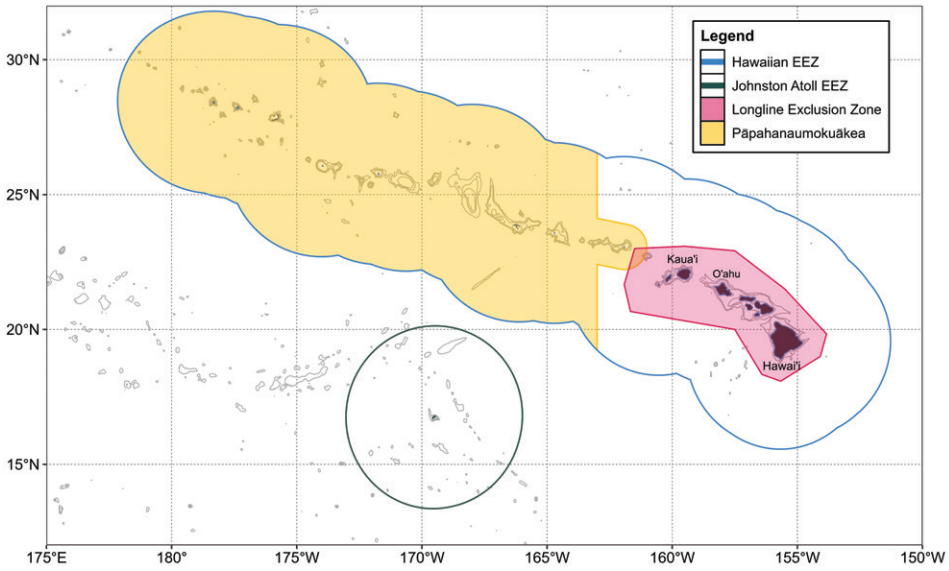
OUT OF SIGHT, OUT OF MIND:

FALSE KILLER WHALE POPULATIONS ARE AT RISK

ROBIN W. BAIRD
Cascadia Research Collective • rwbaird@cascadiaresearch.org



Top Photo: All fishing is excluded from the Papahānaumokuākea Marine National Monument, while around the main Hawaiian Islands only longline fishing is excluded. Pelagic false killer whales range widely inside and outside of U.S. waters, including inside the longline exclusion area, where they overlap with many small-boat nearshore fisheries including shortline, troll, and other hook-and-line fisheries. While foreign fisheries are excluded from U.S. waters, there is additional foreign fishing effort in international waters that likely result in false killer whale bycatch.

Page 76 Photo: HIPc310, an adult female from Cluster 1 of the endangered main Hawaiian Islands population, with a fresh line injury (partially severing the dorsal fin) in October 2016. This injury had largely healed by 2020, but in the last couple of years the wound has opened up again and the fin is in the process of collapsing. *Photo by Robin W. Baird/Cascadia Research.*

In 2018, false killer whales world-wide were categorized as "Near Threatened" on the IUCN Red List of Threatened Species (Baird 2018). This category is for species that are "close to being endangered", and the listing was based on a number of factors: deliberate killing in some areas due to real or perceived conflicts with fisheries, widespread bycatch in fisheries throughout much of their range, biological susceptibility to declines due to their low reproductive rates (e.g., females don't mature until about 10 years of age and give birth only every seven or so years), and the decline of one population of more than 50% in two generations. Prior to 2018 false killer whales globally were listed as "Data Deficient" by the IUCN, and most populations world-wide remain poorly known. False killer whales are frequently confused with other similar species[7], and with their distribution largely restricted to the tropics and primarily in offshore waters, false killer whales have largely remained out of sight of researchers and off the agenda of most conservation organizations.

