NOAA FISHERIES

Pacific Islands Regional Office

Main Hawaiian Islands Insular False Killer Whale Recovery Planning Workshop

Workshop Summary • October 25-28, 2016

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(Cover photo: Pod of false killer whales off Kaena Point, Oahu. Credit: NOAA Fisheries)

Recovery Planning Workshop Summary

Purpose and Overview

The National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS or NOAA Fisheries) Pacific Islands Regional Office (PIRO) Protected Resources Division held a workshop to gather information and perspectives on how to recover the Main Hawaiian Islands Insular False Killer Whale (MHI IFKW) (*Pseudorca crassidens*) Distinct Population Segment (DPS) to the point where protections under the Endangered Species Act (ESA) are no longer needed. The workshop was held October 25-28, 2016, at the Ohana Waikiki East Hotel in Honolulu, Hawaii.

This invitational workshop was designed to bring experts together in order to obtain informed and creative input into the recovery components (see below) of the MHI IFKW. NMFS will use this information to make decisions about recovery actions for this species. Although this Workshop Summary is inclusive of the conversation at the workshop, the Recovery Plan may not reflect all of the ideas raised during the workshop. The Recovery Plan will be open for public comment.

This was not a consensus-seeking meeting; rather, participants were asked to provide their professional or personal opinion as it related to threats or recovery of IFKW. Experts from a range of relevant disciplines were invited to participate in the workshop. We made efforts to include expertise in the following topic areas: Biology, life history, foraging ecology, oceanography, acoustics, contaminants, commercial and recreational fishing, federal and state fisheries management, and recovery planning. The workshop was open to the public and public comment was invited at the end of each day.

The workshop was focused on the following objectives:

- Consider and provide feedback on the current adequacy of the threats characterization to IFKWs (high, medium, or low) as determined in the 2010 MHI IFKW Status Review Report (Oleson *et al.* 2010)
- Brainstorm potential recovery actions to reduce and/or ameliorate threats to IFKWs
- Brainstorm prioritization of the most effective potential recovery actions for the species
- Provide initial thoughts on potential recovery criteria to downlist/delist species

For IFKW recovery planning efforts, NMFS is using a new approach to the recovery planning process, developed by the U.S. Fish and Wildlife Service. This process breaks recovery planning into three independent parts. Information and feedback from this workshop will help inform the recovery components for the MHI IFKW. In an effort to be more efficient and effective, NMFS is drafting these recovery components in-house in lieu of forming a Recovery Team. The recovery components for the MHI IFKW will consist of the following:

- Species Status Assessment. This is a stand-alone document that will summarize the species' current and future status. Traditionally this information was included in the background of a Recovery Plan but often became outdated quickly. The cumbersome and time-consuming process of revising a Recovery Plan made it difficult to keep this information up-to-date and useful for resource managers. By keeping the background separate from the Recovery Plan (now the recovery strategy, criteria, and actions) and up-to-date, information can be kept more relevant and used to inform a variety of recovery activities including critical habitat designation,

section 7 analyses, 5-year reviews, and section 10 conservation plans. The Species Status Assessment will also contain an updated assessment of threats to IFKW.

- Recovery Plan. This second stand-alone document will be an overarching approach to identify recovery actions. The introduction will provide the trail of logic for recovery of the species by referencing information in the Species Status Assessment, and provide a recovery strategy, as well as the three statutory requirements for a Recovery Plan, i.e., objective, measurable recovery criteria; site-specific management actions; and estimates of time and costs to recover the species.
- Recovery Implementation Strategy. In the case of relatively wide-ranging species, we could include a third stand-alone document, which would provide more detail regarding recovery actions and implementation activities. It's unlikely, but not yet determined, that we'll do this for the MHI IFKW.

This workshop summary is presented in 9 main sections: Purpose and Overview, Schedule, Participants, Threats Characterization Feedback, Recovery Actions Brainstorm, Highest Rated Potential Recovery Actions, Recovery Criteria Brainstorm, Public Comments, and Next Steps.

A copy of the agenda and all other meeting-related materials are available on the NOAA Fisheries false killer whale website.

Schedule

The four-day workshop was broken into three parts based on different threat-related themes:

- Tuesday October 25 – Wednesday October 26, 2016: Fisheries interactions
- Thursday October 27, 2016: Nutrition (prey size/biomass, change in prey distribution, competition with fisheries)
- Friday October 28, 2016: Contaminants and noise

Participants

The meeting was attended by 38 workshop participants and invited experts, all representing a variety of expertise (Tables 1 and 2 below). Thirty-one workshop participants were seated at the head table for one or more days and actively provided input and feedback. Two of the workshop participants, Brad Hanson and Gina Ylitalo, participated via video conference. Due to space, the seven invited experts were seated in the audience for one or more days and provided additional information and participated in the breakout groups.

Table 1: List of workshop participants (in alphabetical order). Key: AKFSC = NMFS Alaska Fisheries Science Center; DLNR-DAR = State of Hawaii's Department of Land and Natural Resources Division of Aquatic Resources; NWFSC = NMFS Northwest Fisheries Science Center; OPR = NMFS Office of Protected Resources; PIFSC = NMFS Pacific Islands Fisheries Science Center; PIRO = NMFS Pacific Islands Regional Office.

WORKSHOP PARTICIPANT	PARTICIPANT TYPE	AFFILIATION & EXPERTISE
Bruce Anderson	State Agency	DLNR-DAR, Administrator
Robin Baird	Researcher	Cascadia Research Collective & Hawaii Institute of Marine Biology, Research Biologist
Chris Boggs	Federal Agency	NMFS PIFSC, Director of the Fisheries Research & Monitoring Division
Dan Curran	Federal Agency	NMFS PIFSC, Fisheries Research & Monitoring Division
Bryan Dieter	Federal Agency	NMFS PIFSC, GIS Analyst for Science Operations Division
Phil Fernandez	Fisherman	Hawaii Fisherman's Alliance for Conservation & Tradition, President
Dawn Golden	Federal Agency	NMFS PIRO, Section 7 Consultation Biologist
Brad Hanson	Federal Agency	NMFS NWFSC, Leader of Marine Mammal & Seabird Ecology Team
Elia Herman	State Agency	DLNR-DAR, ESA Section 6 Marine Wildlife Program
Justin Hospital	Federal Agency	NMFS PIFSC, Socioeconomics Program within the Ecosystem Sciences Division
David Itano	Fisherman	Fishery Consultant
Michael Jasny	Non-governmental Organization	Natural Resources Defense Council, Director of Marine Mammal Protection
Brenda Jensen	Researcher	Hawaii Pacific University, Marine Toxicology with Focus on Contaminant Impacts on Cetaceans
Kurt Kawamoto	Federal Agency	NMFS PIFSC, Fisheries Research & Monitoring Division
Eric Kingma	Fishery Council	Western Pacific Regional Fishery Management Council, International Fisheries & Enforcement
Don Kobayashi	Federal Agency	NMFS PIFSC, Ecosystems & Oceanography Program
Jarad Makaiau	Federal Agency	NMFS PIRO, Fish & Wildlife Administrator for Sustainable Fisheries
Sean Martin	Fisherman	Hawaii Longline Association, President
Loyal Mehrhoff	Non-governmental Organization	The Center for Biological Diversity, Endangered Species Recovery Director
Alton Miyasaka	State Agency	DLNR-DAR, Acting Fisheries Program Manager
Joel Moribe	Federal Agency	NMFS PIRO, Section 7 Consultation Biologist
Erin Oleson	Federal Agency	NMFS PIFSC, Cetacean Research Program within the Protected Species Division
Aude Pacini	Researcher	Hawaii Institute of Marine Biology, Cetacean Hearing & Acoustics
Minling Pan	Federal Agency	NMFS PIFSC, Socioeconomics Program within the Ecosystem Sciences Division
Julie Rivers	Department of Defense	U.S. Navy, Pacific Fleet
Roy Sokolowski	Department of Defense	U.S. Navy, Pacific Fleet
Paul Wade	Federal Agency	NMFS AKFSC, Cetacean Assessment & Ecology Program within the Marine Mammal Laboratory
Kristi West	Researcher	Hawaii Institute of Marine Biology & Hawaii Pacific University, Cetacean Health, Disease & Strandings

WORKSHOP PARTICIPANT	PARTICIPANT TYPE	AFFILIATION & EXPERTISE
Phoebe Woodworth-Jefcoats	Federal Agency	NMFS PIFSC, Ecosystems and Oceanography Program
Gina Ylitalo	Federal Agency	NMFS NWFSC, Program Manager for the Environmental Chemistry Program
Nancy Young	Federal Agency	NMFS OPR, Marine Mammal Management

Table 2: List of invited experts (in alphabetical order). Key: DLNR-DAR = State of Hawaii's Department of Land and Natural Resources Division of Aquatic Resources; PIFSC = NMFS Pacific Islands Fisheries Science Center; and PIRO = NMFS Pacific Islands Regional Office.

