Draft False Killer Whale Take Reduction Plan

Submitted on behalf of the False Killer Whale Take Reduction Team

to the

National Marine Fisheries Service
National Oceanic and Atmospheric Administration
Department of Commerce

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False Killer Whale Take Reduction Team
Statement of Consensus
July 16, 2010

We, the members of the False Killer Whale Take Reduction Team, have developed and agreed upon the attached Draft Take Reduction Plan. It reflects the full consensus of the Team, and we agree to work towards its full implementation.

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Additionally, this plan was informed by the full participation of representatives of the National Marine Fisheries Service, who served as Team members.

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1 MMPA STATUTORY REQUIREMENTS AND ESTABLISHMENT OF FALSE KILLER WHALE TAKE REDUCTION TEAM

1.1 Requirements of the Marine Mammal Protection Act

The 1994 amendments to the Marine Mammal Protection Act (MMPA), section 118, established directives and timelines for the development of Take Reduction Plans (Plans) to reduce mortality and serious injury (M&SI, or bycatch) of marine mammals incidental to commercial fishing operations. The immediate goal of a Plan for a strategic stock[1] is to reduce, within 6 months of the plan's implementation, the M&SI of marine mammals incidental to commercial fishing to levels less than the Potential Biological Removal (PBR) level[2] established for that stock. The long-term goal of a Plan is to reduce, within 5 years of the plan's implementation, the M&SI of marine mammals incidental to commercial fishing to insignificant levels approaching a zero rate, taking into account the economics of the fishery, the availability of existing technology, and existing State or regional fishery management plans (MMPA 118(f)(2)).

Plans must include a review of the information available in marine mammal stock assessment reports (SARs) and any substantial new information that may have become available since the publication of the most recent SAR. Such information should include, but is not limited to, an estimate of the total number and, if possible, age and gender, of animals from the stocks that are being incidentally killed or seriously injured each year during the course of commercial fishing operations. Plans must also include recommended regulatory or voluntary measures for the reduction of incidental M&SI, and recommended dates for achieving the specific objectives of the plan (MMPA 118(f)(4)).

Take Reduction Teams (Teams) are established by the Secretary[3] to develop draft Plans. Members of Teams must have expertise regarding the conservation or biology of the marine mammal species that the take reduction plan will address, or the fishing practices that result in the incidental M&SI of such species. Members include representatives of Federal agencies, each coastal state that has fisheries that interact with the species or stock, appropriate Regional Fishery Management Councils, interstate fisheries commissions, academic and scientific organizations, environmental groups, all commercial and recreational fisheries groups and gear types that incidentally take the species or stock, Alaska Native organizations or Indian tribal organizations, and others as the Secretary deems appropriate. In addition, Teams must, to the maximum extent practicable, consist of an equitable balance among representatives of resource user interests and non-user interests (MMPA 118(f)(6)(C)).

[1] A strategic stock is one in which direct human-caused mortality exceeds the potential biological removal level for that stock; which is listed as a threatened or endangered species under the Endangered Species Act of 1973; or, which is declining and likely to be listed as a threatened or endangered species within the foreseeable future (MMPA 3(19)).

[2] The potential biological removal (PBR) is the maximum number of animals, not including natural mortalities, that may be removed annually from a marine mammal stock while still allowing that stock to reach or maintain its optimal population level (MMPA 3(20)).

[3] Secretary refers to the Secretary of Commerce, whose authority for implementation of the Marine Mammal Protection Act has been delegated to the National Marine Fisheries Service (NMFS).

Teams are not subject to the Federal Advisory Committee Act, and meetings of the teams are open to the public with prior notice of the meetings made public in a timely fashion (MMPA 118(f)(6)(D)).

Draft Plans are developed by consensus. In the event consensus cannot be reached, the Team must advise the Secretary in writing on the range of possibilities considered by the team, and the views of both the majority and minority (MMPA 118(f)(7)(A)(ii)).

The timelines specified for the development of draft Plans vary depending on the status of the stocks affected. Strategic stocks are subject to a slightly more accelerated timeline for the development of plans as compared to non-strategic stocks. The MMPA directs teams that are addressing incidental M&SI of strategic stocks to submit a draft Plan to the Secretary within 6 months of the team's establishment (MMPA 118(f)(7)(A)(i)); for non-strategic stocks, the MMPA directs the team to submit a draft plan within 11 months (MMPA 118(f)(8)(A)(i)).[4] The MMPA directs the Secretary to take the plan into consideration and, within 60 days of receipt of the team's draft plan, publish a plan in the *Federal Register*, along with any changes proposed by the Secretary and proposed implementing regulations. Plans are available for public comment for a period not to exceed 90 days (MMPA 118(f)(7)(B)(i)). The MMPA directs the Secretary to issue the final Plan and implementing regulations within 60 days of the close of the public comment period (MMPA 118(f)(7)(C)). After the final plan is published, the MMPA directs NMFS to reconvene the team periodically[5] to monitor the implementation of the final Plan. The team can recommend changes to the plan as necessary until the Secretary determines that the objectives of the plan have been met.

1.2 Scope of the Plan

NMFS published a *Federal Register* notice (75 FR 2853, January 19, 2010) establishing the Team and outlining the marine mammal stocks and commercial fisheries subject to the take reduction process. These stocks and fisheries are discussed below.

1.2.1 Marine Mammal Species

The main focus of the Plan is the Hawaii pelagic stock of false killer whales (*Pseudorca crassidens*). Two additional stocks of false killer whales in the Pacific Islands Region, the Hawaii insular and Palmyra Atoll stocks, are also addressed. The Hawaii pelagic stock of false killer whales is the only strategic stock, as of the final 2009 SAR (Carretta et al. 2010), but all three are known or have potential to interact with the Category I Hawaii deep-set longline fishery. See sections 2 and 3 of this Plan for more information on the distribution, abundance, PBR, and bycatch of these stocks.

[4] In the event that a Take Reduction Team does not submit a draft plan to the Secretary within the timeframe required, the Secretary shall publish the proposed plan and implementing regulations within 8 months of the team's establishment for strategic stocks (MMPA 118(f)(7)(B)(ii)), and within 13 months of the team's establishment for non-strategic stocks (MMPA 118(f)(8)(B)(ii)).

[5] Every 6 months for strategic stocks, and annually for non-strategic stocks, or at such other times as deemed necessary (MMPA 118(f)(7)(E)) and (f)(8)(E)).

One additional stock of false killer whales in the Pacific Islands Region, the American Samoa stock, was newly defined for the Draft 2010 SAR[6], but no abundance estimate or PBR level is currently available for this stock. While NMFS has information on bycatch from the NMFS PIRO Observer Program, the level of M&SI occurring incidental to commercial fisheries, particularly the American Samoa longline fishery, cannot be assessed relative to PBR. This Plan does not address bycatch of false killer whales in American Samoa; instead, it focuses on the M&SI of false killer whale stocks that interact with fisheries known to have unsustainable levels of bycatch of this species. However, the American Samoa stock may be addressed in the future if information becomes available that indicates takes of this stock are occurring at an unsustainable level.

The 2010 final MMPA List of Fisheries (74 FR 58859, November 16, 2009) identifies several other species or stocks of marine mammals that have been observed as seriously injured or killed incidental to the Hawaii deep-set and shallow-set fisheries, including: Blainville's beaked whale, HI stock (*Mesoplodon densirostris*); bottlenose dolphin, HI stock (*Tursiops truncatus*); humpback whale, Central North Pacific (CNP) stock (*Megaptera novaeangliae*); pantropical spotted dolphin, stock unknown (*Stenella attenuata*); Risso's dolphin, HI stock (*Grampus griseus*); short-finned pilot whale, HI stock (*Globicephala macrorhynchus*); striped dolphin, HI stock (*Stenella coeruleoalba*); Bryde's whale, stock unknown (*Balaenoptera edeni*); and sperm whale, stock unknown (*Physeter macrocephalus*). With the exception of humpback whales, the M&SI of all of these stocks is at or below the insignificance threshold, which has been defined in MMPA implementing regulations as 10% of PBR (50 CFR 229.2).

The humpback whale is listed as "endangered" under the ESA, and is therefore designated as "depleted" under the MMPA, per one of three criteria for a "strategic stock." (See *supra* footnote 1). As a result, the CNP stock of humpback whales is classified as a strategic stock (Allen and Angliss 2010). Total estimated M&SI of this stock is below the PBR level of 20.4; therefore, this stock is not "strategic" due to human-caused mortality exceeding PBR (MMPA section 3(19)(A)). The 2009 SAR indicates no M&SI of this stock incidental to HI-based longline fisheries (Allen and Angliss 2010), but one serious injury was reported in the HI-based shallow-set longline fishery in 2006, with 100% observer coverage (Forney 2009). The 5-year average M&SI for the shallow-set longline fishery is 0.2 per year, bringing the total estimated average annual M&SI for the stock to 5.2, which is above the insignificance threshold or 10% of PBR.

The CNP stock of humpback whales, although a strategic stock because of its endangered status, is not designated as "strategic" because of fishery interactions. The level of interactions with the fishery is very low and interactions do not appear to be preventing the stock's recovery: results from the 2004-06 Structure of Populations, Levels of Abundance, and Status of Humpbacks (SPLASH) project indicate stock abundance has increased (Allen and Angliss 2009). Accordingly, in 2009 NMFS identified this stock as "low priority" to receive TRT funding (NMFS 2009a). Additionally, NMFS issued a permit for a period of three years authorizing the incidental taking of individuals from the CNP stock of endangered humpback whales by the HI-

[6] The Draft 2010 SAR for false killer whales, referenced at various points throughout this Plan, was not complete and not available for distribution to the Team during its deliberations. However, key information from the draft 2010 SAR, including revised stock boundaries and M&SI estimates, was presented and provided to the Team for its consideration.

based deep-set and shallow-set longline fisheries, under MMPA section 101(a)(5)(E) (75 FR 29984, May 28, 2010). Prior to issuing the permit, NMFS made a determination that incidental taking from commercial fishing will have a negligible impact on CNP humpback whales. For these reasons, the Plan does not address M&SI of humpback whales.

1.2.2 Commercial Fisheries

The Plan focuses on reducing M&SI of false killer whales in the Category I Hawaii-based deep-set longline fishery (defined on the MMPA List of Fisheries (LOF) as the "HI deep-set (tuna target) longline/set line" and "Western Pacific Pelagic (Deep-set component)" fisheries), and the Category II Hawaii-based shallow-set longline fishery (defined on the LOF as the "HI shallow-set (swordfish target) longline/set line" and "Western Pacific Pelagic Shallow-set component" fisheries). These fisheries operate in both U.S. waters and on the high seas; on the LOF, the high seas components of the fisheries are not considered separate fisheries, but extensions of the fisheries operating within U.S. waters. The Plan also considers potential impacts to the marine mammal stocks from the Hawaii shortline and kaka line fisheries. See section 5 for a description of these fisheries.

The Team acknowledges that there are other U.S. fisheries that may have incidental M&SI of false killer whales, such as commercial and recreational trolling and other hook-and-line fisheries, but the Plan does not include recommendations for reducing bycatch in these other fisheries. Instead, this Plan focuses on the fisheries that are known to pose significant risk to the region's stocks of false killer whales or for which anecdotal evidence of interactions has been reported. However, some of the management and research recommendations contained in this Plan could help to reduce serious injuries and mortalities of marine mammals if also implemented in other fisheries.

1.2.3 Potential Future Changes to the Scope

The goals and recommendations of this Plan are based on the data available and PBR levels calculated and published at the time the Plan was finalized. The Team is aware that changes in the legal status of a stock, PBR, abundance, and M&SI information relative to the stocks under consideration may arise between now and Plan implementation or before the Team reconvenes. The Team is cognizant that new information may influence the scope, and therefore goals, of the Plan in the future.

1.3 Goal of the Plan

The Hawaii pelagic stock is the only stock of false killer whales in the Pacific Islands Region for which M&SI incidental to the Hawaii-based longline fisheries is known to exceed the stock's PBR level. The "immediate goal" of the Plan is to reduce, within six months of its implementation, incidental M&SI occurring within the U.S. EEZ surrounding the Hawaiian Islands of the Hawaii pelagic stock of false killer whales in the Hawaii-based longline fisheries to less than the stock's PBR level of 2.5 false killer whales per year. NMFS noted that this reduction in M&SI inside the U.S. EEZ of the Hawaiian Islands could not be achieved by

displacing fishing effort to areas outside the EEZ if that displacement would be expected to result in an increase in M&SI of false killer whales in waters outside the EEZ.

The Hawaii pelagic stock is a transboundary stock that inhabits waters both within and outside of the U.S. EEZ around the Hawaiian Islands; however, the offshore extent of the stock's range into international waters is unknown. The Hawaii-based longline fisheries also operate both within the U.S. EEZ and in international waters (high seas), and incidental M&SI of the Hawaii pelagic stock of false killer whales have been documented both within the U.S. EEZ and on the high seas. The status of this stock was previously only evaluated in the SAR based on data from U.S. EEZ waters of the Hawaiian Islands, due to limitations on data for international waters. However, the Draft 2010 SAR also includes a calculation of PBR using all available peer-reviewed information on the abundance of false killer whales in portions of the high seas and within the U.S. EEZ around Johnston Atoll. The average annual estimated M&SI by U.S. longline vessels operating on the high seas and within the U.S. EEZ around Johnston Atoll exceeds this PBR, and the combined U.S. and international M&SI is likely substantially higher. Better information on the full geographic range of this stock and quantitative estimates of bycatch in international fisheries are needed to reduce the uncertainties regarding impacts of false killer whales takes on the high seas, but these uncertainties do not change the current assessment that the pelagic false killer whale stock is strategic. Therefore, another short-term goal of the Plan is to not increase above current levels the M&SI of the high seas component of the Hawaii pelagic stock.

The Plan's long-term goal is to reduce, within five years of its implementation, the M&SI of the Hawaii pelagic, Hawaii insular, and Palmyra Atoll stocks of false killer whales to insignificant levels (i.e., less than 10% of their respective PBR levels).

1.4 The Role of the Facilitator in the Take Reduction Plan Process

NMFS contracted with CONCUR, Inc. (Berkeley, CA) to facilitate team meetings and to assist in logistical arrangements of team meetings. In its role as facilitator, CONCUR was responsible for: identifying and contacting potential team members, conducting confidential stakeholder interviews, providing strategic planning support for NMFS, preparing meeting agendas, planning and facilitating team meetings and working groups, working with the team to establish ground rules, guiding and summarizing the deliberations, and synthesizing key results at periodic junctures in meetings. In addition, CONCUR prepared Key Outcomes Memoranda as a concise record of each meeting, maintained open communications with team members, and ensured timely submission of a draft Take Reduction Plan to NMFS.

1.5 Establishment of the Take Reduction Team

The selection of team members followed guidance provided by section 118 of the MMPA. NMFS strove to select an experienced and committed team with a balanced representation of stakeholders. Members of the Take Reduction Team include fishermen and representatives of the Hawaii-based deep-set and shallow-set fishing industry, environmental groups, marine mammal biologists, fisheries biologists, and representatives of the Western Pacific Fishery Management Council, the State of Hawaii, the Marine Mammal Commission, and NMFS.

Team members participated in a stakeholder assessment conducted by CONCUR prior to the first meeting of the team. Based on these interviews, CONCUR concluded that TRT members were willing to work together and shared the goal of reducing the bycatch of marine mammals. TRT members recognized that there would be some challenges in producing a consensus-based Take Reduction Plan, given their divergent interests on some issues. However, they also shared many common interests. Most importantly, they all agreed that incidental take of marine mammals is not in the interest of any of their organizations. This realization gave impetus to the ambitious work plan, which called for TRT members to work together in pursuit of mutual gains to devise common ground solutions within the given timeframe.

Members of the False Killer Whale Take Reduction Team, and their alternates, are listed below. Complete contact information for team members is provided in Appendix A.

False Killer Whale Take Reduction Team Members and Alternates:
William Aila, Hui Malama I Kohola
Robin Baird, Cascadia Research Collective
Hannah Bernard, Hawaii Wildlife Fund
Steve Beverly, Secretariat of the Pacific Community
Alternate: Eric Gilman, Hawaii Pacific University and Blue Ocean Institute
Brendan Cummings, Center for Biological Diversity
Alternate: Liz Alter, Natural Resources Defense Council
Paul Dalzell, Western Pacific Fishery Management Council
Alternate: Asuka Ishizaki, Western Pacific Fishery Management Council
Roger Dang, Pacific Fishing & Supply, Inc.
Clint Funderburg, F/Vs Rachel and Golden Sable
Alternate: Frank Crivello, F/V Laura Ann
John Hall, F/V Zephyr
Kris Lynch, Marine Mammal Commission
Alternate: David Laist, Marine Mammal Commission
Kristy Long, NMFS Office of Protected Resources
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Alternate: Marlee Breese, University of Hawaii
David Nichols, State of Hawaii, Department of Land and Natural Resources
Tory O'Connell, Coastal Marine Research
Alternate: Jan Straley, University of Alaska Southeast
Jerry Ray, F/V Katy Mary
Alternate: John LaGrange, F/V Janthina
Andy Read, Duke University
Alternate: David Johnston, Duke University
Lance Smith, NMFS Pacific Islands Regional Office
Alternate: Lisa Van Atta, NMFS Pacific Islands Regional Office
Ryan Steen, Stoel Rives LLP
Alternate: Sean Martin, Hawaii Longline Association
Sharon Young, Humane Society of the United States

Alternate: Vicki Cornish, Ocean Conservancy[7]

NMFS Advisors and Technical Experts:
Adam Bailey, Pacific Islands Regional Office
Keith Bigelow, Pacific Islands Fisheries Science Center
Alexa Cole, NOAA General Counsel for Enforcement and Litigation
Laura Engleby, Southeast Regional Office
Jason Forman, NOAA Office of General Counsel
Karin Forney, Southwest Fisheries Science Center
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Don Kobayashi, Pacific Islands Fisheries Science Center
Jayne LeFors, Pacific Islands Regional Office
Jamie Marchetti, Pacific Islands Regional Office
Michael Marsik, Pacific Islands Regional Office
Erin Oleson, Pacific Islands Fisheries Science Center
Take Tomson, NOAA Office for Law Enforcement, Pacific Islands Division
Frederich Tucher, General Counsel, Pacific Islands Region
Nancy Young, Pacific Islands Regional Office (TRT Coordinator)
Michelle Yuen, Pacific Islands Regional Office

United States Coast Guard Advisors:
Eric Roberts
Jared England

Facilitators:
Bennett Brooks, CONCUR, Inc.
Scott McCreary, CONCUR, Inc.

[7] Vicki Cornish resigned as alternate to Sharon Young when she left her position at Ocean Conservancy in April 2010.

2 DISTRIBUTION, STOCK STRUCTURE, AND ABUNDANCE OF FALSE KILLER WHALES

2.1 Stock Definitions and Geographic Ranges[8]

False killer whales are found worldwide mainly in tropical and warm-temperate waters (Stacey et al. 1994). In the North Pacific, this species is well known from southern Japan, Hawaii, and the eastern tropical Pacific. There are six stranding records from Hawaiian waters (Nitta 1991; Maldini 2005). One on-effort sighting of false killer whales was made during a 2002 shipboard survey of waters within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands (Barlow 2006). Smaller-scale surveys conducted around the main Hawaiian Islands show that false killer whales are also encountered in nearshore waters (Baird et al. 2008, Mobley et al. 2000, Mobley 2001, 2002, 2003, 2004). This species also occurs in U.S. EEZ waters around Palmyra Atoll, Johnston Atoll, and American Samoa (Barlow and Rankin 2007, Draft 2010 SAR).

Genetic analyses of tissue samples collected within the Eastern North Pacific (ENP) indicate restricted gene flow between false killer whales sampled near the main Hawaiian Islands and false killer whales sampled in all other regions of the ENP (Chivers et al. 2007, 2010). Since 2003, observers of the Hawaii-based longline fisheries have also been collecting tissue samples of caught cetaceans for genetic analysis whenever possible. Between 2003 and 2008, five false killer whale samples (three collected outside the Hawaiian EEZ and two collected more than 100 nautical miles (185 km) from the main Hawaiian Islands) were determined to have ENP-like haplotypes (Chivers et al. 2010). Based on sighting locations and results of the genetic analyses, Chivers et al. (2008) suggested implementing a stock boundary for insular vs. pelagic false killer whales at approximately 75 nautical miles (nmi) (139 km) from the main Hawaiian Islands, until more information was available about the ecology of false killer whales, and especially the movement patterns of the insular stock animals.

For the 2008-2009 marine mammal SARs, a provisional stock boundary for insular and pelagic stocks of false killer whales was recognized as the February-September longline exclusion boundary (at roughly 25-75 miles from the islands), with the expectation that this boundary would be refined as additional studies of false killer whale movements became available. Recent satellite telemetry studies, boat-based surveys, and photo-identification analyses of false killer whales around Hawaii have demonstrated that these two stocks have overlapping ranges, rather than a clear separation in distribution. Insular false killer whales have been documented as far as 112 km from the main Hawaiian islands, and pelagic stock animals have been documented as close as 42 km to the islands (Baird et al. 2008, Baird 2009, Baird et al. 2010, R. Baird unpublished data). Based on a review of new information (Forney et al. 2010), the Draft 2010 SAR recognizes a new, overlapping stock structure for insular and pelagic stocks of false killer whales around Hawaii: animals within 40 km of the main Hawaiian Islands are considered to belong to the insular stock; animals beyond 140 km of the main Hawaiian Islands are considered to belong to the pelagic stock, and the two stocks overlap between 40 km and 140 km from shore

[8] Most of the information in this section is derived from the Draft 2010 SAR. Some of the information has been updated based on other published studies.

(Figure 2.1).

The Draft 2010 SAR also clarifies that the pelagic stock includes animals found both within the Hawaiian Islands EEZ and in adjacent international waters; however, because data on false killer whale abundance, distribution, and human-caused impacts are largely lacking for international waters, the status of this stock is evaluated based on data from U.S. EEZ waters of the Hawaiian Islands (NMFS 2005). The Palmyra Atoll stock of false killer whales remains a separate stock, because comparisons amongst false killer whales sampled at Palmyra Atoll and those sampled from the insular stock of Hawaii and the pelagic ENP revealed restricted gene flow, although the sample size remains low for robust comparisons (Chivers et al. 2007). NMFS will continue to obtain and analyze additional tissue samples for genetic studies of stock structure, and will evaluate new information on stock ranges as it becomes available.

In the Draft 2010 SAR, there are currently four Pacific Islands Region management stocks of false killer whales: 1) the Hawaii insular stock, which includes false killer whales inhabiting waters within 140 km (approx. 75 nmi) of the main Hawaiian Islands; 2) the Hawaii pelagic stock, which includes false killer whales inhabiting waters greater than 40 km (22 nmi) from the main Hawaiian Islands; 3) the Palmyra Atoll stock, which includes false killer whales found within the U.S. EEZ of Palmyra Atoll; and 4) the American Samoa stock, which includes false killer whales found within the U.S. EEZ of American Samoa. [As discussed earlier, the American Samoa stock was not included in the scope of the Team's discussions, and so will not be described further in this Plan.]

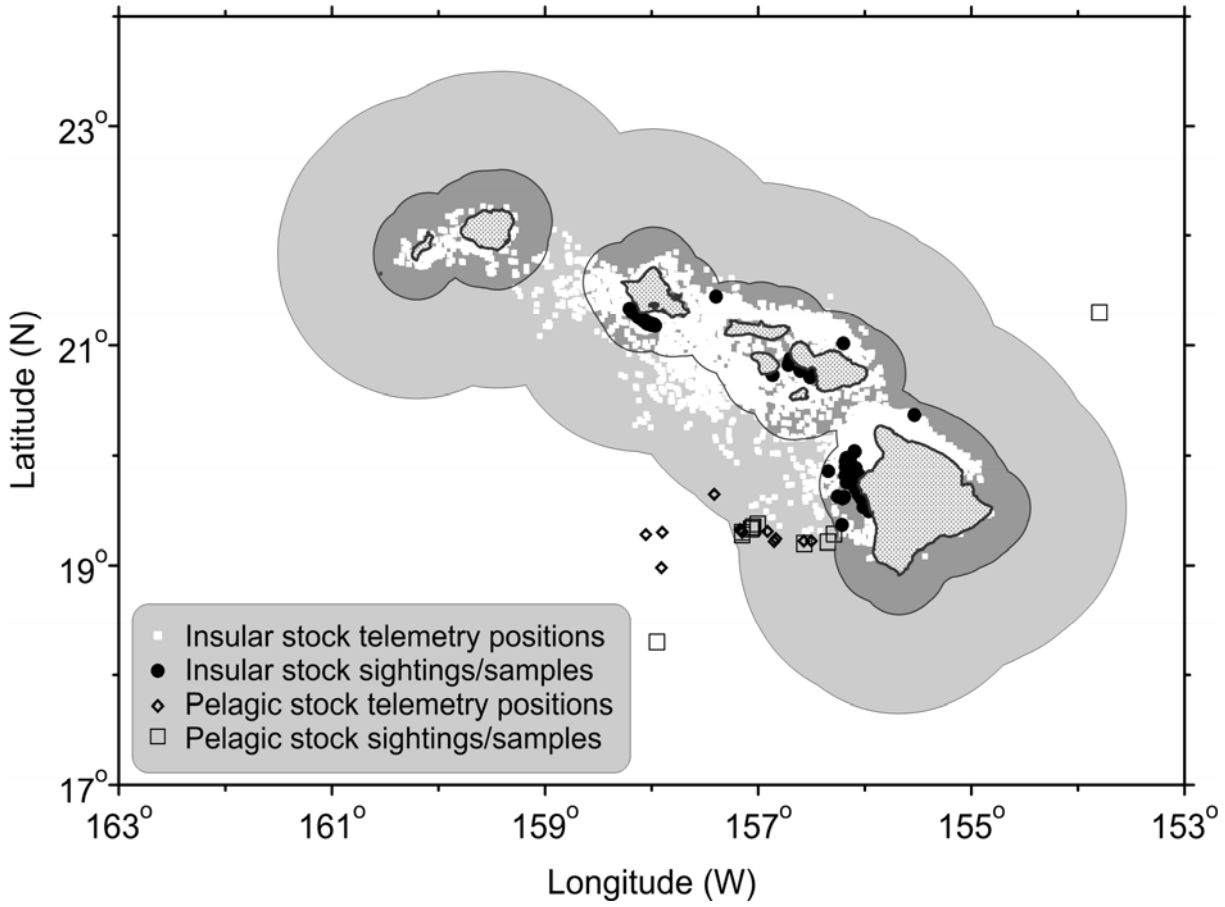

Figure 2.1. Sighting, biopsy, and telemetry records of false killer whales identified as being from insular (closed symbols) vs. pelagic (open symbols) stocks. The dark gray area is the 40-km insular stock core area; light gray area is the 40-km to 140-km overlap zone (Baird et al. 2010; Baird, unpublished data; reproduced from Forney et al. 2010).

2.2 Abundance Estimates and Potential Biological Removal Levels

PBR is the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. The MMPA specifies that it is calculated as the product of the minimum population size of the stock, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3., 16 U.S.C. 1362).

2.2.1 Hawaii Insular Stock[9]

A mark-recapture study of photo-identification data obtained during 2000-2004 around the main Hawaiian Islands produced an estimate of 123 (CV=0.72) insular false killer whales (Baird et al. 2005). The minimum population estimate for the insular stock of false killer whales is the number of distinct individuals identified in this population during the 2002-2004 photo-

[9] At the July Team meeting, at the request of the fishing industry, the Team was provided with a final summary of the November 2009 Pacific Scientific Review Group (PSRG) meeting, in which preliminary inshore cetacean survey results were noted.

identification studies, 76 individuals (Baird et al. 2005). This is similar to the log-normal 20th percentile of the mark-recapture abundance estimate, 71 false killer whales. A recent study (Baird 2009) summarized information on false killer whale sightings near Hawaii between 1989 and 2007, based on various survey methods, and provided evidence that the insular stock of false killer whales may have declined during the last two decades. Evidence of a decline is also supported by a recent genetic study that indicates there has been a decline in the effective population size (Chivers et al. 2010). No data are available on current or maximum net productivity rate for this species in Hawaiian waters.

The PBR level for the insular false killer whale stock is calculated as the minimum population size (76) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.40 (for a stock of unknown status with a human-caused M&SI rate CV>0.80; see Wade and Angliss 1997), resulting in a PBR of 0.61 false killer whales per year.

Hawaii's insular false killer whales are currently being considered by NMFS for listing under the Endangered Species Act.

2.2.2 Hawaii Pelagic Stock

Analyses of a 2002 shipboard line-transect survey of the Hawaiian Islands EEZ (Hawaiian Islands Cetacean and Ecosystem Assessment Survey, or HICEAS) resulted in an abundance estimate of 236 (CV=1.13) false killer whales (Barlow 2006) outside of 75 nmi of the main Hawaiian Islands. A recent re-analysis of the HICEAS data using improved methods and incorporating additional sighting information obtained on line-transect surveys south of the Hawaiian EEZ during 2005, resulted in a revised estimate of 484 (CV = 0.93) false killer whales within the Hawaiian Islands EEZ outside of about 75 nmi of the main Hawaiian Islands (Barlow and Rankin 2007). This is the best available abundance estimate for the pelagic stock of false killer whales. The 2005 survey (Barlow and Rankin 2007) also resulted in a separate abundance estimate of 906 (CV=0.68) false killer whales in international waters south of the Hawaiian Islands EEZ and within the EEZ of Johnston Atoll, but it is unknown how many of these animals might belong to the Hawaii pelagic stock. The log-normal 20th percentile ("Nmin") of the 2002 abundance estimate for the Hawaiian Islands EEZ outside of 75 nmi from the main Hawaiian Islands (Barlow and Rankin 2007) is 249 false killer whales. No data are available on current population trend, and no data are available on current or maximum net productivity rate for this species in Hawaiian waters.

Following the NMFS Guidelines for Assessing Marine Mammal Stocks (GAMMS) (NMFS 2005), the PBR is calculated only within the U.S. EEZ of the Hawaiian Islands, because abundance estimates and estimates of human-caused M&SI from all U.S. and non-U.S. sources are not available in international waters where this stock may also occur. The PBR level for the Hawaii pelagic stock of false killer whale is thus calculated as the minimum population size within the U.S. EEZ of the Hawaiian Islands (249) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.50 (for a stock of unknown status with a Hawaiian Islands EEZ M&SI rate CV ≤ 0.30; Wade and Angliss 1997), resulting in a PBR of 2.5 false killer whales per year.

As noted above, the estimate of abundance is derived primarily from data collected on a shipboard line-transect survey in 2002. The GAMMS provide guidance on the length of time for which estimates of abundance are considered reliable:

> "Clearly, projections of current abundance estimates become less dependable with time after a survey has occurred. When abundance estimates become many years old, at some point estimates will no longer meet the requirement that they provide reasonable assurance that the stock size is presently greater than or equal to that estimate. Therefore, unless compelling evidence indicates that a stock has not declined since the last census, the minimum population estimate of the stock should be considered unknown if 8 years have transpired since the last abundance survey of a stock" (NMFS 2005).

The GAMMS also note:

> "If Nmin is unknown, then PBR cannot be determined, but this is not equivalent to considering PBR equal to zero. If there is known or suspected human-caused mortality of the stock, decisions about whether such stocks should be declared strategic or not should be made on a case-by-case basis. Stocks for which Nmin becomes unknown should not move from "strategic" to "not-strategic", or v.v., solely because of an inability to estimate Nmin" (NMFS 2005).

These determinations were based on the recommendations of the participants in the GAMMS workshop and the relevant recommendations are detailed in GAMMS (pages 20-24). As relevant here, one of these recommendations is as follows:

> "Confidence in the reliability of an abundance estimate declines with age. Therefore, estimates older than 8 years should not be used to calculate PBR. This is necessary to meet the requirement in the MMPA that Nmin represent a level for which there is reasonable assurance that the true population is larger. The consequence of not being able to calculate a PBR for such stocks is that PBR is unknown (not that PBR equals zero). A decision as to whether such stocks are strategic or not will be jointly decided case-by-case by NMFS or FWS and by the SRGs. This recommendation replaces the guidelines stating that recovery factors were "ratcheted down" as abundance estimates became older than 5 yrs."

As of 2011, data derived from the 2002 survey will be considered too uncertain for stock assessment. NMFS is planning to conduct a new cetacean assessment survey in the U.S. EEZ of the Hawaiian Islands (HICEAS II) in August-December 2010. The survey is a collaborative effort between PIFSC and SWFSC, and will involve approximately 175 days at sea on two NOAA research vessels. The multi-faceted survey includes visual observers, acousticians, oceanographers, and birders. While the survey will collect data on all cetaceans, the focus will be on false killer whales. It is anticipated that the HICEAS II survey will result in updated abundance estimates for all Hawaiian cetaceans, including false killer whales; preliminary estimates will likely be available by the end of 2011 or early 2012.

2.2.3 Palmyra Atoll Stock

Recent line transect surveys in the U.S. EEZ waters of Palmyra Atoll produced an estimate of 1,329 (CV = 0.65) false killer whales (Barlow and Rankin 2007). This is the best available abundance estimate for false killer whales within the Palmyra Atoll EEZ. The log-normal 20th percentile of the 2002 abundance estimate for the Palmyra Atoll EEZ (Barlow and Rankin 2007) is 806 false killer whales. No data are available on current population trend or on current or maximum net productivity rate for this species in Palmyra Atoll waters.

The PBR level for the Palmyra Atoll false killer whale stock is calculated as the minimum population size (806) times one half the default maximum net growth rate for cetaceans (½ of 4%) times a recovery factor of 0.40 (for a stock of unknown status with a M&SI rate CV >0.80; Wade and Angliss 1997), resulting in a PBR of 6.4 false killer whales per year.

3 SERIOUS INJURIES AND MORTALITIES INCIDENTAL TO THE HAWAII-BASED DEEP-SET AND SHALLOW-SET LONGLINE FISHERIES

3.1 Data Sources and Methodology

The main source of data for estimating mortalities and serious injuries of marine mammals incidental to the Hawaii-based longline fisheries is from the Hawaii Longline Observer Program, coordinated by the NMFS Pacific Islands Regional Office. Observer data have been collected through this mandatory observer program since 1994.

Observers are responsible for recording information such as fishing gear characteristics and operations, set locations and times, target and non-target species catch, protected species interactions, and details on interactions with fishing gear. NMFS places observers on 100% of vessels in the shallow-set fishery and at least 20% coverage for the deep-set fishery annually. Observed deep-set trips are selected using two sampling schemes to accommodate fluctuating coverage levels and utilize observers efficiently. Coverage levels in the deep-set fishery vary throughout the year because of fluctuation in the fleet's activity level, demands of 100% coverage in the shallow-set fishery, and an influx of observers after completion of NMFS observer training. More details on the sampling schemes are available in McCracken and Forney (2010).

Serious Injury Determinations

Under the MMPA, NMFS must manage serious injuries and mortalities of marine mammals incidental to commercial fishing operations. This charge requires that NMFS be able to distinguish serious injuries from those that are not serious. NMFS has defined "serious injury" in regulations (50 CFR 229.2) as "any injury that will likely result in mortality."

Serious injury determinations have been made using the guidelines developed in Angliss and DeMaster (1998) following a 1997 technical workshop on determining serious injuries in marine mammals. In 2007, new information on injuries to marine mammals was reviewed at a Serious Injury Technical Workshop, resulting in the development of new criteria (Table 1 in Andersen et al. 2008, included here as Appendix E), which were applied in a recent review of injuries to cetaceans in Hawaii-based longline fisheries (Forney 2009). There are several criteria relevant to the types of injuries to small cetaceans, including false killer whales, that are typically documented in the Hawaii-based longline fisheries. Small cetaceans are considered seriously injured if they are hooked internally (ingested or in the mouth, excluding observed lip-only hookings), released with substantial gear attached, and/or are swimming abnormally post-release. "Substantial gear" is gear that is wrapped or has the potential to wrap around appendages, the beak, or head. Conversely, animals that are hooked externally (body, fluke) and released with no or minimal gear are generally considered not seriously injured. Other factors, such as the length of the animal's confinement, are also considered when making the determination (Andersen et al. 2008).

Serious injury determinations are made by NMFS scientists on a case-by-case basis using observer data, photos, and videos that describe marine mammal identification characteristics, the nature of the interaction, details on any injuries sustained by the animals, and the amount and type of gear left on the animal upon release (Forney 2009). In cases where the cetacean species cannot be identified by the at-sea observer, candidate species are determined based on the observer's descriptions, photographs, sketches, and videos (when available).

Based on the new injury determination criteria, all cetacean injures sustained in interactions with Hawaii-based longline fisheries were reviewed to re-assess the severity of the injury. These new determinations are included in Forney (2009), and are the basis for estimates of M&SI in the Hawaii-based longline fisheries.

3.2 Serious Injury and Mortality Estimates

The total M&SI of cetaceans in the shallow-set fishery (with 100% coverage) and the estimated annual and 5-year average M&SI of cetaceans in the deep-set fishery are reported by McCracken and Forney (2010). Their methodology includes prorating all estimated takes of false killer whales based on the proportions of observed interactions that resulted in death or serious injury (89%), or non-serious injury (11%). Further, takes of false killer whales of unknown stock origin within the insular/pelagic stock overlap zone are prorated based on the density of each stock in that area, as recommended in the NMFS Guidelines for Assessing Marine Mammal Stocks (NMFS 2005) and by the Pacific Scientific Review Group. No genetic samples are available to establish stock identity for these takes, but both stocks are considered by NMFS to be at risk of interacting with longline gear within this region. The pelagic stock is known to interact with longline fisheries in waters offshore of the overlap zone (more than 100 nmi from the MHI) based on two genetic samples obtained by fishery observers (Chivers et al. 2008). Insular false killer whales have been documented via telemetry to move sufficiently far offshore on the Southwest side of the main Hawaiian Islands (112 km) to reach some longline fishing areas (R. Baird, unpublished data), and animals from this stock have a high rate of dorsal fin disfigurements consistent with injuries from unidentified fishing line (Baird and Gorgone 2005), which could be attributed to one or more of many different fisheries or to non-fishing activities. The prorating introduces an additional element of uncertainty into the bycatch estimates, but until methods of determining stock identity for animals observed taken within the overlap zone are available (e.g., photos, tissue samples), this approach ensures that potential impacts to both stocks are assessed.

Based on these bycatch analyses, estimates of annual and 5-year average annual M&SI of false killer whales, by stock and EEZ area, are shown in Table 3.1 (Draft 2010 SAR). Estimates of M&SI do not include any of the unidentified animals that may have been false killer whales, and, therefore, are minimum estimates. Efforts are currently underway to develop methods of prorating the unidentified animals by species and stock, taking into account geographic differences in their ranges and observed rates of documented interactions with each species.

Table 3.1. Summary of available information on incidental M&SI of false killer whales in the Hawaii-based longline fisheries, by stock and EEZ area, as applicable (McCracken and Forney 2010). Mean annual takes are based on 2004-2008 estimates unless otherwise indicated. Information on all observed mortalities (M), serious injuries (SI) and non-serious injuries (NSI) is included, because total takes were prorated to mortalities, serious injuries, and non-serious injuries based on the observed proportions of each outcome (see McCracken and Forney 2010 for details).