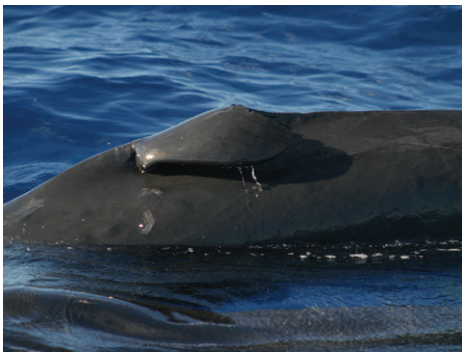
As a scientist who believes that science should inform management, the late 2000s and early 2010s were extremely fulfilling for me, and gave me hope that when science identified a problem, action could be taken to address it. While the scientific results that we were generating on false killer whales in Hawaiian waters were all pointing to threats facing the populations around the main Hawaiian Islands, the management agency, NOAA Fisheries (also called NMFS, short for the National Marine Fisheries Service), was paying attention, and positive steps were being made. By the mid-2000s, our research was showing that the abundance of false killer whales around the main Hawaiian Islands was small (Baird et al. 2005) and individuals appeared to be resident to the islands (Baird et al. 2008), and the population around the main Hawaiian Islands appeared to be genetically differentiated from other false killer whale populations (Chivers et al. 2007). In 2008 these results led NOAA Fisheries to recognize a "Hawai'i Insular" stock, in addition to a "Hawai'i Pelagic" stock (Carretta et al. 2009)—prior to this only a single population encompassing all of U.S. waters surrounding the Hawaiian archipelago was recognized.

At the same time, the photo-identification work was showing that these island-associated false killer whales had high levels of injuries as a result of fishery interactions (Baird and Gorgone 2005), and NMFS observers in the Hawai'i-based longline fishery were finding that false killer whales were the most frequently bycaught species of whale or dolphin. The same biopsy samples we had collected that were used for genetic analyses were also used to assess levels of pesticides and other persistent organic pollutants, and results showed that accumulated levels in the blubber of adult males were high enough to negatively affect the immune system (Ylitalo et al. 2009). With the evidence of threats facing the population becoming more apparent, in early 2008 I approached Randy Reeves about writing up the results of the aerial surveys that he and Steve Leatherwood had undertaken back in 1989, since it had not yet been published. The purpose of those surveys was to come up with a minimum count of false killer whales in Hawaiian waters, and 20 years later their observations were becoming more relevant to understanding how the population of false killer whales may have changed over time.

Both Steve and Randy had extensive aerial survey experience and had literally written the book on species identification[8]. False killer whales were seen relatively frequently during the surveys, much more often than they have been seen in recent years, and in very large groups (they encountered groups with more than 300 individuals on three different days off the north end of Hawai'i Island; Reeves et al. 2009). These sightings were in an area where, 20 years later, we learned that false killer whales from the insular population spent a lot of their time based on satellite tags (Baird et al. 2010). The largest groups they observed contained 460 and 470 individuals, more than three times the estimated abundance of the entire population in the early 2000s. In light of this, I also reached out to Joe Mobley from the

[7] In the last year, I know of two publications that confused false killer whales for another species – Augustin et al. (2025) reported on a "fluke-less pygmy killer whale" that is clearly a false killer whale based on the photos, and Sahri et al. (2024) reported on a "melon-headed whale" sighting that was also a group of false killer whales (see Baird and Jefferson 2024).

[8] If you aren't familiar with Steve's work, see the *Whalewatcher* issue from 1999 dedicated to him - Volume 32(1): "James Stephen Leatherwood (1944–1997)"



Top Photo: HIPc230, an adult female from Cluster 2 of the endangered main Hawaiian Islands population, with a line injury on the leading edge of the dorsal fin. The cause of the large white scar below and behind the dorsal fin is not known. HIPc230 was first photographed by Dan McSweeney off Hawai'i Island in July 1987, and was last seen in May 2022. *Photo by Elisa A. Weiss/Cascadia Research, August 2011.*

Bottom Photo: HIPc186, an adult female from Cluster 3 of the endangered main Hawaiian Islands population. This individual was first photographed in March 1999 with the collapsed dorsal fin and a linear cut at the leading edge of the fin. HIPc186 was last seen in June 2019. *Photo by Cascadia Research Collective.*