INVITED EXPERT	PARTICIPANT TYPE	AFFILIATION
Ali Bayless	Federal Agency	NMFS PIFSC, Cetacean Research Program within the Protected Species Division
Asuka Ishizaki	Fishery Council	Western Pacific Regional Fishery Management Council, Protected Species Coordinator
Kirsten Leong	Federal Agency	NMFS PIFSC, Socioeconomics Program within the Ecosystem Sciences Division
Jamie Marchetti	Federal Agency	NMFS PIRO, Observer Program
Earl Miyamoto	State Agency	DLNR DAR, ESA Section 6 Marine Wildlife Program Coordinator
David Nichols	Federal Agency	NMFS PIRO, Sustainable Fisheries Aquaculture Program
Susannah Welch	State Agency	DLNR DAR, ESA Section 6 Marine Wildlife Program

In addition to the workshop participants and invited experts, staff from the NMFS PIRO Protected Resources Division presented information on recovery planning efforts for the MHI IFKW. Staff included Krista Graham, Endangered Species Biologist and lead on IFKW recovery planning; Susan Pultz, Conservation Planning and Rulemaking Branch Chief; and Ann Garrett, Assistant Regional Administrator for Protected Resources.

Numerous workshop participants provided presentations relating to the species or threats to the species, essentially providing a summary of relevant newly published and unpublished information since the 2010 Status Review Report. Day one had presentations by Erin Oleson, Dawn Golden, Chris Boggs, Bryan Dieter, Robin Baird, Justin Hospital, and Elia Herman. Day three had presentations by Brad Hanson (via video conference), Phoebe Woodworth-Jefcoats, and Chris Boggs. Day four had presentations by Gina Ylitalo (via video conference), Aude Pacini, Joel Moribe, Brenda Jensen, and Kristi West. Krista Graham provided presentations on all four days to set the framework for discussions.

Other NMFS staff and members of the public were present for one or more days throughout the workshop. Public comment was taken at the end of each day. Scott McCreary with CONCUR, Inc. and Bennett Brooks with the Consensus Building Institute served as the neutral facilitators each day.

Threats Characterization Feedback

In the Status Review Report for the insular false killer whale (Oleson *et al.* 2010), a threats characterization table depicted the past, present, and future threats to the species. Each threat was rated on its current and future risk that the threat will contribute to the decline of the species over the

next 60 years (i.e., high, medium, low). The certainty in that determination was also rated (i.e., high, medium, low).

For the recovery planning workshop, certain threats were revisited: fisheries interactions (two days), nutrition (one day), and contaminants/noise (one day). Most threats to IFKW fall into one of these three categories. The remaining threats (discussed later) were not discussed due to time and/or because they are considered a low threat to IFKW. Each day, after morning presentations of newly published and unpublished information, we reviewed a brief reasoning of the threat level as described in the 2010 Status Review Report (Oleson *et al.* 2010). The definition of the "overall threat level" as described in the Status Review Report was shared with the participants and is as follows:

- High = this threat is likely to *eliminate or seriously degrade* IFKW *throughout its range*;
- Medium = this threat is likely to *moderately degrade* IFKW *at some locations* within the species' range; and
- Low = this threat is likely to *only slightly impair* IFKW *in a limited portion* of the species' range.

The level of certainty that the species is affected, as described in the Status Review Report, was also shared with the participants and is as follows:

- High = there is *definitive* published and unpublished data to support the conclusion that this threat is likely to affect the population;
- Medium = there is *some* published and unpublished data to support the conclusion that this threat is likely to affect the population; and
- Low = there is *little* published and unpublished data to support the conclusion that this threat is likely to affect the population. (Emphasis added in italics.)

Summary of Threats Characterization Feedback

After hearing the latest information regarding status of and threats to the species, workshop participants were asked to provide brief feedback on each threat level, specifically whether participants thought the threat level should remain as is, or if the threat should be lower or higher than what it was rated in 2010. Again, we did not seek consensus on the feedback but asked for individual perspectives and opinions. Below is a bulleted synthesis of key feedback from this discussion. (The original threat level and certainty level are listed below in parentheses.)

Key feedback from the threats characterization discussion includes modifying the definitions of the threat levels to more accurately reflect the relative importance among the identified threats. A threat may be deemed high, but will not cause them to go extinct so using the current definitions was challenging. Additional feedback was that "mortality" might not be an appropriate "major effect" for some of the identified threats (i.e., under the "key ecological attribute" column of the original 2010 threat table, "behavior modification" or "serious injury or mortality" may be a more appropriate "major effect" for a threat such as incidental take). There was also discussion regarding whether or not to aggregate all types of fishing under competition, and whether competition is addressed under the threat of reduced biomass, or vice versa. Participants also expressed concern that NMFS should account for an uncertain future and changing conditions (e.g., shifting fishing effort, displacement, climate change effects, etc.). Participants also suggested expanding the scope of "plastic ingestion" to "ingestion of marine debris," and expanding the scope of "interactions with aquaculture facilities" to include "other alternative energy marine structures such as wind farms, etc."

(1) Incidental take in commercial longline fisheries (low threat, low certainty)

- Several participants agreed with this being rated as a LOW THREAT based on the following rationales:
    - Only 5.4% of the newly revised range of insulars overlaps with commercial longline fishing. When the threat was initially evaluated, the stock range was thought to be out to 140 km around islands (versus the new 72 km minimum convex polygon) and there was a fair amount of overlap with commercial longline fishing; now if we reevaluate confidence, it would be medium or high confidence of a low threat.
    - There is 20% observer coverage in the deep-set fishery and 100% observer coverage in the shallow-set fishery, although relatively little effort in the area of overlap. Observer coverage provides lots of data, and there are assurances through reasonable and prudent measures in Section 7 consultations to which the fisheries must adhere (i.e., collect data on the capture, injury, and mortality; comply with all gear requirements and handling protocols for marine mammals implemented through the False Killer Whale Take Reduction Plan, etc.).
- Some participants noted that the following should be considered:
    - The longline fishery has recently changed spatially, moving further north and east, although that effort could shift as oceanographic conditions influence the distribution of fish populations. In addition, 8% of fishing effort in Papahānaumokuākea Marine National Monument (PMNM) is now displaced elsewhere due to the PMNM expansion and we can't predict to where that effort may shift.
    - There is concern that any potential future expansion of the longline exclusion zone boundary (i.e., so there is 0% of overlap with IFKW) might affect smaller vessels, so they might switch from longline to shortline, which is not subject to the same restrictions as longlining. However, there has not yet been a shift from longlining to shortlining.
    - There is concern that fishing effort could continue to increase. It is unknown if the aforementioned displacement north and east will be permanent. As NMFS considers this, think about what factors involved in the displacement of fishing effort seem more permanent or short term in light of the time.
    - Thirteen to 22 longline sets occurred in the overlap area since 2013. Effort is based on log book data and not Vessel Monitoring System (VMS) data; log book data is not a perfectly robust data set. There is error with location data in logbooks and this needs to be addressed. Data quality is the driver of low certainty for this threat. VMS data could be useful in better characterizing this threat.