Fishery Name	Year	Data Type	Percent Observer Coverage	Observed mortalities (M), serious injuries (SI) and non-serious injuries (NSI), and total estimated mortality and serious injury (M&SI) of false killer whales by stock / EEZ region							
				Hawaii Pelagic Stock				**Hawaii Insular Stock**		**Palmyra Atoll Stock**	
				Outside of U.S. EEZs		Hawaiian Islands EEZ					
				Obs. M/SI/NSI	Estimated M&SI (CV)	Obs. M/SI/NSI	Estimated M&SI (CV)	Obs. M/SI/NSI	Estimated M&SI (CV)	Obs. M/SI/NSI	Estimated M&SI (CV)
Hawaii-based deep-set longline fishery	2004	Observer data	25%	0/3/0	13 (0.4)	1/2/0	12 (0.3)	0/0/0	0 (-)	0/0/0	0 (-)
	2005		28%	0/1/0	3 (1.6)	1/0/0	3 (1.9)	0/0/0	0 (-)	0/0/0	0 (-)
	2006		22%	0/2/0	8 (0.7)	0/1/1*	3 (1.7)	0/0/1*	3 (0.7)	0/0/0	0 (-)
	2007		20%	0/0/1	2 (3.7)	0/1/1	8 (0.8)	0/0/0	0 (-)	0/1/0	2 (0.7)
	2008		22%	0/0/0	0 (-)	0/3/1	11 (0.4)	0/0/0	0 (-)	0/0/0	0 (-)
Mean Estimated Annual Takes (CV)					**5.3 (0.5)**		**7.3 (0.3)**		**0.6 (1.3)**		**0.3 (1.3)**
Hawaii-based shallow-set longline fishery	2004	Observer data	100%	0/0/0	0	0/0/0	0	0/0/0	0	No fishing effort	
	2005		100%	0/0/0	0	0/0/0	0	0/0/0	0		
	2006		100%	0/0/0	0	0/0/0	0	0/0/0	0		
	2007		100%	0/0/0	0	0/0/0	0	0/0/0	0		
	2008		100%	0/0/0	0	0/0/1	0	0/0/0	0		
Mean Annual Takes (100% coverage)					**0**		**0**		**0**		
Minimum total annual takes within U.S. EEZs				**7.3 (0.3)**				**0.6 (1.3)**		**0.3 (1.3)**	

* The single NSI take within insular/pelagic stock overlap zone is shown once for each stock, but total estimates derived from this take are prorated by stock based on insular/pelagic false killer whale densities within the overlap zone (see text above, and McCracken and Forney 2010).

Figure 3.1 indicates the locations of observed takes of false killer whales and possible false killer whales (blackfish) in the longline fisheries between 2004 and 2008, and figure 3.2 shows the total number of deep sets (from logbook reports) and estimated (fleet-wide) false killer whale takes during 2001-2008.

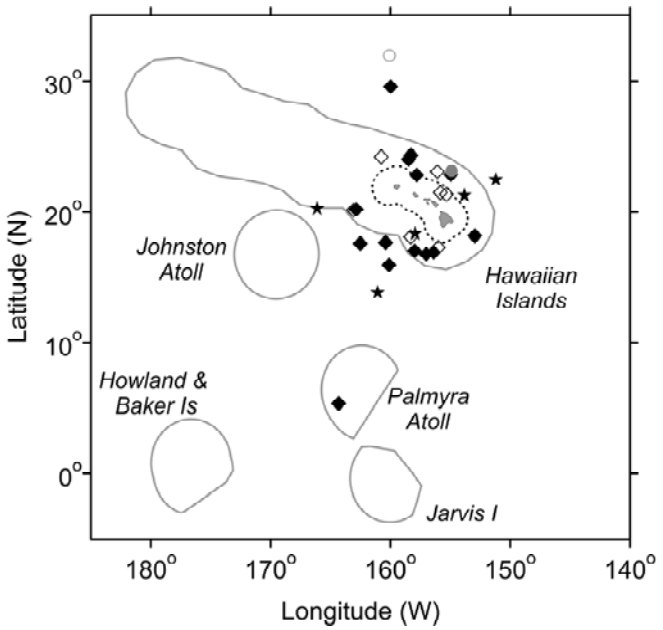

Figure 3.1. Locations of observed false killer whale takes (filled symbols) and possible takes of this species (open symbols) in the Hawaii-based longline fisheries, 2004-2008 Deep-set fishery takes are shown in black; shallow-set fishery takes are shown in gray. Stars are locations of genetic samples from fishery-caught false killer whales. Solid gray lines represent the U.S. EEZ; the dotted line is the outer (140-km) boundary of the overlap zone between insular and pelagic false killer whale stocks.

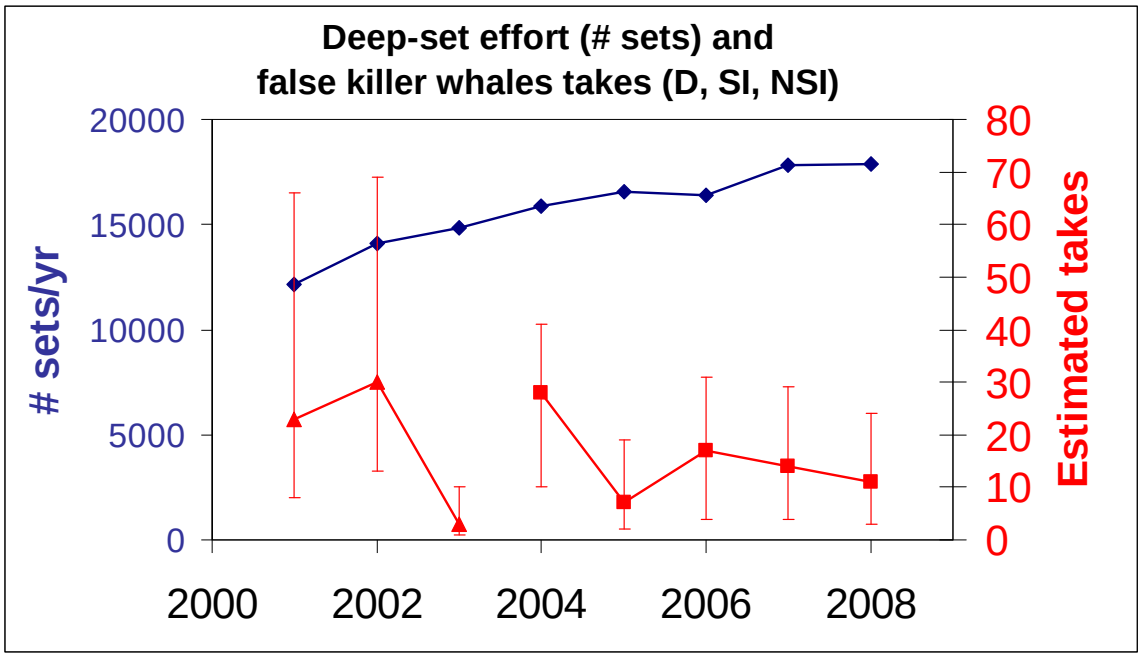

Figure 3.2. The total number of deep sets (from logbook reports) and estimated false killer whale takes (mortalities (D), serious injuries (SI), and non-serious injuries (NSI)) during 2001-2008 (since implementation of the minimum 20% observer coverage requirement). Estimated takes and 95% confidence intervals are derived from Forney and Kobayashi (2007; triangles) and McCracken and Forney (2010; squares). Methods differed for the two reports; the former used set-based ratio estimation methods stratified by geographic region; the latter used probability-based estimation methods, also stratified by geographic region, that accounted for varying levels of observer coverage throughout the year. Given the uncertainty levels associated with the take estimates, it is not possible to draw any conclusions about potential trends in total takes.

3.3 Nature of the Interactions

Interactions with marine mammals in Hawaii-based longline fisheries appear to occur in two "modes." The first involves animals that are hooked or entangled while preying on longline bait and/or catch (i.e., depredation); most of these animals are hooked in the mouth on sets in which depredation is observed. In the deep-set fishery, depredation events are thought to primarily occur with false killer whales and short-finned pilot whales, and in the shallow-set fishery, with Risso's and bottlenose dolphins. The second mode involves animals that accidentally encounter the gear and become hooked or entangled. This is thought to be the mechanism for the documented interactions with small dolphins, beaked whales, and large baleen whales.

Observers on board Hawaii-based longline vessels record marine mammal sightings and behavior, interactions (i.e., any contact with the fishing gear by a marine mammal, including depredation on catch), and takes (interactions involving a hooking, entanglement, or both, which may result in death or injuries that are later determined to be either serious or non-serious). Of the 43 false killer whales taken by Hawaii-based longline fisheries between 1997 and 2009, 3 were mortalities. Of the mortalities, 1 involved hooking (head/beak/mouth), 1 involved entanglement (fluke), and 1 involved both (hooked in fluke, entanglement of tail stock). The remaining 40 interactions were injuries, of which 81% (34) involved hookings, 10% (3) involved entanglements, and 7% (2) involved both hooking and entanglement; 2% (1) were classified as

"other". Of the 34 hookings, 67% (25) were mouth-hooked or the hook was ingested, 11% (4) were hooked in the fluke/tail, and in 22% (8), the location of the hooking was unknown.

Depredation

The high proportion of mouth-hookings or ingestion of hooks by false killer whales is almost certainly linked with depredation. Observers are usually able to differentiate between damage to catch caused by sharks, squid, and marine mammals. Marine mammal damage is commonly characterized by the removal of the fish from the hook, leaving only the "lips" or head, including gill plates, of the fish behind. However, as depredation is not usually correlated with sightings or activities of whales around the gear, it is normally not possible to identify the marine mammal species engaging in this behavior.

Hawaii-based longline fisheries target many of the preferred prey species of false killer whales. False killer whale prey include tunas, billfish, mahi mahi, wahoo (ono), and pomfret, all of which are either targeted or caught by the longline fisheries (Baird *et al*. 2008). False killer whales are primarily hooked or entangled in sets targeting bigeye tuna (Forney 2009). False killer whales have learned to take catch off of the lines, and may have learned to associate longline vessels with the alternate foraging opportunity. False killer whales may be attracted to vessels through unknown mechanisms, potentially including particular visual (lighting) or acoustic cues. Cavitation noise of ship propellers was found to be the likely acoustic cue attracting sperm whales to longline vessels in Alaska (Thode et al. 2007).

Since about August 2003, approximately 1.15% of the tunas landed on observed trips showed signs of marine mammal damage, and 6% of deep-sets and 3% of shallow-sets had depredation of catch (Table 3.2). This may be an underestimate of the total amount of depredation occurring because it does not take into account levels of depredation on bait, or fish completely removed from hooks. Currently, observers do not record depredation on bait, because there is no way to reliably determine whether hooks that come up empty have lost their bait due to depredation by marine mammals, other species (e.g., sharks, squid), or because of other mechanical factors.

Table 3.2. Depredation of longline sets and bycatch data for false killer whales and false killer whales/unidentified 'blackfish' only, based on observer data from August 2003 - December 2009 (excluding vessels that participated in gear research during and subsequent to the experimental trips).

	DEEP-SET				SHALLOW-SET			
	# Sets	%	Sets with Takes		# Sets	%	Sets with Takes	
False Killer Whales								
With depredation	1179	6%	19	1.61%	183	3%	0	0.00%
Without depredation	19545	94%	9	0.05%	6045	97%	1	0.02%
TOTAL	**20724**		**28**	**0.14%**	**6228**		**1**	**0.02%**
False Killer Whales and Unid. Blackfish								
With depredation	1179	6%	22	1.87%	183	3%	0	0.00%
Without depredation	19545	94%	11	0.06%	6045	97%	2	0.03%
TOTAL	**20724**		**33**	**0.16%**	**6228**		**2**	**0.03%**

Depredation appears to be an increasing problem. Fishermen and observers are reporting that depredation is occurring more frequently, and an analysis of information recorded on the

observer program's catch log form is largely consistent with these observations (K. Forney, pers. comm.). Depredation by marine mammals in longline and other fisheries also occurs worldwide. Several workshops and symposia have been held to discuss the issue and recommend research or management actions (Donoghue 2003; Vancouver Aquarium 2006; IOTC and NRIFSF 2007).

Not only is depredation potentially harmful to marine mammals because it may lead to a hooking or entanglement, but it also has negative impacts on the fishery. Depredation may result in loss of catch, loss of bait (and thus lost opportunity to catch target species), damage to or loss of gear, and loss of time spent fishing (TEC Inc. 2009). All of this results in increased operating costs (see TEC, Inc. 2009 for details on estimated economic cost of depredation); therefore, fishermen are highly motivated to find a solution to this problem.

4 SENSORY ABILITIES AND FORAGING ECOLOGY OF FALSE KILLER WHALES

4.1 Sensory Abilities

Sound is the most effective means of transmitting or receiving information about the aquatic environment and communicating. As a result, the sound production system of some cetacean species is highly evolved. Odontocete cetaceans rely heavily on acoustics to sense their environment. Odontocetes possess excellent hearing. False killer whales have a typical mammalian U-shaped audiogram and have a broad hearing range (2-115 kHz), with the most sensitive hearing between 16-64 kHz (Thomas et al. 1988).

Odontocetes have three main vocalization types. Whistles are tonal sounds used for communication or social sounds. Clicks are short-duration broadband impulse sounds. Echolocation clicks are used to "illuminate" objects for foraging, navigation, or communication. Burst-pulse clicks are very fast repetition rate clicks such that they sound buzz-like and have a tonal quality (Au 1993). There is a reasonable body of research on false killer whale acoustics. Their whistles have been identified and classified from field recordings, and they are distinguished from other species quite accurately (Oswald et al. 2003). False killer whale echolocation clicks and echolocation capabilities are also well understood from captive research (Thomas et al. 1990, Thomas and Turl 1990, Brill et al. 1992, Au et al. 1995, Nachtigall and Supin 2008). False killer whale echolocation clicks in the wild were measured to have the highest energy between 30-70 kHz (Madsen et al. 2004). The click characters (peak frequency, beam angle, etc.) are dynamic depending on echolocation task and potential masking. False killer whales can use echolocation clicks to discriminate very fine differences between targets in considerable ambient noise. False killer whales are capable of detecting tuna at moderate range (~200 m) using echolocation clicks (Madsen et al. 2004), but they also use echolocation to locate and discriminate targets even in clear, illuminated waters and at very short distances (<1 m). When targeting their prey species, they are likely echolocating off of the fish's air-filled swim bladder as that is believed to result in a higher target strength (Madsen et al. 2004).

Bottlenose dolphins (*Tursiops truncatus*) have been shown to use passive listening for prey detection (Gannon et al. 2005). Mammal-eating or 'transient' killer whales (*Orcinus orca*) have also been shown to incur ecological costs from echolocating (i.e., from prey being alerted by echolocation). A number of authors (Baird et al. 1992, Barrett-Lennard et al. 1996, Deecke et al. 2002, and Guinet 1992) have hypothesized that mammal-eating killer whales detect prey via passive listening. It is, therefore, not unreasonable to assume that false killer whales can use passive acoustic cues—such as the sounds made by fishing vessels, fishing gear, or hooked fish—to locate food sources. The open ocean is a good environment for sound transmission. Under favorable conditions, sounds produced by longline vessels should transmit over distances of several kilometers.

4.2 Foraging Ecology

There is no information available on the false killer whale diet from the few stranded false killer whales in Hawaii. However, Baird et al. (2008) provide information on false killer whale diet

from observational studies. False killer whales feed during the day, and their frequent prey sharing behavior and long handling time of large prey items allows observers to document the prey items being consumed. False killer whales from the Hawaii Insular stock have been observed preying on nine prey species (Table 4.1), seven of which are fished commercially.

Table 4.1. Prey species documented for false killer whales in Hawaii (Table 4 in Baird 2009). * indicates probable identification. + indicates species caught commercially.

English Name	Hawaiian Name	Scientific Name	Source
Yellowfin tuna +	Ahi	*Thunnus albacares*	Baird et al. 2008
Albacore tuna +	Ahi palaha	*Thunnus alalunga*	Baird et al. 2008
Skipjack tuna +	Aku	*Katsuwonus pelamis*	Baird et al. 2008
Scrawled File fish *	Loulu or Oilepa	*Aluterus scriptus*	Baird et al. 2008
Broadbill swordfish +	A‘u ku	*Xiphias gladius*	C. Babbit pers. comm..
Dolphin fish +	Mahimahi	*Coryphaena hippurus*	Baird et al. 2008
Wahoo +	Ono	*Acanthocybium solandri*	Baird et al. 2008
Lustrous pomfret *+	Monchong	*Eumegistus illustrus*	Baird et al. 2008
Threadfin jack	Kagami ulua	*Alectis ciliaris*	D. Perrine pers. comm.

Karin Forney compiled and distributed to the Team a record of all species observed with marine mammal damage in the longline fisheries since 2003 (see Attachment 4 of the Data Analysis/Mining Work Group call summary, March 23, 2010, available online at http://www.nmfs.noaa.gov/pr/interactions/fkwtrt/workgroups/dataanalysis03232010.pdf). These species included tunas (bigeye, skipjack, yellowfin, albacore, unidentified), mahi, swordfish, wahoo, and unidentified billfish, among others. While these are not necessarily depredated by false killer whales, they do provide an indication of the fish species that are the target of marine mammal depredation, and they demonstrate the partial overlap between the natural diet of false killer whales and species that are depredated from longlines.

5 DESCRIPTION OF THE FISHERIES

5.1 Hawaii-based Deep-set and Shallow-set Longline Fisheries

5.1.1 History

The Hawaii-based longline fishery began around 1917 and was based on fishing techniques brought to Hawaii by Japanese immigrants. The early Hawaiian sampan-style flagline boats targeted large yellowfin and bigeye tuna using traditional basket gear with tarred rope mainline. This early phase of Hawaii longline fishing declined steadily into the 1970s due to low profitability and lack of investment in an aging fleet (Boggs and Ito 1993). During the 1980s, tuna longline effort began to expand to supply developing domestic and export markets for high quality fresh and sashimi grade tuna. In the late 1980s and early 1990s, the nature of the fishery changed completely with the arrival of swordfish and tuna-targeting fishermen from longline fisheries of the Atlantic and Gulf States. In 1985, the longline fishery surpassed landings of the skipjack pole-and-line fleet and has remained the largest Hawaii-based fishery to date. Longline effort increased rapidly from 37 vessels in 1987 to 138 vessels in 1990 (Ito and Machado 2001). Swordfish landings rose rapidly from 600,000 pounds in 1989 to 13.1 million pounds in 1993 (WPRFMC 2003). The influx of large, modern longline vessels promoted a revitalization of the fishery, and the fleet quickly adopted new technology to better target bigeye tuna at depth. The near-full adoption of monofilament mainline longline reels further modernized the fleet and improved profitability.

An emergency moratorium was placed on the rapidly expanding fishery in October 1991 (Fishery Management Plan (FMP) Amendment 4). Also in October 1991, longline fishing was prohibited within a 50 nmi radius of the Northwest Hawaiian Islands to prevent interactions with the endangered Hawaiian monk seal (Figure 5.1) (FMP Amendment 3). Another area closure was implemented in March 1992 in which longline fishing was prohibited around the main Hawaiian Islands to reduce gear conflicts between small troll and handline boats and longline vessels (FMP Amendment 5) (Figure 5.2). The areas of these closures are presented in table 5.1. A limited access program was established in 1994 allowing for a maximum of 164 transferable longline permits for vessels ≤ 101 feet in overall length (FMP Amendment 7). During the same year, the Hawaii Longline Observer Program was initiated, primarily to monitor interactions with protected species.

Table 5.1. Areas of longline fishing restricted areas.

Location	Area (nmi^2)	Percentage of EEZ
EEZ around Hawaiian archipelago	725,915	
MHI longline winter closed area	53,610	7% EEZ, 74% MHI longline summer closed area
MHI longline summer closed area	72,640	10% EEZ
NWHI Protected Species Zone	102,300	14% EEZ

Selected changes to the fishery's management are summarized in Table 5.1.

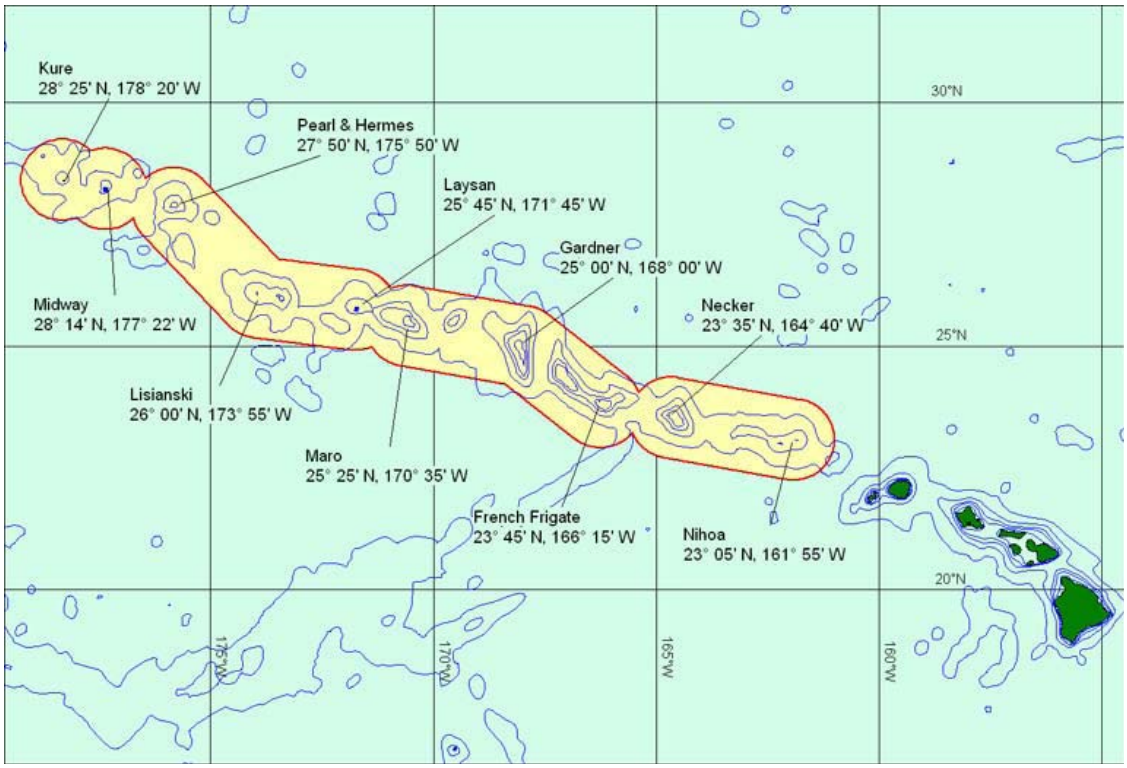

Figure 5.1. Boundary of Northwest Hawaiian Islands Longline Protected Species Zone.

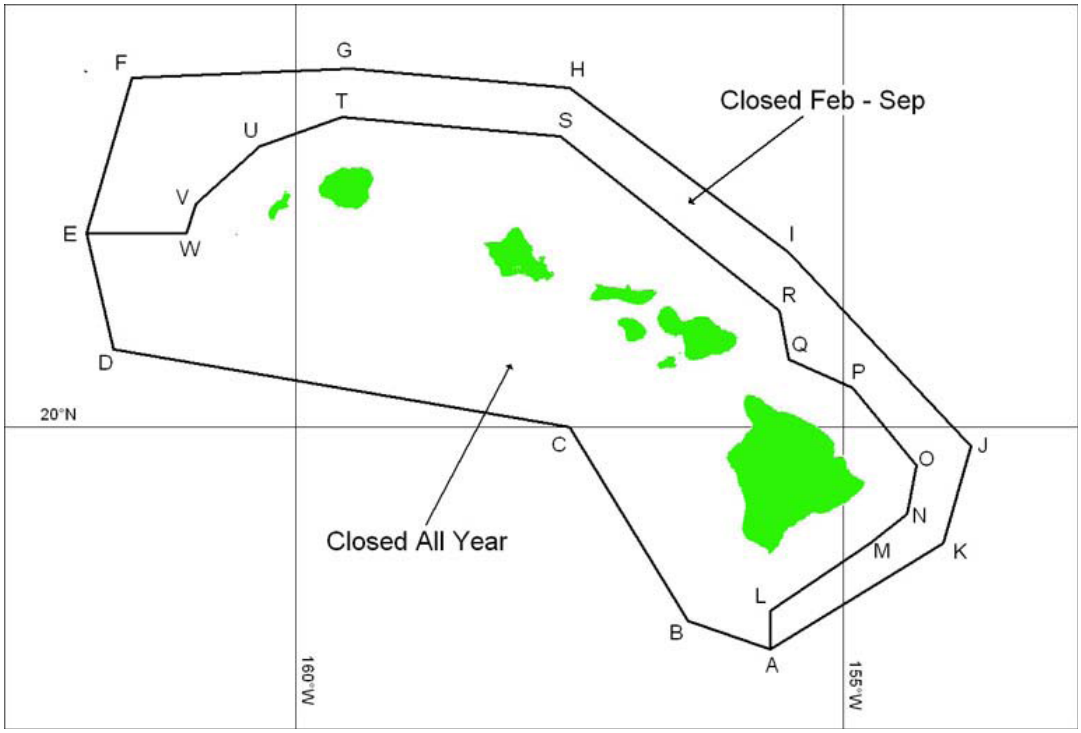

Figure 5.2. Boundary of Main Hawaiian Islands Longline Fishing Prohibited Area.

Table 5.1. Selected regulatory and monitoring changes for the Hawaii-based longline fisheries. (Adapted from Baird 2009).

Year/Month (Effective Date)	Action	Regulatory or monitoring changes
1991 May	FMP Amendment 2	Implementation of permitting and logbook program for recording of catch and fishing effort
1991 Oct	FMP Amendment 3	Created longline exclusion zone around Northwestern Hawaiian Islands (50 nmi) to protect monk seals
1991 Oct	FMP Amendment 4	Three-year moratorium on new entry into fishery imposed
1991 Oct	FMP Amendment 4	Requirement for implementation of NMFS-owned vessel monitoring system (VMS) transmitters, with VMS data monitored by NMFS Office of Law Enforcement to ensure no fishing within prohibited areas
1992 Mar	FMP Amendment 5	Created longline exclusion zone around Main Hawaiian Islands (25-75 nmi) to reduce conflict with near-shore fisheries
1994 Jun	Final rule, 50 CFR Part 685, FR Doc. 94-9325, April 19, 1994	Start of NMFS Hawaii Longline Observer Program and mandatory observer coverage
1994 Jun	FMP Amendment 7	Limited entry program with transferable permits instituted (164 vessels maximum, maximum vessel length 101 feet)
2000		Significantly increased in observer coverage
2001 Mar	Court Order, implemented by emergency rule 66 FR 31561, June 12, 2001	Swordfish fishery closed by court order
2002 Jun	Framework Measure 2	Required use of blue-dyed bait, strategic offal discards, and line shooters with weighted branch lines to mitigate seabird interactions when fishing north of 23° N. Also requirement for owners and operators to attend NMFS' protected species workshop annually
2002 Jun	Regulatory Amendment 1	Ban on swordfish fishing north of the equator for turtle protection; closed waters between 0° and 15° N from April - May; instituted sea turtle handling requirements in EEZ waters.
2004 Apr	Regulatory Amendment 3 Final Rule, 69 FR 17329, April 2, 2004	Reopened swordfish fishery in Hawaii with requirement to use mackerel type bait and 18/0 circle hooks, effort limit of 2,120 sets/year, hard caps on loggerhead and leatherback turtle takes, and 100% observer coverage.
2004 Sep	Final rule, 69 FR 48407, August 10, 2004	Hawaii longline fishery reclassified as Category I fishery in 2004 MMPA List of Fisheries.
2006 Jan	Regulatory Amendment 5	Allowed vessels fishing north of 23° N and those targeting swordfish south of 23 N to utilize side-setting to reduce seabird interactions in lieu of the measures required in Framework Measure 1.

2006 Mar	Temporary rule, 71 FR 14824, March 24, 2006	Shallow-set fishery closed north of the equator for rest of calendar year after reaching interaction limit for loggerhead sea turtles
2006 Jun	Proclamation 8031, 71 FR 36443, June 26, 2006	Establishment of Papahanaumokuakea Marine National Monument around Northwestern Hawaiian Islands with exclusion of longline fishing (boundaries similar to “50 nmi” exclusion zone)
2009 Jan	Final rule, 73 FR 73032, December 1, 2008	Hawaii longline fishery split into the Hawaii deep-set (tuna target) longline and Hawaii shallow-set (swordfish target) longline fisheries in the 2009 MMPA List of Fisheries.
2010 Jan	Final rule, 74 FR 65460, December 10, 2009	Annual limit on the number of shallow sets removed, and loggerhead sea turtle take limit increased.

5.1.2 Overview

The Hawaii-based longline fisheries are the largest of all the commercial pelagic fisheries in Hawaii. In 2008, the longline represented 85% of the total commercial pelagic landings and 89% of the ex-vessel revenue (WPRFMC 2010b). The longline fleet has historically operated in two distinct modes based on gear deployment: deep-set longline to target primarily bigeye tuna (*Thunnus obesus*) and shallow-set longline used to target swordfish (*Xiphias gladius*).

The Western Pacific Regional Fishery Management Council (WPRFMC) and NMFS have regulated the Hawaii-based longline fishery as two distinct segments, deep-set and shallow-set, since the shallow-set fishery reopened in 2004. The 2009 MMPA LOF (73 FR 73032) considered the two longline segments separately when assessing their impacts on marine mammals. Vessel operators must notify NMFS prior to departure whether the vessel is undertaking a deep-set or shallow-set trip. Once the trip type is set, it cannot be changed during the trip (50 CFR 665.813(h)).

The limited access program allows for 164 vessels in the fishery, but active vessel participation has been closer to 130 in recent years. In 2008, 128 vessels actively participated in the fishery (Figure 5.3), with 104 vessels targeting tunas exclusively and 1 vessel targeting swordfish exclusively throughout the year; 23 vessels targeted both swordfish and tunas at some point during 2008 (WPRFMC 2010). Vessel sizes range up to nearly the maximum 101-foot limit, but the average size is closer to 65 – 70 ft. Most of the vessels are of steel construction and use flake ice to hold catch in fresh/chilled condition. A few older wooden boats persist in the fishery. Some of the boats have mechanical refrigeration that is used to conserve ice, but catch is not frozen in this fishery.

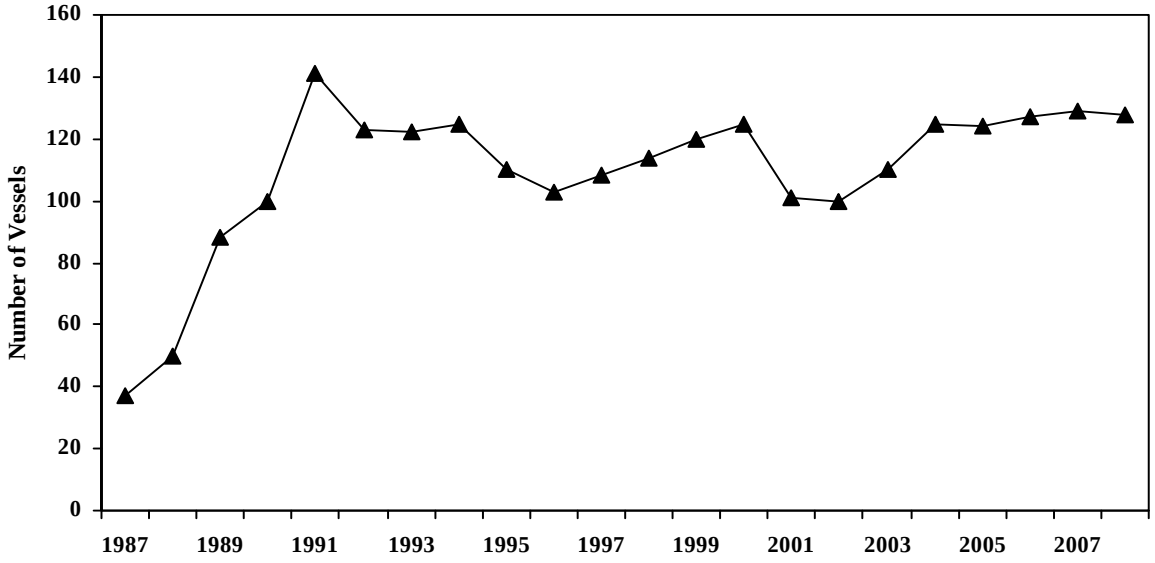

Figure 5.3. Number of Hawaii-based longline vessels, 1987-2008 (WPRFMC 2010b)

The total number of sets by the Hawaii-based longline fleet has remained relatively stable for the past 5 years and above the long-term average, with the large majority (94%) of trips targeting tunas (Figure 5.4). The total number of hooks set by the Hawaii-based longline fisheries,

however, steadily increased since 1994 to a record 41.5 million hooks in 2008 (Figure 5.5, WPRFMC 2010). Much of the increase is due to the shift in effort from swordfish and mixed target to tuna (primarily bigeye tuna). Tuna sets typically set more hooks per day than swordfish and mixed target set types. Most of the hooks set were in areas outside of the EEZ (59%) and MHI EEZ (27%) in 2008 (WPRFMC 2010b).

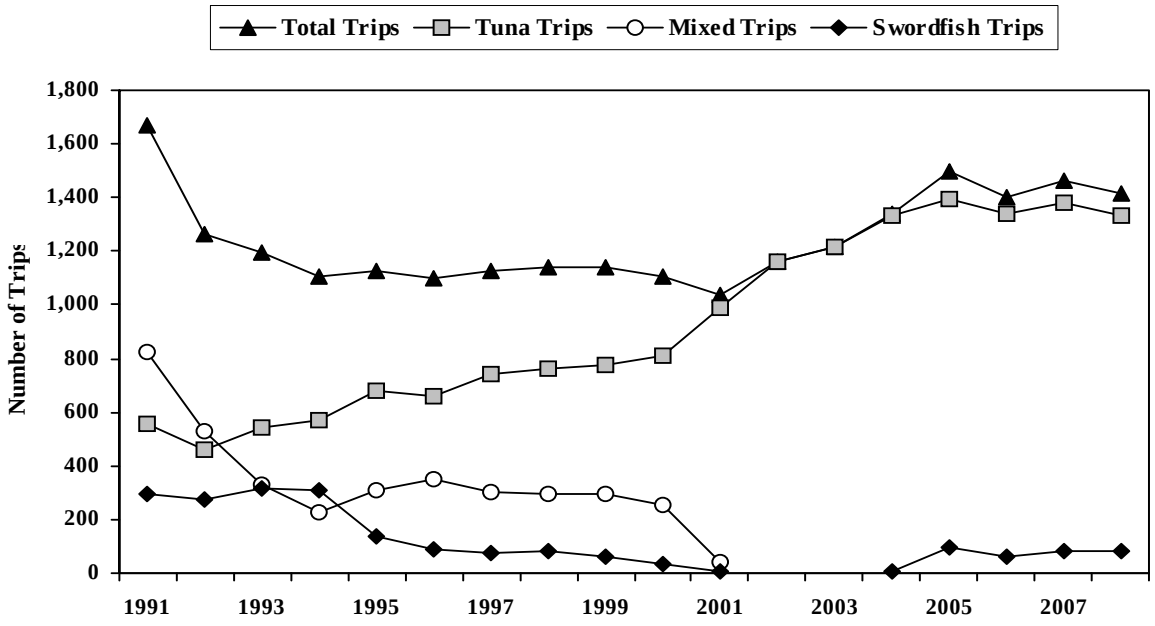

Figure 5.4. Number of trips by the Hawaii-based longline fishery, 1991-2008 (WPRFMC 2010b).

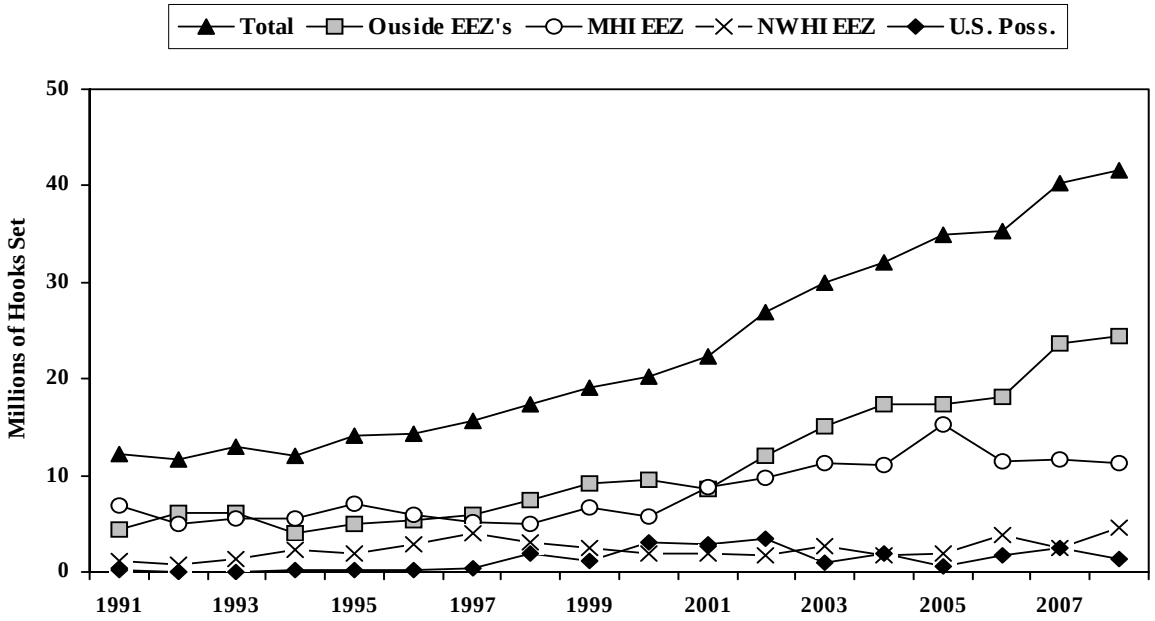

Figure 5.5. Number of hooks set by the Hawaii-based longline fishery, 1991-2008 (WPRFMC 2010b).

All longline vessels carry mandatory Vessel Monitoring Systems (VMS) monitored by NMFS, and must submit mandatory logbook data at the completion of every trip. VMS are satellite-based vessel monitoring systems whereby each unit transmits a signal (typically once per hour) identifying the exact latitude and longitude of a vessel.

Almost all of the Hawaii-based longline catch is sold at the United Fishing Agency auction in Honolulu. It is believed that very little of the longline catch is directly marketed to retailers or exported by the fishermen; however, there are significant exports by wholesalers and retailers who buy their fish from the auction.

Hawaii longline landings in 2008 were nearly 26.7 million pounds, with revenue of $71.9 million. Landings have trended upward since 2001, and total landings and revenue in 2008 were 34% and 27% higher, respectively, than the long-term average (Figure 5.6).

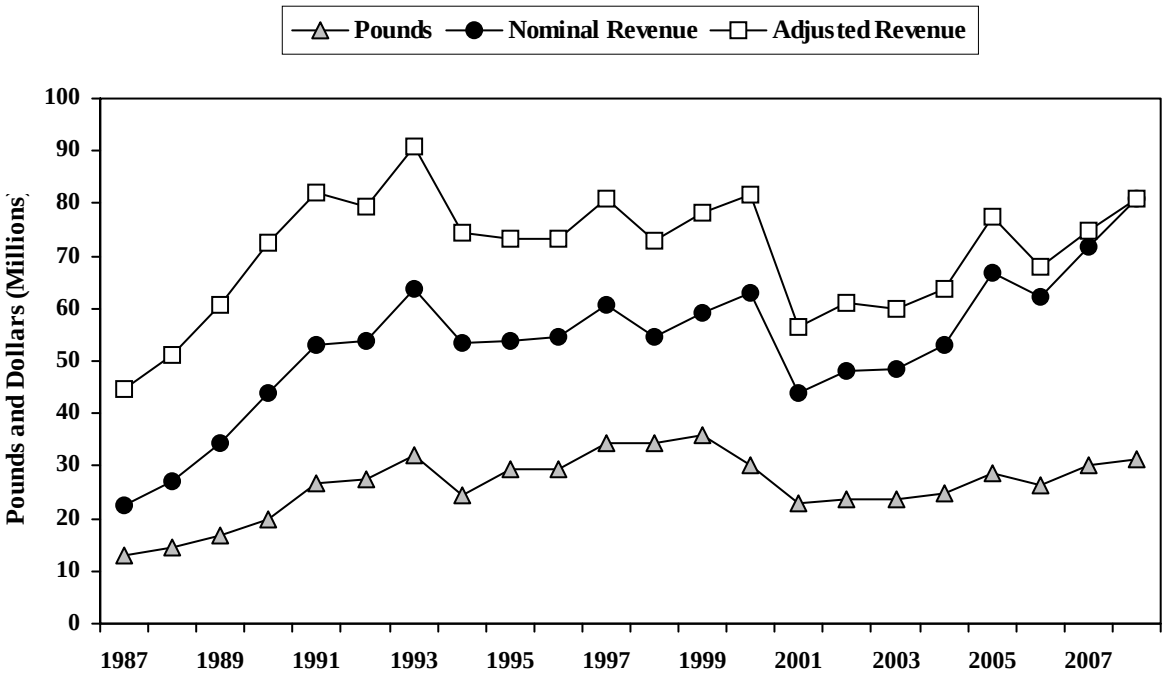

Figure 5.6. Hawaii longline landings and revenue, 1987-2008 (WPRFMC 2010b).