Page 79 Photo: HIPc177 in the Cascadia Research Collective photo-identification catalog, a false killer whale from Cluster 3 of the endangered main Hawaiian Islands population. Based on scaring along the back, this adult female lost her dorsal fin from a line injury prior to when she was first photographed in May 2003. She was last seen in November 2021 off Hawai'i Island. *Photo by Daniel L. Webster/ Cascadia Research.*

University of Hawai'i, and he provided his aerial survey data from around all the main Hawaiian Islands for the years 1993 through 2003. These surveys were primarily focused on humpback whales, but they also recorded other species of cetaceans they observed. Sighting rates of false killer whales were relatively high in 1993 and 1995, but dropped dramatically, to zero, in 2000 and 2003, while sighting rates of four other species of odontocetes showed no such trend (Baird 2009). Similarly, Dan McSweeney, who had been working off the island of Hawai'i since the mid-1980s, had also noted a decline in sighting rates.

All of this science led the Natural Resources Defense Council (NRDC) to submit a petition to NOAA Fisheries in October 2009, to list the Hawai'i insular population as Endangered under the Endangered Species Act, and to designate "critical habitat". Such petitions trigger a process – first the government must release a "90-day finding", which determines whether the original petition "presents substantial scientific [ ] information indicating that the petitioned action may be warranted". The 90-day finding, published on January 5, 2010, indicated the petition had merit. This triggered the formation of a Biological Review Team by NMFS, which included experts in false killer whales, toxicology, oceanography, genetics, fish and fisheries, population dynamics, and the biology of closely related species such as killer whales. The Biological Review Team produced a comprehensive status review that was published just eight months later, in August 2010 (Oleson et al. 2010).

The evidence of population decline and various challenges that false killer whales in Hawai'i were facing closely mirrored those of the more well-known *southern resident* killer whales. However, I realized that one thing that false killer whales in Hawai'i lacked by comparison was a constituency of support within local communities. When the decline became apparent, we shifted some of our attention from focusing only on science to trying to raise awareness and interest in this population in Hawai'i. We gave out thousands of temporary tattoos, printed up and distributed coloring pages and word search games for kids, along with ID pages of distinctive individual false killer whales (for tour operators) and pages on how to tell false killer whales apart from closely related species (for fishermen), and gave public talks on different islands, all to raise awareness of this uniquely Hawaiian population.

The Oleson et al. (2010) status review, which I would highly recommend to anyone wishing to learn more about false killer whales, concluded that the Hawaiian insular population was a "distinct population segment (DPS) of the global false killer whale taxon", and that this DPS was "significant to the taxon based on marked genetic differences and ecological and cultural factors". Both of these findings were critical to any potential ESA listing. They also undertook an assessment of threats and conducted an analysis of extinction risk, and concluded that the population was "at high risk of extinction". This was a biological review team though, and was not made up of the managers that would make a decision on whether to list the population. Fortunately, the managers acted quickly, and in November 2010 NMFS published a proposed rule to list the population as Endangered, and gave 90 days for individuals and organizations to submit public comments. Lots of comments were submitted, including from groups that generally opposed the listing (e.g., the Hawai'i Longline Association, the Western Pacific Fishery Management Council), as well as from those that supported it (e.g., the Marine Mammal Commission, the Humane Society of the U.S). Our ongoing science continued to produce results that supported the arguments behind a listing.

Despite the end of the public comment period in mid-February 2011, NMFS did not proceed with the listing in 2011, and on March 19, 2012 the NRDC submitted a "Notice of Intent to Sue for Failure to Make Required Determination on the Listing of the Hawaiian Insular False Killer Whale as Endangered"[9]. While NMFS appeared to be on the right track, sometimes prodding is needed to make them act. During this delay information was coming out on the presence of what we now know of as the Northwestern Hawaiian Islands population of false killer

[9] A copy of this Notice of Intent to Sue, as well as the original petition, the 90-day finding, the status review, the proposed ESA listing, and the final ESA listing, as well as some of the comments on the proposed listing, can be found at https://cascadiaresearch.org/hawaii-species/false-killer-whales-hawaii/#Comments

whales (see my article in this issue on the history of tagging false killer whales), as well as other results from both satellite tagging and genetics on all populations of false killer whales in Hawaiian waters. In September 2012, NMFS again asked for public comments on the proposed ESA listing, although this time only for three weeks. Finally, in late November 2012 NMFS announced that the main Hawaiian Islands insular population of false killer whales would be listed as Endangered, effective on December 28, 2012.