(2) Incidental take in commercial and recreational non-longline fisheries (high threat, low certainty)

- Input from participants indicated a range of preferences for rating this as a MEDIUM to HIGH THREAT. They provided the following discussion on the topic:
    - The threats relative to one another don't seem to comport with the provided definitions of low, medium, or high that were originally used. It may be a high threat relative to other threats, but will not cause IFKWs to go extinct. If you equate threats to the definitions, these categories are not accurate; some participants stated that depredation doesn't equate to mortality, it equates to an easy meal.
    - Perhaps split fishing types into subcategories (i.e., troll, handline, shortline, kaka line, shoreline, traps, pots, etc.) instead of lumping all as non-longline types so the threat from each one is evaluated separately. However, lumping vs. splitting depends on

recovery action. For outreach, if the same fisherman is using all these methods, then keeping them together is OK, but clearly describe the fishery/gear types separately somewhere if they are kept together as one threat. For research, it's best to aggregate fishing types. Formatting choice will depend on type of action item.

- There are broken teeth in some mouth line injuries. Once shortline fishery was classified as a Category II fishery under the List of Fisheries, people stopped reporting that they were fishing shortline. How fishermen report interactions is influencing how things are categorized and self-reporting is not reliable. Mouth line scarring shows interactions; may not be lethal, but there is a low probability of an animal stranding so there may be many more dying for some reason. Analysis of stranding records of false killer whales indicates between 1 and 3% of animals are actually found that die, so there is a low probability of detecting animals that die.
- Everything regarding shortlining has been anecdotal – no solid info; minimal self-reporting is very concerning, especially given its similarity to longlining. High threat is justified with troll fisheries as there is an incredibly high % of injured animals; this speaks to tremendous interaction with fishing gear, and these are the ones that lived – we don't see the animals that die so we can't use this evidence to say that these are not high mortalities.
- Short line is way outside of IFKW range (mainly at Cross Seamount); no one knows much about kaka line so this fishing type shouldn't be here.
- Extremely limited NMFS funds dictates research, so keeping this a high threat would likely direct more funds to this threat.
- There is a lack of observations of trailing gear. Would be good to tag some IFKW that are trailing gear.
- YouTube and Facebook are very anecdotal and we should not be using that as evidence to determine high, medium, and low threat. Interaction rates show very low incidence so high designation of threat seems inappropriate.
- There are only 12 vessels in short line fishery, and they mostly fish on Cross Seamount.
- Based on Robin Baird's photographs, mouthline injuries are accurate evidence of fisheries interactions. Of the 72 adult IFKWs that have their mouthline visible in a photo, 22% (16 of 72) of IFKWs have mouthline injuries. However, this is probably an underestimate since the mean % of mouthline visible in photos is 58%.
- Definition of "high threat" is based on serious injury determination and yet these injuries seem to be lip and tail hookings, which sound non-threatening.
- Fishermen will have a different perspective than scientists re: how animals interact with fisheries. Scientists are stating the threat is great because the population can't withstand the interaction, but fishermen are going to look at fishing effort and wonder how it can be a threat when there have only been 16 interactions with FKWs during 100s of 1000s of fishing effort days.
- The way recreational fishers catch fish is sometimes very different from the commercial fishing methods. The vast majority of recreational fishers "attend" their gear where the longliners do not. This attendance by recreational fishers allows immediate response to the interaction that usually minimizes injury and leads to release of the animal or avoidance of further interactions should one occur. Most recreational fishers are small boat trollers or handliners, which are much less likely to cause injury due to the lighter lines and smaller hooks on pole or hand gears. They are also more able to move to a different site if an interaction occurs. The threat level should remain low based on this uncertainty.

- Looking more broadly, using the amount of catch as an indicator of threat may be questionable. Since the gear is the threat, fishing effort in terms of trips may be a better threat indicator than catch. But even if the number of interactions with FKWs is higher with more fishing trips, what seems more important is the number of mortality and serious injury incidents. Logically, the number of incidents over the number of trips may be a better predictor of the probability of such interactions occurring than a simple catch number. Also, as each fishing method likely has a different probability of interactions, the different fishing methods may be better assessed in terms of risk, based on the relative differences in probabilities. So a shore-based throw net fisher would have a lower likelihood of having an interaction compared to a longliner.

(3) Interactions with aquaculture facilities: (low threat, low certainty)

- Individual participants generally agreed with the rating of LOW THREAT.
  - This is more of a future threat vs. current threat. What is status on impending Kohala aquaculture permit? Will they farm ahi? Farms off Kona are not near IFKW hot spots but other farms might pop up in higher density areas; need to recognize this risk could increase in the future.
  - Dolphins are food conditioned by pens that contain species they prey on; if there is a big pen full of ahi, IFKW may be attracted to the area and eventually become food conditioned to that type of structure.
  - For section 7 purposes, should note in recovery plan where there are good and bad places for aquaculture pens. Also, need to think about threats from alternative energy (i.e., wind farms, wave energy devices, etc.).
  - Can threat levels be changed? Mortality might not be appropriate in definition of threat.

(4) Intentional harm: (medium threat, low certainty)

- Individual participants discussed rationale for changing this to a LOW THREAT.
  - No recent data; possibly one known individual is not representative of fishermen population.
  - Documented potential harm is to other dolphins/species and is not specific to FKWs; fishermen have a hard time telling the difference between FKW and other cetaceans.
  - Caution creating/increasing regulations as it may increase pressure on fishing community; parallels with monk seals: increased management effort has led to increased incidences (shootings) that are detrimental to population.
  - While currently a low threat, potentially medium threat in future.

(5) Reduced total prey biomass (medium threat, low-medium certainty)

- Individual participants discussed rationale for changing this to a LOW THREAT and others for keeping it at MEDIUM.
  - Many agreed it may be a low(er) threat now, but if changes in climate impacts to fish aren't factored into the threat level for reduced prey biomass, then this threat needs to be updated to include impacts from climate change.
  - Estimated annual prey required should be reflected in the targeted population rate. Need to think in terms of what is needed for recovery, not just what caused the decline.
  - Low threat. Trends in catch and catch-per-unit-effort (CPUE) does not necessarily reflect trend in abundance of fish species; there is no evidence of competition.

- Discussion regarding evidence of emaciated animals. PIFSC started doing studies last year. Has not really been studied carefully and has only been noticeable when the animal was dying.

(6) Reduced Prey Size (medium level, medium certainty)

- Individual participants discussed rationale for changing this to a LOW THREAT, keeping it at MEDIUM, or changing to something in between.
  - Low threat. Total prey biomass is more important than total prey size. How much time is spent foraging vs. resting? Probably resting 20-30% of time (this is a good research question). Some idea of activity states from dive tags. Could get some more info from dive tags.
  - Prey size is not as convincing as biomass; should be lower threat than biomass; but low may too low; maybe low-medium.
  - Unknown if IFKWs specifically target larger fish. There was discussion around whether Southern Resident killer whales specifically target larger fish (some saying we aren't sure and others saying they have a preference for the largest species of salmon and prefer fattier runs). Whales detect swim bladders and smaller fish might not be as detectable.
  - It may not just be size of species, but behavior. Mahi may be easier to catch.

(7) Competition with commercial longline fisheries (medium threat, low-medium certainty)

- Individual participants discussed rationale for changing this to a LOW or LOW-MEDIUM THREAT.
  - Longline competition is only in 5.4% of IFKW range, so should be a low threat.
  - However, if all one stock then it does not matter where fish are caught, so should be low-medium.
  - CPUE declines are captured in reduced prey biomass threat. Maybe eliminate distinct fisheries and keep competition.
  - Competition should be thought of on a time scale, but need to clarify operational vs. ecological competition as solutions are completely different.

(8) Competition with commercial non-longline fisheries (medium threat, low certainty)

- Individual participants discussed rationale for changing this to a LOW-MEDIUM or keeping a MEDIUM THREAT.
  - If using a relative versus absolute scale, and considering that recreational catch is higher than what is considered in 2010 status review, competition with commercial non-longline fisheries should be less than competition with recreational fisheries. Therefore, this threat should be low-medium.
  - Some commercial non-longline fisheries rely on fish aggregating devices (FADs), which could attract FKWs, so this should remain a medium threat.
  - However, while FKWs do pass by FADs, they don't go out of their way to go to FADs; no evidence they work FADs for prey.