5.1.3 Shallow-set longline fishery

Shallow-set longline gear targets swordfish and typically consists of a continuous mainline set near the surface and supported in the water column horizontally by floats with branch lines (gangions) connected at intervals to the mainline (Figure 5.6). Mainline is made of 3.2-4.0 mm diameter monofilament and stored on large hydraulic reels. Hooks are set at depths of 30-90 m. The portion of the mainline with branch lines attached is suspended between floats at about 20-75 m depth, and the branch lines hang off the mainline another 10-15 m. Only 4-5 branch lines are clipped to the mainline between floats, and a typical set for swordfish uses between 700-1,000 hooks. Shallow swordfish-targeting sets are required to use size 18/0 (or larger) circle hooks with no more than a 10 degree offset and mackerel-type bait (the use of squid bait is

prohibited). Seabird mitigation regulations require gear to be set at night, which also coincides with the swordfish nocturnal feeding behaviors, and hauls during the day.

The most productive swordfish areas for Hawaii-based longline vessels are north of Hawaii outside the U.S. EEZ on the high seas, and this fishery operates primarily north of Hawaii (north of approximately 20° N). In some years, when influenced by seawater temperature, this fishery may operate mostly north of 30° N. The fishery operates year-round, with effort highest in winter and spring months and dropping off substantially during the rest of the year.

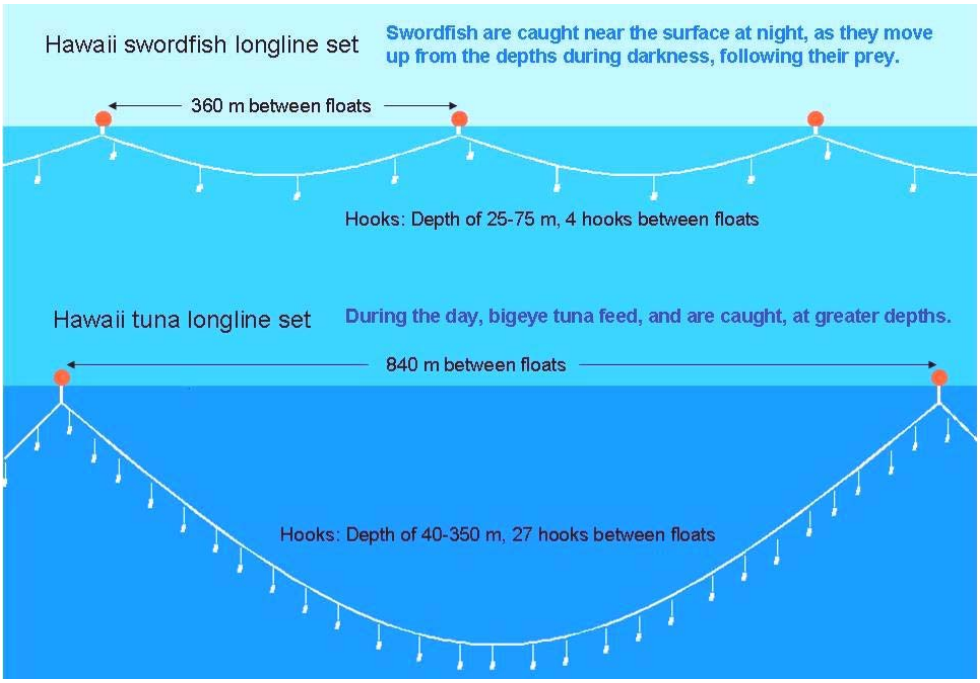

Figure 5.6. Configuration of shallow-set (swordfish target) and deep-set (tuna target) longline gear (NMFS 2009b).

5.1.4 Deep-set longline fishery

The deep-set fishery primarily targets bigeye tuna, which accounts on average for about 32% of the total landings for the Hawaii fleet, followed by yellowfin tuna, which accounts for approximately 10% of landings. Deep-set longline gear typically consists of a continuous mainline set below the surface and supported in the water column horizontally by floats with branch lines attached at intervals on the mainline. Mainline is 3.2-4.0 mm diameter monofilament and stored on large hydraulic reels. In addition, radio buoys are also used to keep track of the mainline as it drifts at sea. Hawaii-based tuna longline vessels typically deploy about 25 to 45 nmi of mainline in the water and use a line shooter to deploy the mainline faster than the speed of the vessel, thus allowing the longline gear to sink to its target depth. Both 3.6-3.8 mm tuna hooks and 14/0-16/0 circle hooks are used in the deep-set fishery, and hooks are set at depths of 40-350 m (average target depth is 167 m, WPRFMC 2010a). A minimum of 15, but typically 25 to 30 (average of 27), weighted branch lines are clipped to the mainline at regular intervals between the floats. All float lines must be at least 20 m in length. The branch lines are typically 11 to 15 m long. Sanma (saury, *Cololabis saira*) or sardines are used for bait. There are approximately 66 floats and an average of 1,690 hooks deployed per set (WPRFMC 2010a). The

use of light sticks (or any light emitting device) is prohibited. Unlike the shallow-set fishery, the deep-set does not have regulations regarding the time of day that the gear may be set. However, it is common for fishermen to set their gear in the morning, allow the gear to soak during the day, and haul in the afternoon/night, mainly to maximize their target catch rates. Total fishing time typically lasts about 19 hours, including the setting and hauling of gear.

Tuna vessels may currently range out to 1,000 nmi but generally make trips within 500 nmi from Honolulu. This fishery operates inside and outside the US EEZ, primarily around the main Hawaiian Islands and Northwestern Hawaiian Islands, with some trips to the EEZs around the U.S. Pacific Remote Island Areas. Vessels vary their fishing grounds depending on their target species. Most of the deep-set fishing occurs north and south of the Hawaiian Islands, according to fishing conditions. This fishery operates year-round, although vessel activity increases during the fall and is greatest during the winter and spring months. Spatio-temporal plots of the fleet's deep-set effort are provided in Appendix F.

5.1.5 Regulatory/Management Structure

5.1.5.1 Domestic Fishery Management

The Western Pacific Regional Fishery Management Council is based in Honolulu, Hawaii and is one of the eight regional fishery management councils established by the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The Council manages domestic fisheries that occur in offshore waters around American Samoa, the Northern Mariana Islands, Guam, Hawaii and the Pacific Remote Island Areas (Palmyra, Johnston and Midway Atolls, Wake, Jarvis, Howland and Baker Islands, and Kingman Reef). This area includes nearly 1.5 million square miles of US EEZ waters. Managed vessels fish in waters of both the Eastern Pacific Ocean (EPO) and the Western and Central Pacific Ocean (WCPO).

In the Western Pacific, domestic US fisheries in the US EEZ and the high seas are regulated by the WPRFMC's Pelagics Fisheries Ecosystem Plan (PFEP). Regulations governing fishing by US vessels in accordance with the PFEP appear primarily at 50 CFR Part 665, Subpart H.

The Council has established a Pelagics Plan Team (PPT) to oversee issues relating to the PFEP, including the production of an annual report. The Council also has an Advisory Panel (AP) which provides the opportunity for fishermen to review and comment on issues and actions before the Council. Recommendations from bodies such as the PPT and AP concerned with science and data are reviewed by the Council's Scientific and Statistical Committee (SSC), which may forward the recommendations unchanged or with suggested revisions.

The Sustainable Fisheries Division (SFD) is the primary division in the NMFS Pacific Islands Regional Office (PIRO) responsible for overseeing and implementing fishery management plans for commercial and non-commercial domestic fisheries in the Pacific islands, as authorized under the MSA). SFD objectives are consistent with NMFS Strategic Plan Objectives, and include: 1) maintain healthy stocks important to commercial, recreational, and subsistence fisheries; 2) eliminate overfishing and rebuild overfished stocks important to commercial,

recreational, and subsistence fisheries; and 3) increase long-term economic and social benefits to the nation from living marine resources.

SFD administers three major programs. First, the fishery management program supports the region's fisheries through the development, evaluation, and implementation of fishery policy and legislation. Program staff provides guidance to the WPRFMC in developing fishery management plans, ensuring that plans are supported by required analyses, and are consistent with all applicable laws. SFD staff coordinate and oversee the processing of proposed and final regulations to implement fishery management plans that are approved by the Secretary of Commerce. Second, the permits program processes and issues Federal fishing permits and related certificates authorized under the MSA. The permits program also issues both Marine Mammal Authorization Program Certificates for pelagic longliners and High Seas Fishing Compliance Act permits for the Pacific Islands region for U.S. fishing vessels fishing in international waters. Third, SFD conducts Protected Species Workshops (PSW) for owners and operators of Western Pacific pelagic longline vessels; a valid workshop certificate is necessary for owners to renew fishing permits, and vessel operators are required to have a valid workshop certificate, or legible copy, on board while fishing. Each year, over 200 fishermen and vessel owners are trained in Hawaii, and almost 100 are trained in American Samoa.

5.1.5.2 International Management Authorities and Agreements

In addition to domestic management, the US and the Council are fully engaged in the international management of highly migratory species (HMS), primarily tunas and billfishes, in the Pacific.

Two regional fishery management organizations (RFMOs) are responsible for international management and conservation of HMS in the Pacific: in the Western and Central Pacific Ocean, the Western and Central Pacific Fishery Commission (WCPFC), and in the Eastern Pacific Ocean, the Inter-American Tropical Tuna Commission (IATTC). The line of demarcation occurs at 150° W, but makes a dog leg to 130° W south of the equator to incorporate all of French Polynesia (which bisects the Pitcairn EEZ) (WPRFMC 2010a, Figure 5.7).

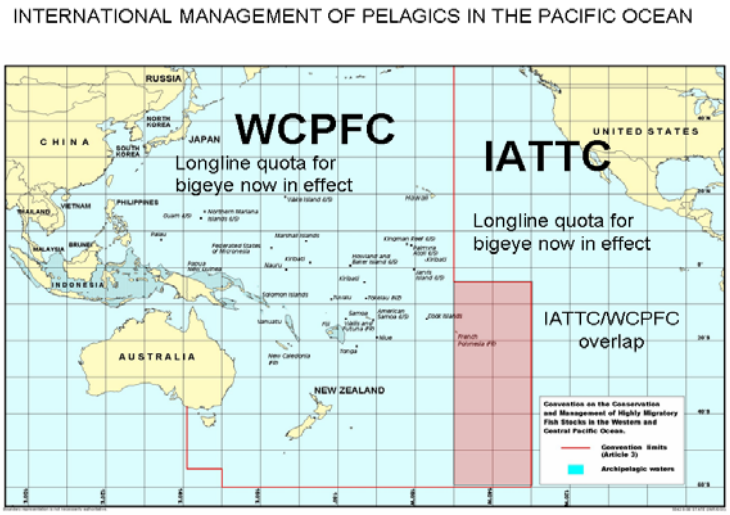

Figure 5.7. Areas of responsibility and overlap of the WCPFC and IATTC (WPRFMC 2010a).

The IATTC was formed in 1950, initially between the USA and Costa Rica, but with other countries involved in distant water fishing subsequently joining. The initial convention was superseded by the Antigua Convention of 2004, which among other things broadened the area of application from 30 degree north and south to 50 degree north and south, thus including stocks such as swordfish, albacore and bluefin tuna.

Members of the WCPFC include small Pacific Island nations, Australia, the US, and Asian nations. The WCPFC was established in 2000 through the Honolulu Convention, and was the first RFMO to be based on the principles of the United Nations Convention on the Law of the Sea.

Under the Council's PFEP, management measures stemming from RFMOs will be implemented by the Council via the MSA.

5.2 Hawaii Shortline and Kaka Line Fisheries

As described in section 1.2.2, the focus of the Team's discussions and the recommendations in this Plan are for the Hawaii-based longline fisheries. However, the Team and this Plan also consider potential impacts to the marine mammal stocks from the Hawaii shortline and kaka line fisheries. This section provides a description of these fisheries.

The State of Hawaii requires that every commercial fisherman (including both operators and crew members) possess a current Commercial Marine License (CML) issued annually by the Hawaii Department of Land and Natural Resources, Division of Aquatic Resources (HDAR). This requirement applies to fishermen who fish in the EEZ, as well as State waters (WPRFMC 2009a). Fishermen must also submit monthly catch reports. HDAR asks fishermen to identify their primary fishing gear or method on the CML at time of licensing; this does not preclude fishermen from using other gear or methods (WPRFMC 2010b).

5.2.1 Shortline Fishery

The State of Hawaii defines the use of shortline gear as "fishing using a horizontal mainline, less than one nautical mile in length and suspended from the ocean surface with floats, from which leaders with baited hooks are suspended." As shortline gear is not defined in the Code of Federal Regulations, use of shortline gear is not subject to existing federal regulations governing longline fishing implemented through the WPRFMC's PFEP. Commercial fishing using shortline gear has been reported since 2003 to the present in the CML reporting system; all reports from the early years (1999-2002) were from kaka line gear, as shortline was not an option under gears on the logbook prior to 2003 (WPRFMC 2010c). It was noted by a longline industry representative on the Team that shortline catch records may not be comprehensive, since some vessels with Hawaii longline permits use shortline gear but record their catch under the longline permit.

5.2.1.1 Cross Seamount

The Cross Seamount is one of 38 seamounts situated southwest of the Main Hawaiian Islands. Seamounts, submarine features usually found in areas of the deep sea, provide habitat for marine species that do not use the surrounding deep sea habitat. The area of the Cross Seamount was fished by Hawaii based longline vessels for several years prior to exploitation by the offshore handline fishery. The earliest handline fishing trip to the Cross Seamount noted by any of the surveyed fishermen was made in 1976 (WPRFMC 2010c).

A few of the long-term operators in this fishery have pioneered the use of shortlines to target bigeye tuna (Figure 5.8). They have also adapted the gear to target seamount monchong (Figure 5.9). When fishing monchong, sub-surface floats are used to keep the deeper-set gear from fouling the seamount summit while maintaining the gear at depth. Additionally, monchong gear uses many branchlines spaced very closely, with small circle hooks (WPRFMC 2010c). A monchong targeting set may deploy 200 hooks in the same length of mainline (Itano 2004). When targeting bigeye tuna, the gear is set a mid-depth above the seamount's summit (Itano 2004).

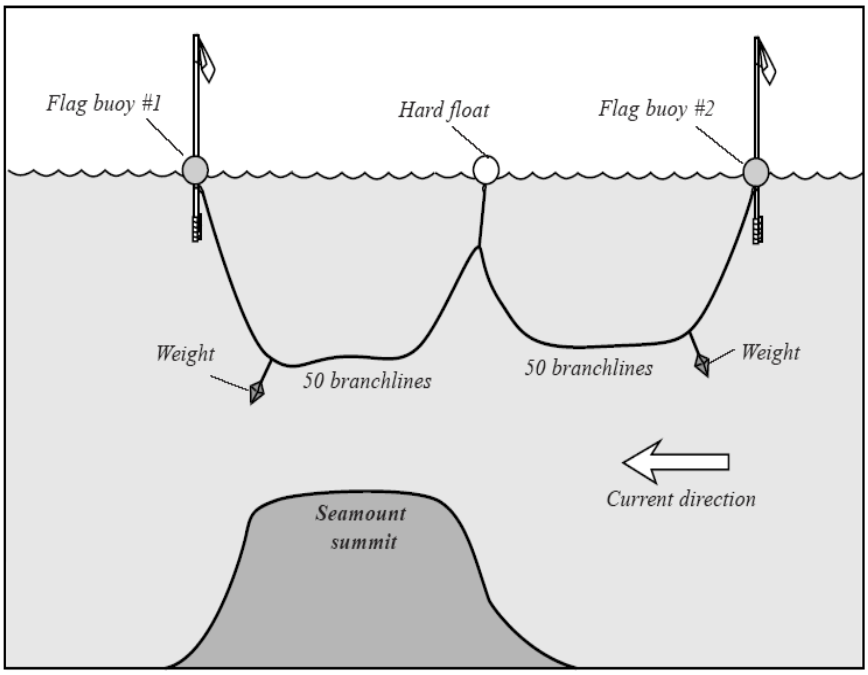

Figure 5.8. Deployment of short line gear on the Cross Seamount to target bigeye tuna (WPRFMC 2009a, adapted from Itano 2004)

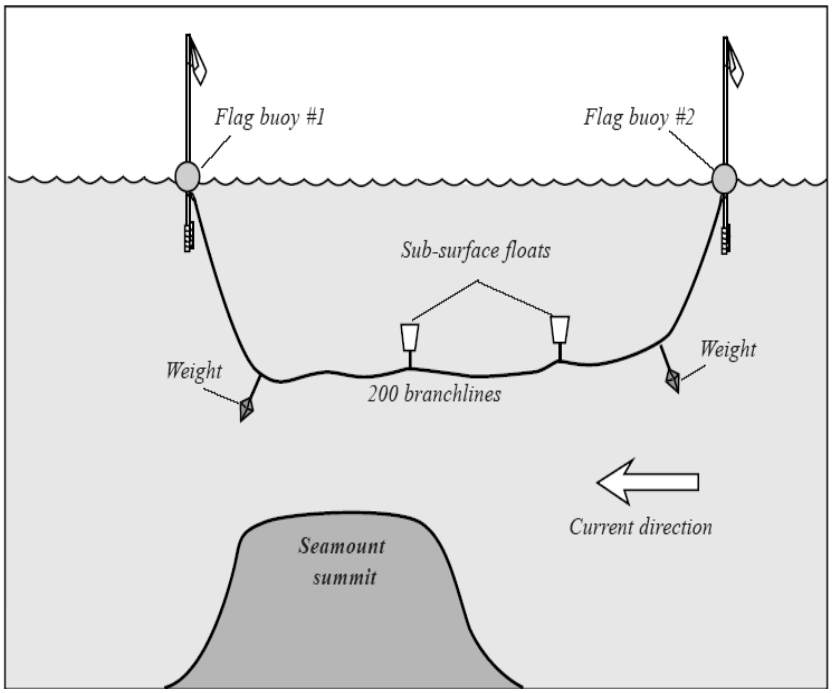

Figure 5.9. Deployment of short line gear on the Cross Seamount to target monchong. (WPRFMC 2009a, adapted from Itano 2004)

Shortline gear began to be deployed earlier this decade and now accounts for about 17% of the reported catch at Cross Seamount, although the percentage is likely higher due to the use of shortlines in the "hybrid" category (WPRFMC 2009b). About 38% of the total catch from the Cross Seamount comes from a mix of gears lumped together under the "hybrid" category, which includes various handlines, pole and line, shortlines, and vertical lines.

There may be potential for the shortline fishery to expand in the future due to several factors, including constraints placed on the Hawaii-based longline fisheries by the advent of international longline fishing catch limits for bigeye and yellowfin tuna, and the closure of the Northwestern Hawaiian Islands bottomfish fishery in 2011. Expansion, if realized, could lead to gear conflicts among different pelagic-targeting sectors such as existing small boat shortline/hybrid gear fishers, trollers, and handline or *ika shibi* fishers.

The WPRFMC is considering defining shortline fishing in a regulation under the PFEP (WPRFMC 2010c). If it were defined, regulations could more easily be developed and implemented should the need arise for management measures or regulations specific to the fishery.

5.2.1.2 Main Hawaiian Islands Other than Cross Seamount

Seasonally, there are areas nearshore to the Main Hawaiian Islands for which setting shortlines can be very effective. It has been demonstrated on the east Maui, Alenuihaha Channel and Haleakala Ridge area for bigeye tuna in the winter (D. Itano, pers.comm. 2009, cited in WPRFMC 2010c). There are other times when large numbers of bigeye tuna can be found near the state fish aggregation devices (FADs), and user conflicts have occurred in these areas

between local trollers and small handline boats and the vessels which typically target the Cross Seamount (D. Itano, pers.comm. 2009, cited in WPRFMC 2010c). Shortline landings have also come from waters off the east side of Hawaii (Big Island), east side of Maui, and north Molokai.

Most landings are reported during the winter months, most likely to supply the holiday demand for tuna. In the shortline fishery around the Main Hawaiian Islands, the majority of trips result in reported landings less than 1,000 lbs, while a small number of "highliners" report catches of more than 1,000 lbs for individual trips.

5.2.2 Kaka Line Fishery

In Appendix A of the Council's 2001 Coral Reef Ecosystem Fishery Ecosystem Plan, "Kaka line (set line) means fishing with a mainline less than one nautical mile in length from which branch lines of baited hooks are attached. Line is set horizontally, on or near the bottom, or in shallow mid-water." The State of Hawaii defines kaka line gear in the same way, with the addition that the gear is "fixed" on or near the bottom, or in shallow-midwater. Thus, kaka lines are essentially bottom-set shortlines fished in nearshore waters. They catch a different suite of fishes than shortline gear (WPRFMC 2010c). As described above, though, shortline trips were categorized as kaka line trips until they were listed separately in the CML reporting system in 2003.

Catches using kaka lines comprise a large variety of species, including different bottomfishes, opelu, a variety of other nearshore and reef-associated species, and pelagic species. The decade of catch reports from kaka and shortline fishers combined represent many trips with small amount of catch (<50 fish) and a few trip with large catches (>100 fish). Catch ranges from 0 fish to nearly 350 fish for one trip, and the majority of trips catch less than 50 fish (WPRFMC 2010c).

6 SUMMARY OF BYCATCH AND DEPREDATION REDUCTION STRATEGIES USED IN LONGLINE FISHERIES

6.1 Bycatch Reduction

6.1.1 Hawaii-based longline fisheries

Numerous regulatory measures have been implemented in the Hawaii-based longline fisheries to reduce bycatch of protected species including sea turtles (primarily leatherbacks, *Dermochelys coriacea*, and loggerheads, *Caretta caretta*) and seabirds.

Each year, owners and operators of longline vessels registered to a Hawaii longline limited entry permit must attend and be certified in Protected Species Workshop (PSW) conducted by NMFS PIRO on mitigation, handling, and release techniques for sea turtles, seabirds, and other protected species (e.g., marine mammals) (50 CFR 665.814). Participants receive a certification card upon completion of the workshop, and the card must be carried on board the vessel during fishing operations. A valid workshop certificate is necessary for owners to obtain or renew longline fishing permits. Workshops have been conducted annually since 2000.

Vessel owners and operators must follow specific guidelines for handling, dehooking, resuscitating, and releasing turtles that interact with longline fishing gear. Longline vessels are required to carry and use specific equipment for handling and releasing sea turtles, and to follow specific procedures if a sea turtle is hooked or entangled. The requirements apply to all Hawaii longline limited entry permitted vessels. Some requirements change depending on what type of fishing trip is declared (i.e., shallow- or deep-set trip). Equipment includes line clippers, dip nets, and dehookers. NMFS specifications governing these gears can be found in 50 CFR 665.812(a), and requirements for sea turtle handling are specified in 50 CFR 665.812(b).

The shallow-set fishery is required to use only 18/0 (or larger) circle hooks (≤10° offset) and mackerel-type bait (50 CFR 665.813(f) and (g)), and observer are placed on 100% of vessels. The shallow-set fishery has maximum annual interaction limits (hookings or entanglements) on leatherback and loggerhead sea turtles. If any interaction limit is reached, the shallow-set fishery is closed for the remainder of the calendar year, and if either annual limit is exceeded in any year, the annual limit for the following year is reduced by the number by which the limit was exceeded. When closed, Hawaii longline vessels are prohibited from shallow-set fishing north of the Equator for the remainder of the calendar year (50 CFR 665.813(b)). Data collected after implementation of these measures in the shallow-set fishery show an 89% reduction in incidental take rates for all sea turtle species in the shallow-set fishery.

Hawaii-based pelagic longline fishermen must also comply with NMFS seabird mitigation measures depending on the declared trip type and where the vessel is fishing (50 CFR 665.815). Longline fishermen may side-set their gear or set gear from the stern. Both setting options require mitigation measures, some of which include weighted branchlines, completely thawed and blue-dyed bait, strategic offal discards, and mandatory night-setting. These measures have reduced incidental interactions with seabirds, primarily North Pacific albatrosses, by over 90 percent. In 2000, it was estimated that the fisheries has 2,433 incidental interactions with

albatrosses. Since the seabird mitigation measures became effective in 2002, there have been about 153 albatross interactions per year (NMFS 2009b).

Finally, the shallow-set fishery has experienced closures related to sea turtle interactions. Two studies concluded that the impact of restrictions on fishing effort in the shallow-set fishery was substantially more, not less, take and mortality of sea turtles in the Pacific Ocean (see Rausser et al. 2008, Sarmiento 2006).

6.1.2 U.S. Atlantic, Caribbean, and Gulf of Mexico Pelagic Longline Fishery

Similar to the Hawaii-based longline fisheries, the U.S. Atlantic, Caribbean, and Gulf of Mexico pelagic longline fishery is subject to measures to reduce bycatch and bycatch mortality, to the extent practicable, of a number of species, including sea turtles and marine mammals. Measures to avoid the likelihood of jeopardy to sea turtles, as required by the ESA, have been incorporated for the continued operation of the fishery. Regulatory measures include time/area closures, safe handling and release gear and protocols for sea turtles, mandatory use of circle hooks, and use of mackerel bait.

The fishery is also subject to regulations developed through the MMPA take reduction process. The Atlantic Pelagic Longline Take Reduction Team developed recommendations to reduce bycatch of pilot whales and Risso's dolphins in the Atlantic pelagic longline fishery. The final rule for the Atlantic Pelagic Longline Take Reduction Plan (PLTRP) was published on May 19, 2009 (74 FR 23349), with regulatory requirements effective June 18, 2009. The Plan included three regulatory requirements:

- All pelagic longline vessels in the Atlantic EEZ off the U.S. East Coast are required to post a placard with marine mammal handling and release guidelines inside the wheelhouse and on the working deck;
- Pelagic longline sets must not exceed 20 nm in mainline length in the EEZ portion of the Mid-Atlantic Bight; and
- Special observer and research participation requirements are in place for the Cape Hatteras Species Research Area (CHSRA), an area defined to capture "hot spots" of bycatch and concentration of fishing effort. The CHSRA includes all waters inside and include the rectangular boundary described by the following lines: 35° N lat., 75° W long., 36° 25' N lat., and 74° 35' W long. If a fisherman deploys or fishes with pelagic logline gear in the CHSRA, or intends to do so, he must call the NMFS Southeast Fisheries Science Center before embarking on the fishing trip, and if assigned an observer, he must take the observer; if he does not take the observer, he may not fish within the CHSRA for that trip. Observers may also conduct additional scientific investigations in the CHSRA to support PLTRP implementation. Vessels fishing in the CHSRA must be willing and able to participate in research as requested, without compensation, for the duration of the assignment, and comply with additional investigations, modifications to fishing behavior, and/or gear as directed by the observer. Or, instead of carrying an observer, boats may be required to carry and deploy gear provided by NMFS or an observer, or to modify fishing practices.

Additionally, four non-regulatory measures are included in the PLTRP: 1) increase in observer coverage (from approximately 8% to 12-15%), with priority given to areas known to have high marine mammal interactions, 2) periodic updates to the marine mammal careful handling and release guidelines, 3) conducting additional research and data collection on marine mammals and their interactions with the longline fishery, and 4) captains' communications regarding protected species interactions.

Research to reduce marine mammal bycatch in this fishery is ongoing. David Kerstetter, from Nova Southeastern University, gave a presentation at the 3rd False Killer Whale TRT meeting on his research using "weak" hooks to reduce pilot whale bycatch in the Atlantic pelagic longline fishery. The use of weak hooks takes advantage of the size and weight difference between the target species (yellowfin tuna and swordfish) and much larger bycatch species; the hook will be strong enough to retain target catch, but will bend and straighten under the pull strain of a hooked marine mammal, allowing the animal to release itself and thereby reduce the severity of the animal's injury. Kerstetter and his colleague tested "weak" and strong circle hooks of two different sizes (16/0 and 18/0) in 30 longline sets. In the yellowfin tuna-targeting sets, there was no significant reduction in total tuna catch or of any target species. Additionally, seven weak hooks were straightened, including one that was observed to have been straightened by a pilot whale (Bayse and Kerstetter 2010).

Similarly, weak hooks have been tested in the northern Gulf of Mexico yellowfin tuna longline fishery to reduce bycatch of bluefin tuna. Researchers from the NMFS Southeast Fisheries Science Center, Pascagoula Laboratory, tested two different gauges of the same circle hook model. The study has shown dramatic reductions in bluefin tuna bycatch without significant decreases in target catch (NMFS 2008, NMFS 2009c).

These results offer a promising bycatch reduction strategy that could be employed in other longline fisheries. See section 8.2.1.3 of this document for the Team's recommendations regarding the testing of weak hooks in the Hawaii-based longline fisheries.

6.2 Depredation Reduction

As noted in section 3.3, bycatch of marine mammals on longlines is often associated with marine mammal depredation, or the removal of catch and/or bait from the hooks. This behavior can have negative consequences for both the depredating cetaceans and the fishery. Depredation appears to be an increasing problem in the Hawaii-based longline fisheries and elsewhere, and depredation by toothed whales (odontocetes), in particular, has been reported in fisheries around the world.

There are several challenges to mitigating depredation. First, depredation is a learned behavior, involving natural prey or new prey species, and food "rewards" such as catch, bait, or offal are powerful training tools that positively reinforce the behavior. If depredation provides a predictable food source, cetaceans can learn to specialize. In false killer whales and other social species, individuals learn from each other, so depredation behavior can be taught and passed on to others, perpetuating the behavior. Cetaceans are intelligent and adaptable, and they may detect

vessels or longline gear through acoustic and/or visual cues, and learn to associate which sounds, such as the hydraulics, are associated with available food.

Three overall strategies for depredation mitigation have been identified: 1) *avoidance*, to reduce encounters between vessels and cetaceans; 2) *deterrence*, to reduce the probability of cetacean depredation when encounters happen; and 3) *protection*, to reduce the probability of harm to the animals when depredation occurs. Numerous mitigation techniques have been considered and/or trialed. Hamer et al. (2010) summarized 24 of the techniques/methods, which fall into the following categories: physical, chemical, electrical, visual, acoustic, behavioral, and management. Their review indicates that the research has had mixed results, with some successes, failures, and many ideas not yet trialed or deemed too problematic to be feasibly implemented. Methods demonstrating success (including limited or initial success) included the use of net sleeves preventing access to caught fish, metal wires that "flap" to deter cetaceans, acoustic detection of cetaceans echolocating in the area, masking/disruption of vessel noises, modification of vessels to make less noise, moving the fishery, changing the depth of the set, or changing the gear type (to pots instead of longlines) (Hamer et al. 2010). Realized or perceived problems were still noted for each method.

Geoff McPherson, from the School of Engineering and Physical Sciences at James Cook University of North Queensland, Australia, gave a presentation at the 2nd TRT meeting on his research to mitigate odontocete depredation in tuna longlines in the Coral Sea. Australian longline fleets in the Coral Sea experience high rates of depredation by false killer whales and pilot whales. In cooperation with the fishing fleet, a number of mitigation measures have been designed, tested, modified, and conclusions drawn about their effectiveness for reduction depredation and their feasibility for use by commercial fleets. Their work has focused on both avoidance of depredation using long range acoustic detection of false killer whale whistles or echolocation clicks, and minimization of depredation using active acoustics (pingers) and passive acoustics (sonar reflective systems on the fishing gear, such as streamers with reflective spheres, cones, and cylinders) (McPherson et al. 2003).

False Killer Whale Take Reduction Team member Clint Funderburg developed and tested several iterations of a sonar reflective system to deter false killer whales from taking bait and/or catch from his hooks. Four deep-set trips were completed between March and June 2010 with NMFS observers on board. Results of this small-scale study are still pending; however, preliminary results indicate that the gear modification had limited to no effect on reducing marine mammal (likely false killer whale) depredation of bait and/or catch.

This research underscores the key theme that marine mammal depredation is a serious and growing issue in longline fisheries, and it is clear that solutions to this problem are difficult and will require further experimentation.

7 EXPECTED EFFECTS OF VARIOUS BYCATCH REDUCTION STRATEGIES: LONGLINE OBSERVER DATA ANALYSES AND SIMULATIONS

7.1 Goals and Analysis Approaches

As described in Section 3.1 above, there has been a mandatory observer program in the Hawaii-based longline fisheries since 1994. Since 2004 coverage rates have been 100% in the shallow-set fishery and at least 20% in the deep-set fishery. The resulting observer data base provides a detailed record of fishing practices, environmental conditions, catch of target species, depredation of catch by marine mammals and other species, and incidental catch of non-target and protected species. The summaries and analyses described below used a subset of the observer data to identify variables that may be predictors of depredation by cetaceans or bycatch of false killer whales. Simulations that used the observer data were developed to evaluate potential mitigation strategies, under the assumption that past patterns in the observer data are representative of what might be expected in the future under similar fishing scenarios. The key objectives of the analyses and simulations were:

A. Examine cetacean depredation rates relative to gear and habitat variables to see if interactions can be avoided or reduced
B. Examine cetacean bycatch rates relative to gear and habitat variables *when cetaceans were documented to be in contact with catch or gear* to see if cetacean takes can be avoided or reduced.
C. Examine catch rates of target species relative to potential mitigation factors
D. Evaluate potential rates of false killer whale mortality and serious injury for subsets of the observer data that meet specified criteria as part of potential mitigation strategies.

These analyses are intended to identify potential mitigation measures, but do not include any evaluation of the fishing data as it relates to fleet dynamics and economics (size of bigeye tuna, seasonal pricing etc). The details of the data sets used and analyses conducted are described in more detail below.

7.2 Observer Data Analyses

7.2.1 Data Overview

The initial observer program data set, extracted on 2 February 2010 using the Pacific Islands Science Center 'Data Trawler', includes observer data from the Hawaii-based longline fleets for the period August 2003 through June 2009. Subsequent to the first TRT meeting (17-19 Feb 2010) additional observer data through the December 2009 became available, and an updated data extraction was performed on 5 March 2010. The August 2003 cutoff date was used because observer protocols related to marine mammal takes changed significantly at this point. The new observer protocols required systematically recording all observed damage to catch and the type of animal that caused the damage (e.g., marine mammal, shark, squid, other). Further excluded from the dataset were all vessels that participated in a series of gear experiments during 2003 and 2006 were excluded from the database during and following their participation, because vessels were able to retain the experimental gear and were no longer representative of the broader fleet.

Trips were defined to have taken place during the calendar year in which the vessel returned to port. The complete 2003-2009 database used in this analysis (Table 7.1) included a total of 26,952 sets, including 20,724 sets with 28 false killer whale takes in the deep-set fishery, and 6,228 sets with one false killer whale take in the shallow-set fishery. Depredation was recorded when there was at least one catch item observed with damage caused by a marine mammal. The Team discussed at length that if a marine mammal take occurred depredation was likely to have happened, either on baits or catch, during the set even if no signs of depredation were recorded.

Table 7.1. Summary of observer data set used for analyses. Depredation includes sets for which observers recorded at least one catch item damaged by marine mammals. Sets without depredation are those where none was recorded, acknowledging depredation may not always be observable.

	DEEP-SET				SHALLOW-SET			
	# Sets	%	Sets with Takes		# Sets	%	Sets with Takes	
False killer whales								
With depredation	1179	6%	19	1.61%	183	3%	0	0.00%
Without depredation	19545	94%	9	0.05%	6045	97%	1	0.02%
TOTAL	**20724**		**28**	**0.14%**	**6228**		**1**	**0.02%**
False killer whales and 'blackfish'								
With depredation	1179	6%	22	1.87%	183	3%	0	0.00%
Without depredation	19545	94%	11	0.06%	6045	97%	2	0.03%
TOTAL	**20724**		**33**	**0.16%**	**6228**		**2**	**0.03%**

Objectives A, C, and D were addressed using the complete data set; objective B was addressed using a subset of data that included only sets where there was evidence that a cetacean interacted with catch or gear (sets with depredation or a marine mammal take). This restriction was designed to increase the power of the analysis to detect potential patterns in cetacean bycatch rates by eliminating sets where there was no evidence that cetaceans were present during fishing operations.

7.2.2 Analyses and Data Summaries

Initial data summaries were performed on individual variables representing geographic area, temporal trends, environmental correlates, and gear configuration variables. These measures are not, however, independent of one another, and a more sophisticated approach using generalized additive models was also applied to examine multiple variables simultaneously. Key findings for the initial summaries and generalized models are provided below.

7.2.2.1 Mainline length

In the Atlantic pelagic longline fishery, the practice of splitting longline sets into two or more shorter lengths of mainline was identified as a gear configuration that was associated with fewer pilot whale takes (Garrison et al. 2007). For the Hawaii-based fishery, the Team also examined mainline length, but there were very few short sets reported in the 2003-2009 data set (n=79) and no effects on depredation were evident (Figure 7.1) Mainline length was not a significant predictor when tested in a generalized additive model along with other variables (p=0.16).

7.2.2.2 Temporal and Spatial Patterns

To investigate potential temporal and spatial patterns in catch, depredation, and bycatch rates, information from all observed sets was summarized by 2 degree latitude/longitude block. The

distribution of both the deep-set and shallow-set fisheries varies seasonally (Figure 7.2). The capture locations of false killer whale takes are also included in Figure 7.2; however, it is important to note that set information and catch rates are summarized based on the haul begin location of the set, which can differ from the capture location.

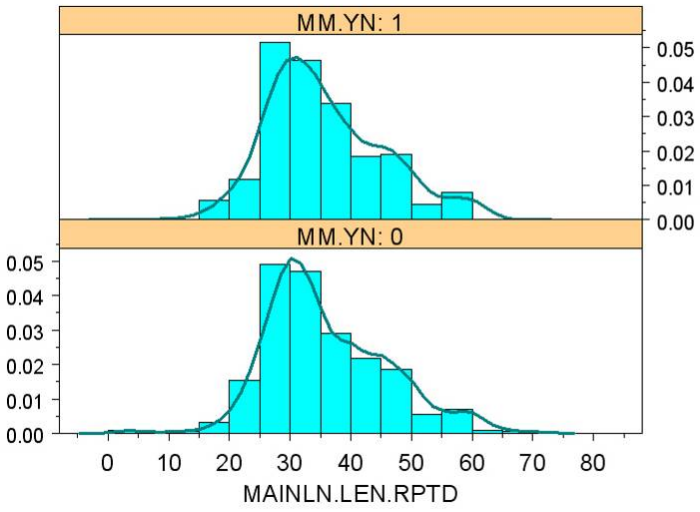

Figure 7.1. Distribution of mainline lengths for observed sets, Aug 2003- Dec 2009, with (top histogram) and without (bottom histogram) depredation by marine mammals. The y-axis represents the proportion of sets of a given mainline length; 'MAINLN.LEN.RPTD' is the length of the mainline as reported to the observer (in miles).

In the deep-set fishery effort was greatest within about 400 km of the Hawaiian Islands, and this is also where most of the false killer whales and blackfish were observed hooked or entangled (Figure 7.3). Rates of false killer whale takes and depredation rates did not exhibit any clear geographic patterns although the fishery has a seasonal movement pattern that is somewhat predictable (Appendix F). No visual patterns were obvious relating the take of false killer whales and blackfish to bigeye tuna catch rates, marine mammal damage as a percent of catch, marine mammal damage per million hooks set, or number of damaged fish per set.