More than a decade has passed since the population was listed as Endangered. Unfortunately, an ESA listing itself does not guarantee proactive recovery efforts by managers. Small steps have been taken, but I've largely lost hope that action will be taken that would help address the threats facing this population of false killer whales. At the same time as NMFS was considering whether to list the main Hawaiian Islands population as Endangered there was a concurrent and related effort to try to reduce bycatch of false killer whales in the offshore longline fisheries. In early 2010 a false killer whale Take Reduction Team (TRT) was established by NMFS, bringing together fishermen, scientists, and conservation and management groups, to work together to address false killer whale bycatch in the deep-set longline fishery for tuna. This TRT, and the resultant Take Reduction Plan, largely focus on the offshore population (Hawai'i pelagic stock) of false killer whales, simply because the longline fishery has been largely excluded from the range of the main Hawaiian Islands population since 1992. The Take Reduction Plan did have one measure that provided some protection to the main Hawaiian Islands population, as it made the longline exclusion zone around the main Hawaiian Islands year-round—previously the zone would shrink closer to the islands for four months of the year, increasing the chances of overlap. Although this was a positive step for the main Hawaiian Islands population, it did not prevent fishery interactions from occurring, as there are numerous other commercial and recreational hook and line fisheries that operate within the range of the main Hawaiian Islands population, that target the same species of fish that false killer whales like to eat. When the TRT was originally established in 2010, many participants on the Team argued that fisheries other than just the longline fishery needed to be part of the purview of the Team, but NMFS did not include any of these other nearshore fisheries. Since then, observations and satellite tag data from pelagic false killer whales have shown that they also overlap with these nearshore hook and line fisheries in Hawaiian waters, not just the longline fisheries, and depredation of catch, and thus likely at least occasional bycatch, occurs. Calculations of bycatch in relation to sustainable thresholds (the "Potential Biological Removal" level) for the pelagic population are made based only on bycatch in the longline fishery, but the potential for bycatch in these nearshore fisheries also needs to be taken into account.

Analyses of fisheries-related injuries on the endangered main Hawaiian Islands false killer whales have shown that a high proportion of individuals have injuries, and that females are more likely than males to have fisheries-related injuries to their dorsal fins (Baird et al. 2015). Managers have been aware of this information since a few years after the original Endangered listing, yet little has been done to try to address the problem. The science has continued—last year we published an updated assessment of evidence of fisheries interactions, again based on individuals that have survived such interactions with injuries (Harnish et al. 2024). The results are not encouraging, to say the least. Based on the age at which fisheries-related injuries are first being documented, individuals begin interacting with fisheries as young as two years of age. Fisheries-related injuries are widespread among the four social clusters from the endangered main Hawaiian Islands population, and such injuries have been documented in almost a quarter of all individuals (Harnish et al. 2024). Based on how quickly injuries heal, and on the availability of mouthline photos (where individuals are most likely to get hooked in the first place), we know this is an underestimate of the proportion of the population that actually depredates catch and have been injured as a result. Importantly, these are just the individuals that survive hooking—those that die are unlikely to be found, given the abundance of large scavenging sharks, ocean currents sweeping dead animals away from shore, and the inaccessible nature of much of the coastline around the main Hawaiian Islands (Faerber and Baird 2010).