(9) Competition with recreational fisheries (low threat, low certainty)

- Individual participants discussed rationale for changing this to a MEDIUM THREAT.
  - Although there is considerable uncertainty in recreational fisheries data, new information suggests that the recreational catch is much higher that what was previously determined, so threat level should be medium (recreational fisheries catch

varies from year to year but has ranged from 11 to 17 million lbs over the last several years based on WPRFMC annual reports; note that the recreational survey includes some commercial fishing).
    - Amount of overlap between commercial and recreational non-longline fishing is only ~4 million lbs., so the amount of catch from recreational fisheries is ~9 million lbs, making this a medium threat.

(10) Ocean warming increasing low productivity zones (low threat, low certainty)

- Individual participants discussed rationale for LOW, LOW-MEDIUM, MEDIUM, and HIGH THREAT.
    - This should be a medium to high threat (with low certainty) as we don't know what the fish will do – they may leave the area in search of more productive areas.
    - This is a persistent background threat that should be rated low to low-medium; real threat but lower than threat with fisheries.
    - Unknown how recovery plan can even address this threat.

(11) Ocean acidification (low-medium threat, low certainty)

- Individual participants discussed rationale for changing this to a LOW THREAT.
    - Lower threat relative to other climate-related impacts. Impacts will be lower on the food web.

(12) Marlin, shark competition (low threat, low certainty)

- Individual participants generally agreed with keeping this as a LOW THREAT.
    - More info available now and should remain low. Marlin and shark abundance is greatly reduced from the past, making this a low threat.

(13) Natural and anthropogenic contaminants (habitat threat as it relates to prey) (low threat, low certainty)

- Individual participants discussed rationale for keeping threat level LOW or changing this to a LOW-MEDIUM or MEDIUM THREAT.
    - We just started looking at prey species; finding that there is a top predator level response of high contaminants. In fish collected in fishing tournaments, mercury levels are surprisingly high (unpublished data), pushes for a medium level because of high levels in prey. Cannot compare this to other threats such as fisheries because mortality is drastically different.
    - Emerging bodies of work for impacts on prey, and opportunities to collect reproductive organs from fisheries; suggests low threat.

(14) Harmful algal blooms (low threat, low certainty)

- Individual participants discussed rationale for a LOW to MEDIUM THREAT.
    - IFKW feed on prey that can and do contain ciguatoxin, making this a low to medium threat.
    - Others felt threat of harmful algal blooms was low.

(15) Environmental Contaminants (to animals themselves) (medium threat, medium certainty)

- Individual participants discussed rationale for keeping this as a MEDIUM or changing it to a HIGH or VERY HIGH THREAT.

- 2010 Status Review assessment was only based on a small sample; more information and studies on more animals since then indicate it is a higher threat.
- Concerned that environmental contaminants are limited to Persistent Organic Pollutants (POPs). There are other contaminants (Perfluorinated Chemicals (PFCs), heavy metals, etc.) that can have an effect and aren't readily found in blubber (dependent on stranding samples). Recommend keeping it a medium level.
- Others agreed that there is much more data available since 2010 that indicate a medium to high to very high threat level was more appropriate.

(16) Short and long-term climate change (increase in disease vectors) (medium threat, low-medium certainty)

- Individual participants discussed rationale for keeping this as a MEDIUM THREAT.
  - Difficult because there have only been 4 stranded IFKWs, so even one positive finding of something like morbillivirus could be severe. Agree with both level and certainty, with potential for risk factor of disease.
  - High potential of transference throughout entire social group; keep at medium.

(17) Sonar and seismic exploration (noise) (medium threat, low-medium certainty)

- Individual participants discussed rationale for changing this to a LOW or HIGH THREAT, or keeping it a MEDIUM THREAT.
  - Overall range is smaller so overlap with navy sonar is smaller. Most Naval activities are outside the range of foraging areas and is consistently less than projected levels in permit. Species will avoid vessel before it avoids sonar because sonar is pointed down/underneath vessel. Tag data and other Navy data indicate that sonar doesn't warrant a medium level specific to MHI IFKW, but rather a low threat level.
  - Reason for animal remaining in area of sonar is unknown; could have habituated and not avoided area. Keep at medium, based on account that mass strandings can happen to the species.
  - Potential for mass stranding would be catastrophic (example of FKWs stranding in Argentina); habitat loss, aggregate of noise exposures are significant risks, so keep at medium.
  - Depends on the area around Hawaii; some areas are low risk to noise, some are high so comfortable with medium ranking.
  - Universal source of noise threats should be expanded.
  - More data and studies to come. If threat level stays medium, then certainty should be low because there is little data showing a threat.

(18) Parasitism (low threat, low certainty)

- Individual participants generally agreed with LOW THREAT.

(19) Oil Spill (low threat, low certainty)

- Individual participants discussed rationale for keeping this a LOW THREAT or changing this to a MEDIUM THREAT.
  - Although low frequency, if it actually occurred it would be a big deal, so should be medium.
  - A poorly placed oil spill could be devastating and exposure could be high, but IFKWs do move frequently and fast and could leave area quickly, so it's a low threat.
  - IFKW circumnavigated Oahu 9-10 times in 3 weeks, so threat to exposure fairly likely.

(20) Plastic ingestion (low threat, low certainty)

- Individual participants discussed rationale for changing this to a MEDIUM THREAT.
  - 1 out of 4 stranded IFKW had plastic bottle in stomach, so should be medium.
  - Should expand scope to "marine debris," which is an increasing threat.
  - Agrees level should be higher. Disagrees that "ingestion of chemical light sticks used on swordfish longlines in Hawaii may pose additional risk."

In addition to the aforementioned 20 threats, there are 7 other threats that were not discussed during the workshop due to limited time. The threats not reviewed during the workshop are as follows: reduced genetic diversity (medium threat, medium certainty), inbreeding depression (medium threat, low certainty), other Allee effects (medium threat, low certainty), predation from killer whales (low threat, low certainty), predation from sharks (e.g., tiger sharks) (low threat, low certainty), vessel strikes (low threat, low certainty), and whale/dolphin watching (low threat, low certainty). We will use the best available data to reevaluate each of these threats and their current/future threat level and certainty, and include this new assessment in the Species Status Assessment and Recovery Plan.

Feedback from the recovery planning workshop, review of the best available data, and further discussions with experts will be used to reevaluate each of the threats. A revised threats characterization table and associated textual descriptions with revised rationales will be presented in the Species Status Assessment and will be peer reviewed.

Recovery Actions Brainstorm

The Endangered Species Act mandates that Recovery Plans be developed and implemented for the conservation and survival of ESA-listed species. Recovery Plans are not solely to guide funding and actions of NMFS; they are meant to guide funding and actions of all stakeholders who may be involved or interested in conserving and recovering a species. Recovery Plans are meant to be guidance documents, not regulatory documents. Recovery Plans are also typically frontloaded with research actions in order to later inform management actions.

There are three types of recovery actions: Research, management, and monitoring actions. Each recovery action should explicitly relate to the causes of imperilment; contribute to achieving recovery; include short and long-term actions; be objective and measureable; and be concise, action-oriented, and fundable. Examples of the three types of recovery actions were excerpted from the Southern Resident killer whale, Cook Inlet beluga whale, North Atlantic right whale, and Hawaiian monk seal Recovery Plans and presented during the workshop.

Following an overview of recovery actions, workshop participants were divided into groups and asked to brainstorm on research, management, and monitoring recovery actions as it pertained to the days' threat theme (i.e., fisheries interactions, nutrition, or contaminants/noise). Each group was asked to record all ideas. Near the end of each brainstorm, each group was asked to rank their recovery actions as either high or low priority. In the interest of time during the group report out, only the actions deemed high priority by each group were discussed.