7.2.2.3 Generalize Additive Model

Generalized additive models (GAMS) are an extension of regression models and allow the identification of non-linear relationships between multiple predictor variables and one response variable. The emphasis of GAMS is on exploring data nonparametrically (Hastie and Tibshirani 1990). In the present analysis, they were applied to the observer data set to examine of the effects of individual variables on depredation and bycatch rates while controlling for other potential confounding factors. For example, initial summaries of temporal patterns suggested lower depredation rates during the second and third quarters but it was not known whether this could be attributable to seasonal geographic shifts in fishing effort. Generalized additive models allowed the examination of this pattern in the context of the areas fished as well as other potential confounding factors. In the analyses below, binomial models predicting the presence or absence of depredation and bycatch of false killer whales or blackfish were developed to examine potential predictors of each.

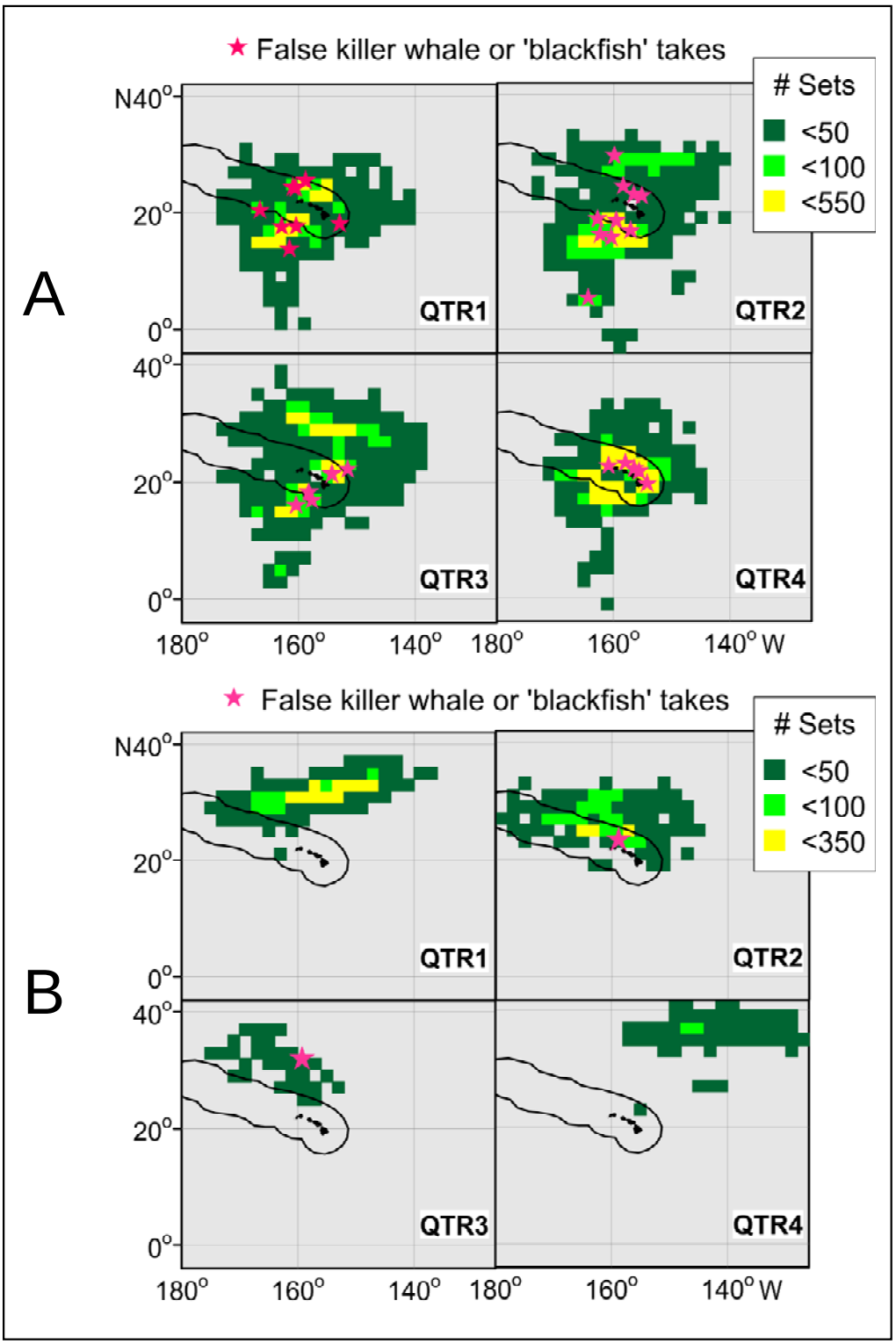

Figure 7.2. Quarterly summary of observed effort (Aug 2003 - Dec 2009) by 2x2 degree square (based on haul begin location for each set) and capture locations of all false killer whale or 'blackfish' takes (stars) for the deep-set (A) and shallow set fisheries (B).

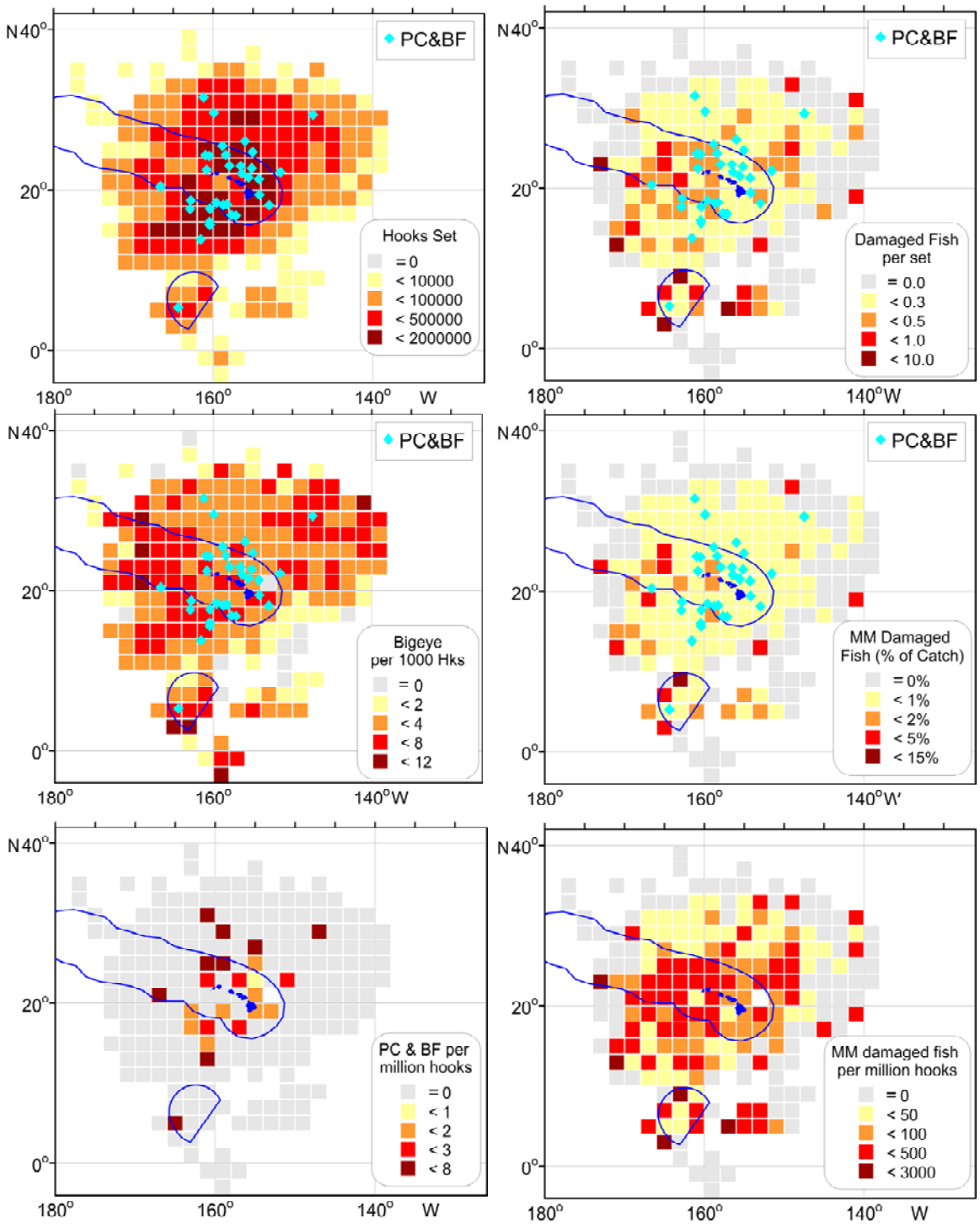

Figure 7.3. Spatial summary of observer data , Aug 2003- Dec 2009: observed effort (number of hooks set), bigeye tuna catch rates per 1000 hooks, false killer whale and blackfish (PC&BF) take rates per million hooks set, and three measures of depredation rates (fish damaged by marine mammals) for the 2003-2009 observer data included in the present analyses. Set information is summarized based on the haul begin location and is only an approximate representation of the true distribution of hooks, because sets are tens of miles long and can span multiple 2x2 degree squares.

Variables tested for inclusion were: latitude, longitude, month, year, haul begin hour of day, number of floats, number of hooks set, soak time, vessel, vessel length, total catch, sea surface temperature (SST) and SST gradient, sea surface height, sea surface chlorophyll-a concentration, meridional and zonal current strength, water depth, east-west bathymetric slope, north-south bathymetric slope, and distance to the 200 fm (366 m) isobath. For models predicting bycatch of false killer whales or 'blackfish' when cetaceans were know to have interacted with catch or gear, the majority hook type used during the set and haul end hour of day were also considered. Hook type was examined in grouped categories, because there were changes in observer protocols and data collection forms during the period 2003-2009 that precluded using finer subdivisions (e.g. offset hook types). The four hook type categories (Figure 7.4) were defined as follows: tuna hooks (3.4mm, 3.6mm and 3.8mm), small circle hooks (13/0, 14/0, 15/0 and 16/0), large circle hooks (18/0), and other hooks (8/0 and 9/0 J-hooks, any other hook types).

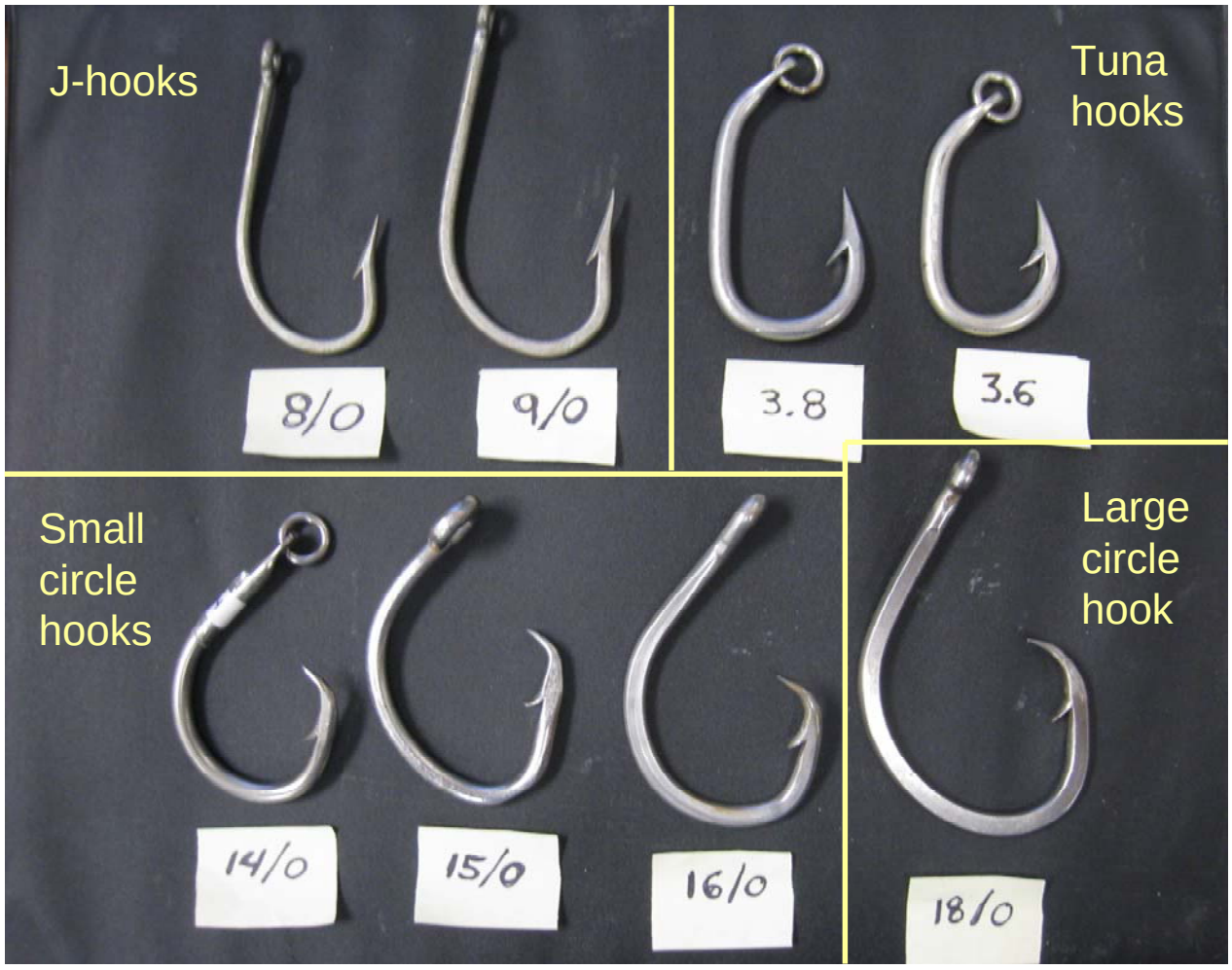

Figure 7.4. Selection of hook types used in the Hawaii-based longline fishery, by category used for analyses.

The 'best fit' generalized additive model (selected based on AIC, Akaike's Information Criterion) predicting **depredation rates** in the deep-set longline fishery, included 10 variables: latitude, longitude, year, month, number of hooks set, soak time, total catch, water depth ('bathy'), east-west bathymetric slope ('bathy.dv'), and vessel (Figure 7.5, Table 7.2), but overall explained deviance was low (about 6%).

Table 7.2. Output results for the best-fit GAM predicting depredation rate.

	Df	Npar Df	Npar Chisq	P(Chi)
(Intercept)	1			
s(HAUL.BEGIN.LAT)	1	2.8	21.23802	7.28E-05
s(HAUL.BEGIN.LON)	1	3	9.70191	0.021195
s(SET.BEG.YR)	1	2.9	11.06458	0.009913
s(SET.BEG.MON)	1	2.8	22.5111	4.08E-05
s(NUM.HKS.SET)	1	3	7.93941	0.0476
s(SOAK.TIME)	1	3	13.23647	0.00419
VSL	143			
s(CATCH.ALL)	1	2.8	63.78012	0
s(bathy)	1	2.8	7.20852	0.056716
s(bathy.dv)	1	2.8	12.34711	0.005226
Null Deviance: 9043.15 on 20720 degrees of freedom				
Residual Deviance: 8443.19 on 20542.07 degrees of freedom				

Vessel effects were of interest to the Team and were further explored (Figure 7.5) Potential causes of the apparent individual vessel effects were examined in more detail, including hook types used, areas fished, vessel size, and set and gear characteristics; however, no commonalities were identified that might explain the apparent higher depredation rates for these vessels. It is possible that vessel effects could be caused by other, unreported factors, such as the acoustic properties of the vessel or the type and quantity of lights used during fishing operations. Some lights are very bright and could provide a visual target from tens of miles away. Also individual fishing practices related to haul back, offal discard etc. could be at play.

Table 7.3. Output results for the best-fit GAM predicting takes of false killer whales and blackfish.

	Df	Npar Df	Npar Chisq	P(Chi)
(Intercept)	1			
s(SET.BEG.YR)	1	3	9.59619	0.021527
s(NUM.FLTS)	1	2.9	6.66969	0.076784
s(CATCH.ALL)	1	2.8	2.3319	0.467655
s(sst)	1	2.8	6.19641	0.091374
s(ssh)	1	2.9	10.07212	0.017114
Null Deviance: 295.26 on 1202 degrees of freedom				
Residual Deviance: 242.43 on 1182.575 degrees of freedom				

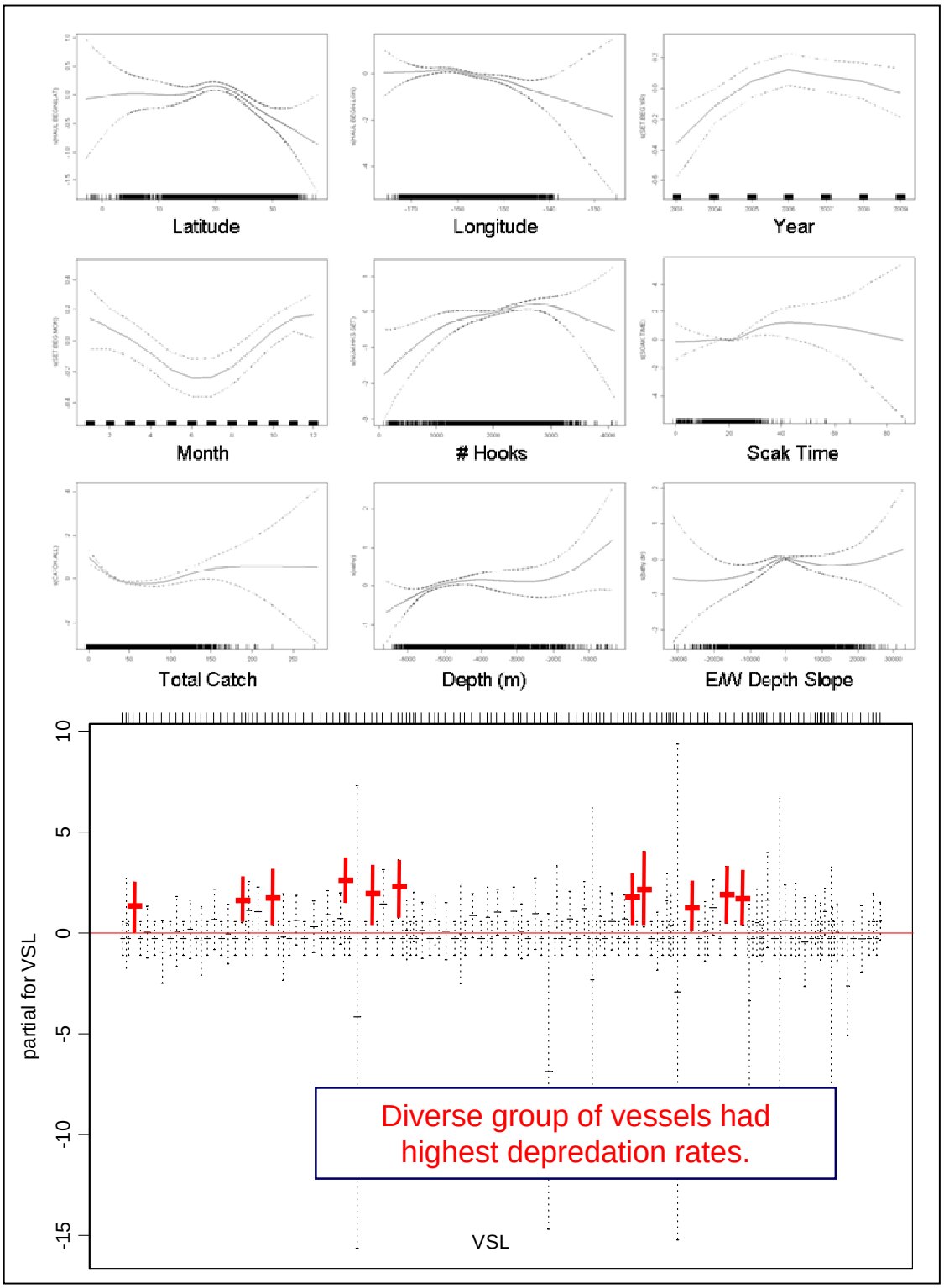

Figure 7.5. Partial residual plots for best fit generalized additive model predicting depredation rates. The y-axis represents standardized effect of each variable on depredation rates when examined simultaneously with all other variables in the model.

The best fit model predicting **bycatch rates** of false killer whales or 'blackfish' when cetaceans were known to be interacting with catch or gear included year, number of floats, total catch, sea surface temperature, and sea surface height, with 18% of variation explained (Figure 7.6, Table 7.3). In contrast, the number of hooks set per 2x2 degree block (Table 7.4, see also Figure 7.2) was found to explain 43% of the pattern in bycatch rates in a generalized linear model, suggesting that takes are closely linked to overall fishing effort.

Table 7.4. Output results for a generalized linear model (Poisson family) predicting takes of false killer whales and blackfish based on the number of hooks set per 2x2 degree geographic block (See Figure 7.2).

	Df	Deviance	Resid. Df	Resid. Dev	F Value	Pr(F)
NULL			227	157.3862		
Hooks.set	1	67.43896	226	89.9472	98.27136	0

Null Deviance: 157.4 on 227 degrees of freedom

Residual Deviance: 90.0 on 226 degrees of freedom

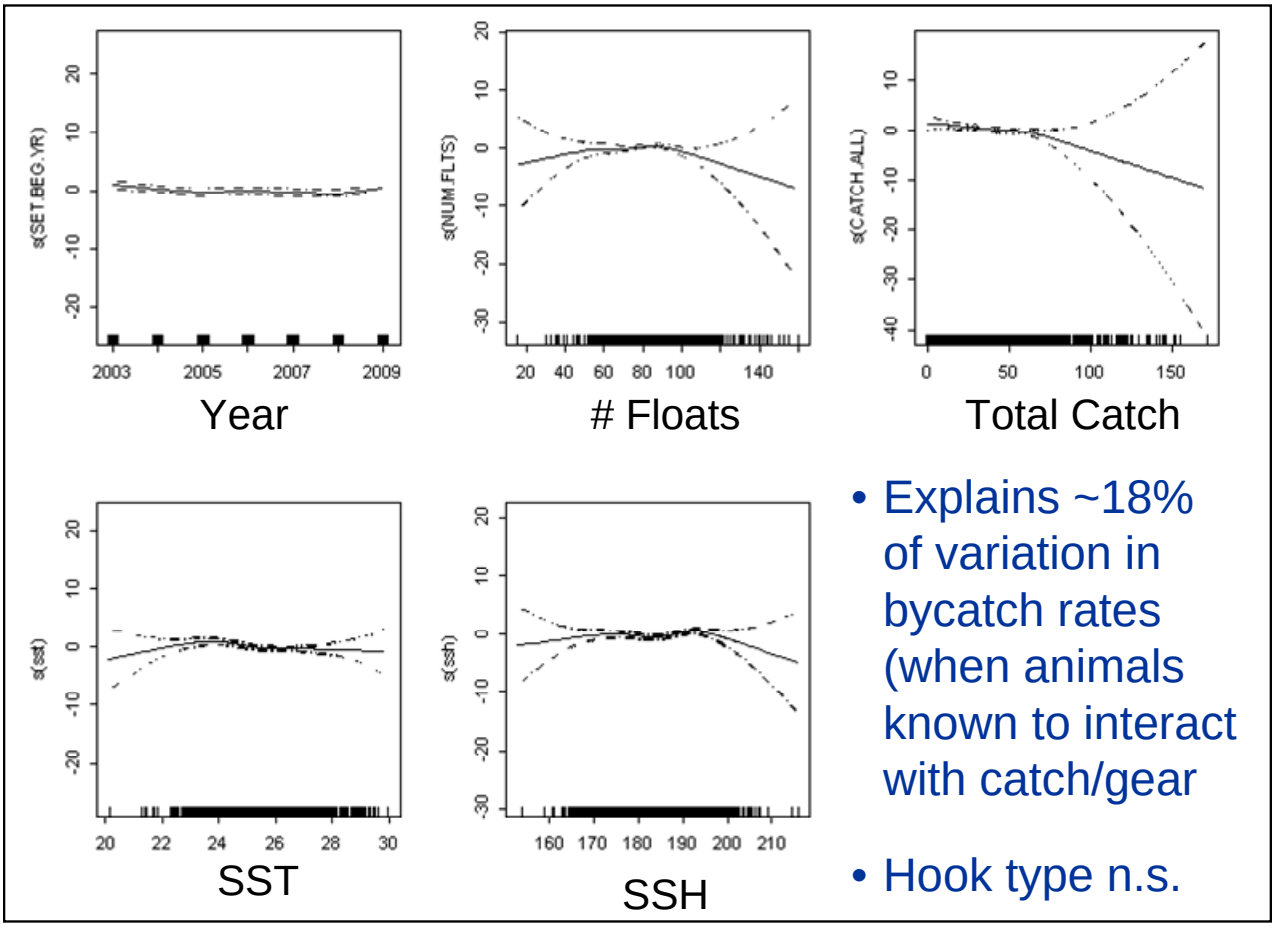

Figure 7.6. Partial residual plots for best fit generalized additive model predicting bycatch rates of false killer whales or blackfish when cetaceans were known to have interacted with catch or gear. Y-axis represents standardized effect of each variable on bycatch rates when examined simultaneously with all other variables.

Overall, the generalized additive models did identify variables that had a significant effect on rates of depredation and bycatch, but even the most comprehensive models explained very little variation in the data set. Therefore, these models were not considered useful for identifying and evaluating mitigation measures that would reliably result in a substantial reduction in false killer whale takes. An alternate, simulation-based approach was selected instead to conduct further evaluations of the likely success of potential mitigation measures (see section 7.3 below).

7.2.2.4 Distance traveled between sets and repeated depredation

The extent to which false killer whales may follow fishing vessels between sets, resulting in repeat depredation events on subsequent sets, has not been systematically documented. The observer data base allowed an empirical evaluation of the frequency of depredation as a function of a) whether or not depredation took place on the previous set during a given trip, and b) how far the vessel moved between these sets. The proportion of sets with depredation was significantly higher when the previous set had depredation (14%) than when it did not (5%) (Table 7.5).

Table 7.5. Observed numbers of cases for which the previous and current sets had or did not have depredation. There was a significant difference when the previous set had depredation vs. when it did not (chi-square test).

	Depredation during set	**Current: No**	**Current: Yes**	**Total**	**% Depr**
Observed	**Previous: No**	17,069	941	18,010	5%
	Previous: Yes	934	148	1,082	14%
	Total	18,003	1,089	19,092	
		Chi-square=	134.18		
		p=	0.0000		

The analysis revealed that, once depredation occurred, there was a significantly greater chance of experiencing depredation on the subsequent set. The frequency of repeat depredation was influenced by the distance traveled between sets, but the pattern was non-linear, and even at great distances (>500km), the second set had a higher frequency of depredation than when no depredation took place during the initial set. This gives credence to the suggestion that there are vessel effects. A generalized additive model suggested that the optimum distance to travel to reduce the chance of repeat depredation was about 100km: sets more than 100km away from an initial set with depredation had about a 12% chance of experiencing depredation again, while sets that remained within 100km had about a 14% chance. This in turn translates into a 16% lower probability of repeat depredation if the vessel moved at least 100km. Beyond 100km, the depredation risk remained roughly the same (about 12%). Sample sizes for false killer whale takes were insufficient to examine the potential effects of distance between sets on bycatch rates, but if hookings and/or entanglements of false killer whales are linked to depredation activities, then moving at least 100km following a set with depredation could slightly reduce bycatch rates, on the order of about 0.6% fleet wide.

7.2.2.5 Within-set patterns when false killer whales were taken

The 41 sets during which 42 false killer whales were observed taken were examined in detail with respect to catch, gear, length (mainline and number of hooks), catch species, species with marine mammal damage (depredation), and locations of catch, depredation and false killer whale

hooking/entanglement along the mainline and – for false killer whales - within the basket. False killer whales depredated a wide variety of caught fish species (esp. billfishes, tunas, wahoo, moonfish, and mahimahi), along large sections of the line (10-30 floats or more). There appeared to be a greater frequency of false killer whales caught in the center of a basket (farthest from the float, Figure 7.7), but no specific reason for this pattern could be identified within the available data.

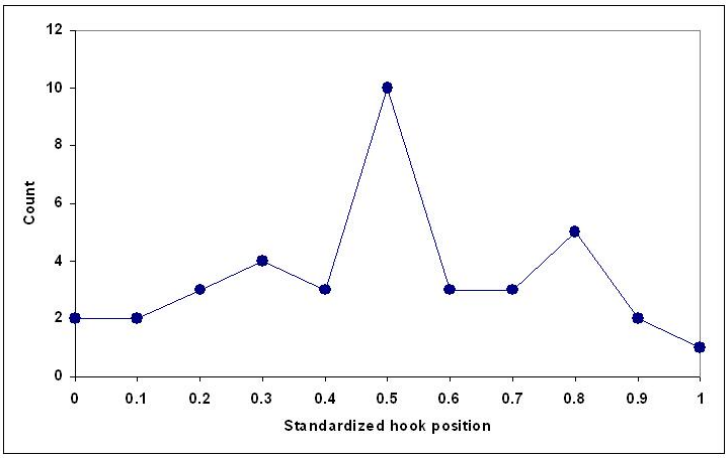

Figure 7.7. Number of observed false killer takes relative to standardized hook position within a basket, showing a peak at the center, farthest from the floats.

7.2.2.6 Injury severity reduction

The Team examined two potential factors that might lead to a reduction in the number of seriously injured vs. non-seriously injured false killer whales and blackfish. The first relates to the probability that an animal would be seriously injured or killed vs. not seriously injured using small (15/0 or 16/0) circle hooks in contrast to tuna hooks. The second relates to the potential to free animals from all gear in a manner that would reduce the severity of the injury from serious to non serious. Each of these possibilities is considered below using observer data from the reported takes of false killer whales and blackfish.

The observer data provide some information on the proportion of animals caught on tuna hooks vs. 15/0 and 16/0 circle hooks that were determined to be not seriously injured vs. killed or seriously injured (Table 7.6). Only interactions for which the hook type could be determined are included. The overall rate of non-serious injury across all hook types is about 9% for false killer whales, or 11% for false killer whales, blackfish, and short-finned pilot whales combined. The proportion of non-serious injuries for the few animals caught on circle hooks is greater (25-50%, depending on species groupings), but sample sizes are too small for meaningful statistical tests. The probabilities of obtaining at least 1 out of 3, 1 out of 4, or 3 out of 6 non-serious injuries by chance alone if the true probability of a non-serious injury were 11% are 30%, 37% and 2%, respectively.

These data are difficult to interpret. The inclusion of pilot whales increases the sample size, but there may be important differences in entanglement characteristics and behavior of pilot whales that make them a poor proxy for false killer whales. However, if the observed pattern is not simply a small sample size artifact, then false killer whales hooked or entangled on small circle hooks might have a lower rate of mortality and serious injury than those hooked on tuna hooks.

In the best case scenario (including the pilot whales), these data suggest that the mortality and serious injury rate could be reduced from 89% to 50% (a 44% reduction); in the worst case scenario, there is no difference, and no reduction in mortalities and serious injuries would be achieved. Efforts to record hook types for all cetaceans caught should be continued by the observer program to allow this pattern to be re-evaluated in the future.

Table 7.6. Number and proportion of non-serious injuries (NS) for hookings/entanglements of false killer whales, blackfish, and short-finned pilot whales when the involved hook types was known.

	15-16/0 Circle Hooks			Tuna Hooks			Total (Both Hook Types)		
Species	# Takes	# NS	% NS	# Takes	# NS	% NS	# Takes	# NS	% NS
False killer whale	3	1	33%	29	2	7%	32	3	9%
False killer whale or blackfish	4	1	25%	36	2	6%	40	3	8%
False killer whale, blackfish, or short-finned pilot whale	6	3	50%	39	2	5%	45	5	11%

It is not known how many of the false killer whales and blackfish that were hooked or entangled might have been releasable with non-serious injuries, but the observer data from the interactions that include sufficient detail on the nature of the hooking or entanglement can be used to assess a range of potential values (Fig 7.8).

In one scenario, if all animals that are not deep-hooked (i.e., have not ingested the hook) could potentially be freed from all gear and released with non-serious injuries, then the success rate would depend on the proportion of takes during which safety or the other constraints would have allowed an opportunity to handle the animal and attempt release. Based on the above interactions with known circumstances, this would mean that 29 out of 31 false killer whales or blackfish (94%) were caught in a manner that would be amenable to a release attempt, and 18 out of 29 interactions (62%) did not document safety concerns or high activity of the animal that would have prevented such an attempt. Thus, in this scenario, up to 0.94*0.62 = 58% of the animals could potentially have been released with non-serious injuries.

In an alternate scenario, it is possible that the number of animals released with serious injuries could be further reduced if safety issues are less of a concern. Current handling techniques developed for sea turtles involve bringing the turtle close to the vessel. Trying to do this with an active animal the size of a false killer whale can be dangerous, and animals have, therefore, been cut loose without attempting to free them from gear. However, techniques that might allow an animal to pull out or straighten a weak hook would not necessarily require bringing the animal close to the vessel, and the safety concerns may be reduced. Therefore, the proportion of animals cut loose because of safety concerns might be reduced, which would allow a greater number of animals to be freed from gear.

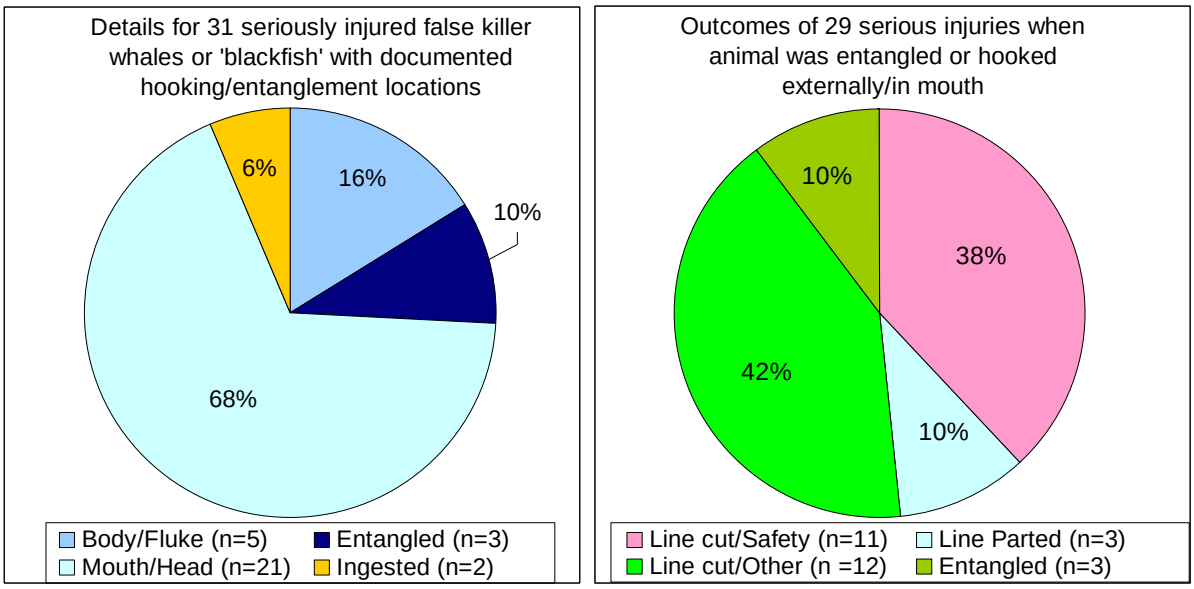

Figure 7.8. Information on seriously injured false killer whales reported by the observer program 1994-2009. Only interactions with sufficient detail to characterize where and how animals were hooked or entangled are show. Left panel shows nature of entanglement/hooking. Right panel shows outcome of interaction for the 29 animals that were entangled or hooked externally/in mouth and this might have been amenable to release attempts. Line cut/Safety represents interactions where the observer noted that the line was cut because of safety concerns or because the animal was too active for handling. Line cut/Other refers to interactions where the observer noted that the line was cut but without any indication that this was for safety reasons.

In contrast, if we acknowledge that in some cases it may not be possible to release with non-serious injuries, e.g. because the hook location is in sensitive tissues and release attempts would cause additional serious injuries, or because the release attempt is unsuccessful, the success rate will be lower and in the worst case scenario, lead to no decrease in the proportion of animals released with serious injuries.

In summary, the limited data available suggest 0% to 58% of false killer whales or blackfish caught in manner that would have led to serious injury could have been freed from gear and released with non-serious injuries, with the upper end possibly higher if safety concerns are reduced. It is likely that the true value falls somewhere within this range rather than either end of the range.

7.3 Predictive Simulations

To evaluate potential effects of various gear configuration, seasonal or area restrictions, effort levels, or other factors, a bootstrap simulation framework was developed that sampled sets from the above-described observer data, with replacement, to examine take rates under various scenarios. The results indicate only what the patterns in the existing observer data are under these scenarios, and can inform future expectations to the extent that fishing practices otherwise remain the same. If either the fishing fleet or the false killer whales were to alter their behavior in response to certain scenarios, this would affect the outcome in unknown ways that are not presently measurable. Nonetheless, the simulations using this extensive observer data base can be informative for identifying the potential magnitude of changes in bycatch rates, and for examining cumulative effects of multiple factors implemented simultaneously.

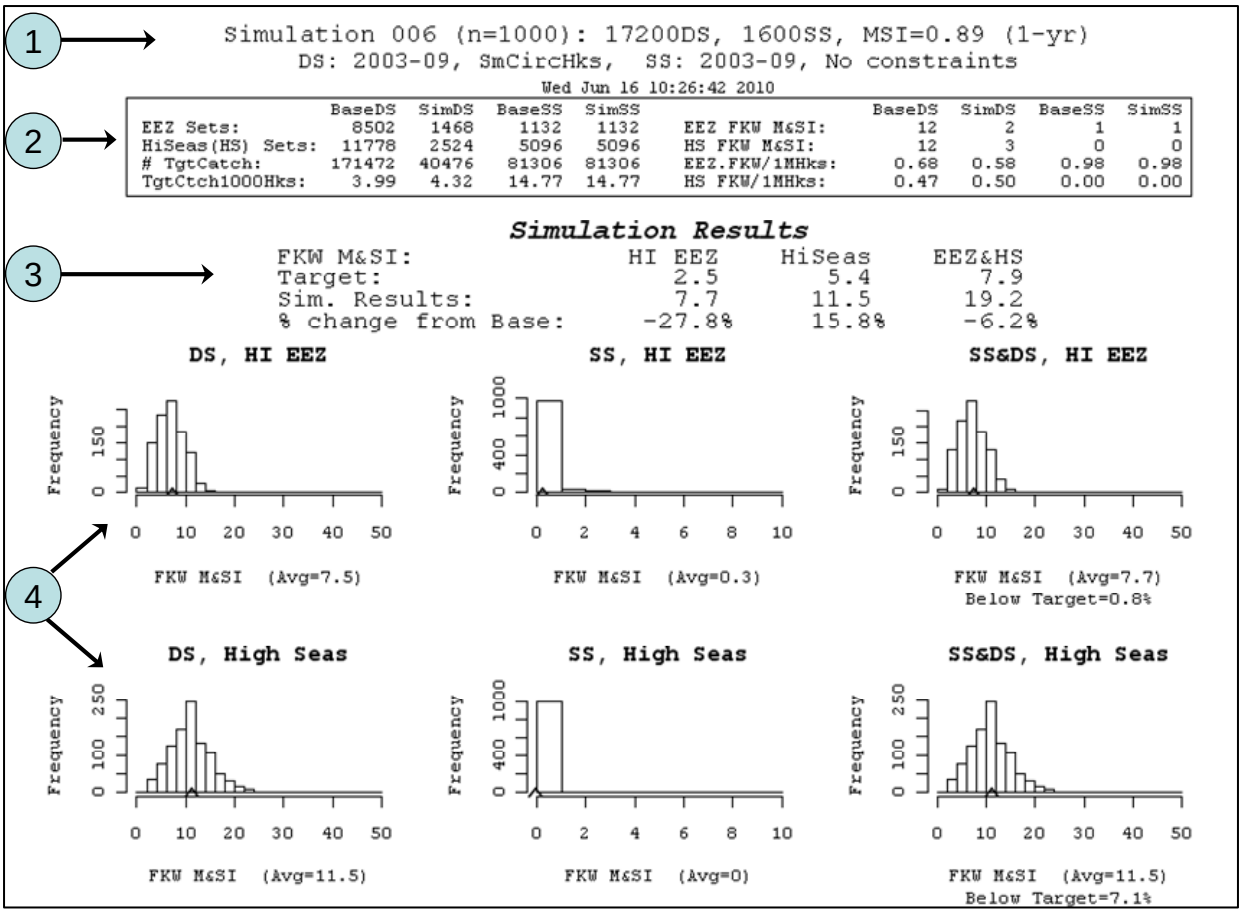

Figure 7.9. Sample simulation output for 17,200 deep sets per year, 1600 shallow sets per year, an unchanged mortality and serious injury rate of 89% (McCracken and Forney 2010), and the mandatory use of small circle hooks. In this case, the average expectation is that mortalities and serious injuries of false killer whales would decrease by about 6.2%, although there was large variation in the total numbers of takes across simulation runs, as illustrated by the broad histograms. Details for numbered sections are as follows:

(1) Header with input specifications: Simulation number, simulated samples (e.g. n=1000), annual sets to be drawn for DS and SS fisheries, assumed mortality and serious injury (MSI) rate of caught false killer whales, and number of simulated years;

(2) Box summarizing key parameters for the full observer data (BaseDS and BaseSS) and the simulation subset of the data (SimDS and SimSS), including the number of sets within the U.S. EEZ of the Hawaiian Islands ('HI EEZ') and on the high seas, total catch and catch per 1000 hooks of target species (bigeye tuna for DS and swordfish for SS), the number of takes and take rate (per million hooks) of false killer whales within the HI EEZ and on the high seas. This summary is intended to allow the reader to evaluate sample sizes and overall mean rates for each data set;

(3) Average simulation results relative to take reduction target levels for the HI EEZ, the high seas, and both areas combined. Also shown is the percent change in false killer whale mortality and serious injury for the simulated data relative to the base data;

(4) Histograms of the distribution of false killer whale M&SI across all simulation runs. The top row shows results for the HI EEZ, (deep-set, shallow-set, and combined longline fisheries); the bottom row shows the same information for the high seas. The percentage of simulation runs that met the take reduction target is shown below the combined plot

The natural unit of fishing is the fishing trip, generally lasting two or more weeks with multiple sets. The most realistic simulations would, therefore, use the trip as the sampling unit; however this would not allow the use of set-specific variables (e.g. latitude, longitude, number of hooks sets, etc) that were of interest in the present analyses. For this reason, the unit of sampling for the simulations was selected as the set. This is not expected to affect mean parameter estimates (and indeed, test simulations confirmed that the means were identical), but it is expected to affect variances because sets within a trip are not independent.