Efforts that have been undertaken in the last decade to address the fishery interaction issue in nearshore waters have been limited to education and outreach—sharing information to try to help fishermen correctly identify false killer whales, given the presence of three similar-appearing species (short-finned pilot whales, melon-headed whales, and pygmy killer whales), and providing guidance on what to do if they do see false killer whales (primarily moving away, to minimize the likelihood of having the

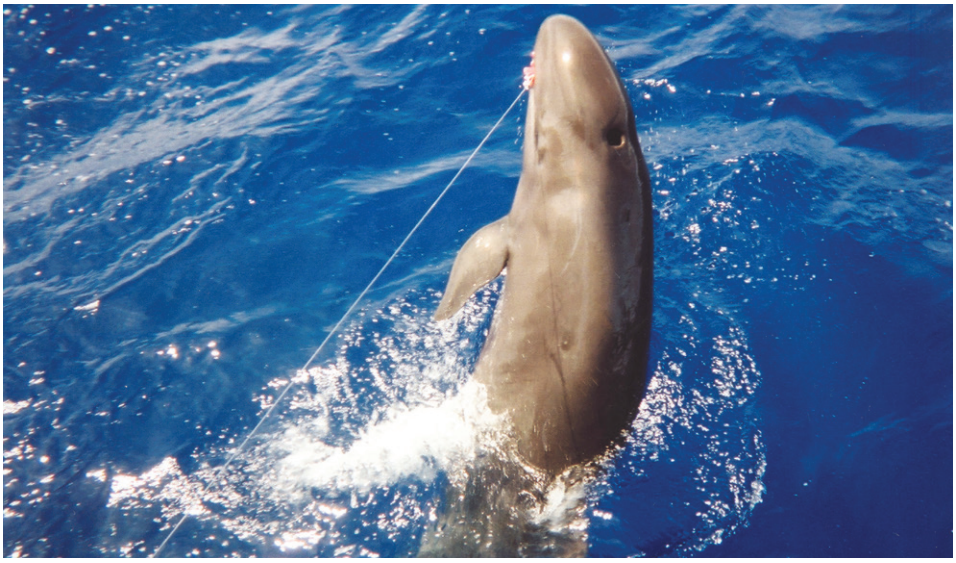
false killer whales try to take their catch). While these efforts are needed, they are clearly not enough to address the problem. The Harnish et al. (2024) assessment of fisheries interactions has shown that these interactions, and subsequent injuries and some unknown level of serious injury and mortality, continue. Much more worrying are the results of recent abundance estimation efforts for the endangered main Hawaiian Islands population, which have shown that the population has been declining at an average of about 3.5% per year since it was listed as endangered (Badger et al. 2024[10]). This translates to a loss of 45 individuals from the population over that time, and the most recent abundance estimate, from 2022, is just 139 individuals (Badger et al. 2024). This is for a population that spans the range of the main Hawaiian Islands, spending similar amounts of time on the windward and leeward sides of the islands. Many factors may have contributed to the decline. A more recent study showed that all adult males and a third of adult females sampled from this population have high levels of persistent organic pollutants, exceeding thresholds for immune system and reproductive impairment (Kratofil et al. 2020). Deliberate shooting may also occur—this has been documented in Hawai'i against other dolphin species that take bait or catch from fishermen (Oleson et al. 2010; Harnish et al. 2019). These cumulative effects alone (i.e., in the absence of bycatch) could result in population decline. However, the findings from the Harnish et al. (2024) study suggests that fishery interactions are probably the most likely culprit for false killer whales' population decline in Hawai'i.