The following list is the suite of recovery actions, in no particular order, from each group and includes both high and low priority recovery actions. (Low priority actions that weren't discussed but were captured on note pads have been included here.) Actions are grouped according to the three threat themes (i.e., fisheries interactions, nutrition, or contaminants/noise) and then sub grouped under

specific topics. A total of 81 potential recovery actions to conserve and recover IFKWs are listed below. Potential partners in carrying out these potential recovery actions are also listed where provided. Also, note that some potential recovery actions have similar components since they were discussed during different days of the workshop.

Following the group brainstorm on potential recovery actions, we conducted a ranking exercise of the highest-priority actions to understand participant preferences better. Participants were each given a certain number of dot stickers and asked to allocate their dots based on which actions they perceived to be the most effective for recovery of the species. All dot stickers were of equal value, each person could place up to three dot stickers on any one item, and individuals could choose not to use all of their dot stickers. Total number of dot stickers varied for each threat theme/day and was based on the number of highest-priority actions (i.e., the fisheries interaction day had the most number of potential recovery actions [35 actions], nutrition had 24 recovery actions, and contaminants/noise had 23 recovery actions). Therefore, participants were given 30 dot stickers to allocate on the fisheries interaction workshop day, 12 dot stickers on the nutrition day, and 10 dot stickers on the contaminants/noise day.

Participants were given time to review the highest-priority actions and allocate their dot stickers. Dot stickers were then tallied and the actions with the highest number of dot stickers were discussed (see next section "**Highest Rated Potential Recovery Actions**"). The number of dot stickers attributed to the action are presented in parentheses in the list below.

FISHERIES INTERACTIONS

MHI Demographic Research:

1) Maintain and continue photo ID and satellite tagging efforts (37 dots)
    a. Focus on existing data gaps: Cluster 2, winter and spring surveys, and windward surveys
    b. Determine if movements of social groups are changing over time (i.e., moving offshore) and whether there are additional social groups
    c. Provide tour operators with cameras to help obtain more photos
    d. *Partners*: various researchers (Cascadia, PIFSC)
2) Use hydrophones on tour boats, charter boats and FADs to detect IFKW (9 dots)
    a. Outreach component – focus message on reducing depredation, not reducing takes
    b. *Partners*: DLNR, Non-Governmental Organizations (NGOs), tour groups, fishing groups
3) Use acoustic instrumentation in hard to survey areas (13 dots)
    a. Place on buoys and FADs
    b. *Partners*: DLNR, Pacific Islands Ocean Observing System (PacIOOS), researchers, fishers, Navy
4) Incorporate new Unmanned Aircraft Survey (UAS) technology (e.g., hexacopter) into ongoing survey efforts to assess demographics and health of IFKW (6 dots)
    a. Stage people/boats in areas on the windward side for opportunistic monitoring when weather is good
    b. Systematically use drifting sensors or gliders to look at distribution more broadly to target IFKW hotspots, and focus on windward side
5) Obtain more demographic info (abundance, injury trends, survival rates, range, habitat use, and social clusters), etc. with SPLASH-level effort (40 dots)
    a. Continue tracking injuries, trends, movements, etc.
    b. Collect data with robust survey design/effort for trend analysis (current population trend is unknown). During the status review, all models concluded that the IFKW

population is at risk of extinction with a decline of 9%. With new data, we may have a higher capacity to detect trends within clusters. Use the SPLASH research model in Hawaii for IFKWs using researchers across all islands at the same time. Trend analysis can influence how much time we have to do research

c. *Partners*: Cascadia, PIFSC, Sanctuary, State, Hawaii Institute of Marine Biology (HIMB), University of Hawaii (UH)-Hilo, fishermen, PacIOOS, Navy. Consider compensatory mitigation involving the Navy as they have gliders.

6) Repeat 2003 aerial survey effort to feed into trend and abundance estimates (4 dots)

a. Targeted flights for group size over sighted groups/clusters

Monitoring of Commercial Longline Fisheries

7) Continue to monitor level of take and address any changes through the FKW Take Reduction Team (TRT) process and section 7 process (10 dots)

8) Monitor changes in longline fisheries (e.g., effort, location) (5 dots)

9) Implement electronic monitoring to supplement observers to assess compliance with FKW Take Reduction Plan (TRP) measures (e.g., how fishers are dealing with FKW bycatch) when no observer is on board (e.g., Atlantic longline fleet) (14 dots)

a. Note that the Council did investigate video monitoring in 2009 on a few boats and PIFSC has funds to continue researching. It's not an enforcement tool, but for data collection. Need software to analyze camera data; technology has significantly advanced since 2009. Electronic monitoring is a national priority, and is occurring elsewhere (e.g., the entire Atlantic longline fleet has electronic monitoring).

b. *Partners*: NOAA, Council

Better Characterize Interactions between State Fisheries & IFKWs

10) Understand the method, how, and what's causing dorsal fin cuts. Use FKW cadavers to test physical elements of the gear (i.e., line strength) to see what might be causing injuries. This might also help identify segment of fishery most likely to cause serious injuries (39 dots)

11) Conduct targeted surveys in IFKW/fisher overlap areas with methods tailored to collect sensitive information (29 dots)

a. Conduct social science survey (using randomized response technique or related methods) to determine the type of gear, methods, target species, and motivation of fishermen of those fishing in IFKW hotspots. Also, survey fishermen to assess how often FKW are even seen. Use data for targeted outreach and education. Caution that surveys may not be best methodology as some fishermen may feel (or be) excluded. The issue of subjects being protected from self-incrimination for interactions with protected species will also need to be addressed in order for data collected via surveys to be considered accurate.

b. *Partners*: Universities with specialties using survey techniques, DLNR, fishermen

12) Research best hook type to mouth-catch fish (12 dots)

a. Assess if circle hooks are a viable alternative compared to J hooks; research size, barbless, bait. Includes broad outreach component.

b. Incorporate testing of measures in tournaments with high-dollar prizes to winners from sponsors

c. *Partners*: Academia, international partners

13) Continue tracking injury rates (27 dots)

14) Model habitat hotspots using telemetry, sighting data, eddies and oceanographic data so fishermen can avoid areas that are important habitat (13 dots)

a. Educate fishermen to avoid IFKW hotspots/areas

15) Research interaction with proxy species (9 dots)
   a. Do literature review, look at proxy species and other regions (is there data from other fisheries re: gear and interaction rates as proxies of evidence); look at deterrents and acoustic gear

16) Conduct human-wildlife interaction cooperative research study – work with fishermen who have had interactions to see if we can glean more data (13 dots)
   a. Engage more with fishermen to get broad involvement (i.e., what actions to avoid FKW/unhook, etc. are reasonable to take from a fishermen's perspective; how can we better engage with fishermen, etc.)
   b. Obtain more data regarding intentional harm; incorporate survey with other surveys to understand motivation; take care not to draw attention to this issue
   c. *Partners*: PIFSC, Hawaii Fishermen's Alliance for Conservation and Tradition (HFACT), fishing clubs

17) Deploy additional dive tags to assess dive behavior (6 dots)
   a. Get at feeding on different prey during day vs. night, and how fisheries might be interacting with the population given diving behavior
   b. Tag different clusters for this info

18) Research ways to deter/avoid/prevent depredation. Incidental take will be reduced by reducing depredation on catch

State Management Actions

19) Encourage State of Hawaii to develop a Habitat Conservation Plan (HCP) for an ESA section 10 Incidental Take Permit (ITP) for all protected species (to insulate fishermen from legal trouble) (16 dots)
   a. Some confusion about what is an ITP, how it works, and assurances that fishery won't be shut down? Support for an ITP among fishermen varies. Take is already occurring so an ITP would allow fishermen to report take and not worry about prosecution. Could support State to modify licensing, and ramp up outreach and education about how an ITP will protect fishermen and won't shut the fisheries down. Example: pound net fisheries in either Virginia or North Carolina are covered by ITP and fishery has not shut down.
   b. Have a class/workshop/presentation to build understanding around ITP

20) Incorporate IFKW in State of Hawaii Comprehensive Wildlife Conservation Strategy (CWCS) and implement strategy (1 dot)
   a. *Partners*: DLNR; Note DLNR is currently revising the 2005 CWCS