The simulations were structured to draw a pre-set level of fishing effort (number of sets) for the deep-set (DS) and shallow-set (SS) fishery, respectively. Sets were drawn from the observer data subset that met additional criteria of interest, e.g. that used small circle hooks during the set or that fished during a particular time of year or within a specified geographic area. Simulation output included summaries of the full data set and the simulation data subset, histograms of the simulated results, and a table summarizing the average take rates relative to the target take levels for the TRT (see Figure 7.9 for sample output).

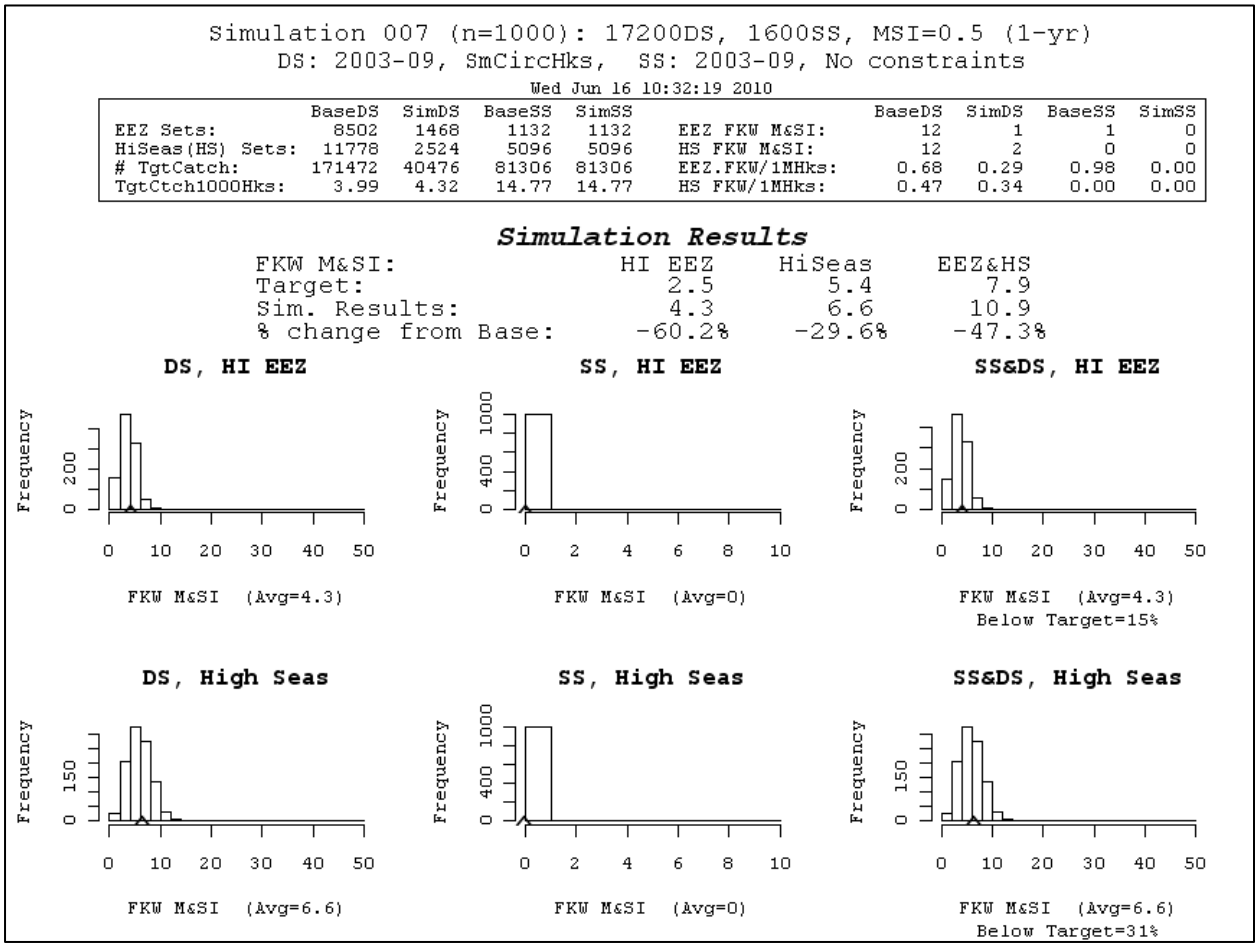

Figure 7.10. Sample simulation output for 17,200 deep sets per year, 1600 shallow sets per year, a reduced mortality and serious injury rate of 50%, and the mandatory use of small circle hooks. In this case, the simulation forecasts that mortalities and serious injuries of false killer whales would decrease by about 47.3%.

Based on the simulations, the Team identified the use of small circle hooks (14/0, 15/0 or 16/0) as a measure that could result in a 6% decrease in false killer whales killed or seriously injured. (Figure 7.8). Combined with a simulated reduction in the M&SI rate from 0.89 to 0.50 (because hookings/entanglements might be less severe with circle hooks, and through the use of best practices to free animals from gear and release them with non-serious injuries), the simulations indicate an overall potential reduction in M&SI of up to 47% (Figure 7.10).

7.4 Summary

7.4.1 Variables considered in crafting potential mitigation measures

Based on the observer data, the type of hook used in the deep-set fishery appeared related to the severity of the hooking of short-finned pilot whales and false killer whales. Small circle hooks appeared to have a more positive outcome than traditional tuna hooks, which had a higher rate of serious injury and mortality. Adopting the use of circle hooks appears to hold promise for reducing the number of serious injuries.

Fisheries representatives to the Team explained that it was common practice to simply cut the line when cetaceans were entangled, much in the manner suggested for turtle entanglements. Training of captains and crew in successful methods of releasing cetaceans (that have not ingested a hook) appeared to hold promise of increasing the number of animals for which the outcome of an entanglement or hooking was a non-serious injury.

These discussions and the information provided above also led to the suggestion that weaker circle hooks with a smaller wire diameter than the commonly used 4.5 mm circle hooks might facilitate cetaceans freeing themselves or being released without gear through the efforts of captain and crew, while still retaining high value larger tuna.

In crafting portions of the take reduction plan, the Team relied to a great extent on patterns of false killer whale and “blackfish” sightings and/or takes as documented by observers. Data showing the number of hooks per two by two degree square, bigeye tuna catch per 1000 hooks, bycatch of false killer whales or blackfish per million hooks (Figure 7.2) were also informative in determining the areas within the EEZ in which protective measures appeared likely to have the greatest benefit.

Mainline length, environmental variables (e.g., sea surface temperature, sea surface height, presence of eddies, etc.) were not predictive relative to bycatch and depredation.

7.4.2 Initial Conclusions

The initial simulation results (Figure 7.9) indicate that a requirement that the entire fleet use small circle hooks could result in about a 6% reduction in false killer whale takes, perhaps greater if the mortality and serious injury rate is reduced with circle hooks compared to tuna hooks.

The limited data available suggest 0% to 58% of false killer whales or blackfish caught in a manner that would have led to serious injury could have been freed from gear and released with

non-serious injuries. The further use of weak circle hooks and training of captains in the release of hooked or entangled false killer whales will likely result in an additional reduction in serious injuries, although this effect has not been tested and cannot presently be quantified. In a second simulation that assumed a serious injury rate of 50% (rather than the current 89%) in addition to the small circle hook requirement (Figure 7.10), a 47% reduction in overall mortalities and serious injuries was achieved. Therefore, gear changes and best practices were seen as a large step toward the goal of reducing take to below PBR and approaching a zero mortality and serious injury rate in 5 years.

The Team also identified a suite of voluntary best practices designed to reduce the attraction of false killer whales to vessels and gear and thus reduce likelihood of depredation, entanglement, or hooking. These included advising captains to move more than 100 km following depredation on a set to reduce the probability of repeat depredation in subsequent sets (by about 16%). Given that depredation occurs on only about 5% of all sets, this would reduce the overall incidence of depredation in the fleet by about 0.6%

The Team also deliberated extensively on the location of take data, economics of the fishery, and the potential interaction between the insular stock and the fishery. Based on these data a closure area was proposed that would likely result in reduction of false killer whale mortalities and serious injuries to below PBR. Complete Team recommendations are presented in Chapter 8.

8 RECOMMENDATIONS FOR MANAGEMENT STRATEGIES TO REDUCE MORTALITIES AND SERIOUS INJURIES OF FALSE KILLER WHALES IN THE HAWAII LONGLINE FISHERY

8.1 Background

The False Killer Whale Take Reduction Team discussed and considered a wide range of possible management strategies over the course of its six-month long deliberations. The Team's development and consideration of possible options took place both at full Team meetings and in small interim work group sessions convened via teleconference.

These deliberations were supported and informed by the detailed data analysis and predictive model described in Chapter 7, as well as by ongoing input from Observer Program staff, Sustainable Fisheries Division, Office of Law Enforcement, Office of General Counsel, the U.S. Coast Guard and others. Additionally, Team members were provided detailed presentations on relevant mitigation and research activities being conducted elsewhere in the U.S. and abroad.

8.1.1 Key Principles Guiding the Team's Deliberations

Several key principles and approaches shaped the Team's discussions.

- ***Target different aspects of the problem.*** The Team early on focused on a conceptual approach for thinking through possible actions that centered on four different scales: (1) strategies to reduce false killer whales' chances of finding vessels; (2) strategies to minimize active depredation; (3) strategies to minimize hookings/entanglements; and (4) strategies to minimize serious injuries and mortalities. This approach was essential in shaping the Team's work and deliberations.

- ***Mine and analyze observer data to the extent possible.*** The Team put a premium on using the detailed observer data to identify possible trends and solutions. Both the Team and NMFS staff dedicated significant time and resources to analyzing the observer data in an attempt to uncover potential links to depredation and take events – from fishing methods and vessel characteristics, to seasonality, location and gear type.

- ***Encourage brainstorming of multiple options.*** From the outset of its deliberations, the Team very deliberately encouraged brainstorming of a wide range of options. This approach was underpinned by the awareness that early-on recommendations in Take Reduction Teams elsewhere that were dismissed as being unworkable (i.e., pingers) proved to be a key to reducing M&SI. Below is a chart summarizing the range of options raised during the course of the Team's deliberations.

Table 8.1. Candidate actions raised during the course of the Team's deliberations.

Circle hooks (size 14/0, 15/0, 16/0)	Line length or soak time limits
Captain/crew training on marine mammal handling/release from gear	Time/area closures or other effort reductions (effort caps, fleet buyouts, etc.)
Move vessel after FKW interaction or depredation	Decoy buoys or gear to draw FKW away from vessels
Weak hooks	Barbless hooks
Gear modifications to reduce bait depredation	Line changes – color, coating, diameter, snaps
Acoustic buoys/listening devices to identify FKW presence and/or depredation	Fleet communications (FKW sightings, possible use of VMS)
Bait/discard/offal retention	Spotters (air or vessel-based)
Eliminating hooks in center of basket	Noise deterrents
Set-splitting/gaps between baskets	Center basket illumination
Minimizing vessel light/noise profile	Taste deterrents
FKW sedation (to foster gear removal)	

- ***Solicit wider fishing industry input on current practices and potential measures.*** Team members emphasized the importance of garnering extensive input from the broader longline fishing community – both to inform the Team of mitigation measures already in use and to provide feedback on the viability of ideas developed during Team discussions. A well-attended outreach meeting was convened by the Hawaii Longline Association in mid-April to foster broader input.

- ***Focus on linked packages of actions.*** The Team's earliest deliberations, as well as its consideration of a "what if" spreadsheet developed for the second meeting by K. Forney, underscored the extent to which a range of strategies and approaches – and not just one quick fix – were likely to be needed to meet the near-term goal. To that end, the Team opted to explore multiple paths early on.

- ***Consider other regulatory actions.*** Team members acknowledged the need to consider and take into account other regulatory requirements and considerations when devising strategies to reduce false killer whale M&SI.

8.1.2 Key Findings

As mentioned earlier, the extensive observer data collected for this fishery afforded the Team a unique opportunity (among other Take Reduction Teams) to sift through past data for possible causes and fixes to reduce false killer whale M&SI. While the analysis and related conversations did not find any single "silver bullet" likely to bring M&SI below PBR, the work did offer insights into factors more or less likely to impact take rates. Below is a summary of some the key findings that shaped the Team's eventual recommendations.

- ***No silver bullet.*** The observer data analysis did not demonstrate any "smoking gun" tied to false killer whale depredation or M&SI. Based on K. Forney's analysis of observer data, other than fishing effort, no single variable (soak time, vessel effect, time of year, line length, distance traveled between depredation events, etc.) carried much explanatory weight in understanding the variance in depredation or take rates.

- ***Promising gear modifications.*** While analysis of the observer data did not identify a smoking gun, it did identify some promising trends related to gear changes. Circle hooks appeared to result in M&SI of marine mammals at lower rates than other hook types. And though the sample sizes were small, the numbers were seen as promising by a diverse set of Team members. Weak hooks were also identified as likely to provide reductions in M&SI of false killer whales. A key factor for the fishery is the extent to which gear modifications are likely to negatively impact target catch rates. Studies to-date on circle hooks suggest no negative impact on bigeye tuna catch rates. There are no definitive studies on target catch rate impacts with weak hooks.

- ***Potential for training to impact take rates.*** Team discussions revealed a significant gap in captain/crew awareness regarding marine mammal handling. Most critically, industry members were not aware that proper handling of an entangled or hooked marine mammal can significantly impact whether that interaction is characterized as a serious injury. (Prior to the Team's deliberations, industry members on the Team were under the impression that any hooking of a false killer whale would be counted as a serious injury, regardless of where the animal was hooked or whether the hook was removed.) This finding was instrumental and led to extensive Team deliberations regarding the potential for revised training approaches to reduce the number of false killer whale serious injuries.

- ***Knowledge gaps constrain more informed recommendations.*** Team members were repeatedly frustrated by the many unknowns that made it difficult to craft well-informed mitigation strategies. These uncertainties are discussed in greater detail in Chapter 9, but significant knowledge gaps – from false killer whale biology, behavior and abundance, to a lack of basic data on kaka line and shortline fisheries and an understanding of factors in the longline fleet that may influence depredation and/or bycatch – made it difficult for Team members to identify additional concrete strategies to reduce M&SI.

- ***Proactive Voluntary Steps by Industry***. In an effort to reduce false killer whale M&SI as soon as possible, the fishing industry is taking steps to immediately remove as many Japanese-style tuna hooks from the fishing fleet as possible. The fishing industry, through its trade association (the "Hawaii Longline Association") also intends to develop and implement an internal captain and crew training program in which captains and crew are internally trained and certified. These trainings would be consistent with the trainings contemplated by the Team and as described in Section 8.2.2.

Despite the difficulties and constraints facing the Team, the Team was ultimately able to reach consensus on recommendations of a suite of regulatory and non-regulatory measures that they expect will reduce M&SI of false killer whales consistent with the goals of the TRT.

8.2 Management Recommendations

The suite of management recommendations for which the Team was able to reach consensus are believed by the Team to be consistent with the MMPA objectives of reducing M&SI of false killer whales while taking into account economic and other effects on commercial fisheries. The recommendations consist of a mix of measures effective immediately upon plan implementation (e.g. gear changes, captain training, a longline exclusion zone), as well as measures that become effective only following experiment (e.g. weak hooks), or if M&SI is not reduced following plan implementation as anticipated by the Team (e.g. Southern Exclusion Zone). Some measures are regulatory (e.g. hook requirements), while others are non-regulatory (e.g. best practices recommendations). While the primary focus of the Team's recommendations involve the deep-set longline fishery, the Team also made recommendations regarding other fisheries suspected or known to have interactions with false killer whales (e.g. shortline fishery, foreign longline fisheries).

As described below the Team believes circle hooks will likely reduce both interactions (i.e. prevent some hookings) as well as the likelihood of M&SI of false killer whales (e.g. mouth hookings rather than ingestion) following interaction. Small circle hooks (14/0, 15/0, 16/0) are also generally weaker (i.e. straighten with less force) than the Japanese-style tuna hooks used by a portion of the fleet, and therefore some animals that are hooked in the lip, jaw, or flukes may be able to pull free (i.e. straighten the hook) if tension is placed on the line. Improved captain and crew training such that when an interaction occurs, hooked animals are provided an opportunity to pull free of the hook, has potential to further reduce M&SI.

While "standard" circle hooks (14/0, 15/0, 16/0; 4.5mm wire diameter) will likely help reduce M&SI, the Team believes that weaker than standard circle hooks (e.g. 4.0 or 4.2mm) would provide even greater benefits. Consequently, the Team recommends that such hooks be required if no "substantial impact" (as that term is used in Section 8.2.1.3) on bigeye tuna catch rate occurs.

The area north of the Main Hawaiian Islands that is currently seasonally closed to longline fishing was a particular focus of the Team's attention. Several M&SI of false killer whales have been documented in this zone. Additionally, this area overlaps the inferred range of the Hawaii insular stock of false killer whales as delineated by NMFS in the 2009 SAR. Given that fishing in this zone may impact both the insular and pelagic stocks, the Team recommends that this area be closed to longline fishing gear on a year-round basis. The Team believes that such an exclusion (the Northern Exclusion Zone) effectively eliminates any risk the deep and shallow-set longline fisheries may pose to the insular stock of false killer whales, and, therefore, that the deep-set and shallow-set fisheries operating pursuant to this Plan would not affect, or are not likely to adversely affect, the insular false killer whale stock. The Northern Exclusion Zone would also provide significant benefits to pelagic whales.

While the Team expects the combination of circle hooks, weak hooks, and captain's education and outreach, combined with the Northern Exclusion Zone will meet Team goals, the Team also recommends contingency measures that would better protect false killer whales in the EEZ should such measures prove ineffective in the near-term. The primary measure is a Southern

Exclusion Zone in which deep-set longline fishing would be excluded as specifically set forth in Section 8.2.4 below. This measure, combined with the reconvening of the Team, provides additional assurances that Team goals will be met.

While the Team believes the suite of measures described below are currently appropriate for meeting the goals of the Plan, the Team expects new information on the biology, distribution, abundance and stock structure of false killer whales, as well as on the extent and nature of interactions between false killer whales and commercial fisheries, will become available in the future. Similarly, the Team expects that innovations in fishing gear and/or fishing methods may change the extent and nature of interactions between false killer whales and commercial fisheries. As such, the Team does not consider any of its recommended management measures to be permanent or unchangeable, and expects recommendations regarding, and implementation of, management measures will change as new information and circumstances dictate.

8.2.1 Gear Fixes

8.2.1.1 Hook requirement

For the deep-set longline fishery, the Team recommends the required use of 14/0 – 16/0 circle hooks with the following characteristics: wire diameter not to exceed 4.5 mm; round wire; pull strength not to exceed 325 pounds; 10 degree offset or less. Longline gear for any other fishery that does not meet these standards may not be aboard a fishing vessel during a declared deep-set trip unless it is stowed and unavailable for use.

A gauge can be used to determine wire diameter.

8.2.1.2 Terminal tackle

For the deep-set longline fishery, the Team recommends that any monofilament branchlines/leaders are not less than 2.0 mm diameter. Any other materials used in branchlines/leaders must meet or exceed the intent of this measure. The intent is that the gear be assembled and maintained such that the hook is the weakest component of the terminal tackle.

8.2.1.3 Near-Term Weak Hook Pilot Testing

The Team recommends that a weak hook trial be conducted as soon as practicable to assess whether fishing with weak hooks will affect the catch of bigeye tuna. The trial will compare 4.5mm circle hooks with 4.0mm circle hooks. The trial will include 2 trips by four (4) vessels (8 trips total), with a minimum of 120 sets, with a preferred experimental design of sequentially alternating hook types, and equal numbers of hooks (control and treatment) deployed per longline set.

The number of sets to be conducted (120) is based on a power analysis that was performed to ensure there is sufficient power to determine whether there is a 10% or greater change in catch rates between hook types. Vessels will receive compensation per set, and both control and experimental hooks (from the same manufacturer) will be provided to the vessels.

The data gathered from the weak hook trial described above will be analyzed by the Pacific Islands Fisheries Science Center to determine whether the use of a 4.0mm hook by the deep-set fleet is likely to result in a substantial impact to the catch of bigeye tuna. For purposes of this analysis, "substantial impact" means that the weight of bigeye tuna caught on 4.0mm circle hooks is more than 10% less than the weight of bigeye tuna caught on 4.5mm circle hooks.[10] The Team anticipates that the hook trial described above can be completed, and that the data can be analyzed, before NMFS issues a final TRP and implementing regulations. If the analysis of the weak hook trial data demonstrates that the use of 4.0mm weak hooks will not have a substantial impact on bigeye tuna catch rates, then the Team's recommendation to NMFS regarding the hook requirement shall be modified as follows:

> For the deep-set longline fishery, the Team recommends the required use of 14/0 – 16/0 circle hooks with the following characteristics: wire diameter not to exceed 4.0 mm; round wire; 10 degree offset or less. Longline gear for any other fishery that does not meet these standards may not be aboard a fishing vessel during a declared deep-set trip unless it is stowed and unavailable for use.

If the analysis of the weak hook trial data demonstrates that the use of 4.0mm hooks *will* have a substantial impact on bigeye tuna catch rates, the use of such hooks will not be required. However, the Team recommends that additional trials and analyses be performed to test whether 4.2mm hooks will have a substantial impact on bigeye tuna catch rates. If the analysis of the results of such trials and demonstrate demonstrates that the use of 4.2mm weak hooks will not have a substantial impact on bigeye tuna catch rates, then the Team's recommendation regarding the hook requirement shall be modified as follows:

> For the deep-set longline fishery, the Team recommends the required use of 14/0 – 16/0 circle hooks with the following characteristics: wire diameter not to exceed 4.2 mm; round wire; 10 degree offset or less. Longline gear for any other fishery that does not meet these standards may not be aboard a fishing vessel during a declared deep-set trip unless it is stowed and unavailable for use.

While the Team believes that trials of the 4.0mm circle hook and analysis of the data from such trials can be accomplished before NMFS issues a final TRP and implementing regulations, subsequent trials of a 4.2mm hook, if necessary, are unlikely to be completed before plan implementation. Therefore the Team recommends that any such subsequent trials be launched and completed as soon as possible, and, if such trials demonstrate no substantial impact on bigeye tuna catch rates, that NMFS promulgate regulations requiring use of such gear as soon as practicable.

If the analysis of the weak hook trial data demonstrates that the use of 4.0mm hooks will not have a substantial impact on bigeye tuna catch rates, the Team recommends that additional trials and analyses be performed, subject to available funding, to test whether weaker hooks (such as

[10] The Team recognizes that further deliberations with PIFSC are needed to further refine the required experimental design.

3.8mm hooks) will have a substantial impact on bigeye tuna catch rates. The results of any such trials and analyses shall be analyzed by the Team, which will make additional appropriate recommendations if the trials demonstrate that weaker hooks will have no substantial impact on bigeye tuna catch rates.

8.2.2 Captain/Crew Training

8.2.2.1 Marine Mammal Certification Program

The Team recommends that NMFS expand and clarify the section on marine mammals included in the Protected Species Workshop. The Team requests that NMFS implement these recommendations specific to the marine mammal component of the Protected Species Workshops immediately (i.e., before the final TRP becomes effective).

Specifically, the Team recommends the following with respect to the certification program:

- *Require marine mammal certification.*
  - NMFS require via regulation that, as part of the marine mammal component of the Protected Species Certification Program, owners and captains complete the marine mammal portion of the training course and receive certification once a year similar to the regulations for sea turtles and seabirds.
  - The first certification course should be completed in-person and subsequent recertification may take place via the internet. Specifically, owners and operators must attend a classroom workshop before taking the course online. After the initial classroom session, ***owners*** may take the online course indefinitely. ***Operators*** (captains) may take the online course for two years in a row before being required to take a classroom course. This requirement is to show they understand protected species handling techniques, at least every three years. However, annual in-person participation is encouraged.
  - Additionally, NMFS and industry should encourage crewmembers (particularly deck bosses) to become certified and should facilitate this by holding trainings at Piers 17 and 38 and Kewalo Basin.

- *Expand marine mammal content.*
  - NMFS shall develop course content in cooperation and consultation with the Team.
  - The training should be organized in the following order:
    1. Regulatory overview (e.g., FKWTRT/MMPA, serious vs. non-serious, etc.)
    2. Species identification
    3. Marine mammal handling and release techniques
    4. Best practices for reducing marine mammal bycatch
  - The first portion of the training should focus on the importance of releasing marine mammals in a healthy condition (i.e. as not seriously injured)
    - Healthy populations and less bycatch would have fewer impacts on the fishery
    - Non-serious injuries do not "count against" the fisheries, but serious injuries do

  - Clearly describe the difference between a serious and non-serious injury in practical terms (i.e., removing hook and other gear could mean that an animal may not count against PBR and the fishery).
    - Highlight that the approach for marine mammals is different than for sea turtles
  - NMFS should distribute draft course training materials on marine mammal content (e.g., power point presentations, handouts, etc.) to the Team for review and comment; significant future revisions to the training materials should also be distributed to the Team for its ongoing input.
  - Encourage owners/captains to train crew and share/post training materials (e.g., placard) where crew can readily access
  - Use observer video from prior hookings/entanglements and subsequent releases to train owners/captains and provide an example
  - Add a voluntary component to the training (either at the end of required training or on a separate occasion) on photo identification (e.g., purpose, protocols, etc.) for those interested in participating in the research
- *Marine Mammal Reporting Requirement.*
  - The training should include specific discussion of the reporting requirement included in MMPA section 118(e), which all fishermen are already required to fill out after an interaction with a marine mammal.
  - Walk through instructions for filling out the form as well as useful information to include in the comments section (e.g., specific gear information, such as hook type, branchline diameter, etc., and its configuration as well as specifics on the condition of the gear on the animal and its condition), which may help in characterizing the interaction. Training should also note that captains can affix an additional comment page to provide further information on the interaction since this is the captain's opportunity to get their input incorporated into the process.
  - The Team recommends that NMFS review the MMAP forms when determining whether an injury is considered a "serious injury".
- *False killer whale sampling*.
  - When an observer is onboard, the Team recommends that captains are encouraged to retain dead false killer whales, if safety permits.
- *Best practices*.
  - The Team recommends that NMFS provide information on "best practices" during the marine mammal certification (see below)
- *Translation*.
  - Marine mammal handling and release protocols should be translated into pictorial depictions to reach crew who may not speak/read English
  - Training materials should be translated into Vietnamese and Korean
  - The Team recommends that HLA translate both the MMAP reporting form and the marine mammal observer form into appropriate languages
- *Course feedback*. Develop and administer a survey, both online and during in-person workshops, to evaluate the course after it is completed.

8.2.2.2 Marine Mammal Placard/Sticker

The Team reviewed existing NMFS placards (Atlantic Pelagic Longline and Hawaii Longline) and discussed approaches to modifying the Hawaii longline placard and considered how the placard should be displayed on the vessel. The Team strongly requests that NMFS implement the recommendations specific to the marine mammal placards immediately (i.e., before the final TRP becomes effective).

Team members noted that captains are not always on deck during the haul and may not observe marine mammal bycatch events. Further, the captain may be the only person on the vessel trained in marine mammal handling and release protocols. Therefore, the Team recommends that the placard address this situation accordingly (see below).

The Team recommends the following with respect to developing a Hawaii Longline-Marine Mammal placard and sticker:

- Require handling and release placard to be posted onboard the vessel (e.g., in the wheelhouse/galley)
- Include a photo on the Hawaii placard of a false killer whale
- Use same format as Atlantic placard with text boxes and species identification on the back
- Add text about avoiding a "serious" injury and noting the importance of removing gear from marine mammals
- Update placard if and when weak hooks are required in the fishery because handling and release protocols may differ based on modified gear (e.g., if an animal is calm or tired, use a long-handled dehooker)
- Add text that if a marine mammal is hooked or entangled, the captain should be notified and on deck to direct the release of the marine mammal. (Note: This is not intended to be a regulatory requirement.)
- The Team recommends that the crew be required via regulation to notify the captain if and when a whale is hooked or entangled. Further, the Team recommends that NMFS' observers tell the deck boss not to cut the line and for the crew to notify the captain immediately.
- The Team recommends that the captain be required to supervise the handling and release of any hooked or entangled whale.
- The Team also recommends that a separate, smaller sticker be required to be posted on deck stating that, if a marine mammal is hooked or entangled, the captain must be notified immediately. This sticker should be translated into as many relevant languages as possible and provided to owners and captains.

8.2.2.3 Best Practices

The Team discussed several voluntary best practices for reducing false killer whale interactions recognizing that not much is currently known about the nature of the interactions. The Team suggests the following practices, which may be successful in reducing depredation or M&SI of false filler whales. The Team is interested in obtaining feedback from captains on whether they

have insight into reducing interactions or facilitating de-hooking/removal of gear from past experiences. In-person attendance at the marine mammal trainings would facilitate interactive discussions. The information from these discussions should be incorporated into subsequent training sessions. The Team recommends that captains/crew:

- Maintain gear so it is as strong as possible, thereby making the hook the weakest part of the terminal gear
- Do not feed whales damaged/depredated catch or dump offal when whales are present
- Consider moving 100km (54 nautical miles) after a depredation event or marine mammal interaction to reduce the likelihood of repeated depredation on the subsequent set. NMFS analysis showed that the likelihood of repeat depredation is about 16% lower if the vessel moves 100 km compared to staying in the same area.
- Reduce light and noise profile of vessels
- Real-time fleet communication if and when false killer whales are encountered
- Recognize that the process/methods for removing gear need to consider health and well being of animal such that releasing with minimal injury. Note that not all hooked animals can be de-hooked (e.g., swallowed hooks).

8.2.3 Changes to Observer Protocols

- As noted in Owner/Captain training, the Team recommends that if and when a whale is hooked or entangled, the observer tell the deck boss not to cut the line and for the crew to inform the captain immediately.
- The Team encourages captains to take the opportunity to comment on the marine mammal observer form after an interaction when a captain can offer additional information. If the captain has something to add, that information should be included in the comments section and attributed to the captain. This is already part of the observer protocols; the Team simply wants observers to emphasize this opportunity for captains.
- The Team recommends that the Pacific Islands Region Observer Program use video from prior hookings/entanglements and subsequent releases to train observers.
- The Team strongly requests that NMFS implement the recommendations specific to changes to observer protocols immediately (i.e., before a final TRP becomes effective).

8.2.4 Notification of False Killer Whale Takes

The Team recommends that NMFS notify the Team as soon as there is an observed interaction of a known or possible false killer whale in the fishery, and provide any non-confidential details about that interaction as soon as possible. Further, the Team recommends that NMFS make the serious injury determination and confirm the identification of the species of the animal involved in the interaction as soon as possible after the observer debriefing and data approval for the interaction, and provide the information to the Team with the rationale for the determination. In addition, the Observer Program should give high priority to debriefing and data approval for the interaction.

8.2.5 Other Measures

8.2.5.1. In addition to implementation of the measures described in Sections 8.2.1 – 8.2.3 above, upon the effective date of final regulations implementing this Plan (the "Effective Date") [11], the following measures shall be implemented:

a. The area to the North of the Main Hawaiian Islands ("MHI") [the area bounded by straight lines connecting the points listed in Table 8.2; see Figure 8.1] (the "Northern Exclusion Zone") shall be closed to commercial deep-set and shallow-set longline fishing.

b. Observer coverage in the deep-set longline fishery shall be increased to at least a 25% average quarterly observer coverage rate, provided that any such increase is funded by the federal government.

c. After the Effective Date, NMFS shall reconvene the Team every six (6) months for at least two (2) years.

Table 8.2. Boundaries of the Northern Exclusion Zone. Point names correspond to those currently listed in federal regulations at 50 CFR 665.806.

Point	N. Latitude	W. Longitude
A	18° 05'	155° 40'
L	18° 25'	155° 40'
M	19° 00'	154° 45'
N	19° 15'	154° 25'
O	19° 40'	154° 20'
P	20° 20'	154° 55'
Q	20° 35'	155° 30'
R	21° 00'	155° 35'
S	22° 30'	157° 35'
T	22° 40'	159° 35'
U	22° 25'	160° 20'
V	21° 55'	160° 55'
W	21° 40'	161° 00'
E	21° 40'	161° 55'
F	23° 00'	161° 30'
G	23° 05'	159° 30'
H	22° 55'	157° 30'
I.	21° 30'	155° 30'
J	19° 50'	153° 50'
K	19° 00'	154° 05'
A	18° 05'	155° 40'

[11] The first day of the month immediately following 30 days after publication of the final TRP in the Federal Register.

8.2.5.2. If, during the 12-month period following the Effective Date ("Year 1"), the deep-set longline fishery has one (1) observed M&SI interaction[12] with a false killer whale[13] within the U.S. EEZ surrounding the Hawaiian Islands ("HI EEZ"), then NMFS shall notify the Team of the interaction and immediately reconvene the Team via telephone conference.

8.2.5.3. If, during Year 1, the deep-set longline fishery has the greater of

a. two (2) observed M&SI interactions with false killer whales within the HI EEZ, or

b. the number of observed M&SI interactions with false killer whales within the HI EEZ that, when extrapolated based on the percentage observer coverage for that year,[14] are greater than the applicable false killer whale HI EEZ PBR (whether or not the applicable false killer whale HI EEZ PBR is published in a Final SAR),

then the Team shall be immediately reconvened, and the area prescribed by the boundaries listed in Table 8.3 (and shown in Figure 8.1) (the "Southern Exclusion Zone") shall be immediately closed to commercial deep-set longline fishing until no later than the end of Year 1.

Table 8.3. Boundaries of the Southern Exclusion Zone.

Boundary	Description
Western	165° W long, extending to (or between) the HI EEZ in the south and the Papahanaumokuakea Marine National Monument in the north.
Eastern	154.50° W long between HI EEZ in the south to the current Feb-Sept MHI Longline Exclusion Zone in the north
Southern	HI EEZ
Northern	Combination of current Feb-Sept MHI Longline Exclusion Zone and Papahanaumokuakea Monument boundaries

8.2.5.4. If the Southern Exclusion Zone closure is implemented pursuant to Section 8.2.5.3, and if, during the 12-month period following the re-opening of the Southern Exclusion Zone after such closure ("Year 2"), the commercial deep-set longline fishery has one (1) observed M&SI interaction with a false killer whale within the HI EEZ, then NMFS shall notify the Team of the interaction and immediately reconvene the Team via telephone conference.

8.2.5.5. If the Southern Exclusion Zone closure is implemented pursuant to Section 8.2.5.3, and if, during Year 2, the deep-set longline fishery has the greater of

a. two (2) observed M&SI interactions with false killer whales within the HI EEZ, or

[12] The term "M&SI interaction," as used in this Plan, means a false killer whale interaction that is determined, pursuant to the process described in Section 8.2.4 *infra*, to be a serious injury or an interaction that results in a mortality.

[13] For the purposes of this chapter, given the closure of the Northern Exclusion Zone, all takes of false killer whales within the HI EEZ are presumed to be from the pelagic false killer whale stock, as that stock is described in the 2009 final SAR, unless additional information indicates otherwise.

[14] For example, at 25% observer coverage, two observed M&SI would extrapolate out to an M&SI estimate of eight animals for that year. A newly calculated PBR would have to be less than eight for this threshold to be triggered.

b. the number of observed M&SI interactions with false killer whales within the HI EEZ that, when extrapolated based on the percentage observer coverage for that year, are greater than the applicable false killer whale HI EEZ PBR (whether or not the applicable false killer whale HI EEZ PBR is published in a Final SAR),

then NMFS shall immediately reconvene the Team, and the Southern Exclusion Zone shall be immediately closed to commercial deep-set longline fishing.

8.2.5.6. Assuming that the Southern Exclusion Zone has been closed pursuant to Section 8.2.5.5, the Southern Exclusion Zone shall be immediately re-opened to commercial deep-set longline fishing if:

a. NMFS determines, upon consideration of Team recommendations made after the Team's consideration and evaluation of all relevant circumstances, that re-opening of the Southern Exclusion Zone is warranted[15];

b. in the two-year period immediately following the date of the closure, the deep-set commercial longline fishery has had zero (0) observed M&SI interactions with false killer whales within the HI EEZ;

c. in the two-year period immediately following the date of the closure, the deep-set commercial longline fishery has reduced its rate of combined M&SI interactions with false killer whales within the HI EEZ and on the high seas[16] in an amount proportionate to the rate required to reduce M&SI interactions with false killer whales within the HI EEZ to a level equivalent to the applicable false killer whale HI EEZ PBR;[17] or

d. if the average estimated M&SI interactions for the deep-set longline fishery in the HI EEZ for up to the five most recent years following implementation of the Plan is below the applicable false killer whale HI EEZ PBR at that time.

8.2.5.7. If no M&SI interactions are observed in the first 12 months after the Effective Date, the year in which the first M&SI interaction is observed after the Effective Date will be treated as Year 1, and the subsequent year will be treated as Year 2 for purposes of implementing Sections 8.2.5.2. to 8.2.5.6.

[15] The Team anticipates that certain M&SI may result not from the failure of the measures recommended in this Plan, but from non-compliance or other factors not characteristic of the fleet's practices. In such case, NMFS, in consultation with the Team may determine that no further changes in management measures are warranted and/or that maintaining the closure of the Southern Exclusion Zone is not warranted. Alternately, M&SI may indicate that new, different or additional management measures may be required to meet the goal. In such case, the Southern Exclusion Zone would remain closed until such measures are implemented.

