting in a PBR of 9.1 false killer whales per year.

STATUS OF STOCK

The status of the Hawaii pelagic stock of false killer whales 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. They are not listed as "threatened" or "endangered" under the Endangered Species Act (1973), nor as "depleted" under the MMPA. Following the NMFS Guidelines for Assessing Marine Mammal Stocks (NMFS 2005), the status of this transboundary stock of false killer whales is assessed based on the estimated abundance and estimates of mortality and serious injury within the U.S. EEZ of the Hawaiian Islands because estimates of human-caused mortality and serious injury from all U.S. and non-U.S. sources in international waters are not available, and because the geographic range of this stock beyond the Hawaiian Islands EEZ is poorly known. Because the rate of mortality and serious injury to false killer whales within the Hawaiian Islands EEZ (13.8 animals per year) exceeds the PBR (9.1 animals per year), this stock is considered a "strategic stock" under the MMPA. The total fishery mortality and serious injury for the Hawaii pelagic stock of false killer whales cannot be considered to be insignificant and approaching zero, because it has exceeded the PBR for more than 10 years.

NMFS has considered whether the status assessment of this transboundary stock would change if animals outside the Hawaiian Islands EEZ are considered. Using all available peer-reviewed information on the abundance of false killer whales on the high-seas and within the EEZ of Johnston Atoll, a PBR can be calculated as the lower 20th percentile of the Barlow and Rankin (2007) abundance estimate (539), times one half the default maximum net

growth rate for cetaceans (½ of 4%) times a recovery factor of 0.50 (for a stock of unknown status with a mortality and serious injury rate CV = 0.30; Wade and Angliss 1997), resulting in 5.4 false killer whales per year. This minimum abundance estimate may be based on a smaller geographic area than the (unknown) full range of the pelagic stock because areas to the north of the Hawaiian Islands EEZ are not included; however, the estimate meets the definition of a „minimum population estimate" under the MMPA. Bycatch information for the high seas is incomplete because the levels of false killer whale takes in non-U.S. fisheries are not known. The average annual estimated mortality and serious injury by U.S. longline vessels operating on the high seas and within the EEZ of Johnston Atoll is 11.3 (McCracken 2011). This value is greater than the PBR of 5.4, and the combined U.S. and international mortality and serious injury is likely substantially higher, because fishing effort by foreign vessels may be up to six times greater than that of the U.S. fleet (NMFS, unpublished data). Better information on the full geographic range of this stock and quantitative estimates of bycatch in international fisheries are needed to reduce the uncertainties regarding impacts of false killer whale takes on the high seas, but these uncertainties do not change the current assessment that the pelagic false killer whale stock is strategic.

NORTHWESTERN HAWAIIAN ISLANDS STOCK

POPULATION SIZE

A 2010 line transect survey that included the waters surrounding the Northwestern Hawaiian Islands produced an estimate of 552 (CV = 1.09) false killer whales attributed to the Northwestern Hawaiian Islands stock (Bradford et al. 2012). This is the best available abundance estimate for false killer whales within the Northwestern Hawaiian Islands. Bradford et al. (2012) reported that most (64%) false killer whale groups seen during the 2010 HICEAS survey were seen moving toward the vessel when detected by the visual observers. Together with a significant increase in sightings close to the trackline, this behavioral data suggests vessel attraction is likely occurring and may be significant. Although Bradford et al. (2012) employed a half-normal model to minimize the effect of vessel attraction, any potential positive bias could not be entirely eliminated. The abundance estimate is presumably positively biased as a result of vessel attraction, but the extent of any bias is unknown. The acoustic data collected during the 2010 survey are still being analyzed and additional refinements to this estimate are expected.

Minimum Population Estimate

The log-normal 20th percentile of the 2010 abundance estimate for the Northwestern Hawaiian Islands stock (Bradford et al. 2012) is 262 false killer whales. This estimate has not been corrected for vessel attraction and may be an over-estimate of minimum population size.

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 the waters surrounding the Northwestern Hawaiian Islands.

POTENTIAL BIOLOGICAL REMOVAL

The potential biological removal (PBR) level for the Northwestern Hawaiian Islands false killer whale stock is calculated as the minimum population size (262) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.50 (for a stock of unknown status, Wade and Angliss 1997), resulting in a PBR of 2.6 false killer whales per year.

STATUS OF STOCK

The status of false killer whales in Northwestern Hawaiian Islands waters relative to OSP is unknown, and there are insufficient data to evaluate trends in abundance. Ylitalo et al. 2009 documented elevated levels of polychlorinated biphenyls (PCBs) in three of nine Hawaii insular false killer whales sampled, and biomass of some false killer whale prey species may have declined around the Northwestern Hawaiian Islands (Oleson et al. 2010, Boggs & Ito 1993, Reeves et al. 2009), though waters within the Papahānaumokuākea Marine National Monument have been closed to commercial longlining since 1991. This stock is 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 Northwestern Hawaiian Islands is unknown, but may be approaching zero if the stock remains entirely within Monument waters and the longline exclusion zone near Kauai. Mortality and serious injury does not exceed the PBR (2.6) for this stock and thus, this stock is not considered "strategic" under the MMPA.

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