21) Conduct a finer-scale analysis of State data overlaid with IFKW hot spots
   a. Go to hot spot ports/communities/fishing clubs to better characterize gear, especially hybrid gear (hybrid includes fishing multiple gears at once, and could include shortlining)
   b. Find out how much reported shortlining is not at Cross Seamount but is within IFKW boundary
   c. Assess which ports fishermen are based out of, numbers and type of fishermen (commercial vs. non-commercial), and what community they are from, type of gear they use, etc. Use results for targeted outreach and education
   d. First, compile what you think you know and then ground truth it with fishermen
   e. *Partners*: Cascadia, DLNR-DAR, PIFSC, universities, researchers

22) Monitor development of aquaculture projects

a. Increase attention of permitting of those with potential to attract FKWs (i.e., yellowfin tuna, all pelagic species). Fishermen are concerned that pens might change migratory behavior of fish. Pens may also change FKW behavior

Trigger-dependent Management Actions

23) Craft trigger-dependent management actions (6 dots)
   a. If population is in decline, it would trigger some type of emergency action (closure of area/hot spot, etc.). Need trigger language: if x then y
   b. Can be seen as a staged mapping process: 1st – hotspot mapping analysis, then management action; 2nd – trolling assessment, then management action; 3rd – gear assessment, then modifications; etc. Systematic process of moving from research with provisional outreach to management
   c. Examples of what could constitute a management trigger: population decline, trend decline, increased interactions
   d. Examples of emergency measure: close hot spot area(s), close other areas

Develop Strategic Outreach Plan

24) Develop best management practices/materials (23 dots)
   a. What to do if you see FKW (or blackfish or another protected species) or interact with them

25) Promote use of "good" hooks in fishing tournaments (1 dot)

26) Develop/distribute waterproof interpretive materials (e.g., developed by Robin Baird) to appropriate audiences (25 dots)
   a. Include species ID, natural history, interesting facts, and what to do if you catch dolphin, whale, turtle, etc. Look at Fishing Around Sea Turtles (FAST) materials and modify
   b. Better educate non-longline captains on species info to present to clients to enhance their experience
   c. Include targeted education and outreach: don't feed, etc.

27) Demonstrate State/Fed coordination and united front on issues relevant to FKW (12 dots)
   a. Fishermen are very confused, even though Fed & State working together, the perception is that things are inconsistent. Need clear messaging to public

28) Develop a smart phone app (examples include Alaska app for humpbacks) for reporting interactions or sightings
   a. If enough interactions, might be able to identify real-time hotspots for avoidance
   b. This might be a way to identify other contributors for photo ID efforts
   c. Need correct messaging. App to include species ID
   d. Partners: look to existing app developers, charter fleet fishermen

29) Develop strategic outreach with lots of involvement from fishing community, using key messaging (5 dots)
   a. Targeted outreach to fishermen with highest potential to interact with IFKW (i.e., Kaneohe, Molokai, Maui north shore, Kawaihae)
   b. Make fishermen part of the solution, not the problem
   c. Promote that this is our local resource (species) and our local responsibility
   d. Don't talk about takes of FKWs; focus on depredation. Solve the problem of takes by solving the problem that fishermen want to avoid, which is depredation. Need fishermen involved in the process. Use DLNR ongoing outreach efforts through section 6 grant
   e. Include standard operating procedure is to leave area if you see FKWs

f. Include what to do (protocol) if an interaction happens. Include consistent messaging for all protected species. We have protocols developed as part of FKWTRP and FAST program; challenge and need is to communicate this to non-longline fishers
g. Real time outreach. If you know where the whales are, you are doing management by telling people how/where to avoid them. More valuable to know where FKW spend most of their time and telling fishermen what areas to avoid. Not sure if real-time satellite tag reporting can be used. Otherwise use verbal communication

30) Foster cooperative involvement among fishers, especially charter and tour boats, to improve fleet communication to avoid (or find) FKW
   a. Partners: Fishers, tour groups

31) Hold non-longline commercial fishing protected species course similar to longline course

Better Characterize State Fisheries

32) Develop technical descriptions of different gear types/methods to better characterize state fisheries (34 dots)
   a. Ground truth info with fishing groups and HFACT (24 dots)
   b. Engage with fishing community on language and terminology; possibly redesign ID cards if fishermen ID them differently from scientists. Co-develop materials with fishermen
   c. Distribute at annual CML license distribution, community events, general public
   d. *Partners*: Everyone

33) Assess adequacy/modify State Commercial Marine Licenses (CML) reporting forms (11 dots)
   a. Understand what reporting information would be helpful (e.g., gear aspects not reported, observation of FKWs, etc.)
   b. Test revised form before officially modifying it. Could email CML holders for info on expanding info on forms
   c. Conduct periodic targeted survey to supplement state form
   d. *Partners*: State, fishers, PIFSC, Council

34) Establish and implement State non-commercial fishing license (20 dots)
   a. Concept on the table at DLNR but no formal process yet (might come to fruition in 1-2 years). Will be a good way to reach fishermen

35) Pursue electronic monitoring of 'hybrid' fishery to understand what that means; need a longer time horizon (~10 years) (2 dots)

NUTRITION

Prey-related

36) Assess stock structure/connectivity of non-tuna prey species – determine if highly migratory or local stocks (26 dots)
   a. If local stocks, develop stock assessments and consider management actions (e.g., catch/size limits to maintain or rebuild healthy local stocks)
   b. *Partners*: PIFSC, DLNR-DAR, Academia, Secretariat of the Pacific Community

37) Assess seasonal/spatial variation of prey distribution/quality (7 dots)

38) Advance international conservation of highly migratory prey species (5 dots)
   a. Consider trophic cascades relations; more marlin could mean less tuna, less mahi mahi

39) Identify most important prey species of IFKW and competing odontocetes
   a. Conduct fecal analysis

40) Conduct diet comparison with other HI FKW populations
   a. Especially NWHI given lack of fishery overlap

41) Research role of sharks as competitors

Foraging/Whale

42) Assess IFKW diet composition via multiple methods (25 dots)
   a. Genetics, fecal analysis, stable isotope studies, etc.
   b. Dive tags for foraging behavior
   c. Critter cam footage of foraging
   d. Proportion of time foraging, day-night differences, prey switching
   e. Take catch data already available and just look at prey species
   f. Competition for squid prey
   g. Tie things to age structure, age animals from DNA; need more samples
   h. *Partners*: Cascadia, PIFSC, researchers, fishers

43) Assess body condition over time using multiple methods (22 dots)
   a. Measure or marker for nutritional stress (cortisol measurements)
   b. UAS/hexacopter with aerial photogrammetry (fat vs. emaciated)
   c. Are certain genes expressed in starved animals?
   d. *Partners*: Researchers (gov't, universities, NGOs)

44) Continue monitoring IFKW stock (5 dots)

45) Monitor changes in IFKW foraging activity over time
   a. Correlate with productivity/changes in fish abundance

46) Understand social dynamics of foraging behavior

47) Analyze and model prey abundance dynamics within the range of IFKW stock
   a. I.e., Would decrease in local biomass affect IFKW?