[16] For these purposes, the high seas includes the Johnston Atoll EEZ, but not the Palmyra Atoll EEZ.

[17] For example, as of July 2010, PBR for the Pelagic Stock is 2.5 animals within the HI EEZ, while estimated M&SI is 7.3 animals within the HI EEZ. An approximately 66% reduction in estimated M&SI for the entire deep-set fishery would be necessary to meet this threshold at this time.

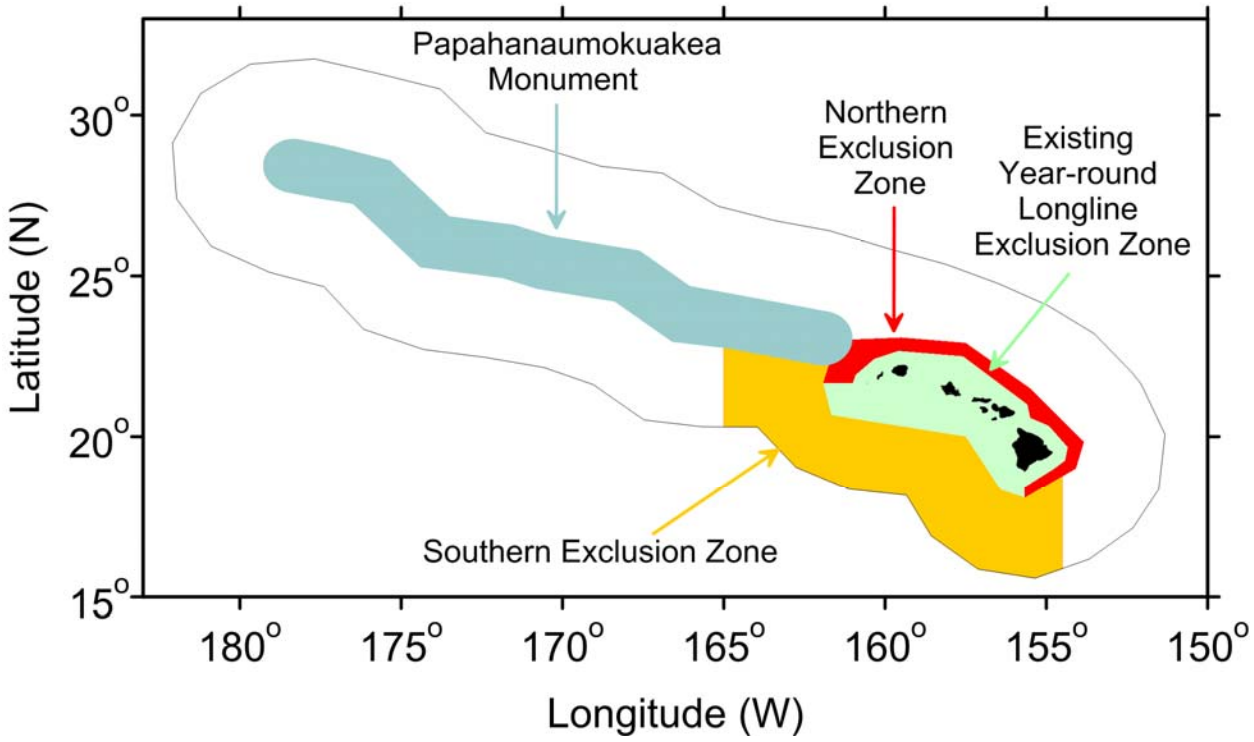

Figure 8.1. Recommended Northern and Southern Exclusion Zones, shown with existing year-round longline exclusion zone and Papahanaumokuakea Marine National Monument.

8.3 Implementation of Recommended Management Measures

The consensus recommendations identified in Section 8.2.1 represent a mix of regulatory and non-regulatory actions. Below are the Team's recommendations regarding implementation approach.

- ***Regulatory Actions.*** The following actions are recommended by the Team to be implemented through regulation: circle hook and terminal tackle requirements; weak hook requirements (if criteria for use met); owner/captain training; on-board placards/sticker; Northern Exclusion Zone; Southern Exclusion Zone; and all triggers and thresholds for invocation and relaxation of the Southern Exclusion Zone.

- ***Non-Regulatory Actions.*** All other actions, while strongly endorsed by the Team, are put forward as non-regulatory actions. These include: weak hook testing; research recommendations (see Section 9); photo identification research; best practices for avoiding and reducing severity of interactions; and observer coverage increases.

Additionally, the Team recommends that NMFS PIRO and the fishery work cooperatively to implement as soon as possible (i.e., before a final TRP and any implementing regulations become effective through a final rule) several recommended actions. More specifically, the Team recommends that NMFS work with the fishery to promote the early conversion to circle hooks, as well as the incorporation into existing captain/crew training of marine mammal handling guidelines.

8.4 Other Recommendations

8.4.1 Shortline and Kaka Line Fisheries

Very little information is available about the shortline and kaka line fisheries, but they target prey species of false killer whales using gear similar to that known to result in interactions with, and consequent mortality and serious injury to, false killer whales. These fisheries also operate within the documented range of the Hawaii insular stock of false killer whales. There also exists anecdotal information that these fisheries have had interactions with false killer whales. NMFS should prioritize gathering information about these fisheries, including placing observers on vessels or on alternative platforms so as to observe these fisheries. If any interactions with false killer whales are documented for either fishery, NMFS should consider issuing regulations pursuant to Section 118(f) of the MMPA imposing any necessary measures (e.g. weak circle hooks or other gear modifications, time-area closures, and/or effort limitations) so as to reduce or eliminate the risk of serious injury and mortality to false killer whales from any such fisheries.

8.4.2 Other Fisheries

NMFS should prioritize gathering information about any and all commercial and recreational fisheries targeting false killer whale prey species that operate within the range of the Hawaii insular stock of false killer whales. Such measures should include placing observers on vessels or on alternative platforms so as to observe these fisheries. If any interactions with false killer whales are documented for any such fishery, NMFS should consider issuing regulations pursuant to Section 118(f) of the MMPA imposing any necessary measures (e.g. weak circle hooks or other gear modifications, time-area closures, and/or effort limitations) so as to reduce or eliminate the risk of serious injury and mortality to false killer whales from any such fisheries.

8.4.2.1 Foreign Fisheries

NMFS should promptly implement the requirements of Section 101 of the MMPA requiring the banning of imports of fish products from nations engaged in longline fishing until and unless such nations can demonstrate they are utilizing measures comparable to those recommended in this Plan so as to protect false killer whales and other marine mammals from bycatch. At present, we have reason to believe that no nation has demonstrated such compliance and therefore importation of tuna, swordfish and other longline caught fish products from these nations should be banned. NMFS should work to ensure that measures adopted by the U.S. fleet (e.g. weak circle hooks) are made known to other countries operating longline fleets so as to increase the likelihood of such measures being adopted by those nations.

9 RECOMMENDATIONS FOR ADDITIONAL RESEARCH AND DATA COLLECTION

9.1 Background

The Team's deliberations and development of a plan to reduce bycatch were constrained by considerable uncertainty in many areas. To better inform the development of long-term solutions to reduce interactions between FKW and pelagic longline gear (and the consequent mortalities and serious injuries), additional knowledge of the cues to interactions, mechanics of depredation, distribution, behavior and demographics of FKW, differences between the population as a whole and "depredators", and effects of fleet behavior on interactions is needed. Although the observer data is rich in some regards, these data do not inform the mechanics of interactions. Based on the available data the TRP proposes some measures to reduce bycatch. However, meeting the 5-year Zero-Mortality Rate Goal, and being able to evaluate the success of the plan are both facilitated by research that is concurrently launched to answer these basic questions.

The Team's deliberations highlighted numerous data gaps and information needs. These deliberations – both in full group and in a research-focused work group – centered around two broad areas: (1) longer-term research needs; and, (2) improvements to observer data collection. Other suggestions – focused around near-term data analysis necessary to support the Team's immediate deliberations - were undertaken (as possible) in real-time and summarized in Chapter 7.

The recommendations below reflect a consensus of the Team members present at the fourth Team meeting.

9.2 Research Needs

Recommendations for additional research
Recognizing there are both short-term and long-term goals of the Plan, and the need to evaluate the effectiveness of the Plan as well as reduce uncertainty in aspects of which populations are involved with bycatch, there is consensus that considerable research is needed. Uncertainty exists in aspects of false killer whale biology, behavior, abundance, and distribution of stocks; there is a lack of even basic information on the shortline and kaka line fisheries. Additionally, there is need for a better understanding of potential factors within the longline fleet that may influence depredation and/or bycatch, as well as how proposed methods to reduce bycatch might influence bycatch or target species catch rates.

The Team developed a list of 35 research recommendations over the course of four meetings and during several conference calls of a Research Needs Work Group that included broad representation of the Team. For each research question/activity, information was compiled on the approach and purpose or benefit, the feasibility, and relative costs. These research questions/activities were then grouped into one of four general categories: 1) false killer whale biology; 2) longline gear and fishing; 3) shortline and kaka line fishing; or 4) false killer whale assessment. With the exception of the shortline and kaka line fishing categories these groupings facilitate answering the "how, when, where, who" questions. The shortline and kaka fishing

category underscores the lack of information regarding this fishery and the Teams consensus that these gears likely have interactions.

During the 3rd Team meeting 14 Team members present scored each research question/activity within each of the four categories as one of high, medium or low priority. One Team member not present also provided scores. Scores were based primarily on the importance of the research activity in trying to address the Team's goals while also taking into account the feasibility and costs, and with an attempt to assign balanced scores (e.g., not everything within a category being scored "high" or "low").

In order to prioritize the research recommendations for the Team as a whole, the scores of high, medium and low were converted to numerical values of 2, 1, or 0 respectively, and values were summed. With this ranking scheme, the potential scores could range from 0 (if all scored a research activity as low) to 30 (if all scored a research activity as high). Because the scores were developed within categories the rankings should not be viewed as representing overall priorities. After discussion at the third Team meeting, two relatively high-ranked questions regarding shortline and kaka line fishing methods were aggregated into a single research question. The Team also recognized that some of the research activities span multiple research categories (e.g., could go under either falser killer whale biology or longline gear and fishing activity) and at the fourth Team meeting one of the recommendations was moved to a different category.

Within-category rankings of research priorities are presented in table 9.1 below. It should be noted that some of these research questions will be addressed with the existing observer program or are likely to be initiated prior to the implementation of the TRP based on assurances provided to the Team that funding will be available. These are highlighted with *.

Table 9.1. Ranking of research recommendations by category.

FALSE KILLER WHALE BIOLOGY	**Scores**
Distinguish FKW calls from other odontocete species	22
Telemetry studies to examine range and movements of FKWs	20
Evaluate FKW acoustic behavior near longlines using recorders on fishing gear	18
Determine range at which a hook in a fish can be acoustically detected by FKW	16
Carry out underwater observations of FKW foraging behavior to understand mechanisms of depredation	16
Mine existing acoustic data from Cross Seamount and elsewhere to assess frequency of FKW occurrence	15
Evaluate acoustic differences between insular vs. pelagic FKWs	12
Assess impact of hook density on FKW ability to follow line	11
Understand FKW foraging and acoustic behavior using acoustic tags	10
Evaluate FKW capability to see floats, as well as monofilament line of different colors and width	7
Conduct vessel sound playbacks to FKWs to determine the distance of reaction and whether insular individuals react	7
Assess FKW response to compounds found in oil fish and other fish species that FKWs do not depredate	4
Test FKW visual acuity using different types of lights	3
Study adaptive learning, particularly by young FKW	2

LONGLINE GEAR AND FISHING	
Evaluate impact of weak hooks on FKW bycatch rates*	30
Understand impact of weak hooks on target species catch rates*	29
Develop methods for fleet to use acoustic recorders to determine FKW presence prior to setting	23
Survey all longline vessels to identify commonalities among those with high depredation rates	16
Evaluate effectiveness of wire loops on hooks as a method to reduce depredation on bait, catch and takes of FKWs (already completed during the deliberations of the Team)	15
Evaluate where FKWs are caught within a set and why	14
Record acoustic profile during setting, soaking, and hauling to assess potential cues to FKWs	11
Assess potential for hooks to be modified (foam coating, etc.) to increase or decrease detection range	10
Record individual sound profile of longline vessels	9
Evaluate potential to use killer whale/other playbacks as deterrents	5
Evaluate feasibility of using moored listening stations (FADs, etc) to determine FKW occurrence before a trip	5
SHORTLINE AND KAKA LINE FISHING	
Determine number of vessels that use shortline & kaka line gear	23
Begin data collection on when and how shortline and kaka line fishing occurs	20
Form an observer program to assess level of FKW and other cetacean bycatch in shortline and kaka line fisheries	18
FALSE KILLER WHALE STOCK ASSESSMENT	
Regular Hawaiian EEZ survey (at least every 5 years) to estimate abundance	29
Continue research into FKW abundance using towed and stationary acoustics	24
Collect additional FKW genetic samples to assess population structure	20
Evaluate alternative methods for estimating FKW abundance, with emphasis on improving precision	19
Develop methods to pro-rate "blackfish" bycatch	16
Develop predictive habitat models of FKW density	13
Evaluate degree of genetic differentiation between insular and pelagic FKW stocks	13

After the ranking exercise was completed during meeting #3 and during meeting #4 there were further discussions about research needs and the following additional items identified:

- The use of mark/recapture studies (either in terms of tags, photo identification, or genetic samples) to supplement information regarding abundance, stock structure, and injury categorization
- The role vessel light and noise profiles have on interactions. These potential cues are complicated and likely involve a combination of profiles and behaviors.
- Further studies to validate the current assignment of mortality and serious injury designations specific to FKW and the pelagic longline fishery.
- Utilize Kina, the UH captive killer whale, to facilitate research including testing of passive deterrence.

- Examine the role of bait type, size, and manner of threading on the hook, on bait depredation.

The team discussion underscored the iterative process inherent in research and the need to maintain this section of the plan in particular as a living document with changes and additions anticipated over the course of the TRT process.

Although the scores were given within each of the four categories noted above, for the purposes of assessing the highest ranked research priorities overall, the Team agreed that it would be appropriate to pool research questions from all four categories; those which received a score of at least two-thirds of the maximum (20) are presented below. This step then generated a list that included at least two questions from each of the four research categories (taking into account the pooling of the two shortline/kaka line questions). Each of these is discussed in more detail below.

Table 9.2. List of the top nine ranked research activities over all four research categories sorted by research category.

Research Category	Research Activity
Longline gear	Evaluate impact of weak hooks/circle hooks on FKW bycatch rates
Longline gear	Understand impact of weak hooks on target species catch rates
Longline gear	Develop methods for fleet to use acoustic recorders to determine FKW presence prior to setting
Shortline/ kaka line fishery	Assess shortline and kaka line fishing: number of vessels, location, timing and method of fishing
FKW biology	Distinguish FKW calls from other odontocete species
FKW biology	Telemetry studies to examine range and movements of FKWs
FKW assessment	Regular Hawaiian EEZ survey (at least every 5 years) to estimate abundance
FKW assessment	Continue research into FKW abundance using towed and stationary acoustics
FKW assessment	Collect additional FKW genetic samples to assess population structure

Evaluate impact of weak hooks/circle hooks on FKW bycatch rates. Since depredating false killer whales frequently leave the head of the fish on the line, the use of circle hooks (which typically embed in the mouth of the fish) should reduce false killer whale bycatch rates. If a FKW is hooked , if hooks that straighten with less force are used ('weak hooks') this should increase the likelihood that a hooked false killer whale will straighten the hook and end up being released without gear attached (i.e., reducing the likelihood of serious injury). Long-term

evaluation of bycatch rates using the observer data will be required to evaluate the effectiveness of weak hooks and circle hooks on false killer whale bycatch and serious injury rates.

Understand impact of weak hooks on target species catch rates. Weak hooks have the potential to reduce the false killer whale serious injury rate, but may also influence the catch rates of target species or other non-target species. Assessment of the impact of using weak hooks on the catch rates and size of target species caught, as well as the catch rates of other bycatch (e.g., sharks) needs to be assessed. A controlled experiment with alternating hook types would allow for the assessment of using weak hooks on target species catch rates. A pilot experiment has been funded in cooperation with NMFS, HLA, and the New England Aquarium, that will use 4 vessels and 8 trips to evaluate the difference between 4.5 diameter wire circle hooks and 4.0 diameter wire circle hooks in catch per unit effort of bigeye tuna. Research is expected to commence in the fall of 2010.

Develop methods for fleet to use acoustic recorders to determine FKW presence prior to setting. Minimizing overlap of fishing efforts with false killer whale presence will both reduce depredation of catch and bycatch of false killer whales. Methods need to be developed to use remote radio buoys to alert fishermen of the presence of false killer whales in the area prior to and during setting of gear.

Assess shortline & kaka line fishing: number of vessels, location, timing and method of fishing. There is considerable uncertainty regarding the potential role for false killer whale bycatch in shortline or kaka line fishing, due to a lack of information on the number of vessels using these gear types, where and when they are fishing, and the methods of fishing, including the species of fish being targeted, the amount of gear in the water, hooks being used etc. However it is reasonable to assume that these fisheries likely have interactions with FKW. These fisheries have no observer coverage. Accumulating information on these fisheries is necessary to evaluate their potential role in false killer whale bycatch.

Distinguish FKW calls from other odontocete species. Acoustic methods (e.g., moored acoustic monitors or towed systems from boats) can be used to detect vocalizing false killer whales. Being able to consistently and accurately distinguish false killer whale calls (whistles and clicks) from other species of toothed whales is critical if these methods are to be used in abundance estimation and/or fishery avoidance of false killer whales. False killer whale whistles can be readily distinguished from most other odontocetes in the eastern tropical Pacific (Oswald *et al.* 2003); however, anecdotal reports suggest that discrimination among species in other regions is not as accurate. Further, discrimination of false killer whale echolocation clicks versus those of other odontocetes has not been widely studied.

Telemetry studies to examine range and movements of FKWs. Information on movements of tagged false killer whales can be used to assess which populations are involved in fisheries interactions within or outside of the Hawaiian EEZ as well as assess movements relative to fisheries activity. For example, tag deployments on pelagic animals could be used to assess whether individuals from the Hawaiian EEZ move to the Palmyra or Johnston EEZ; tags on insular animals will help to assess overlap between the insular population and the fishery area.

Efforts to deploy tags on both pelagic and insular individuals will reduce uncertainty in population structure and populations potentially impacted by longline fishing.

Regular Hawaiian EEZ survey (at least every 5 years) to estimate abundance. Potential Biological Removal (PBR) levels are based on EEZ-wide abundance surveys. After 8 years NMFS considers such abundance estimates "stale" and these surveys must be repeated on a regular basis to assess abundance and allow for understanding of changes in abundance over time. Prior to 2010 only one such abundance survey has been undertaken in the Hawaiian EEZ (in 2002). In order to estimate abundance, the Team recommends conducting large-scale surveys (two vessels, at least 175 days at-sea) covering the entire Hawaiian EEZ with both visual and acoustic observations at least every five years.

Continue research into FKW abundance using towed and stationary acoustics. Visual methods for detecting false killer whales in abundance surveys are limited by sea conditions and distance from the vessel. Acoustic methods allow for detecting vocalizing false killer whales at a greater distance than is possible with visual methods, but determination of the probability that any particular group is vocalizing, how vocalization rates may change with group size or time of day, and how the probability of detecting a vocalizing group varies with distance are all needed to accurately assess abundance using acoustics.

Collect additional FKW genetic samples to assess population structure. Genetic analyses of biopsy samples allow for distinguishing stock and range of stocks, as well as assessment of population structure and estimation of effective population size. Additional samples of the pelagic stock in particular are needed in the areas offshore within the Hawaiian EEZ as well as in international waters. These samples should be collected when possible by observers as well as through dedicated research efforts.

9.3 Improvements to Observer Data Collection

On numerous occasions, Team members acknowledged the breadth and value of existing observer data. Unlike other fisheries in the United States, the Hawaii longline fleet has extensive observer coverage (100% in the shallow set and 20% in the deep set), as well as data going back 16 years.

Still, the Team's discussions over the course of the six months of deliberations highlighted several opportunities to further strengthen the focus and approach to current observer data collection. These recommendations, listed below, are intended to provide more detailed data to support future Team deliberations. Some of these recommendations involve recording additional data during interactions, collection of gear or additional samples, or involve activities outside of recording interactions (e.g., collection of biopsy samples or photographs from false killer whales observed when not actively fishing).Those activities requiring changes in data recording protocols should involve appropriate changes to data sheets as well as electronic databases allowing for long-term analyses of collected data.

- Differentiate among mouth hooking types (lip, jaw, internal, ingested, other) when possible.

- Provide more detail on handling of caught animals and any efforts made to release it without gear.

- Record hook type and terminal tackle configuration for caught animals when possible.

- Record when sets are split and the configuration of split sets.

- Record details of vessel light configurations (sodium, spot lights etc) and how these lights are utilized (prior to and during setting and haulback).

- Record presence/absence of FKW during setting and haulback.

- Record FKW sighting data such as location, group size, and behavior, not associated with active fishing (e.g., during transits), as well as visual sighting effort data (e.g., hours of on-deck observation) so that sighting rates can be quantified.

- Retain gear from interactions (gangions/leaders even in the absence of hook).

- If hooks or gear involved in marine mammal interactions are recovered the gear should be closely examined to determine if any marine mammal tissue (abraded skin on leaders or tissue on hooks) is present and if so such gear should be retained in a way would facilitate genetic analyses of tissue samples.

- Provide better photographic equipment and photo-identification training to more experienced observers to support the development of a more robust false killer whale photo-identification catalogue, facilitate mark/recapture abundance estimates, and document animals involved in depredation.

- A sub-set of observers who are specifically trained and qualified, after authorization through a research permit, should attempt to obtain biopsy samples from bowriding false killer whales when possible for stock assessment studies.

- Provide space on observer form(s) to record injuries to crewmen that are incurred associated with gear changes and release of protected species. The data collected should include the nature and severity of the injury and a description of how the injury occurred.

9.4 Collaborative Photo-Identification Research with the Fishery

Photographs of distinctive individual false killer whales can be used to produce abundance estimates using mark-recapture methods, inform delineation of stock boundaries when individuals from known populations are documented, and can be used to assess survival of

individuals, for example, individuals hooked and released that otherwise might be considered seriously injured. Assessment of survival in such circumstances has the potential to contribute to re-assessment of the criteria NMFS uses to determine serious versus non-serious injuries. To date photo-identification research has primarily been undertaken from dedicated research platforms. The Team recognizes that the fishing fleet potentially provides a unique opportunity for obtaining large numbers of photographs of distinctive false killer whales in the waters offshore of the main Hawaiian Islands, and that such photos could contribute to improving stock assessments as well as assessing serious injury criteria.

The Team recommends that NMFS and a subgroup of the Team (e.g., academic and industry) collaborate on developing research protocols to implement a photo-identification research project in conjunction with the fishery (both deep-set and shallow-set) to train interested captains/crew, provide equipment, develop a process for transferring data/images, and determine how data analysis should be completed. This effort would be voluntary and – given equipment expense and training needs – should be targeted only at captains seriously interested in participating in the photo-identification research effort.

10 NEXT STEPS

Over the course of its deliberations, the Team stepped out several specific actions intended to inform and guide ongoing implementation. The intent of these follow-on actions is to ensure that the Take Reduction Plan is informed both by the best available data and Team expertise and input. Below is a summary of these recommended next steps.

10.1 Near-Term Implementation Recommendations

To support near-term reductions in false killer whale M&SI, the Team recommends the following near-term (i.e., before a final TRP and any implementing regulations become effective through a final rule) steps:

- Early adoption by the deep-set fleet of circle hook and terminal tackle requirements set out in draft TRP.

- Early development and incorporation of marine mammal handling requirements into existing Captain/Crew Training.

- Fishery industry outreach to deep- and shallow-set vessels to foster fleet awareness and understanding of draft TRP regulatory and non-regulatory measures and the potential benefits to industry of widespread and effective adoption.

10.2 Ongoing Team Input into Owner/Captain Training

To ensure the planned marine mammal handling training for owners, captains and crew is as effective as possible and presented in a manner that is meaningful to industry, the Team recommends the following:

- Provide draft training and placard/sticker materials to the Team for review and comment. Team members are to focus their review and comment on substantive feedback, but NMFS staff are encouraged to provide all draft materials to the Team to ensure members have an opportunity to identify and flag areas that NMFS staff might not have considered noteworthy.

- As possible, involve TRT industry members in owner/captain trainings to underscore the benefit to the Hawaii longline fleet of marine mammal handling strategies and the important distinctions from existing sea turtle handling recommendations.

10.3 Early Access to and Consideration of 2010 HICEAS II Survey Results

Team members expressed strong interest in getting early access to 2010 HICEAS II survey results to inform its ongoing discussions regarding potential TRP actions and needs. Team members recommend that NMFS staff expedite the processing of the survey data and provide

preliminary results to the Team once the PSRG has completed its peer review. The Team also recommends the PSRG complete its review as expeditiously as possible. The Team further asks that NMFS staff not wait until the results have been published in the SARs to provide the results to the Team. Additionally, the Team asks that NMFS inform the Team as early as possible regarding any obvious trends or findings.

10.4 Ongoing Team Deliberations

The Team recognizes its ongoing deliberations will be needed to help meet the short- and long-term goals of the Plan. To that end, the Team acknowledges the following:

- The Team is expected to meet during the public comment period of the False Killer Whale Take Reduction Plan Proposed Rule.

- Additionally, the Team expects to meet two times each year for at least the two years following Plan implementation, and as appropriate thereafter, to evaluate the success of the Plan relative to the short- and long-term goals and, as necessary, recommend changes to the Plan.

- The Team recommends that NMFS notify the Team as soon as there is an observed interaction of a known or possible false killer whale in the fishery, and provide any non-confidential details about that interaction as soon as possible. Further, the Team recommends that NMFS make the serious injury determination and confirm the identification of the species of the animal involved in the interaction as soon as possible after the observer debriefing and data approval for the interaction, and provide the information to the Team with the rationale for the determination. In addition, the Observer Program should give high priority to debriefing and data approval for the interaction.

- Team deliberations should track ongoing research results and gear/fleet practices elsewhere to ensure the Plan is informed of the latest findings and potentially successful management actions.

10.5 Measures of Success

The Team identified the following as measures of success of the Plan:

- Full implementation of circle hooks
- Completion of weak hook trial and associated implementation, as indicated by trial
- Achieve zero FKW M&SI in two years within the EEZ
- Achieve reduction of FKW M&SI consistent with a percentage needed to move below PBR within the EEZ
- Reduce FKW M&SI rate
- Measurably reduce FKW take rate
- Convene the Team twice each year for the two years following plan implementation
- Achieve observer deployment levels of 25% or more in the deep-set fishery

- Make progress in each of the four identified research categories
- Complete 2010 abundance survey and provide the results in the manner recommended in the Plan
- Complete abundance surveys on recommended schedule (every five years)
- Achieve rapid processing of and notification of the Team of FKW M&SI information

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12 LIST OF APPENDICES

APPENDIX A

Contact Information for Team Members and Alternates

Under the 1994 amendments to the Marine Mammal Protection Act (MMPA), NOAA Fisheries (NMFS) is required to establish Take Reduction Teams to develop and implement Take Reduction Plans for reducing incidental mortality and serious injury to strategic stocks of marine mammals that interact with commercial fisheries. The MMPA provides guidance regarding the membership and composition of Take Reduction Teams. For example, Section 118(f)(6)(C) states that:

> Members of take reduction teams shall have expertise regarding the conservation or biology of the marine mammal species which the take reduction plan will address, or the fishing practices which result in the incidental mortality and serious injury of such species. Members shall include representatives of Federal agencies, each coastal State which has fisheries which interact with the species or stock, appropriate Regional Fishery Management Councils, interstate fisheries commissions, academic and scientific organizations, environmental groups, all commercial and recreational fisheries groups and gear types which incidentally take the species or stock, Alaska native organizations or Indian tribal organizations, and others as the Secretary deems appropriate. Take reduction teams shall, to the maximum extent practicable, consist of an equitable balance among representatives of resource user interests and nonuser interests.

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APPENDIX B

Key Outcomes Memoranda for the False Killer Whale Take Reduction Team Meetings

False Killer Whale Take Reduction Team
Meeting #1, February 17-19, 2010
Honolulu, HI

KEY OUTCOMES MEMORANDUM

I. OVERVIEW

The National Marine Fisheries Service (NMFS) held the first meeting of the False Killer Whale Take Reduction Team on February 17-19, 2010, in Honolulu, Hawaii. (See **Attachment 1** for a copy of the agenda.[1]) The meeting focused on the following objectives:

- Introduce TRT members and staff
- Review project goals and approach
- Provide common understanding: population estimates, serious injury and mortality estimates, species behavior, fisheries practices, etc.
- Understand Team members' underlying interests and aspirations
- Initiate discussions related to possible elements to include in a Take Reduction Plan
- Consider information needs to support Team deliberations
- Outline next steps

This meeting summary is presented in five main sections: Overview, Participants, Meeting Materials, Key Outcomes, and Next Steps. The Key Outcomes section is further segmented into the following:

- ***Welcome and Introduction.*** This section provides a brief overview of meeting, purpose, agenda overview and ground rules.
- ***Background Briefings and Presentations.*** This section summarizes the various briefings presented at the meeting outset.
- ***Overarching Themes.*** This section summarizes the results of the team's brainstorming and deliberations over the three-day meeting. Any recommendations or actions agreed to by the Team are called out in this section.

Additionally, a number of meeting materials are included as attachments.

II. PARTICIPANTS

The meeting was attended by nearly the entire Team: seventeen of the nineteen full Team members and one alternate. Participants included the following: William Aila, Robin Baird, Steve Beverly, Brendan Cummings, Paul Dalzell, Sharon Young, Hannah Bernard, Ryan Steen,

[1] In addition to the main meeting, an orientation session was held the morning of February 17 for those who did not attend the November pre-meeting. As well, there were two optional field trips conducted before and after the Team's February 19 deliberations: one to the Honolulu fish auction and the longline vessel *Katy Mary* (owned by Vessel Management Associates); the other to observe Kina, a captive false killer whale, at the University of Hawaii's Hawaii Institute of Marine Biology facilities on Coconut Island.

Clint Funderburg, John Hall, Kristy Long, Kris Lynch, Paul Nachtigall, David Nichols, Tory O'Connell, Andy Read and Lance Smith. John LaGrange attended as an alternate in place of Jerry Ray, and only one Team member – Roger Dang – was not in attendance.

Lisa Van Atta and Nancy Young, both with NMFS Pacific Islands Regional Office (PIRO), and Erin Oleson and Karin Forney, with the Pacific Islands and Southwest Fisheries Science Centers, respectively, also joined in Team deliberations. Scott McCreary and Bennett Brooks from CONCUR, an environmental dispute resolution firm specializing in marine resource and water issues, served as the neutral facilitators. As well, about 20 people, including staffers from NMFS, NOAA Office of Law Enforcement, the U.S. Coast Guard and other entities, attended all or part of the meeting.

III. MEETING MATERIALS

Extensive meeting materials were provided to support the group's deliberations. Virtually all meeting materials were sent out ahead of time, but some documents and all presentation material were distributed as handouts. (A detailed listing of materials is included as **Attachment 2.)** All materials are available on the web at http://www.nmfs.noaa.gov/pr/interactions/fkwtrt/).

IV. KEY OUTCOMES

Below is a summary of the main topics and issues discussed. This summary is not intended to be a meeting transcript. Rather, it provides an overview of the main topics covered, the primary points and options raised in the discussions, and areas of full or emerging consensus.

A. Welcome and Introductions

The meeting began with a welcome by Lisa Van Atta, PIRO Assistant Regional Administrator for Protected Resources, who thanked participants for their participation and commitment. This was followed by a brief overview of the meeting purpose, self-introductions, and a review of the meeting agenda. The Team next reviewed draft Ground Rules prepared by CONCUR and – after making revisions to the Media Contact ground rule to more clearly delineate guidelines related to general media contacts versus false killer whale take reduction-focused inquiries – participants unanimously ratified the guidelines. (The revised ground rules are included as **Attachment 3**.)

The opening discussion also included a chance for Team members to voice their expectations for the process and underscore their primary objectives. Comments centered on the following:

- Broad support for the process, with participants emphasizing the opportunity to make an impact both in Hawaii and in fisheries worldwide striving to successfully address issues related to marine mammal depredation and bycatch. Several participants underscored the importance of participants setting aside their traditional roles and working collaboratively to find workable solutions.
- Interest in finding creative gear solutions, potential fixes tied to passive deterrence, and improving future abundance and PBR estimates for false killer whale stocks.

- Optimism based on (1) the Hawaii longline fleet's demonstrated ability and willingness to identify and commit to address tough bycatch issues; and (2) the shared interest among fishermen and conservationists to reduce bycatch.
- Potential to resolve differences through new strategies that fix the underlying problems and minimize the likelihood of time-consuming and expensive lawsuits.
- The need to consider solutions at four different conceptual levels: avoiding overlap between whales and the fishery (in time and space); avoiding interaction (if whales and longliners are in the same areas); avoiding hookings and entanglements (if interactions occur); and avoiding serious injuries (if hookings or entanglements result).
- Strong interest in having Team members visit longline boats and see fishing gear to ensure deliberations are rooted in the reality of the fishery's mechanics.
- Recognition that the six-month timeframe gives the Team an opportunity to make a good start, yet an awareness that longer-term fixes – focused both at minimizing interactions and improving abundance estimates – will necessitate a longer time horizon and additional deliberations.

Finally, several participants noted that the Team, as composed, brings the appropriate interests to the table – both Team members and supporting staff (NMFS and others).

B. Background Briefings and Presentations

The meeting included focused updates on a number of topics. Below is a quick synopsis of the topics covered. (Broader discussion themes based on these presentations are captured in Section C below.) As noted earlier, copies of all presentations are available on-line.

- ***False Killer Whale Take Reduction Process Overview.*** K. Long and N. Young with NMFS provided a brief overview of the Take Reduction Team process, emphasizing Plan goals and content, participant roles, and the overall Team timeline.

- ***False Killer Whale Take Reduction Team Scope.*** N. Young summarized the Team's proposed scope as listed in the *Federal Register* (FR) notice, noting both the fisheries and stock to be included and presenting the underlying rationale for what is and is not included. She further noted the opportunities for the Team to consider other stocks and fisheries not formally included in the scope.

- ***Background Information: False Killer Whale Assessments and Biology.*** K. Forney and E. Oleson provided a brief overview of the false killer whale assessment and biology information presented in greater detail at the November 2009 pre-TRT meeting. The presentations included information on false killer whale stock structure, insular and pelagic stock overlap, species movement patterns and echolocation behavior.

- ***Overview: Observer Program and Fisheries-False Killer Whale Interactions.*** K. Forney presented an overview of the NMFS Observer Program and fisheries-false killer whale interactions, which included information on observer program protocols, observer data forms used, and frequency of depredation and marine mammal takes. The presentation also included a summary of takes by time of year and location, as well as

Observer Program videos showing false killer whale interactions with longline fishing gear and their behavior around longline vessels.

- ***Stakeholder Assessment Summary.*** B. Brooks and S. McCreary presented an overview of key findings from their confidential interviews conducted with a wide range of stakeholders prior to the TRT's formal convening. CONCUR's synthesis centered on interviewees' recommendations for structuring Team deliberations, sharing information, and initial ideas for reducing takes of false killer whales.

- ***Hawaii Longline Fishery.*** Team member P. Dalzell provided a detailed overview of the Hawaii longline fishery, summarizing trends related to fleet size, number of trips, hooks, and catch type, size and value. Additionally, his remarks included information on fishing tactics and gear, related regulations, and fleet ownership and characteristics by ethnicity.

- ***Lessons Learned.*** In response to stakeholder interest in "not reinventing the wheel" – a comment heard frequently in CONCUR's stakeholder interviews – several presentations focused on summarizing lessons learned from other fisheries striving to address depredation and marine mammal bycatch issues. Presentations included the following:

    - ***Mitigating cetacean depredation.*** E. Oleson summarized lessons learned from other efforts worldwide to better understand and identify effective strategies for mitigating marine mammal depredation. Her presentation focused on two general topics – behavioral insights and mitigation strategies – and called out both promising and problematic findings. Her presentation drew on, among other things, the 2006 Vancouver Depredation Symposium, Geoff McPherson's recent acoustic-related work, the Western Pacific Regional Fishery Management Council's Marine Mammal Advisory Committee, and the 2007 Seychelles Depredation Workshop.

    - ***Take Reduction Teams.*** K. Long summarized actions and approaches adopted as part of take reduction plans developed by other teams. Her presentation highlighted both regulatory and non-regulatory measures, including gear modifications, changes in fishing practices, fishery-specific limits, time and/or area closures, training and/or certification workshops, marine mammal and fishery research, monitoring, and enforcement.

    - ***Atlantic Pelagic Longline Take Reduction Team.*** Laura Engleby, Marine Mammal Branch Chief with NMFS's Southeast Regional Office, presented a detailed overview of the Atlantic Pelagic Longline Take Reduction Team's approach to reducing marine mammal takes in the East Coast longline fishery. The presentation offered a comprehensive overview, highlighting: background and impetus; scope and goal; challenges; strategies for reaching consensus; and the eventual regulatory and non-regulatory aspects of the Plan. A key aspect of L. Engleby's presentation focused on the use of predictive models to assess the potential impact on takes of possible gear modifications and fishing practices.

- ***Assessment of Patterns in Observer Data.*** K. Forney presented some first-cut findings of a data-mining exercise to assess patterns in the Observer Program data collected between 2003 and mid-2009. Though preliminary in nature, the review of the data suggested several areas meriting a closer look. These included the potential impact of seasonality, hook type, and soak time. K. Forney underscored the need for further analysis and input from Team members to better assess and understand potential patterns.

C. Overarching Themes

The Team's deliberations over the course of the three-day meeting generated a number of overarching themes. These themes aggregated into a handful of categories: (1) Team process/focus; (2) underlying abundance estimates; (3) possible mitigation strategies; (4) Observer Program data (5) research needs; and (6) other. Below is a synthesis of the Team's key discussion points.

Team Process/Focus

Presentations generated extensive Team discussions and feedback on the Team's upcoming work – both the focus of its deliberations and various strategies for supporting productive discussions. Key themes focused around the following topics:

- ***Scope Concerns[2].*** Several Team members voiced concern regarding the scope as outlined in the FR notice. The most significant concern centered on including the insular stock, with one Team member suggesting the scope should not include the insular stock as the added task risked diverting Team focus from the pelagic stock. The Team member further suggested that including the insular stock falls short of meeting MMPA standards as there are no documented interactions between insular false killer whales and the longline fleet[3], nor have any insular false killer whales been tracked beyond the longline exclusion zone. Another Team member voiced concern regarding the absence of recreational charter boats. (K. Long noted that, under the MMPA, the take reduction process applies only to commercial fisheries.) NMFS staff reminded Team members that any formal comments on Team scope are to be submitted by 5 pm (EST) on February 18.

- ***Distinction Between Near-Term and Longer-Term Solutions.*** A number of Team members emphasized the importance of distinguishing between actions likely to generate the critical near-term results (i.e., reduce mortalities and serious injuries below PBR) and those candidate actions likely to yield a longer-term return (e.g., reducing takes to levels approaching zero mortality, improving abundance estimates, etc.) These distinctions are critical, several participants said, as the Team's immediate task is to successfully address the near-term challenge.

[2] It is worth noting that several Team members who submitted written comments to NMFS opted not to voice their comments again during the Team meeting. Lack of comment during the meeting should not necessarily be interpreted as endorsement of the scope as put forward by NMFS.

[3] Another Team member noted that, while there are no documented interactions between insular false killer whales and the longline fleet, genetic samples are only available for a small number of takes.

- ***Need to Identify Concrete Near-Term Actions.*** Team deliberations highlighted the importance of generating a suite of near-term actions that can, to the extent possible, be expected to reduce false killer whale takes below PBR. Team members noted that the eventual recommendations are likely to encompass a range of actions – regulatory and non-regulatory, highly quantifiable and less quantifiable – but the intent should be to craft a package that NMFS can accept based on its follow-on analysis of the expected impact. Some Team members were interested in the predictive model developed to support the Atlantic Pelagic Take Reduction Team's deliberations and asked that a similar model be developed to support its work. (K. Forney noted that she intends to use the Observer Program data to develop such a model in support of the Team's work.)