What can be done about this? I wish I could identify one or two clear easy-to-take actions that could help solve the fishery interaction problem, but, with an emphasis on "easy-to-take", I don't think there is a quick or simple solution. For the pelagic false killer whale population, even with a Take Reduction Team that has involved fishermen working with scientists and managers, coming up with a solution to bycatch in the longline fishery has been slow going. All parties were motivated by the belief that no one wins when a false killer whale is bycaught. Captains of fishing vessels have been willing to test out novel gear or new methods, because a hooked false killer whale often leads to damaged or lost gear and extra time that takes away from fishing. After many meetings and testing and trial of gear by fishermen on the Team, in 2013 a Take Reduction Plan was put into effect that included "weak" circle hooks (based on a maximum wire diameter of 4.5 mm, although these turned out not to be that weak), and strong terminal gear (i.e., a branch line with a minimum diameter of 2.0 mm), combined with recommendations for the captain and crew in terms of how to handle the gear. The idea was to make the hook the weakest part of the gear, so that tension could be put on the line and a hooked false killer whale could bend the hook and be released. Unfortunately, when put into practice by the fishing crews, the hooks weren't weak enough and the branch lines weren't strong enough. In many cases branchlines would break, or fishermen would cut the branchline rather than put tension on the gear, both releasing the hooked whale trailing gear that could result in a lethal entanglement. This was happening even when NMFS observers were on board, and when no observers were on board, I suspect that there were few if any attempts to release the whale without gear. In recent years, with the evidence that the Take Reduction Plan is not working as intended, fishermen on the Team came up with a "fighting line device", and the Hawai'i Longline Association manufactured them for all the vessels. Although it is too soon to say how effective this device will be, the idea is that it will make it easier for the crew to safely put tension on the gear and bring hooked animals in closer to the boat where the line can be cut close to the individual, thereby avoiding entanglement from trailing line. The Hawai'i Longline Association has also made efforts to get all of the crew trained in methods to try to get hooked animals off the gear, rather than just the captains, since the crew are the first responders and interactions often happen very rapidly.

> "More citizen scientists are needed—if you know of someone who has photos of false killer whales and has not contributed them, encourage them to do so!"

I have been arguing for many years that independent video monitoring (typically referred to as electronic monitoring) is needed onboard longline vessels, to supplement what observers see, and in the absence of observers, to motivate the crew to do their best to try to release animals unharmed. More information on the frequency and nature of the interactions with false killer whales and other protected species will provide information that can also be used to help develop solutions to the bycatch problem. Some longline vessel owners have voluntarily accepted a two-camera electronic monitoring system, with one camera facing the back deck and one facing just over the side of the boat to record catch being brought over the rail. However, for recording cetacean bycatch, a three-camera system is clearly needed, with the third camera facing out to the side of the vessel to potentially record hooked or entangled false killer whales or other species that may break free, or are cut free, before they get close to the vessel. This type of electronic monitoring system is being discussed for the offshore longline fishery, particularly since the observer coverage in the fishery is declining rapidly due to decreases in federal funding for observer programs. For many years the Hawai'i-based longline fishery had among the highest level of observer coverage, if not the highest coverage, of any longline fishery, with observers on 100% of shallow-set trips for swordfish and 20% of deep-set trips for tuna. The percentage began to drop in recent years, down to 15% in October 2023, 13% in April 2024, and to just 7% in January 2025. Not only will this increase uncertainty in the bycatch estimates and the outcome of individual interactions (e.g., whether an animal was considered seriously injured or not), but the likelihood of captains and crew following gear handling guidelines will diminish with no monitoring on board. Incomplete monitoring (either through observers or electronic monitoring) is a fatal flaw of the Take Reduction Plan, since it relies on behavior of the captain and crew to remove gear and reduce the likelihood of serious injury or mortality (Baird 2024).

[10] A manuscript on this work is currently under review at the journal Endangered Species Research and we are eagerly awaiting a decision from the reviewers and editor.



Left Photo: A false killer whale hooked on a longline. This photo shows a linear mark along the side of the individual caused by struggling against the taut line, illustrating how fighting against fishing gear can cause the dorsal fin injuries frequently seen on free-ranging animals. *Photo by Eric Forney, courtesy NOAA Fisheries.*

Right Photo: False killer whales that are hooked or entangled in some non-U.S. longline fisheries may not receive the same efforts to release them that happens in the Hawai'i-based longline fishery. There are several videos available that show a live false killer whale being dragged up on the deck of foreign longline vessels so that the teeth can be harvested. This is a still image from one of those videos.

These multi-stakeholder Take Reduction Teams have great potential to address bycatch issues, and one has long been needed to try to address bycatch of the endangered main Hawaiian Islands population in nearshore hook and line fisheries. However, they still require timely and forceful action by the management agency (in this case, NOAA Fisheries), to implement new or revised Take Reduction Plans when the evidence suggests the first plan doesn't work. In the case of pelagic false killer whales and the offshore longline fisheries, that evidence has been apparent since 2018, yet still, seven years later, no action has been taken, and with a new federal administration in place in the U.S., it is unlikely that any action will be taken in the next four years. This is a great example of where apparently small delays in action can turn into much longer ones, to the detriment of the whales.