48) Research prey size and foraging bioenergetics of IFKW

49) Conduct depletion studies
   a. Fish hard in one area and leave other areas unfished to check for local depletion
   b. Could do natural experiments with the newly expanded monument, compare before and after
   c. See example studies with sea lions

Fishery-related

50) Characterize fisheries (recreational/commercial non-longline) effort/catch (13 dots)
   a. Where and when do fisheries take fish and how many to determine local depletion
   b. Look at motivation of recreational fishers – are they fishing for sport or food? Do they want one good fish? That will determine the amount/type of outreach
   c. *Partners*: Fishers, PIFSC-socioeconomics program

51) Encourage catch and release especially in recreational fisheries (2 dots)
   a. If competition with recreational fisheries is a concern, include info on fishing catch vs. IFKW consumption in outreach efforts

52) Encourage minimum size of retention of prey species (8 dots)

53) Improve accuracy of non-commercial catch data (19 dots)
   a. Look into implementing state non-commercial license
   b. Partners: State, Fed, fishers, PIFSC, UH, Council, Conservation International, Council's License Registry Permitting Study Group

54) Complete more targeted analysis of recreational/non-longline commercial catch data of IFKW prey species (9 dots)

a. *Partner*: Chris Boggs

Large-scale

55) Model ecosystem relationships (13 dots)
   a. Prey, IFKW, fishers, and other competitors
   b. *Partners*: PIFSC, academia, Cascadia, researchers, fishers

56) Develop a conceptual model of how threats are interconnected (8 dots)

57) Reduce global greenhouse gas emissions (3 dots)

58) Downscale climate models to look at productivity and species climate envelopes in HI
   a. *Partners*: Pacific Islands Climate Change Cooperative, PIFSC, UH

59) Conduct vulnerability assessment of IFKW prey preference due to climate change
   a. Anticipate changes due to future trophic shifts in prey items
   b. Consider ocean acidification impacts upon small pelagic fish (prey of prey)

CONTAMINANTS AND NOISE

Contaminants

60) Conduct necropsies and post-necropsy analyses – contaminants, bio-markers, disease screening

61) Monitor for/identify toxic levels of contaminants
   a. Collect biopsies from insular, pelagic and NWHI stocks
   b. Analyze fecal samples
   c. Analyze contaminant levels in prey species collected from fishermen
   d. Compare NWHI and pelagic populations to insular population

62) Fill in knowledge gaps that might be low-hanging fruit
   a. Identify and control land sources of pollution – there may be data out there we're not familiar with (e.g., superfund data, landfill data, where Polychlorinated Biphenyls (PCBs) might be leaking)
   b. Contaminants from runoff and streams
   c. Determine if mercury sources are local or international
   d. Don't forget tenting for termites
   e. Partners: Environmental Protection Agency (EPA), DLNR, Department of Health, Department of Commerce

63) Assess emerging contaminants in runoff and wastewater

64) Implement secondary sewage treatment (e.g., for Ala Wai Canal)

Noise:

65) Monitor effects of Navy training

66) Tag and monitor behavior of live stranded animals that are released to wild

67) Continue to better understand hot spots for habitat use

68) Better characterize MHI soundscape
   a. Validate sound source: is noise traveling the way we think it is?
   b. Make sure it works with current modeling sound source validation; add explosives, etc. as a noise source

69) Consider time-area closures not just for sonar, but for all categories of anthropogenic noise exposure that have been established as stressors

70) Conduct year-round acoustic monitoring of background noise
   a. Ambient/anthropogenic sources
   b. Make IFKW hot spots a priority
   c. Relate NOAA acoustic buoy info with IFKW hot spots; link with ocean noise strategy

d. *Partners*: State, Federal, researchers

71) Tag animals and analyze stress hormone levels (via fecal samples) before, during, and after anthropogenic (military) events and among populations (pelagic and NWHI)
   a. Tag IFKW in vicinity of hydrophones on Pacific Missile Range Facility; analyze reactions to vessel movement and sonar use

72) Compare at-sea noise on a captive FKW
   a. Determine what amount of engine noise affects masking on a captured animal

73) Develop emergency mass-stranding plan
   a. Tie to current stranding plans (e.g., oil spill response plans monitor exposures of marine mammals)
   b. Tag and biopsy stranded individuals that are returned to sea
   c. *Partners*: Fed, State, Hawaii Pacific University (HPU), UH, NGOs

74) Improve reporting to public during a stranding and outreach on how public should report a stranded animal(s) – report cause and findings
   a. *Partners*: NOAA, HPU, UH

75) Assess diet, disease, and anthropogenic stomach contents of stranded animals

76) Better understand seasonal patterns of IFKW
   a. Prey
   b. Ocean conditions (i.e., eddies)

77) Determine if facility to rehabilitate live animals is a good option

78) Understand impacts of alternative energy projects – how will these projects change the environment?
   a. Wind offshore (noise)
   b. Undersea power cables
   c. Wave generation

79) Understand difference between primary and secondary treatment of sewage discharges for Honolulu county
   a. Consider additional treatment for places (e.g., Ala Wai Canal)
   b. *Partners*: City and County of Honolulu, EPA, State

80) Involve other agencies in monitoring for strandings

81) Research contaminant levels in captive animals
   a. Captive FKW in Hawaii and one in Canada (Vancouver Aquarium)
   b. Comparison of diet

Highest Rated Potential Recovery Actions

The 25 actions with the most number of dot stickers, interpreted to be the most/important/effective for recovery of the species, are listed below, along with the discussion that ensued among workshop participants. These potential recovery actions are listed in descending order based on the number of dot stickers received.

FISHERIES INTERACTIONS

1) Determine population trends with SPLASH-level of effort (40 dots)
   a. SPLASH-level effort will help guide future work and interpret previous work. Will be pricey but worth it in the end. To be done periodically over time (3 sample types over 1-1.5-year period). Need NOAA ship time, but Recovery Plan could help to leverage ship time. Could leverage partners including Pacific Whale Foundation, National Fish and Wildlife Foundation, etc. Getting others to commit can get the government to commit

2) Conduct gear test to understand the mechanism of injuries (39 dots)
    a. This is necessary to correctly assign injuries to a fishery and increase our certainty and accountability to a fishery, and to direct/focus our outreach and research. As there is foundational information that is obviously lacking, this is critically necessary to drive management and determine if management actions are working
3) Continue satellite tagging and photo ID efforts (37 dots)
    a. Ensure this info is continually collected over time. This comports with continuing to track injury rates (27 dots) as this gets to the crux of threats to this population. The overall utility of this research has been invaluable for informing us of the population
4) Develop technical descriptions of different gears in state fisheries (34 dots)
5) Conduct targeted surveys in IFKW/Fisher overlaps using sensitive methodology (29 dots)
6) Continue tracking injury rates (27 dots)
7) Develop audience appropriate cetacean ID materials (25 dots)
8) Convene workshops with fishers to ground truth info (24 dots)
9) Establish and implement state non-commercial fishing license (20 dots)

NUTRITION

10) Assess prey stock structure/connectivity/local depletion (26 dots)
    a. *Partners*: DLNR-DAR, Secretariat of the Pacific Community, PIFSC
11) Conduct diet studies (25 dots)
    a. *Partners*: Cascadia, PIFSC, researchers, fishermen
12) Assess body condition over time (22 dots)
    a. *Partners*: researchers (gov't, universities, NGOs)
13) Improve accuracy of catch data (19 dots)
    a. Note: there is a licensing & permitting study group report available from the Council
    b. *Partners*: DLNR-DAR, PIFSC, UH, Council, Conservation International
14) Characterize fisheries – catch/effort; know what is being caught, where and when (13 dots)
    a. *Partner*: Chris Boggs; know motivations of fishers (*Partner*: some work has been done by Justin Hospital)
15) Model ecosystem relationships (13 dots)
    a. *Partners*: PIFSC, academia, Cascadia, researchers

CONTAMINANTS AND NOISE

16) Develop an emergency mass-stranding plan (14 dots)
    a. *Partners*: DLNR-DAR, NOAA, U.S. Coast Guard, HPU, HIMB, Native Hawaiian community, Incident Command
17) Continue support for necropsy efforts on insular and pelagic stock FKWs and for subsequent analyses – contaminants, bio-markers (14 dots)
    a. *Partners*: HIMB, HPU, NOAA
18) Continue to collect biopsies – conduct subsequent analyses (14 dots)
    a. *Partners*: Researchers (government, academic, NGOs, National Institute of Science and Technology)
19) Understand sound scape – monitoring of background noise, IFKW hot-spots, anthropogenic ocean noise (12 dots)

a. *Partners*: NOAA - Monument and Sanctuaries, Navy, Bureau of Ocean Energy Management, citizen science, Jupiter Project, researchers, private sector (Horizon, Matson, Young Brothers)

20) Conduct stress hormone studies and tagging before, during, after anthropogenic events among all populations (11 dots)

21) Improve outreach for strandings (11 dots)

a. *Partners*: NOAA, HIMB, UH, HPU, Office of Hawaiian Affairs, State emergency management, Native Hawaiian groups, DLNR-DAR, public