- ***Importance of Early-On Brainstorming.*** Several participants encouraged Team members to – in the early phase of discussions – brainstorm a wide range of possible options, noting that early-on recommendations in other teams that were dismissed as being unworkable (i.e., pingers) proved to be a key to reducing takes. At the same time, several comments stressed that the Team's deliberations take into account the viability of any potential action (will it be effective, practical, safe, enforceable, impact bycatch or target catch, etc.). Several team members agreed that these questions are crucial, but recommended they be engaged later in the process. To that end, Team members asked that its work be supported by the Coast Guard, law enforcement, and others able to advise on candidate actions' viability.

- ***Fishing Industry Input Key.*** Several Team participants emphasized the importance of garnering extensive input from the broader longline fishing community – both to inform the Team of mitigation measures already in use and to provide feedback on the viability of ideas developed during Team discussions. This feedback, Team members said, needs to span the full ethnic make-up of the longline fishery. Fishing representatives around the table agreed to work aggressively to engage the broader fishing community. Team members also encouraged NMFS to foster an outreach effort (though participants agreed that the fishing representatives around the table – and not NMFS – will likely be more effective in engaging fishermen.)

- ***Other.*** The Team's discussions generated other topics related to process and focus, such as:

    - Interest in understanding how cost is factored into Team deliberations. (Answer: Cost-effectiveness of potential fixes is not formally factored in until takes are below PBR.)
    - Noting the potential for Team members to advocate for adequate funds to support Team recommendations (though it was noted that this effort would need to be done independent of a formal Team recommendation or action).
    - Clarifying that only full Team members – and not alternates – get to formally weigh in on Team support for proposed recommendations (unless, of course, the full Team member is not present). B. Brooks with CONCUR also emphasized that full Team members are expected to participate in all meetings unless they have unavoidable constraints.

Abundance Estimates

Several Team members expressed concern that the abundance and bycatch estimates underpinning the establishment of the Team are not statistically sound, and they pressed for different methods to calculate these figures. Specific concerns about the data focused on the following: (1) abundance estimates are based on soon-to-be "stale " (i.e., nearly eight-year-old) data; (2) current levels of genetic sampling are not sufficient to distinguish stocks other than the insular stock; (3) the full range of overlap between the insular and pelagic stock is not well established; (4) the Team does not have the benefit of the 2010 SAR figures to inform its deliberations; (5) calculations of PBR are overly precautionary; (6) abundance estimate methodologies may underestimate false killer whale population estimates.; and (7) bycatch estimates may be negatively skewed as bycatch coded as "blackfish" are not incorporated into the false killer whale data.

NMFS staff acknowledged the potential to strengthen the underlying data and encouraged the Team to recommend strategies for longer-term improvements. (Team member recommendations for strengthening these data are included in the research recommendations section below.) But, NMFS staff said, the Team is required under the MMPA to use the best available science to inform its deliberations (in this case, the 2009 Stock Assessment Report, or SAR). Additionally, NMFS noted that it hopes to make available data from the draft 2010 SAR in time to inform the Team's near-term deliberations. Finally, NMFS offered to provide feedback at a later date on the legal and practical ramifications of the concern tied to NMFS's aging underlying data. Staff also emphasized that while the abundance and PBR estimates contain a number of uncertainties, the figures included in the SAR are based on established methodologies and best practices and there is no evidence to suggest abundance estimates are biased in any direction.

Mitigation Strategies

The bulk of the Team's initial deliberations centered on early brainstorming related to possible mitigation strategies. In discussing possible actions, Team members suggested a handful of cross-cutting recommendations and parameters to guide the Team's thinking.

- Conceptualize actions as addressing one of four different scales: avoiding overlap; avoiding interaction; avoiding hookings and entanglements; and avoiding serious injuries. This approach was also summarized as identifying candidate actions that can "avoid," "deter," and "protect."
- Take into account other regulatory requirements and considerations when devising strategies to reduce false killer whale takes. For example, the Team needs to make sure actions intended to protect false killer whales do not unintentionally undermine or run contrary to existing efforts to protect seabirds or turtles.
- Recognize the extent to which a range of strategies and approaches – and not just one quick fix – are likely to be needed to meet the near-term goal. To that end, explore multiple paths early on.
- Rely on local fishermen's expertise and past practices to inform the Team's deliberations.

The Team's deliberations centered on a range of possible fixes, with initial suggestions centering on gear modifications, vessel lights and acoustics, early detection of the presence of whales, and improved communications within the fleet. Below is a table summarizing the range of actions mentioned by Team members.

List of Mitigation Ideas Brainstormed During FKWTRT Meeting *(List is intended to spark discussion only; the Team did not endorse any particular ideas nor are candidate actions presented in any type of ranked order)*	
Category	**Possible Action**
Strategies to reduce false killer whale chances of finding vessels	- Lower-profile deck lighting - Intermittent use of spotlights instead of constant lighting to find buoys - Intermittent lights on buoys - Use of oceanographic buoys (NMFS, naval, other) to foster location and avoidance of FKW - Real-time fleet communication to foster avoidance of whales - Use of hydrophones from longliners to identify presence of FKW - Annual haul-out to reduce vessel noise profile (change rudder, cutlass bearing, etc.) - Degaussing of steel boats (demagnetize) - Direct current through vessel hull to eliminate electric profile - Diminish hydraulic profile (pumps, hoses, reel, steering) to background levels - Decoy buoys
Strategies to minimize active depredation	- Small solid structures (i.e., plastic beads) to alter acoustic target profile of bait/catch - Streamers deployed alongside hook to change acoustic target profile of bait/catch - Different leaders to change acoustic target profile - Use of nails/metal tabs in bait tail to change acoustic target profile - Revised rules to allow fishermen to retain gills/guts on board - Offal processed on-board into an on-vessel commodity - Retention of bait during haul - Limits on line length and/or soak time - Vessel shift in location/tactics once whales are spotted
Strategies to minimize hookings	- Expanded use of hook types, designs and sizes that reduce bycatch (i.e., circle hooks)
Strategies to minimize serious injuries and mortalities	- Use of weak hooks - Use of barbless hooks

As noted earlier this summary, these ideas were put forward in the spirit of brainstorming and were not evaluated based on viability or acceptability at this point.

Research Activities

The Team spent significant time identifying research needs. Below, however, is a brief synthesis of key research themes that emerged during the Team's discussions.

- The importance of distinguishing between near-term tasks needed to inform development of the Take Reduction Plan within the next few months and those longer-term tasks intended to improve abundance estimates and identify future mitigation measures. Near-term tasks focused primarily on further mining of observer data; identifying near-term gear changes that have the potential to reduce the likelihood of depredation; understanding the recent increase in depredation and takes; and assessing the impact on depredation and take rates of recent fleet movements to the north and east.

- As noted above, Team members expressed great interest in looking more deeply into the observer data to identify possible correlations and fixes. Discussion sparked several areas for further exploration, including the following: (1) looking at sets without depredation to identify shared characteristics; (2) identifying possible distinctions in the East-West break along Necker Ridge; (3) understanding the relationship between hook type and injury severity; (4) exploring depredation patterns by vessel ownership; (5) assessing links, if any, between catch rates and depredation; (6) assessing the extent to which there is any observer effect on data; and, (7) identifying boats that have never been "whaled." (As one Team member put it: The search for the unicorn.) Additionally, members suggested using vessel logbook data and, as needed, VMS data to create a richer database. Based on the discussion, K. Forney asked Team members to review the list of variables collected by observers and identify candidates to evaluate.

- Team members' interest in longer-term research tended to aggregate around the following topics: (1) improving abundance estimates and other underlying calculations and assumptions that determine overall species status and allowable take levels; (2) better understanding false killer whales' ability to echolocate vessels, hooks and prey; (3) better understanding the acoustic profile of longline vessels and their various systems and gear to inform masking strategies; (4) identifying modifications to leaders, hooks and other gear that can alter the acoustic target profile to deter false killer whale depredation; (5) better understanding false killer whale behavior, with a particular emphasis on understanding learned behavior – both positive and negative and across age ranges; and (6) sharpening classification of false killer whale echolocation and vocalizations (with an eye towards reducing false positives among other species). There was also interest in gathering data on the shortline and kaka line fisheries.

- Recognize that Team members can play a role – informally – in making the case to NMFS senior management and others to provide the resources necessary to undertake a robust and timely research agenda. (NMFS staff emphasized that any efforts along those lines needed to be undertaken independent of the Team.)

A detailed list of research needs are summarized in the table on page 11 under Next Steps.

Other

Team deliberations raised numerous other issues not yet captured in the summary above. Below is a listing of some of the other issues and themes that emerged during the discussion.

- ***Monitoring.*** Team members expressed interest in better understanding how Plan effectiveness will be monitored and assessed. This is particularly pertinent, they said, as it is particularly difficult to assess changes in a fishery with very low levels of takes.
- ***Compliance.*** Several members underscored the critical importance of compliance – both in assessing the viability of a measure and in assessing the effectiveness of actions eventually adopted.
- ***Data Requests.*** Team members identified numerous data requests during the course of the meeting. These requests are summarized in the Next Steps section below.

V. NEXT STEPS

A. Research Needs

Based on Team discussions, K. Forney and E. Oleson on Day Three presented possible research needs sorted into three categories: (1) short-term information needs, to support the Team's April deliberations; (2) medium-term, to support the Team's deliberations over the next five months; and (3) longer-term, to support consideration of false killer whale issues over the next two years. Below is a synopsis of the needs summarized by K. Forney and E. Oleson, as well as comments provided by Team members.

Research Needs to Support False Killer Whale Take Reduction Team			
Short-Term – General (by April meeting)	**Short-Term – Observer Program Data (by April meeting)**	**Mid-Term – General (over next four months)**	**Long-Term – General (six months to two years)**
• Assess changes in depredation before and after gill/gut Dec. 2004 regulations • Determine extent to which false killer whales are able to drag hooks & catch to surface if hooked at deepest part of set • Understand which vessel characteristics serve as proxy for noise profile • Compile information related to FKW echolocation capabilities • Identify further insights from Geoff McPherson & Tom Nishida • Assess vessels using various light configurations • Evaluate split sets • Determine parity between observer and logbook datasets • Elicit fisherman input into depredation avoidance techniques	• Assess individual vessel effects (light, sound) • Identify spatial-temporal patterns in distribution of effort and depredation • Determine percent of boats with mixed hook types • Identify within-set patterns of depredation and bycatch • Tease out rates of false killer whale bycatch in sets/trips with/without depredation • Determine depredation rates given soak time pattern relative to other variables • Assess relationship between depredation and spacing of fishing vessels • Supplement observer data with vessel logbook or VMS data, if possible	• Develop photo-ID of pelagic-zone animals, including scars & disfigurements • Pursue additional satellite tagging (April) • Develop acoustic characterization of insular vs. pelagic animals • Develop predictive model of potential measures (take rate, depredation rate, target catch, fleet movements) • Determine feasibility of mooring listening stations (FADs, NOAA weather buoys)	• Conduct FKW-targeted research on the R/V Sette, September 2010 • Pursue longline acoustic monitoring • Undertake photo-ID & movement studies • Examine echolocation, foraging and acoustic behavior using acoustic tags • Conduct echolocation studies with respect to detection of hooks in fish • Develop methods for pro-rating "blackfish" bycatch • Pursue recording acoustic profile of individual longline vessels • Undertake HICEAS II-Hawaii EEZ survey 2011 • Develop predictive habitat modeling • Better understand mechanism of hooking • Better understand adaptive learning by FKW, and particularly young animals

In comments following the presentation, Team members added the following suggestions:
For short-term:

- Gain access to non-confidential observer data for Team members.
- Better understand the percentage of boats that use uniform hook types. Such data, Team members said, would make it possible to compare depredation rates by hook type.
- Mine vessel logbook data to learn more about depredation activity.
- Understand set size to get better feel for the relationship between depredation and CPUE (catch per unit effort).
- Use observer data to identify individual vessels that have higher than average depredation and/or no depredation; look for factors that may be influencing varying depredation rates.

For medium term:

- Consider opportunity for fleet to use acoustic recorders to determine false killer whale presence.

- Begin collecting data on shortline/kaka line fishery – where fishing, how fishing, etc. This included a suggestion that NMFS consider strategies to provide observer coverage for these fisheries (either on-board or through alternative platforms).

For longer term:

- Consider more efficient/alternate ways to measure abundance.
- Move forward on industry support for engaging vessels in false killer whale photo identification.
- Consider ways Team members (external to NMFS) can generate funding/other support for 2011 survey.

B. Meeting Timeline

CONCUR provided an overview of the Team's expected meeting schedule and focus between the February 17-19 meeting (Meeting #1) and the July 19, 2010, deadline for submitting a consensus take reduction plan to NMFS. Key dates are as follows:

- April 6-9: Meeting #2 (Maui)
- May 4-7: Meeting #3 (Big Island Kona side)
- Week of June 14: Meeting #4 (Kauai or Maui); three- to four-day meeting
- Mid-June to July 19: Team member review and confirmation of the final Draft TRP via email and/or teleconference

Additionally, CONCUR noted that work teams will be convened between meetings to develop ideas for discussion at the full Team meetings.

C. Work Teams

Given the extensive work to be completed in the next few months, Team members agreed to form between-meeting work teams to generate options for further consideration. The work teams – open to all interested Team members and expected to begin meeting between now and the April meeting – are to be convened by teleconference; all materials developed as part of work team discussions will be shared with the Team for its full deliberation. Below is an overview of work group focus and participants.

- **Data Analysis/Mining Work Team:** Andy, Sharon, Robin, Ryan, Tory
- **Potential Solutions Work Team:** Hannah, Kris, Paul D., Clint, Andy, Tory, William, Steve, Brendan, John L. (possible), Robin (as observer only)
- **Outreach:** David, Paul D., Kris, Hannah, Robin, Ryan
- **Research Needs:** Paul N., Tory, Robin, Kris, Sharon, Paul D., David, John H.

Additionally, L. Van Atta, E. Oleson, P. Dalzell and A. Cole will meet to explore the viability of accessing VMS data, if needed, to support better understanding of observer data.

D. Project Web Page

The Team briefly discussed the use of web pages to support False Killer Whale Team deliberations. NMFS staff noted that both PIRO and headquarters Office of Protected Resources have web pages set up to provide information related to the Team. Participants agreed that an additional mechanism – either a separate web page, email exchanges or an FTP site – is needed to support the Team's sharing of draft materials. NMFS and CONCUR are to consider options and provide an update to the Team via email.

E. Team Travel

CONCUR noted that travel and hotel arrangements for future meetings will be handled by NMFS. Several Team members expressed concern that NMFS-arranged travel is cumbersome and a significant detriment to participation. At least one Team member favored NMFS-arranged travel, as it eliminates the need to cover direct expenses upfront and then await reimbursement. K. Long is to explore options and provide an update to the Team via email.

F. Next Steps

Based on the three-day meeting, participants agreed to a series of next steps to be completed prior to Meeting #2 in April. The table on the following page summarizes these activities.

False Killer Whale Take Reduction Team Primary Next Steps	
Interim Deliberations	• Convene Work Teams focused on Outreach (by early March), Data Analysis and Mining (by early March), Potential Solutions (by mid-March), and Research Needs (by late March); all Work Teams expected to convene via teleconference • L. Van Atta, E. Oleson, P. Dalzell and A. Cole to explore viability of accessing VMS data, if needed, to support better understanding of observer data
Information-Related	• Provide Team members with: (1) electronic copies of completed Observer take forms; (2) categories included on observer forms (to inform Team input into further analyses); and (3) vessel self-reports on takes, if any • Team members to provide input on further analyses based on Observer Program data • A. Read to provide, as possible, recent weak hook studies (Kerstetter, Gulf of Mexico) • P. Nachtigall to work with NMFS staff to provide relevant echolocation data • K. Forney to provide detailed spatial and temporal data on take locations • Solicit input from fishermen regarding past actions aimed at limiting depredation
Logistics	• Determine approach to handle Team member travel and hotel arrangements • Identify web-based mechanism for Team to share draft documents • Provide Team members with electronic version of presentations (as appropriate) • Add alternate members to Team email string
Other	• CONCUR/PIRO to contact those individuals expected but unable to attend Meeting #1; assess future participation • HLA, others to undertake efforts to ensure longline fleet aware of and engaged in TRT issues • CONCUR to provide draft Key Outcomes by mid-March for review by Team • NMFS General Counsel to provide feedback on ramifications of "aging/stale" data • NMFS to consider request to appoint Eric Gilman as alternate for Steve Beverly

Questions or comments regarding this summary should be directed to Bennett Brooks (212-678-0078 or *bennett@concurinc.net*) or Scott McCreary (510-649-8008 or *scott@concurinc.net*).

ATTACHMENT 1

False Killer Whale Take Reduction Team Kick-Off Meeting
February 17-19, 2010: Sheraton Waikiki, Honolulu, Hawaii

AGENDA

(as of 2/17/10)

MEETING OBJECTIVES

- Introduce TRT members and staff
- Review project goals and approach
- Provide common understanding: population estimates, takes, serious injury and mortality, species behavior, fisheries practices, etc.
- Understand Team members' underlying interests and aspirations
- Initiate discussions related to possible elements to include in a Take Reduction Plan
- Consider information needs to support Team deliberations
- Outline next steps

DAY ONE, FEBRUARY 17: AFTERNOON[1]

Arrival and Greetings **12:45 PM**

Welcome and Introductions **1:00 PM**

- Welcome and Opening Pule *(Van Atta, Aila)*
- Meeting Purpose *(CONCUR)*
- Self-Introductions

Meeting Approach **1:20 PM**

- Review and confirm proposed Meeting Agenda *(CONCUR)*
- Review, revise and adopt proposed Ground Rules *(CONCUR)*

False Killer Whale Take Reduction Process Overview **2:00 PM**

- Brief overview of project parameters *(K. Long, N. Young)*
- Initial opportunity for Team member comment on project aims and aspirations

[1] *Note: There is a morning orientation session from 9 a.m. to 11:00 a.m. It is intended for TRT members who did not attend the November pre-meeting, but all interested Team members and public are welcome to attend.*

False Killer Whale Take Reduction Team Scope **2:40 PM**

- Present summary of and rationale for Team scope; synthesis of public comments received to-date *(N. Young)*
- Clarifying questions and comments from Team members

Break ***3:10 PM***

Initial Discussion: Background Information **3:30 PM**

- Review false killer whale assessments: stock structure, abundance, bycatch (*E. Oleson,30 minutes total*)
  - Presentation, followed by questions and comments
- Overview of false killer whale biology, including acoustic capabilities (*E. Oleson, 40 minutes total*)
  - Presentation, followed by questions and comments

Public Comments **4:40 PM**

Preview of Day Two **5:00 PM**

Adjourn **5:05 PM**

Team Dinner *(location to be determined)* **6:30 PM**

DAY TWO, FEBRUARY 18: FULL DAY

Arrival and Greetings **8:15 AM**

Welcome and Overview **8:30 AM**

- Overview of Day Two agenda and focus *(CONCUR)*
- Questions and Comments from Day One *(PIRO, CONCUR)*

Discussion: Background Information *(continued)* **8:45 AM**

- Overview (*K. Forney, 40 minutes*)
  - Deep-set and shallow-set fisheries: effort, seasonality, key distinctions and overlap with cetacean takes
  - Observer Program data and nature of interactions between fishery and false killer whales
- Team member comments and questions (*20 minutes*)

Break ***9:45 AM***

Initial Discussion: Beginning the Search for Solutions **10:00 AM**

- Briefing on Stakeholder Assessment *(CONCUR, 15 minutes total)*
  - Brief overview of key findings followed by stakeholder comments
- Understanding the Fisheries
  - Summary of longline fishery mechanics (*P. Dalzell, 25 minutes, including Q&A)*
    - Existing rules/regulations that shape fishery
    - Fishing practices/gear
    - Brief synthesis of ethnic composition of fishery
  - Team Discussion: Cultural aspects of fishery and potential implications for Take Reduction Plan approach *(20 minutes)*
- Lessons Learned *(E. Oleson, 60 minutes total, including 30 minute Q&A)*
  - Summary of key findings related to depredating cetaceans and potential mitigation strategies. Includes findings from Vancouver Symposium, MMAC, Fishermen Survey (TEC Report) and other relevant workshops/ studies
  - Team member comments and questions

Lunch ***Noon***

Initial Discussion: Beginning the Search for Solutions *(continued)* **1:15 PM**

- Lessons Learned – Continued *(75 minutes total)*
  - Presentations
    - General overview of actions and approaches adopted by other Take Reduction Teams *(K. Long, 20 minutes total, including Q&A)*
    - Overview of approaches taken by the Atlantic Pelagic Longline Take Reduction Team *(L. Engleby, 55 minutes total, including Q&A)*
  - Team member comment and questions following each presentation
- Assessment of patterns in observer data *(K. Forney, 45 minutes total)*
  - Presentation
    - Summarize data sets, analysis and results of bycatch correlate re-analysis
  - Team member comment and questions during and after presentation

Break ***3:15 PM***

Initial Discussion: Beginning the Search for Solutions *(continued)* **3:30 PM**

- Team Member Initial Thoughts and Recommendations
  - Open discussion on Team member preliminary thoughts regarding possible management actions and approaches based on "*Lessons Learned*" discussion and other materials presented

Public Comments **4:55 PM**

Preview of Day Three **5:10 PM**

Adjourn **5:15 PM**

Team Happy Hour *(location to be determined)* **5:30 PM**

DAY THREE, FEBRUARY 19: MORNING ONLY

Arrival and Greetings **7:50 AM**

Welcome and Overview **8:00 AM**

- Overview of Day Three agenda and focus *(CONCUR)*

Continued Discussion: Lessons Learned **8:15 AM**

- Opportunity for Team members to fold in additional reflections based on Day Two *"Lessons Learned"* discussion; provide any updates on informal discussions and caucuses

Discussion: Developing TRT Work Plan **9:15 AM**

- Information Needs to Support Team Deliberations (*K. Forney/E. Oleson presentation*)
  - Team member feedback on essential short-term and longer-term needs for the TRT (information, data, analyses). Focus on identifying critical unknowns and data gaps.

Break ***10:45 PM***

Continued Discussion: Developing TRT Work Plan **11 AM**

- FKWTRT Meeting Schedule *(20 minutes, CONCUR)*
  - Outline and seek feedback on planned schedule, locations and topics
- Work Teams *(30 minutes, CONCUR/PIRO)*
  - General discussion on use of work teams, as well as a more focused conversation – based on Team deliberations thus far – regarding immediate Work Team needs. Also consider outreach needs.
  - Also can and should include discussion of TRP drafting and process. To what extent is it good/helpful to have Team members engaged in the drafting process? What's the timeline and steps for developing a draft TRP?
- Team Web Site *(10 minutes, CONCUR/PIRO)*
  - Information available
  - How best to use to support Team deliberations
- Next Steps (*15 minutes, CONCUR/PIRO*)

Public Comments **12:15 PM**

Adjourn **12:30 PM**

ATTACHMENT 2

False Killer Whale Take Reduction Team (FKWTRT)
Meeting #1, February 17-19, 2010
Honolulu, Hawaii

Meeting Materials

1) General Meeting Information
   a. Provisional Meeting Agenda
   b. Team Member and Alternate List
   c. Proposed Ground Rules
   d. CONCUR Introduction
   e. CONCUR Stakeholder Assessment Report (Interviews Summary) (*to be provided at meeting*)

2) Process Overview
   a. Federal Register notice establishing the FKWTRT (75 FR 2853, January 19, 2010)
   b. Frequently Asked Questions about the False Killer Whale Take Reduction Process (*to be provided at meeting*)

3) Background Information
   a. Draft 2009 Stock Assessment Report (SAR) (*or Final 2009 SAR to be provided at meeting if available*)
   b. Forney, K.A. 2009 Serious injury determinations for cetaceans caught in Hawaii longline fisheries during 1994-2008. Draft document PSRG-2009-09 presented to the Pacific Scientific Review Group, November 3-5, 2009, Del Mar, CA.
   c. Table of Pacific Islands Region Cetacean Mortalities and Serious Injuries and Potential Biological Removal Levels (PBR)
   d. Revisions to Guidelines for Assessing Marine Mammal Stocks (GAMMS II)
   e. Differentiating Serious and Non-Serious Injury of Marine Mammals: Report of the Serious Injury Technical Workshop, 10-13 September 2007, Seattle, Washington.
   f. 90–Day Finding on a Petition to List the Insular Population of Hawaiian False Killer Whales as an Endangered Species (75 FR 316, January 5, 2010)

4) Selected Scientific Literature on False Killer Whales
   a. Baird, R.W. 2009. A review of false killer whales in Hawaiian waters: biology, status, and risk factors. Report prepared for the U.S. Marine Mammal Commission under Order Number E40475499, December 23, 2009, 41 pp.
   b. Baird, R.W., A.M. Gorgone, D.J. McSweeney, D.L. Webster, D.R. Salden, M.H. Deakos, A.D. Ligon, G.S. Schorr, J. Barlow, and S.D. Mahaffy. 2008. False killer whale (*Pseudorca crassidens*) around the main Hawaiian Islands: Long-term site fidelity, inter-island movements, and association patterns. *Marine Mammal Science* 24(3): 591-612.
   c. Madsen, P.T., I. Kerr, and R. Payne. 2004. Echolocation clicks of two free-ranging, oceanic delphinids with different food preferences: false killer whales (*Pseudorca*

crassidens) and Risso's dolphins (*Grampus griseus*). *Journal of the Acoustical Society of America* 207: 1811-1823.

d. Yuen, M.M.L., P.E. Nachtigall, M. Breese, and A.Ya. Supin. 2005. Behavioral and auditory evoked potential audiograms of a false killer whale (*Pseudorca crassidens*). *Journal of the Acoustical Society of America* 118(4): 2688-2695.
e. Reference list of additional false killer whale bioacoustics papers

5) Longline Fishery Information

a. Overview/Description
   i. Swenarton, T. and S. Beverly. 2004. Documentation and classification of fishing gear and technology on board pelagic longline vessels: Hawaii module. Working Paper for the 17th Meeting of the Standing Committee on Tuna and Billfish, Majuro, Marshall Islands, 9-18 August 2004, INF-FTWG-2, 17 pp.
   ii. Pooley, S. 1993. Hawaii's Marine Fisheries: Some History, Long-term Trends, and Recent Developments. *Marine Fisheries Review* 55(2): 7-19.
   iii. Boggs, C.H. and R.Y. Ito. 1993. Hawaii's Pelagic Fisheries. *Marine Fisheries Review* 55(2): 69-82.
   iv. Pacific Pelagic Fisheries Overview – Western Pacific Regional Fisheries Management Council, http://wpcouncil.org/pelagic-fisheriestoday.html
b. Regulations
   i. Summary of Hawaii Longline Fishing Regulations – January 28, 2010
   ii. Seabird Compliance Guide – October 2009
   iii. Sea Turtle Compliance Guide – October 2009
   iv. Protected species placards for longline fishing vessels in the Pacific Islands Region
c. Landings
   i. Pacific Islands Fisheries Science Center. 2009. The Hawaii-based Longline Logbook Summary Report: January–December 2008. PIFSC Data Report DR-09-004, 15 pp.
d. Sociocultural Assessments
   i. Allen, S. and A. Gough. 2007. Hawaii Longline Fishermen's Experiences with the Observer Program. NOAA Tech. Memo. NMFS-PIFSC-8, 47 pp.
   ii. Reference list of additional sociocultural assessments

6) Observer Reports

a. 1994-2001 Annual Reports - HI Longline
b. 2002-2009 Annual Reports - HI Longline Deep-set
c. 2004-2009 Annual Reports - HI Longline Shallow-set
d. Representative Marine Mammal Biological Data Forms

7) Search for Solutions: Lessons Learned

a. Atlantic Pelagic Longline Take Reduction Plan
   i. Atlantic Pelagic Longline Take Reduction Team's recommended Draft Take Reduction Plan
   ii. Final Rule implementing the Take Reduction Plan
b. Summary of existing measures from other Take Reduction Plans (*to be provided at meeting*)

c. The Western Pacific Regional Fishery Management Council's Marine Mammal Advisory Committee (MMAC)
    i. Recommendations from the MMAC
    ii. Table of possible mitigation measures developed by PIRO for the MMAC in 2007
d. Reports from Workshops Addressing the Depredation Issue
    i. Report of the Workshop on Interactions between cetaceans and longline fisheries, 11-15 November 2002, Apia, Samoa
    ii. Relevant abstracts and workshop summaries from the Vancouver Aquarium's Symposium on Fisheries Depredation by Killer and Sperm Whales (Behavioural Insights, Behavioural Solutions), October 2-5, 2006, British Columbia, Canada
    iii. Report of the Workshop on the Depredation in the Tuna Longline Fisheries in the Indian Ocean, 9-10 July 2007, Victoria, Seychelles
e. Acoustic Research on Depredation
    i. Mooney, T.A., A.F. Pacini, and P.E. Nachtigall. 2009. False killer whale (*Pseudorca crassidens*) echolocation and acoustic disruption: implications for longline bycatch and depredation. *Canadian Journal of Zoology* 87: 726-733.
    ii. Thode, A., J. Straley, C.O. Tiemann, K. Folkert, and V. O'Connell. 2007. Observations of potential acoustic cues that attract sperm whales to longline fishing in the Gulf of Alaska. *Journal of the Acoustical Society of America* 122(2): 1265-1277.
    iii. McPherson, G., P. Turner, C. McPherson, and D. Cato. 2003. Testing of acoustic tracking system for toothed whales around longline and gillnet fishing gear, and preliminary trials of depredation mitigation devices for longline fisheries. Project Report (R02/0923). Report to Eastern Tuna Management Advisory Committee, Southern and Western Tuna and Billfish Management Advisory Committee and Australian Fisheries Management Authority, 37 pp.
f. Moreno, C.A., R. Castro, L.J. Mújica, and P. Reyes. 2008. Significant conservation benefits obtained from the use of a new fishing gear in the Chilean Patagonian toothfish fishery. *CCAMLR Science* 15: 79-91.
g. Other Relevant Information
    i. TEC, Inc. 2009. Cetacean depredation in the Hawaii longline fishery: Interviews of longline vessel owners and captains. Report for NOAA NMFS Pacific Islands Regional Office, 34 pp.
    ii. Reference list of additional relevant papers on bycatch and depredation

ATTACHMENT 3

False Killer Whale Take Reduction Team
FINAL GROUND RULES

(Ratified unanimously at February 17-19, 2010, False Killer Whale Take Reduction Team kick-off meeting.)

The following ground rules have been informed by CONCUR's professional experience, discussions with NOAA Fisheries, directives in the Marine Mammal Protection Act, and confidential interviews conducted with the primary Take Reduction Team (TRT) members. These ground rules are intended to foster and reinforce constructive interaction and deliberation among TRT members. They emphasize clear communication, respect for divergent views, creative thinking, collaborative problem solving, trust building, working towards consensus, and the pursuit of mutual gains. The TRT may decide to reconsider and revise these ground rules if they appear not to be serving the TRT process.

1. Membership: TRT members have been invited to serve by NOAA. TRT members were selected based on professional expertise or experience in the areas of conservation or biology of marine mammal species or fishing practices which result in the incidental mortality and serious injuries of such species. TRT members were also selected for their diversity of interests, geographic location, communication network, capability to work with diverse viewpoints, and commitment to developing a consensus-based Take Reduction Plan in the prescribed timeframe. Membership reflects a balance by interest, region, and sector.

   TRT members have also been recruited based upon their ability to ably represent the views of an important constituency. TRT members should work to keep their constituencies informed of the TRT's efforts and to reporting relevant feedback to the TRT. In reporting back, TRT members will strive to integrate the views of their constituency rather than resorting to a "lowest common denominator" portrayal.

2. Alternates: Primary TRT members will make every effort to attend all TRT meetings. For those members unable to attend a meeting due to scheduling conflicts, a designated alternate is invited to attend and speak on behalf of the member. Each team member may have one alternate. Names of candidate alternates are to be submitted at least one month in advance of the next meeting for approval by NMFS. Alternates should represent the same organization or constituency as the primary representative, be knowledgeable and able spokespersons, and be committed to work collaboratively towards a consensus agreement. (Note: If an alternate has already been formally appointed by NMFS, there is no need to reconfirm approval.)

   A Team member who needs to send an alternate is requested to notify NMFS at least two weeks in advance that the approved alternate will attend for them. Primary TRT members will work with their alternates to ensure that they are up to speed on TRT deliberations. This will enable alternates to step in effectively and keep the project from "backsliding." If neither the member nor alternate can participate, another individual is welcome to attend the meeting as an observer.

3. Collaboration. Below are a series of ground rules intended to foster collaborative, effective and respectful Team deliberations.

   - **Active, focused participation**. Every participant is responsible for communicating his/her perspectives. Everyone is encouraged to participate; no one dominates. Only one person will speak at a time and only after being recognized by the facilitation team (CONCUR). Everyone will help stay on track.

   - **Respectful interaction.** Participants will respect each other's personal integrity, values and legitimacy of interests. Participants will assist each other in creating an effective atmosphere by: using microphones; turning off cell phones; refraining from sidebar conversations; and using computers for TRT-related work only.

   - **Integration and creative thinking.** Participants will strive to be open-minded and integrate members' ideas and interests. Participants will attempt to reframe contentious issues and offer creative solutions in a timely fashion to enable constructive dialogue.

   - **Adherence to ground rules.** As a set of mutual obligations, TRT members will commit to adhere to these ground rules once they are adopted. TRT members are encouraged to help uphold and enforce these ground rules.

   - **Negotiating in good faith.** In their formal capacity as TRT members, appointees are asked to negotiate in good faith at and between TRT meetings. Nothing in these Ground Rules limits Team members' abilities to take action in other fora. However, Team members are asked to be mindful of how their actions elsewhere will likely impact the collaborative process and the Team's collective efforts to reach consensus.

4. Meeting Materials: NMFS staff and CONCUR commit to provide, to the extent practicable, all primary meeting materials at least two weeks ahead of time in order to give TRT members ample time to review the relevant information. All TRT members will have equal access to meeting materials. Members are expected to review meeting materials beforehand to foster informed deliberations. Members also are asked to bring their binders to each TRT meeting.

5. Information Sharing: TRT members recognize that the False Killer Whale TRT project depends on using the best readily available information. TRT members commit to identify information needs in a timely fashion and to contribute in framing needs for additional research and analysis. TRT members commit to share, and not withhold, relevant information. Likewise, NMFS will strive to share information to the greatest extent possible consistent with existing legal and regulatory constraints. Preliminary information will be treated as such. Analyses will be presented in a manner that distinguishes interpretation and inference from underlying data.

6. Meeting Participation. Meeting deliberations are focused among TRT members only. Members of the public are invited to participate at set times during the meetings. As appropriate, NMFS may invite comment from designated liaisons to the non-English-speaking elements of the longline fleet in order to foster effective outreach efforts. Also, as needed, the convenors or

facilitators may ask NMFS staff and other experts in attendance to fold in relevant expertise and information.

7. Multi-interest Work Teams and Interest Group Caucusing: NOAA Fisheries staff and CONCUR expect that cross-interest group work teams may be an important way to develop constructive, integrative work products during and between TRT meetings. The aim of such work teams is to encourage multi-interest options and work products rather than work products put forward by a single bloc or interest group. It is anticipated that between-meetings work teams will meet by teleconference. As appropriate, opportunities will be provided during TRT meetings for caucusing within and across interest groups.

8. Decision-Making: The False Killer Whale Take Reduction Team (TRT) will seek to develop consensus recommendations where possible. In this context, "consensus" means that the recommendation in question is supported by all TRT members present at the meeting; this does not necessarily mean that each TRT member likes everything about the recommendation, but that each member is willing to accept and support it. Where consensus cannot be reached in the time available, the range of possibilities considered by the TRT will be presented, including the views of both the majority and minority.

   In order to assist the Team in building broader consensus and help the Agency understand and characterize the extent of common ground, the facilitators may opt to use straw votes during the process to gauge the extent to which Team members support various items under discussion. Meeting summaries will not attribute votes to specific Team members.

9. Meeting Summaries: The facilitation team will prepare and distribute to Team members Key Outcomes Memoranda (KOM) following each meeting. The KOM will endeavor to summarize key decisions made, issues discussed, and the next steps identified. It will not serve as a meeting transcript nor will it typically attribute comments or suggestions to specific individuals. As well, to the extent the Team relies on straw votes, the KOM will not record each Team members' vote. In general, the KOM will characterize the extent of consensus reached on important management options. In such instances, the summary will make clear the degree of consensus across various groups and not just present a straight numeric tally.

   In the event TRT members believe the KOM significantly misrepresents particular decisions, issues, or next steps, they are requested to notify the project facilitators or convenors in a timely fashion. The project facilitators or convenors will review the matter and use their professional judgment to determine if revisions are needed. If so, they will prepare a revised KOM and distribute it in a timely fashion to all TRT members.

10. TRT Communication Protocols: TRT members wishing to send email correspondence or documents to the full TRT are asked to send these through the facilitation team or convenor. To the extent TRT members email documents to their constituents to elicit feedback, Team members are asked to make clear that the materials are being provided to support Team deliberations and not targeted for general distribution.

11. Media Contact: The Team recognizes that members may be contacted by press during the course of the Team's deliberations. To the extent Team members are contacted, we agree to the following:

    - TRT members agree not to attribute particular comments to particular individuals, nor to characterize others' views;
    - TRT members agree not to portray ideas as consensus before the TRT has explicitly agreed on them;
    - TRT members inform PIRO when False Killer Whale Team and/or issues appear to be the primary focus of the media contact

12. Project Website: NMFS Office of Protected Resources (OPR) will prepare a password-protected website to support Team deliberations. This website is intended to facilitate the sharing of draft or interim work products by the TRT. Similar to the discussion under the Communication Protocols ground rule, to the extent TRT members wish to provide others affiliated with their organization access to the password-protected website in order to foster broader input, Team members are asked to make clear that the materials on the website are being provided to support Team deliberations and not targeted for general distribution. Additionally, NMFS OPR and PIRO have established public web pages that will serve as repositories of and links to agendas, KOM and other meeting materials.

13. Role of Facilitation Team. The facilitation team is non-partisan and will not act as an advocate for particular outcomes. CONCUR will strive to enforce the ground rules in a consistent, fair and firm manner and ensure that the meeting stays on track. CONCUR will keep a list of those waiting to speak, but may opt to take speakers out of turn to foster focused discussions on a particular topic. The facilitation team may, at its discretion, call for breaks to refine meeting strategies to foster effective TRT deliberations. The facilitators may also recommend the use of within- and across-interests, small-group breakout sessions.

    In addition to drafting the Key Outcomes memoranda, the facilitation team will serve as the primary secretariat in assisting parties to develop the draft Take Reduction Plan. The Take Reduction Plan will be subject to detailed review and approval by all TRT members.

14. Public Comment: Members of the public may provide comment at designated times on the meeting agenda.

False Killer Whale Take Reduction Team
Meeting #2, April 6-9, 2010
Maui, HI

KEY OUTCOMES MEMORANDUM

I. OVERVIEW

The National Marine Fisheries Service (NMFS) held the second meeting of the False Killer Whale Take Reduction Team on April 6-9, 2010, at the Sheraton Maui in Lahaina, Hawaii. (See **Attachment 1** for a copy of the agenda.) The meeting focused on the following objectives:

- Provide updates on recent activities
- Consider results and implications of interim work on observer data mining/analysis, potential solutions, and efforts of other work groups
- Begin identifying promising candidate measures; consider data inputs and conceptual elements of predictive models
- Discuss Take Reduction Plan (TRP) structure and drafting process needs
- Continue deliberations on long-term research and outreach needs

This meeting summary is presented in five main sections: Overview, Participants, Meeting Materials, Key Outcomes, and Next Steps. The Key Outcomes section is further segmented into the following:

- ***Welcome, Introduction and Updates.*** This section provides a brief overview of meeting purpose, agenda overview and relevant updates.
- ***Background Briefings and Presentations.*** This section summarizes the various briefings presented at the meeting outset.
- ***Overarching Themes.*** This section summarizes the results of the team's brainstorming and deliberations over the three-day meeting. Any recommendations or actions agreed to by the Team are called out in this section.