While I see no 'silver bullet' to solve the fisheries bycatch problem, there are things that could help identify the fisheries that members of the endangered main Hawaiian Islands population of false killer whales are interacting with the most. A few years ago we published an index of overlap between false killer whales and nearshore fisheries around the main Hawaiian Islands, to try to identify areas where individual fishermen would have the greatest likelihood of a false killer whale taking their catch, and thus having some risk of hooking or entanglement (Baird et al. 2021). This analysis used satellite tag data from the insular population and commercial fisheries data from the State of Hawai'i Commercial Marine License program. The areas that we predict the greatest individual interaction rates (from the fishermen's perspective) are between O'ahu and Moloka'i, off the north side of Moloka'i, and off the north side of Hawai'i Island. If NOAA Fisheries or the State of Hawai'i wants to try to grapple with this issue, requiring video/electronic monitoring on fishing vessels fishing in those areas would probably be the most cost-effective way of gaining information on actual interactions. Our methods, using photos of individuals that have survived fishery interactions, can tell us a lot (Harnish et al. 2024), but they don't tell us which fisheries are involved.

Citizen scientists have played a major role in learning more about all three populations of false killer whales in Hawaiian waters, contributing photos, and in some cases providing GPS data of their vessel tracks, all of which have been used in abundance estimation as well as examination of social organization and fishery interactions. More citizen scientists are needed—if you know of someone who has photos of false killer whales and has not contributed them, encourage them to do so! We have particularly tried to involve fishermen in the science, by providing cameras to fishermen that were interested in taking photos that could be used to help in estimating abundance. While we've given out a number of cameras over the last few years, and produced online "how to" videos[11], the program hasn't received as much support as we'd like. Social science surveys are also needed, to better understand the motivation of fishermen in Hawai'i. Fishing is a major source of protein in Hawai'i, and has important cultural significance, and no solution to this problem can be found without the support of fishermen. Working together is the only way that false killer whale bycatch issues will eventually be solved. But this will still require the support of the State of Hawai'i and NOAA Fisheries, so encouraging your elected representatives to support these efforts, and voting for those who are likely to do so, is critical. Spreading the word is also needed. While false killer whales range widely among the main Hawaiian Islands, given their rarity and their tendency to be farther offshore, most of the residents of Hawai'i probably have never heard of or seen one, despite wide-spread and ongoing public education efforts by the State of Hawai'i and non-profit groups such as Cascadia Research.

Aside from continuing efforts to understand factors resulting in fisheries interactions, our science on other aspects of false killer whale ecology, behavior, and health is on-going. This includes understanding social dynamics, habitat preferences, predator-prey relationships, and estimating trends in body condition. The information from these studies is or will be valuable for advancing knowledge on false killer whales, but ongoing science shouldn't be used as an excuse to delay action that will actually help in the recovery of these populations.

The articles in this issue represent a diversity of approaches to understanding false killer

[11] https://cascadiaresearch.org/hawaii/cameras-for-fishermen

Robin W. Baird Cont.

whale populations world-wide. While the main Hawaiian Islands population is the only regional population officially listed as Endangered, given the species' low reproductive rates, high trophic level, and overlap in diet with human fisheries, other populations are also likely at risk. In some countries there are either no legal protections for false killer whales, or some fishermen choose to ignore what protections exist, and thus the process that I describe above to try to release hooked animals isn't even considered. Videos exist of live false killer whales in recent years being dragged up onto the deck of non-U.S. longline vessels, apparently so that the animals can be harvested for their teeth. I hope that as research on false killer whales continues and expands more broadly around the world, we find potential solutions to some of these issues, along with elucidating the status of additional populations.

