Updated evidence of interactions between false killer whales and fisheries around the main Hawaiian Islands: assessment of mouthline and dorsal fin injuries

Robin W. Baird[1], Sabre D. Mahaffy[1], Annie M. Gorgone[1], Kelly A. Beach[1], Tori Cullins[2], Dan J. McSweeney[3], Deron S. Verbeck[1], Daniel L. Webster[1]

[1]Cascadia Research Collective, 218 ½ W. 4th Avenue, Olympia, WA, 98501
[2]Wild Dolphin Foundation, 1850 Worthington Road, Eagle Point, OR, 97524
[3]Wild Whale Research Foundation, P.O. Box 139, Holualoa, HI, 96724

Introduction

Assessing the frequency and nature of non-lethal interactions of cetaceans with hook and line fisheries may be undertaken by direct observations of depredation (Powell and Wells 2011) or by examining wounds (or scars from wounds) on animals that break free from fishing gear (Moore and Barco 2013). Both methods have their own biases and limitations. When there are large numbers of fishing vessels and depredation rates are low, or if they occur at night, in rough seas, or at a significant distance from the vessel (e.g., with longline or shortline gear), recording depredation events would be difficult, to say the least. When there are multiple overlapping populations that may depredate catch, such as the case with false killer whales around the main Hawaiian Islands (Bradford et al. 2015; Baird 2016), knowing which population is depredating catch requires at least good quality photos of the individuals involved, and obtaining such photos may not be feasible from a vessel while fishing.

False killer whale depredation of catch was recorded around the main Hawaiian Islands as early as 1963 (Pryor 1975), and was considered to be “very common” throughout the 1970s (Shallenberger 1981). For both false killer whales and other species, it is likely that most depredation interactions do not involve actual hooking of the depredating cetacean, thus individuals with scars will likely only be a subset of those that interact with gear, and documenting the wounds or scars may be difficult in itself. Cetaceans depredating catch from fishing gear may become hooked in the mouth or ingest a hook, and if the line remains taut while an individual exerts pressure against the line, they may acquire linear injuries on the gape or break teeth, either from the abrasion of the line itself or as a hook pulls out (Moore and Barco 2013). Since the mouth is the most likely site of hooking for depredating species, scars on the gape may be the best indicator of non-lethal interactions, other than direct observations of the interactions themselves, although head photos of free-ranging individuals may be difficult to obtain. For hooked individuals which struggle against a taut line, linear wounds may also be acquired on the dorsal fin or other appendages as the individuals react to the hooking (Baird and Gorgone 2005; Kiszka et al. 2008; Nery et al. 2008). One advantage of using photos to assess non-lethal interactions is that the individuals themselves can be identified and attributed to population, and ancillary information (e.g., sex and social group) can also be used to understand the dynamics of depredation interactions.

Individuals can also acquire linear wounds on the leading edge of the dorsal fin from line entanglements through the mouth even when the individual is not hooked, as evidenced by an entangled bottlenose dolphin from Florida from 2011 (R.S. Wells, pers. comm.). Recent video footage from the Hawai‘i-based longline fishery of a pygmy sperm whale that was hooked in the mouth showed evidence of a fresh (i.e., bleeding) wound at the leading edge base of the dorsal fin (Bradford and Forney in prep), similar to the types of injuries that have been attributed to fisheries interactions for false killer whales (Baird et al. 2014).

Using photos available through the end of 2013, Baird et al. (2014) provided evidence of interactions between false killer whales and fisheries in Hawaiian waters. The primary finding of that assessment was that 7.5% of individuals from the main Hawaiian Islands (MHI) insular population of false killer whales had dorsal fin injuries consistent with fisheries interactions, compared with 0% for pelagic false killer whales and 0% for northwestern Hawaiian Islands (NWHI) false killer whales. Sample sizes of available photographs from both pelagic and NWHI individuals was relatively small, however. Another important finding from that study was a significant sex bias in individuals with such injuries, with all sexed individuals either known (n=6) or inferred (n=1) to be females (Baird et al. 2014). The purpose of this report is to update information on evidence of fisheries interactions for false killer whales in Hawai‘i, using mouthline photos available through 2015 and dorsal fin photos available through 2016.

Since 2013 there have been two encounters with NWHI false killer whales, two encounters with false killer whales whose population identity is not known, and 59 encounters with MHI insular false killer whales. In addition to new photos for assessment of injuries both on the dorsal fin and mouthline, information on the sex of individuals was obtained through genetic analyses of biopsy samples, through documentation of individuals with small calves, or based on head morphology, as adult male false killer whales can be distinguished by their protruding melon.

For NWHI false killer whales, 12 identifications were obtained of individuals that were considered distinctive and with good or excellent quality photos (see Baird et al. 2008), the same criteria used in the Baird et al. (2014) analyses. Of those, four individuals were new to our photo-identification catalog, and none of the four individuals had evidence of wounds or scarring indicative of fisheries interactions. Thus the remainder of this assessment focuses on MHI insular false killer whales and also discusses the individuals from two encounters whose population identity is not known.