22) Fill the knowledge gaps about land-based contaminants and control land-based sources of contaminants (10 dots)

a. *Partners*: EPA, State, City and County, Department of Health, Federal Highway Administration, DLNR-DAR

23) Compare anthropogenic ocean noise on a captive FKW (8 dots)

24) Consider time-area closures for all types of anthropogenic noise (i.e., military, cruise ships, tankers, etc.) (5 dots)

25) Conduct monitoring of pelagic FKWs for contaminants-level comparison to IFKW (1 dot)

a. *Partners*: Navy, Bureau of Ocean Management, NOAA, Researchers, Army Corps of Engineers, US Coast Guard, Department of Defense

Recovery Criteria Brainstorm

When a species is listed as threatened or endangered under the ESA, the Act requires that Recovery Plans incorporate objective, measurable criteria, which, when met, would result in a determination that the species be removed from the list (i.e., delisted). Developing objective, measurable criteria for a Recovery Plan focuses on two areas:

- Biology-based criteria. These criteria will measure the performance of the population over a meaningful period of time. These criteria can be tied to metrics relating to abundance, growth rate, and demographics (e.g., age and sex ratios, distribution of individuals among different subpopulations)
- Threats-based criteria. These criteria will focus on the reduction of threats that may have caused the population decline or that limit recovery. The five ESA section 4(a)(1) factors that were considered during listing must be considered during delisting (i.e., habitat destruction or modification; overutilization; disease or predation; inadequacy of existing regulations; and other natural or manmade factors affecting its continued existence)

After an overview of recovery criteria and examples from Recovery Plans from the Southern Resident killer whale, Cook Inlet beluga whale, North Atlantic right whale, and the Hawaiian monk seal, workshop participants were asked to brainstorm on potential recovery criteria for IFKW. Recovery criteria discussed during the first workshop theme (fisheries interactions) were compiled and presented during the second workshop theme (nutrition), and then further compiled and presented during the third workshop theme (contaminants and noise). Below is the suite of potential recovery criteria compiled from all three workshop themes:

Potential Biology-based Criteria to Downlist or Delist:

1) Increasing population trend (~2%) over ~1 generation (~25 years [262 individuals] to ~35 years [320 individuals]) (calculation based on 160 current IFKWs and compounded over 25-35 years)

Or

2) Minimum abundance of 262 or 500 to downlist (500 is a plausible number often used for cetacean abundance, and is similar to the number of FKWs counted during the 1989 aerial survey (although unknown what proportion were insular or pelagic individuals)); 320 or 750 to delist (NOTE: These numbers are a starting point for discussion only and could be characterized by X and Y as in the items below)

Or

3) Population growth (1-5%) over decades (at least 20 years)

Or

4) Stable or increasing population across social clusters (may be complicated due to potential changes in clusters over time)

Or

5) No more than 50% of population in a single social cluster (caveat: clusters are fairly stable in short term, but in long term may split (e.g., Southern Resident killer whales))

And

6) No more than X% risk of quasi-extinction over X years

7) Genetic diversity within population/among social clusters

8) X # or X% of mature females in population or in each social cluster

Potential Threats-based Criteria to Downlist or Delist

1) None of the known threats are causing a decline in the population growth rate

Or

2) Threat-induced mortality is reduced to acceptable mortality level

a. Zero evidence of new anthropogenic injuries over a set time (not just lethal injuries/strandings)
b. There is enough prey that the population is growing (important to put message about having large populations of fish in there. IFKW numbers could grow but individuals might not have enough food)
c. Long-term evidence of contaminants in juveniles is declining over time, or average juvenile contaminant levels are declining over time
d. Impacts from predators, disease, etc. are low enough/stable that the population is growing
e. Mortality from bycatch is severely reduced and injuries from interactions are reduced (consider how increased population will affect injury rate)

3) X% of individuals within each social cluster is generally robust over X time

Summary of Potential Recovery Criteria

Key feedback in the recovery criteria brainstorm over the entire workshop includes consideration of a changing environment due to climate change. Also, it's important to note that we don't have an estimated historical abundance of IFKW, so it's difficult to develop absolute abundance numbers to downlist or delist. The Status Review Report (Oleson *et al*. 2010) provided a plausible historical abundance (769 individuals) based not only on several caveats, but extrapolated the density out to a range that has since been revised and contracted (from 140 km around the MHI to a convex polygon around the MHI that approaches within 72 km in some areas; see Bradford *et al*. 2015). Additionally, a current abundance trend does not exist. Therefore, regardless of the abundance numbers that may be used in the Recovery Plan to downlist or delist IFKW, it was stressed that numbers should be derived from objective criteria and be very transparent. Finally, this is not meant to be the final list of recovery criteria but instead is a solid start to developing recovery criteria for IFKW.

Public Comment

Public comments from all four days are summarized as follows:

- Look at the spatial distribution of fisheries to characterize them. Set up messaging to fishermen to make fishermen a part of the solution versus part of problem.
- Directed take shouldn't be a medium level risk; there are too many assumptions with too low of a certainty and could be poorly perceived by fishermen.
- It is important to note the distinction between characterizing the fishery versus characterizing interactions. While the NMFS Observer program could be helpful, the info source should be fishermen.
- The State fishing reporting form is weak and needs revised. Without that we won't be able to monitor things over time to see if we are effective. Observer program can be used as a way to verify the info collected on the new form.
- Adding a depredation line to the reporting form took significant effort to appropriately phrase so there was not any self-incrimination. We need to ensure fishermen don't get in trouble for providing the info we need with limitations we have under the ESA.
- We can't solve the problem unless we have the entire picture and fishermen may worry about self-incriminating and therefore may not be truthful. When surveying fishermen about interactions, there are research techniques that can be used to capture accurate responses for sensitive information.
- Gear modifications should be considered and encouraged. Depredation deterrence could be considered, but the agency's hands are likely tied because of the ESA. We need to be creative in how we can work within the confines of the ESA.
- Regarding recovery actions and partners, the Council may not directly manage those fisheries but they do work closely with those fishers that are the non-longline community and thus the Council should also be considered a partner in efforts. The Council could also be an implementation partner. Non-longline issues are getting built into the Council process and have already begun having discussions.
- Additionally, increasing public outreach for strandings will increase the number of strandings that are reported and therefore the number that NMFS responds to in order to help the animals or to learn more about the cause of death.
- There are concerns about numbers used in the downlisting and delisting criteria. It needs to be clear how the numbers are derived in the Recovery Plan. You don't want population abundance numbers to seem arbitrary – it needs to be derived from objective criteria and be very transparent.

Next Steps

This workshop summary will be posted on our NOAA Fisheries false killer whale web site. Additionally, the following actions will continue or commence:

- Further refine the Threats Characterization Table. This revised table will be included in the IFKW Species Status Assessment.
- Finish drafting the Species Status Assessment. As previously discussed, this information is typically in the background of a recovery plan, but in accordance with new recovery planning guidance, we will separate the status of the species into its own living document. We anticipate completing a draft in 2017 and finalizing in 2018. This document will be peer reviewed.
- Draft the MHI IFKW Recovery Plan. We anticipate completing a draft in 2017 and finalizing in 2018. This document will be peer reviewed and will go out for public comment.

- Draft the Recovery Implementation Strategy. If we decide to do this (i.e., keeping it separate from the Recovery Plan), we anticipate completing a draft in 2017 and finalizing in 2018. This document will be peer reviewed.

Fisheries Interactions (Days 1 and 2) Group Photo. Back row: Bennett Brooks, Kim Maison, Erin Oleson, Loyal Mehrhoff, Dave Itano, Michael Jasny, Paul Wade, Robin Baird, Dan Curran, Ann Garrett, and Nancy Young. Middle row: Kirsten Leong, Dawn Golden, Asuka Ishizaki, Justin Hospital, Don Kobayashi, Susan Pultz, Elia Herman, Jarad Makaiau, Scott McCreary, Mingling Pan, and Phil Fernandez. Front row: Krista Graham, Kurt Kawamoto, and Chris Boggs.