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Top Photo: A false killer whale from the endangered main Hawaiian Islands population leaping while chasing prey off O'ahu, October 2016. *Photo by Robin W. Baird/Cascadia Research.*

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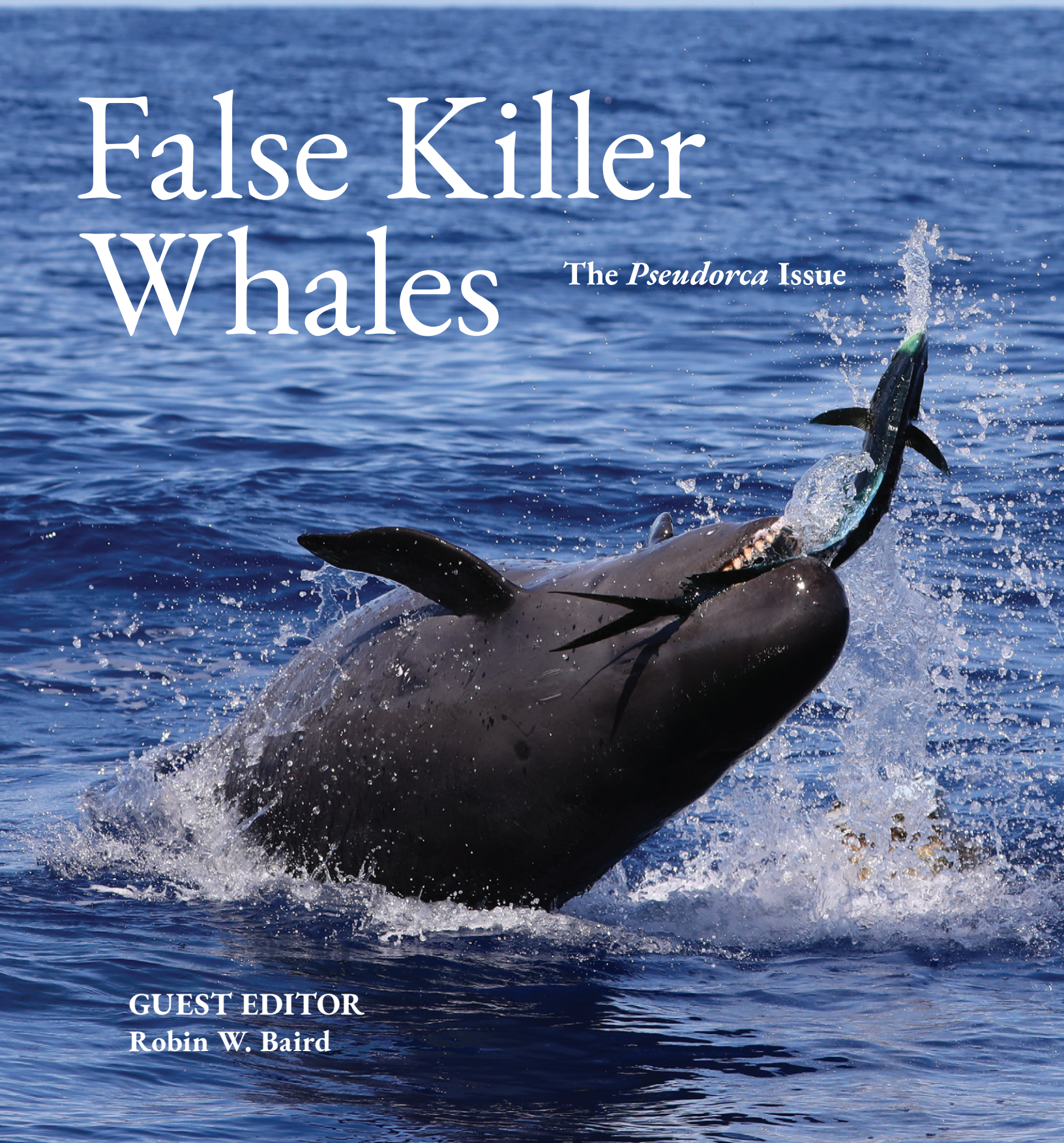
The *Pseudorca* Issue



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