Mouthline injuries

Within encounters, series of photos of individuals surfacing were used to link head photos to individual identifications obtained from dorsal fins (see Baird et al. 2008). All head photos available from MHI insular false killer whales were examined for evidence of lacerations along the gape, large quantities of white scar tissue on the gape indicating major damage, or tissue loss (i.e., notches in the gape, sometimes with teeth visible). For each individual with mouthline photos available the proportion of the mouthline visible was estimated, and only those with 50% or greater (i.e., at least all of one side of the head) were used in calculations of proportions. Photos that were of insufficient quality to accurately assess the type of mouthline injury were excluded from analyses. Calves and small juveniles were also excluded from analyses as the probability of them having interacted with fishing gear while nursing or shortly after weaning was low.

Eighty-nine individuals from the MHI population had 50% or more of the mouthline visible, with a median % visible of 60% (range 50-100%). Sixteen individuals were excluded due to photo quality. The median proportion of mouthline visible for the remaining 73 individuals was 55%. Four of the remaining 73 were individuals with dorsal fin injuries that were consistent with fisheries interactions from the Baird et al. (2014) study. All four of these had mouthline injuries that were consistent with fisheries interactions. Of the 73 individuals, a total of 17 (23.3%) have mouthline injuries that are consistent with fisheries interactions (Figure 1). The median proportion of mouthline visible for those with injuries was 75%, while for those without injuries it was 53%. This suggests that some of those individuals with no evidence of injuries may have had such injuries but were not documented due to the incomplete documentation of the entire mouthline.

Sex was known based on genetics (10) or inferred based on the presence of calves (4) for 14 of the 17 individuals with mouthline injuries consistent with fisheries interactions. Of the 14, 10 were females and 4 were males, although this difference was not significant (two-tailed sign test p=0.17).

Dorsal fin scarring

For the MHI insular population, there were additional 162 identifications available from 2014 through 2016, restricted to distinctive individuals with good quality photos. These represented 76 different individuals, five that were new and 71 that had been documented prior to 2014. There were encounters with all three social clusters (see Baird et al. 2012), and the five new individuals were from Cluster 3 (3 individuals) and Cluster 2 (2 individuals). Adding the five new individuals, the total number of distinctive individuals from the MHI population with good quality photos that were considered in assessing the proportion of individuals with evidence of fisheries interactions was 165. Of the 76 individuals documented in 2014-2016, three individuals had new injuries that are consistent with fisheries interactions (i.e., linear cuts through leading edge of the dorsal fin parallel to the body axis). Combined with those individuals presented in Baird et al. (2014), 15 of 165 individuals (9.1%) have dorsal fin injuries consistent with fishery interactions. The three individuals with new injuries included one individual each from Cluster 1, Cluster 2 and Cluster 3. They were last seen in 2015, 2010, and 2009, respectively, without evidence of fisheries-related injuries, thus the injuries had all occurred subsequent to those dates. One individual (from Cluster 1, last seen without the injury in 2015) had an injury that had not yet completely healed (Figure 2).

Of the 15 individuals, sex was known (based on genetics) for nine (all females), and inferred for three (two females based on presence of small calves and one male based on head shape). With an expected sex ratio of 1:1, this difference (11 females, 1 male) is significant (two-tailed sign test p=0.0063), similar to what was reported in our earlier analysis (Baird et al. 2014).

For the two encounters with individuals with unknown population identity, there were two distinctive individuals with good quality photos. Both of these individuals have injuries that are consistent with fishery interactions. The dorsal fin of one individual was split down the middle (Figure 3), consistent with a monofilament entanglement that involved wrapping of the fluke or peduncle (W.A. McClellan, personal communication). These individuals were documented 6.07

km offshore of the west side of Hawai‘i Island, within the range of the MHI insular stock, and inshore of the stock boundary of the pelagic stock (Bradford et al. 2015). If they are from the MHI insular population it is likely they will be identified with known individuals from that population at some point in the future.

Summary

In summary, our results provide evidence that: 1) fishery interactions which result in injuries for the MHI insular population of false killer whales are continuing; 2) both sexes have injuries that are consistent with fisheries interactions, although there is a significant sex bias towards females in dorsal fin injuries consistent with fisheries interactions; and 3) mouthline injuries suggest that at least 23% of adult individuals from the MHI insular population depredate catch.

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Figure 1. Examples of false killer whales with notches on the gape, injuries that are consistent with fisheries interactions. Teeth are visible for individuals HIPc398 and HIPc339. HIPc398 also has dorsal fin injuries consistent with fisheries interactions (see Baird et al. 2014). Individuals are from Cluster 2 (HIPc339 and HIPc398) and Cluster 1 (HIPc201).

Figure 2. False killer whale from Cluster 1 of the MHI insular population with fresh linear cut through the base of the dorsal fin, 8 October 2016. Photo © Annie M. Gorgone/Cascadia Research

Figure 3. A false killer whale of unknown population identity photographed off the west side of Hawaiʻi Island in September 2016 with a line injury through the dorsal fin. This individual was seen within the range of the MHI insular population. Photo © Deron S. Verbeck