Additionally, a number of meeting materials are included as attachments.

II. PARTICIPANTS

The meeting was attended by the entire Team (either primary members or alternates). Participants included the following: William Aila, Robin Baird, Hannah Bernard, Brendan Cummings, Paul Dalzell (with his alternate, Asuka Ishizaki, attending on his behalf April 6-7), Roger Dang, Clint Funderburg, Eric Gilman (for Steve Beverly), John Hall, John LaGrange (for Jerry Ray), Kristy Long, Kris Lynch, Paul Nachtigall, David Nichols, Tory O'Connell, Andy Read, Ryan Steen, Lisa Van Atta (for Lance Smith) and Sharon Young.

Nancy Young, with the NMFS Pacific Islands Regional Office (PIRO), and Erin Oleson and Karin Forney, with the NMFS Pacific Islands and Southwest Fisheries Science Centers,

respectively, also joined in Team deliberations. Scott McCreary and Bennett Brooks from CONCUR, an environmental dispute resolution firm specializing in marine resource and water issues, served as the neutral facilitators. As well, about 15 people, including staff from NMFS, NOAA Office of Law Enforcement, the U.S. Coast Guard, and members of the public, attended all or part of the meeting.

III. MEETING MATERIALS

Meeting materials were provided to support the group's deliberations. As possible, meeting materials were sent out ahead of time. However, some documents and nearly all presentation materials were distributed as handouts. (A detailed listing is included as **Attachment 2.)** All materials are available on the web at http://www.nmfs.noaa.gov/pr/interactions/fkwtrt/).

IV. KEY OUTCOMES

Below is a summary of the main topics and issues discussed. This summary is not intended to be a meeting transcript. Rather, it provides an overview of the main topics covered, the primary points and options raised in the discussions, and areas of full or emerging consensus.

A. Welcome and Introductions

The meeting began with a welcome by Lisa Van Atta, PIRO Assistant Regional Administrator for Protected Resources, who thanked participants for their participation and commitment. This was followed by a brief overview of the meeting purpose, self-introductions, and a review of the meeting agenda. It also included brief updates on the following topics:

- ***Team Membership.*** B. Brooks informed the Team that Eric Gilman has been appointed as Steve Beverly's alternate. He also noted that, based on various constraints, alternates Lisa Van Atta and John LaGrange are expected to attend all future meetings rather than Lance Smith and Jerry Ray, respectively.

- ***Team Scope.*** N. Young noted that the Agency had reviewed all comments received on the draft scope and has opted to maintain the Team's scope, as originally framed in the Federal Register Notice.

- ***2010 Stock Assessment Report.*** K. Forney noted that the Draft 2010 Stock Assessment Report (SAR) is not yet finalized but is expected to be available for distribution to the Team prior to its next meeting.

- ***2002 Abundance Estimates.*** Following up on a discussion from the Team's first meeting, K. Forney informed participants that – based on the MMPA and existing guidance – the SARs will have valid abundance estimates and PBRs (based on the 2002 survey) through at least the 2010 SAR. Barring new and compelling evidence, this information is the best available science and serves as the basis for TRT deliberations until new abundance estimates can be generated (which would likely occur after the Team's initial deliberations have been completed).

Other updates included a brief review of recent press coverage.

B. Background Briefings and Presentations

The meeting included focused updates on a number of topics. Below is a quick synopsis of the topics covered. (Broader discussion themes based on these presentations are captured in Section C below.) As noted earlier, copies of nearly all presentations are available on-line. (Only the presentation by D. Curran is not posted as that material is not yet finalized.)

- ***Circle Hook Catch Efficacy.*** Dan Curran with the NMFS Pacific Island Fisheries Science Center presented an overview of the Center's work to assess the catch efficacy of large circle hooks in the Hawaii-based tuna longline fishery. As well, he presented several lessons for the Team to consider when undertaking future field trials of various gear fixes. The bottom line results: no significant different in the catch rates for bigeye tuna; likely reduced catch of other non-target incidental species.

- ***Data Analysis Efforts.*** K. Forney provided findings based on her review of observer data, noting that – other than fishing effort – no single variable (soak time, vessel effect, time of year, hook types, distance traveled between depredation events, etc.) carried much explanatory weight in understanding the variance in depredation rates. A. Read summarized Work Group discussions based on K. Forney's findings, which centered on the following main points: (1) confirming K. Forney's assessment of "no obvious smoking gun;" (2) noting the varying depredation patterns between deep- and shallow-set longlines; and (3) suggesting specific topics (hook type, spatio-temporal analysis) for future near-term study.

- ***"What If" Analysis.*** K. Forney presented to the Team a draft "what if" spreadsheet to be used as a tool to help invent options for potential solutions. The tool forecasts potential reductions in false killer whale serious injuries and mortalities based on given changes in four different categories: (1) overlap of false killer whales and fishing effort; (2) depredation rates; (3) catch probability when depredation occurs; and (4) serious injury and mortality probability. The model is intended to support the Team's brainstorming on the potential efficacy of different suites of actions, but is not intended as a strict tool to gauge the predicted success of the measures. The model (provided in **Attachment 3**) generated significant interest and discussion. (See discussion summary below.)

- ***False Killer Whale Echolocation.*** Team member and University of Hawaii Professor Paul Nachtigall presented to the Team the results of studies on false killer whale echolocation. The presentation summarized findings related to: (1) distance detection; (2) echolocation discrimination and high frequency hearing loss; (3) active hearing control; (4) hearing directionality and sound paths; and (5) acoustic characteristics. P. Nachtigall also offered several suggestions for future research efforts. (See section below on research recommendations.)

- ***Historical Experience of False Killer Whale Depredation in the Northwest Coral Sea, and Mitigation of Depredation Behaviour by Toothed Whales on Tuna Longlines.*** Geoff McPherson from James Cook University of North Townsville, Australia, presented a historical look at the Japanese longline fishery's experiences with depredation and mitigation strategies in the Northwest Coral Sea since 1986, and work done in Australia,

Japan, Seychelles, and elsewhere on toothed whale depredation mitigation. The presentation summarized findings related to radio buoys, pingers, and passive acoustics and biosonar interference. Additionally, the presentation noted several promising areas for future mitigation efforts, including (1) modified radio direction-finding buoys to detect and avoid false killer whales; (2) next-generation pingers; and (3) sonar reflective equipment to discourage whales from taking fish from lines.

- ***Experimental Gear Modifications.*** Team members C. Funderburg and J. Hall provided brief overviews of possible gear modifications to reduce depredation rates on deep-set longline gear. The first effort, currently being tested on C. Funderburg's vessels, focuses on using wire loops placed over the bait to reduce bait depredation by increasing the acoustic reflection. The second modification, still under development by J. Hall, also focuses on changing bait acoustic reflections through the use of plastic beads with embedded microspheres placed on the wire loops described above[1].

- ***Spatio-Temporal Patterns of Effort and False Killer Whales.*** Michael Marsik with the NMFS Observer Program presented monthly summaries of logbook data for 2008-2009 highlighting the spatio-temporal patterns of longline fishing effort, as well as spatio-temporal data on false killer whale sightings and takes, along with marine mammal-caused depredation. Team members expressed strong interest in seeing additional years of data presented that more fully meld spatio-temporal patterns of effort with false killer whale sightings, takes, and depredation, along with sea surface temperature and sea surface height maps.

C. Overarching Themes

The Team's deliberations over the course of the three-day meeting generated a number of overarching themes. These themes aggregated around three primary categories: (1) identifying potential management strategies; (2) analyzing the impact of potential actions; and (3) clarifying the Potential Biological Removal (PBR) target. Below is a synthesis of the Team's key discussion points.

<u>Identifying Potential Management Strategies</u>

The bulk of the Team's initial deliberations centered on discussions – both during plenary and in informal caucuses within and across different interest groups – to identify candidate measures to include in a possible Take Reduction Plan (TRP). Though the conversations were very preliminary in nature, the discussions generated important concepts and approaches to consider at future Team meetings. Below is a summary of the primary themes.

- ***Core ideas emerging.*** Team members deepened their discussion – begun at the first meeting – regarding possible actions to include in a TRP. The Team's deliberations generated a substantial number of ideas. It also began to segment the concepts into ideas ready for implementation and those requiring additional experimentation to confirm the

[1] The approach to this experimental gear modification was revised somewhat based on Geoff McPherson's presentation.

viability of the fix, both in terms of limiting bycatch and minimizing impact to the fleet's target species catch rates. Below is a table summarizing the Team's discussion.

Most Frequently Discussed Candidate Actions and Nature of Team Interest		
Measure	**Status Relative to Implementation-Readiness (ready/not ready)**	**Status Relative to Empirical Findings of Effectiveness (no research needed/research needed)**
Circle hooks (size 14/0, 15/0, 16/0)	Ready	No significant new research needed; observer data might indicate potential for reducing M&SI, but sample sizes are too small to be conclusive.
Captain training on marine mammal handling/release from gear to reduce severity of injuries	Ready	No significant new research needed; however, discussions indicated that many fishermen are unaware that the release of animals can potentially reduce M&SI takes
Time/area closures or effort reductions, triggered if other measures are not effective	Mixed views	Additional data mining needed to identify candidate areas, seasons or effort reduction strategies
Weak hooks	Mixed views	Near-term research needed – impact on target species catch rates Long-term research needed - impact on FKW interactions
Gear modifications to reduce bait depredation	Not ready	Need to confirm design and usefulness
Acoustic buoys/listening devices to identify FKW presence and/or depredation	Mixed assessment of readiness	Information needed on how to test and implement
Bait/discard/offal retention	Ready	Storage/disposal considerations
Fleet communications (FKW sightings, possible use of VMS)	Ready unless changes to VMS required	Information needed on how to test and implement; changes to VMS would require development
Set-splitting/gaps between baskets	Ready	Information needed on how to test and implement; effectiveness unknown
Other Actions Discussed and Nature of Team Interest		
Vessel light/noise characteristics	Potential, but additional information from fleet needed	
Line changes – color, coating, diameter, snaps	Potential, but additional research/data mining needed	
Eliminating hook in center of basket	Potential, but additional research/data mining needed	
Spotters (air or vessel-based)	Limited effectiveness; significant implementation barriers	
Noise deterrents	Not currently promising based on past research results; interest in tracking potential of "next generation" pingers	
Center basket illumination	Not seen as promising based on past research results	
Taste deterrent	Not seen as promising based on past research results	
FKW sedation (to foster gear removal)	Not seen as promising based on past experience and practicality concerns	

- ***Possible TRP Framework Outlined for Deep-Set Fishery.*** Team members discussed a possible framework for structuring a Take Reduction Plan for the deep-set longline fishery that would evolve over time based on plan effectiveness. The approach, proposed as a starting point by a subset of conservation interests with input from other Team members, draws on the following key aspects:

- Phased Approach. The TRP would center on a plan that relies on a series of regulatory and non-regulatory actions, pre-determined triggers, and pre-approved consequences to reduce the number of false killer whale mortalities and serious injuries to the target level. Further deliberations are needed to confirm triggers but initial discussions centered around an agreed-upon number of observed false killer whale M&SI. (The precise number would depend on the target reduction necessary and the level of observer coverage).

- Early Actions. The TRP would move forward initially with a set of gear modifications and training to help reduce false killer whale M&SI. This approach is seen as an incentive for fleet-wide participation, as it avoids upfront closures, effort reductions or similar measures. Possible candidate actions include circle hooks, weak (circle) hooks, acoustic buoys/listening devices, bait depredation gear fixes, leaving an area when depredation has occurred, and captain training on marine mammal handling/release from gear. Possible secondary actions focused on offal retention, set-splitting/gaps, and fleet communication. Additional discussion is needed to determine the viability of near-term actions (*i.e.*, whether there is enough information on effectiveness to support inclusion in the plan), as well as to determine which actions would be regulatory versus non-regulatory.

- Triggers and consequences. Based on this approach, if observed M&SI were below the target level, the current TRP measures would continue. If M&SI were to exceed the pre-determined target level after the TRP goes into effect, the TRP would include a trigger that immediately implements a pre-determined time/area closure or some other type of agreed-upon effort reduction/other management measure. The consequence would then be maintained through the end of the calendar year or other appropriate period until emerging gear modifications or other fixes are ready for implementation. The Team would likely need to be reconvened to discuss and confirm the appropriateness of any additional proposed follow-on actions.

Other aspects of the proposed approach discussed by the Team include the following: use of M&SI determinations (and *not* takes) as triggers; periodic triggers to assess ongoing effectiveness; need for timely determination of whether takes are classified as serious injuries; importance of fostering creativity; and, early adoption/testing of potential fixes. Additionally, the proposed approach does not focus on the shallow set, shortline or kaka line fisheries, though the Team would consider the applicability of gear modifications and other relevant actions to these fisheries.

The proposed approach generated significant deliberations over the course of the meeting. Many Team members representing different constituencies voiced interest in the conceptual ideas embedded in the strategy, saying it incentivized fishermen to take upfront steps that would, hopefully, obviate the need for harsher actions (i.e., time/area closures or effort reductions) later on. Several participants also noted the importance of making sure that all measures (i.e., gear modifications or other changes) applied evenly

across all deep-set fishermen. Still, many TRT members were reluctant to delve too deeply at the meeting into the specifics of any consequences[2]. For one, a number of Team members emphasized the importance of having better metrics drive the drafting of any specific consequence area or management action. There were also concerns raised whether time/area closures – as opposed to across-the-board effort reductions – would be effective given false killer whales' wide distribution. Finally, while fisheries interests characterized the proposal as "something we're open to," they also noted that "the devil is in the details" and they made clear that they needed to have further within-caucus discussions before the fisheries could meaningfully address any time/area closures or effort reduction issues. Fisheries interests did not agree during the meeting to any specific triggers or consequences.

- ***Additional information needed to support Team consideration.*** As noted above, aspects of the proposed approach generated preliminary interest among many Team members and across interest groups. At the same time, Team members acknowledged the early-on nature of the discussion and the many uncertainties and details yet to be fully discussed. Below is a listing of the key issues and concerns to be fleshed out in future discussions.

    - Defining consequence actions. Team members agreed that significant work and discussion will be needed to identify potential consequence actions that can be expected to reduce false killer whale interactions and still garner widespread support. Among the most important considerations cited in identifying potential time/area closures as a potential consequence included the following: demonstrated benefit; potential impact on fleet catch rates; fleet-wide acceptance and enforceability. There is also the need to assess the effectiveness of specific closure areas versus more cross-cutting effort reductions. Fisheries interests also underscored the inevitably controversial nature of any closure and, while not agreeing to any specific time/area closure concepts, stressed the need for industry to meet as a caucus to consider effort reduction issues. NMFS staff are to further develop analyses and spatio-temporal plots to support these discussions.

    - Additional research needs. As noted above, Team members have divergent views regarding the implementation-readiness of some proposed actions. Most critically, while all Team members see weak hooks as a promising potential mitigation measure, there are divergent views among participants regarding the viability of including weak hooks as a core near-term TRP measure. Team members agreed that very near-term testing is essential. NMFS staff will be

[2] The initial concept put forward by the conservationists included a "consequence box" – drawn to capture the majority of false killer whale takes – with coordinates between 168- and 151-degrees west and 12-degrees and 26-degrees north. That iteration of a potential consequence area was later tightened to 162- and 151-degrees west and 12-degrees and 26-degrees north. A third iteration included only the waters inside the Hawaiian Islands EEZ east of 162-degrees west. These areas were presented for discussion purposes only; no support from Team members was sought or offered. Team members largely agreed that any "consequence box" should be empirically driven (*i.e.*, tied to FKW bycatch rates, depredation frequency, etc.), and evaluated via simulations. Team members also expressed strong interest in seeing other options and concepts generated by fisheries interests.

exploring the viability of procuring weak hooks from its facility in Pascagoula[3]; Team members also discussed the importance of identifying other funding sources, as possible, to support near-term trials. Other research needs focused on gear modifications to reduce bait depredation, acoustic listening devices, and, as noted above, potential consequence actions.

- Regulatory versus non-regulatory. Future Team deliberations need to sharpen discussions regarding regulatory vs. non-regulatory measures – in other words, those measures that would be required for all vessels and those measures that are recommended but not mandatory. In general, Team members agreed that measures such as circle hooks and captains' training should be required.

- Other. The discussion generated numerous other information needs and requests, including: identifying possible false killer whale hot spots; strategies to make weak hooks readily identifiable to law enforcement; identifying fishermen willing to test weak hooks; confirming the availability of observers to cover weak hook trials; and assessing impact of possible consequence areas on fleet economics.

Team members are to continue deliberations on this approach prior to Meeting #3. Likely actions are to include the following: vetting of the basic approach to broader constituencies; further research into the viability of circle hooks; data mining and predictive modeling to identify and evaluate effectiveness of possible consequence area(s); and both Work Group and informal cross-interest group caucus discussions. (Several Team members are considering an informal in-person meeting on the West Coast in late May.)

Clarifying Take Reduction Target Level

The Team engaged in an extensive discussion intended to clarify the take reduction target level, with stakeholders strongly contesting NMFS's proposed approach to determining that target.

NMFS put forward a proposal that would define the Team's target take reduction level by the U.S. fleet both within and outside the Hawaii EEZ. (NMFS proposed approach is provided as **Attachment 4**.) The key aspects of the proposal are summarized below.

- Calculate the target reduction rate for false killer whales within the Hawaii EEZ using current PBR and M&SI rates. This results in the need to reduce average annual M&SI within the EEZ by 4.8 animals, a 65.8 percent reduction from the current M&SI level of 7.3 animals to the current PBR of 2.5.
- Since complete bycatch and abundance data are not available on the high seas, apply the same proportional reduction – 65.8 percent – to the combined number of Hawaii EEZ and high seas M&SI (12.6 animals per year) in the deep-set and shallow-set fisheries. This results in the need to reduce total M&SI by US fisheries to no more than an average of 4.3 animals per year (2.5 inside the Hawaii EEZ and 1.8 on the high seas).

[3] Subsequent to the meeting, NMFS determined that the Pascagoula facility did not have additional weak hooks to make available for tests in the Hawaii longline fleet.

- Given current 20 percent observer coverage levels, this corresponds roughly to an average annual limit of one observed false killer whale M&SI for the Hawaii EEZ and high seas combined.

NMFS staff explained that the rationale is based on the MMPA's mandate to reduce bycatch for a stock throughout its range. As Agency staff explained, NMFS must ensure that M&SI of the Pelagic stock – distributed within the Hawaii EEZ as well as on the high seas – is addressed throughout that range; it would not be consistent with the MMPA to reduce M&SI only within the Hawaii EEZ if fishing effort is simply displaced to the high seas where the stock would still be at risk. NMFS staff noted that its approach is consistent with the MMPA's requirement to use the "best available information" to protect the stock. NMFS staff also noted that failure to adequately address M&SI of Pelagic stock false killer whales occurring on the high seas now will likely result in the need to reconvene the Team and develop additional take reduction measures at a later date.

Team members across all interest groups strongly contested the proposed approach. For one, several members said that there are not sufficiently robust data to generate a target for international waters, and they challenged the underlying assumptions NMFS is using to calculate such figures (for example, similar depredation/bycatch rates within and outside the Hawaii EEZ). Some team members also said that NMFS' approach was not consistent with the MMPA or the manner in which NMFS has addressed the pelagic false killer whale stock in its annual Stock Assessment Reports.. Moreover, stakeholders said that such an approach unfairly penalizes the fishery and undermines the Team's ability to craft a viable and potentially consensus-supported plan within the Hawaii EEZ by folding in a new and difficult-to-reach target in a process already challenged by a tight timeframe. Finally, there were suggestions that NMFS distinguish between the formal determination for meeting PBR (within Hawaii EEZ only) and a determination used to assess effectiveness (looking at M&SI more broadly). Team members asked that the topic be kept open for further discussion and consideration.

NMFS staff acknowledged the difficult and unprecedented challenge – no TRT has ever had to deal with a fleet that takes the same stock both within and outside the EEZ – and they agreed to consider additional comments and perspectives from Team members. R. Steen, B. Cummings and NMFS counsel are expected to discuss this issue further before the next TRT meeting.

Analyzing Impact of Potential Actions

K. Forney engaged the Team in two discussions intended to foster consideration and assessment of possible management actions: (1) review of a draft "what if" spreadsheet structured to help Team members assess the impacts of addressing differing areas of concern; and (2) need for and structure of a predictive model to assess the likely impacts of any proposed suite of management actions. Below is a summary of key discussion highlights.

- ***"What If" analysis.*** Team deliberations to-date have focused on identifying possible management actions intended to address one of four areas of concern: (1) reduce false killer whale chances of finding vessels; (2) minimize active depredation; (3) minimize hookings; and (4) minimize serious injuries and mortalities. The "what if" tool is a

spreadsheet intended to enable Team members to evaluate – at a very crude level – the impact of different changes in each of the four areas of concern noted above, using the observer data from 2003-2009. For example, Team members may plug in different combinations of values for the variables – say, significant reductions of depredation events and number of false killer whale hookings but no change to effort – and assess the overall impact on the expected reduction of false killer whale M&SI.

Team members offered the following comments based on the discussion:

- Useful tool. Team members considered the spreadsheet to be quite helpful, as it concretely highlights the potential impacts of and trade-offs between different approaches. (For example, K. Forney demonstrated that even aggressive and successful efforts to nearly eliminate depredation would not bring M&SI below PBR.) It also, they said, helps identify further information and research needs.

- Strategies to improve. Team members suggested the spreadsheet be revised to incorporate the following refinements: (1) calculate distinct depredation/bycatch rates for within and outside the Hawaii EEZ, and by calendar quarter to allow seasonality; (2) restructure bycatch rate for sets without depredation as a variable (rather than as a given); (3) allow for effort to shift from the deep-set fishery to the shallow-set fishery; and (4) make clear distinctions between "givens" (firm sideboards associated with statute, regulation, or adopted protocols) and "assumptions" explicitly chosen by Team members for solution-finding purposes.

- Caveats. Though appreciative of the model, Team members identified several caveats regarding the model that may make it too simplistic. Below is a listing of the primary caveats noted.

    - As configured, the model does not take into account nonlinear effects;
    - Assumption that take rates on sets with and without depredation are independent variables;
    - Inclusion of serious injury and mortality rates as a given (rather than an assumption that can be adjusted depending on factors such as the adoption of weak hooks or adoption of safe handling and release procedures);
    - Need to consider impact of management actions in other arenas on underlying assumptions;
    - Impact of foreign fleet activity;
    - Whether effort should be tied to hooks rather than sets; and,
    - Need to consider whether per-set depredation rates are likely to increase as the amount of gear in the water decreases.

K. Forney will take the Team's comments into consideration and distribute a third iteration of the model via email for the Team members' use. (A second version of the model, developed based on the Team's feedback, was already distributed at the meeting.)

- ***Predictive Model Development.*** While the "what if" model is helpful in assessing the impact of different areas of focus, a more nuanced model is needed to predict the expected impacts of specific management actions. To address this need, K. Forney proposed developing a simulation model to calculate likely impacts on M&SI of various suites of measures. Some Team members recommended K. Forney incorporate lessons learned from other similar exercises, including work undertaken by both Debra Palka and Don Kobayashi of NMFS and Marine Protected Area (MPA) site selection algorithms intended to optimize possible closure locations relative to bycatch reduction potential and minimization of economic impacts. Team members also cautioned that the model, while helpful, should not drive the Team's decisions. Some Team members strongly supported the development of such a model and a work group was established to support K. Forney's work on the model. Fishermen input into the effort is considered critical.

Research Activities

Team members continued to expand the list of research needs developed at the first TRT meeting. Deliberations over the four-day meeting identified numerous research areas, with the greatest interest focused around research related to (1) further mining of observer data to identify trends related to depredation and/or false killer whale M&SI; (2) potential gear modifications, particularly as it relates to the impact of weak hooks on catch rates; and (3) improving the precision of false killer whale abundance estimates (broadening platforms used – longline vessels, Navy vessels and planes, others – to gather data). Team members representing the fishing industry noted that obtaining an accurate and current abundance estimate for Hawaiian pelagic false killer whales is the fisheries' top research priority. Additionally, Team members voice support for cooperative research efforts, and several speakers reiterated interest in research targeting the shortline and kaka line fisheries. Below is a table summarizing research ideas generated over the first two meetings. (Please note: Short-term research needs identified at Meeting #1 and already completed are not listed.)

Research Needs to Support False Killer Whale Take Reduction Team			
Short-Term – General (by June meeting)	**Short-Term – Observer Program Data (by June meeting)**	**Mid-Term – General (over next three months)**	**Long-Term – General (six months to two years)**
• Determine extent to which FKW are able to drag gear & catch to surface if hooked at deepest part of set • Understand which vessel characteristics serve as proxy for noise profile • Determine which vessels are using various light types and configurations (*fleet input needed*) • Elicit fisherman input into depredation avoidance techniques • Examine habitat maps for first quarter 2010 and 2009 to assess possible differences to explain high take rate in 2009 • Review fishing data to determine number of boats depredated at same time to provide sense of FKW population range and size • Continue efforts to understand why FKW more likely to be hooked in middle of basket • Assess impact of C. Funderburg tests of bait gear modification to reduce depredation • Develop predictive model of potential measures (take rate, depredation rate, target catch, fleet movements)	• Assess individual vessel effects (light, sound) • Assess relationship between depredation and spacing of fishing vessels • Supplement observer data with vessel logbook or VMS data, if possible • Examine relative hook positions for bigeye • Simulate hookings v. hook number to see if significant pattern • Plot sets, takes and depredation versus eddies, sea temperatures and monthly spatio-temporal composite • Determine appropriate scale (2°x2° or 5°x5°) for examining variance patterns • Assess bigeye catch rate and FKW/blackfish M&SI rates on small circle v. tuna hooks • Assess impact of various line colors and widths • Assess data by both captain and code group *(fleet would need to provided vessel IDs for respective code groups)* • Review mouth hookings to assess hook-type trends • Assess extent to which depredation is distributed evenly between floats	• Develop photo database of pelagic-zone animals, including scars & disfigurements • Continue satellite tagging of FKWs (April) • Evaluate acoustic differences between insular vs. pelagic animals • Evaluate feasibility of mooring listening stations (FADs, NOAA weather buoys) • Begin data collection of shortline and kaka line fisheries (where and how fishing) • Develop methods for fleet to use acoustic recorders to determine FKW presence prior to setting • Begin weak hook experiments • Survey all longline vessels to identify commonalities among those with high depredation rates • Understand impact of weak hooks on target species catch rates *(may need to be longer-term effort)*	• Conduct FKW-targeted research on the R/V Sette, September 2010[4] • Begin longline acoustic monitoring • Understand foraging and acoustic behavior using acoustic tags • Develop methods for pro-rating "blackfish" bycatch • Record acoustic profile of individual longline vessels • Undertake HICEAS II-Hawaii EEZ survey 2011[5] • Develop predictive habitat models of FKW density • Understand mechanism of hooking • Study adaptive learning, particularly by young FKW • Evaluate alternative methods for estimating abundance, with emphasis on improving precision • Begin photo-ID from fishing vessels with industry support • Consider ways for Team members and their constituents to generate funding/support for future abundance surveys • Assess range at which hook in fish can be detected by FKW • Assess impact of hook density on FKW ability to follow line • Assess potential for hooks be modified (foam coating, etc.) to increase detection range • Carry out underwater observations of foraging behavior • Test visual acuity using different types of lights • Evaluate FKW capability to

[4] Based on an update from NMFS received after the meeting, the HICEAS II- Hawaii EEZ survey, originally planned for September 2011, will now occur in 2010. Targeted research on FKW will be folded, as possible, into the HICEAS 2010 effort and not conducted as a separate September 2010 effort.

			see floats, as well as monofilament line of different colors and width • Assess whistling and echolocation using Dtags • Evaluate potential to use killer whale/other playbacks as deterrent • Continue satellite tagging of FKWs • Have observers collect samples from bow-riding FKW • Playback of various vessel noise to assess FKW reactions

A work group is to meet via teleconference before Meeting #3 to begin prioritizing potential research activities by focus area (gear, false killer whale biology and shortline/kaka line). Issues to consider when prioritizing within focus areas include likelihood of success, importance and timeframe.

Other Relevant Issues

Team deliberations raised numerous other issues not yet captured in the summary above. Below is a listing of some of the other issues and themes that emerged during the discussion.

- ***Serious Injury and Mortality.*** The Team's discussions triggered questions for some participants pertaining to the Agency's policy regarding determination of serious injury and mortality in false killer whales. In particular, some Team members questioned the Agency's assumptions about serious injury and mortality and whether those assumptions must be taken as a "given" when calculating the expected impacts of various management actions. NMFS staff explained that the criteria for making determinations were outlined after extensive discussion, consensus seeking, and concurrence among a wide range of experts, including leading veterinarians, who attended a series of Agency-sponsored workshops. Importantly, NMFS also clarified that a hooking is not automatically classified as a serious injury; rather, Agency staff explained that the classification is based on the location of the hooking (lip vs. jaw vs. body); the extent to which the animal struggles during the hooking; and the nature and amount of the gear remaining on the animal at the time of release (whether hook was removed, type and length of trailing gear). Based on the discussion, Team members offered several suggestions for the Agency's consideration:

    - Add a "lip only" designation to data fields in observer forms, to enable observers to provide a more detailed description of the hooking;
    - Provide better training to captains on handling and gear removal, so they understand the value – *i.e.,* the potential to impact whether a take is classified as a serious injury or a non-serious injury – of careful dehooking/gear removal;
    - Review observer program data – and any other applicable information – to better understand any trends associated with hook type and mouth hookings; and,

- Consider the need and/or opportunity to redesign dehookers kept on longline vessels

The discussion was considered critical to Team members, as it pointed out the very real potential for education among captains to have a significant impact on the severity of false killer whale injuries– a factor that would directly and significantly impact the fleet's ability to keep M&SI rates below PBR.

- ***TRP Drafting.*** The Team discussed strategies for preparing draft sections of the TRP, agreeing that many of the upfront sections are essentially boilerplate in nature and appropriately drafted by NMFS staff for review and comment by the Team. The Team further agreed that the Pelagic Longline TRP table of contents offers a reasonable starting point for its plan, but recommended discussion of several additional topics: false killer whale interaction with international fisheries; kaka and shortline fisheries; and recreational fisheries. N. Young is to take the lead in drafting early sections for review; P. Dalzell is to provide relevant Council-generated materials. A first draft is to be distributed prior to Meeting #3 to foster Team input.

- ***Meeting #3 Focus.*** Based on the Team's deliberations, participants highlighted several areas necessitating further discussion at the third meeting. The bulk of the meeting is expected to focus on ongoing discussions related to identifying an emerging suite of measures to include in the TRP. Additionally, Team members identified possible candidate topics for more in-depth briefings: (1) observer training on release of hooked or entangled animals; (2) serious injury determinations; (3) weak hook status and effectiveness; (4) Magnuson-Stevens Fishery Conservation and Management Act and MMPA provisions intended to improve foreign fleet compliance with U.S. fleet standards; and (5) updates on the 2010 SARs[5] and the FKWTRT's take reduction target. Progress at Meeting #3 is considered essential if the Team is to stay on track for meeting its July 19 deadline.

- ***Future Meeting Timeframe and Location.*** Given various Team members' scheduling constraints, the Team opted to revise its meeting schedule to hold Meeting #3 June 15-18 and Meeting #4 July 13-16. The fourth meeting is to be held in Honolulu, but the location of the third meeting has not yet been determined. (Several participants suggested holding the third meeting in Honolulu to foster attendance by fishermen; others, including the facilitators, voiced concern that a Honolulu-based location might impede the informal, after-hours discussions considered crucial to identifying common ground.) Team members acknowledged that the shift in schedule – canceling the May meeting and pushing Meeting #4 back to mid-July – has several implications:

  - The importance of maintaining momentum generated at Meeting #2 through timely convening of work groups;
  - Taking advantage of the time interval between Meetings #2 and #3 to conduct additional modeling and analysis;

[5] The 2010 SARs will be provided to the Team prior to the June meeting if it is available.

  - The need for ongoing vetting both before and after Meeting #3 to confirm the acceptability of any evolving package of TRP measures; and
  - The imperative to prepare final drafts of the TRP at Meeting #4.

- ***Other.*** The Team's deliberations generated several additional points:

  - ***Defining Success.*** Team members briefly discussed different measures to determine plan success. These include levels of M&SI relative to PBR; tracking declines in depredation; and reducing uncertainty in bycatch and abundance data. Further Team discussions are needed.
  - ***Outreach Efforts.*** The Outreach Work Group reported back on its efforts to increase awareness of and input into Team deliberations. The Work Group's efforts to-date have focused primarily on: (1) publicizing Team meetings; and (2) convening an April 20 informal meeting with longline fishermen.
  - ***Fishermen Survey.*** Team members voiced interest in a survey of fishermen to identify, among other things: (1) possible mitigation strategies; (2) vessels willing to participate in gear experiments; (3) unique vessel characteristics (including light/vessel effects) that may increase or decreased the likelihood of depredation; and (4) willingness of vessel captains to carry cameras and obtain dorsal fin photos to support a mark-recapture abundance assessment.
  - ***Observer Program Costs.*** Some Team members expressed interest in expanding observer coverage in the deep-set fishery to reduce uncertainty of bycatch estimates.

V. NEXT STEPS

Team deliberations over the course of the four-day meeting stepped out a number of next steps. Below is a summary of the follow-on tasks identified.

A. Meeting Timeline

The Team's meeting schedule was revised based on participant availability. The new meeting schedule is as follows:

- Meeting #3: June 15-18 [four full days; location not yet determined]
- Meeting #4: July 13-16 [half-day on the 13th followed by three full days; Honolulu]

Additionally, work groups will be convened between meetings to further develop ideas.

B. Work Groups

Given the extensive work to be completed in the next few months, and the interest in maintaining the momentum gained in the meeting, Team members agreed to establish several work groups to push at several topics under discussion. As before, the work groups – open to all interested Team members – will be convened by teleconference between now and the June meeting; all materials developed as part of work group discussions will be shared with the Team for its full deliberation. Below is an overview of work group focus and participants.

- **Predictive Model Work Group:** J. Hall, R. Baird, T. O'Connell, A. Read, E. Gilman, R. Steen, J. LaGrange, R. Dang
- **TRP Strategy Work Group:** B. Cummings, R. Steen, K. Lynch, T. O'Connell, J. LaGrange, S. Young, W. Aila, C. Funderburg, H. Bernard, R. Baird
- **Fisheries Survey Work Group:** R. Dang, H. Bernard, D. Nichols, R. Steen, K. Lynch
- **Research Needs:** P. Nachtigall, T. O'Connell, R. Baird, K. Lynch, J. Hall, E. Gilman, A. Read, R. Steen, C. Funderburg

The Research and Predictive Model work groups are expected to meet the week of May 3. The TRP Strategy Work Group is not expected to meet until mid- to late-May so its deliberations can be informed by modeling undertaken earlier in the month. The Fisheries Survey Work Group was to have met the week of April 12 to offer quick input into a survey for use at the planned April 20 informal longline fishermen's meeting. However, that effort has now been deferred in order to give NMFS staff, HLA and interested Team members more time to define survey focus, needs and approach.

C. Follow-on Tasks

Based on the meeting, participants agreed to a series of follow-on tasks to be completed prior to Meeting #3 in June. The table below summarizes these activities.

False Killer Whale Take Reduction Team Primary Next Steps	
Interim Deliberations	• Convene work groups focused on Research and Predictive Modeling (week of May 3), TRP Strategy (by mid- to late May), and Fisheries Survey (timing to be determined); all Work Teams expected to convene via teleconference • A subset of Team members may meet informally on the West Coast in May to continue talks related to the possible structure and elements to be included in a TRP; the results of any deliberations will be shared with all Team members and discussed at the June meeting
Information-Related	• NMFS to confirm appropriate take reduction target level; update Team members on approach • M. Marsik to expand spatio-temporal effort plots to include, as possible, false killer whale sightings, takes and depredation, along with sea surface temperatures and heights; as possible, generate for six-year period 2003-2009 • K. Forney to update and distribute "what if" spreadsheet based on Team input • NMFS/Team members to consider opportunity to support near-term weak hook testing; includes exploring possible funding source to procure hooks and determining the feasibility of observer coverage for weak hook trials • D. Curran to provide information on hook type related to two marine mammal takes during circle hook testing • NMFS to provide weak hook powerpoint from the NMFS Pascagoula Lab staff • NMFS to distribute updated list of research needs based on Team discussion (*see above listing*); Team to provide feedback on completeness
Logistics	• Finalize meeting locations for Meetings #3 and #4 • Identify alternate for William Aila (Meting #3) and Roger Dang (Meeting #4)
Other	• NMFS to work with HLA regarding focus for April 20 meeting with longline fishermen • NMFS to post copies of meeting presentations on Team website (as possible) • CONCUR to provide draft Key Outcomes by late April for Team review • NMFS to work with Council to identify existing materials to use in drafting TRP

Questions or comments regarding this summary should be directed to Bennett Brooks (212-678-0078 or *bennett@concurinc.net*) or Scott McCreary (510-649-8008 or *scott@concurinc.net*).

ATTACHMENT 1

False Killer Whale Take Reduction Team Meeting
April 6-9, 2010: Wailuku Room, Sheraton Maui, Lahaina, Hawaii

PROVISIONAL AGENDA

(as of 3/18/10; subject to revision prior to meeting)

MEETING OBJECTIVES

- Provide updates on recent activities
- Consider results and implications of interim work on observer data mining/analysis, potential solutions, and efforts of other work groups
- Begin identifying promising candidate measures; consider data inputs and conceptual elements of predictive models
- Discuss Take Reduction Plan (TRP) structure and drafting process needs
- Continue deliberations on long-term research and outreach needs

DAY ONE, APRIL 6: AFTERNOON

Arrival and Greetings **12:45 PM**

Welcome and Introductions **1:00 PM**

- Welcome and Meeting Purpose *(Van Atta)*
- Self-Introductions
- Agenda Review *(Facilitation Team)*

Updates **1:15 PM**

- Team Membership - Members and Alternates *(Facilitation Team)*
- Team Scope - Fisheries and Species *(N. Young)*
- Recent Press Coverage *(Facilitation Team)*
- Follow-up on Meeting #1 Requests *(Facilitation Team)*
- 2010 SAR status *(Karin/Erin)*
- Other

Report Out: Outreach Work Group **1:45 PM**

- Summary of Work Group discussion and proposed next steps
- Team discussion

Discussion Focus: Data Analysis/Mining **2:15 PM**

- Report out from Data Analysis/Mining Work Group
- Presentations (*K. Forney introduces*)
  - Spatio-temporal patterns of effort, depredation and takes *(M. Marsik)*
  - Examination of hook types used during mixed v. single type set *(J. Marchetti)*
  - Updates on observer data analysis/data mining findings *(K. Forney)*
  - Fishery Biology and Stock Assessment Division hook experiments *(D. Curran)*

Break **3:00 PM**

Discussion Focus (continued): Data Analysis/Mining **3:20 PM**

- Continue presentations, as needed
- Team discussion on ramifications/next steps
  - May include need for breakout sessions or caucuses

Public Comment **4:40 PM**

Wrap-Up and Preview of Day Two **4:50 PM**

Adjourn **5:00 PM**

Happy Hour *(Location TBD)* **5:30 PM**

DAY TWO, APRIL 7: FULL DAY

Arrival and Greetings **8:45 AM**

Welcome and Overview **9:00 AM**

- Overview of Day Two Agenda and Focus *(Facilitation Team)*
- Questions and Comments from Day One *(Facilitation Team, PIRO)*

Discussion Focus: Potential Solutions **9:15 AM**

- Report out from Potential Solutions Work Group
- Presentations
  - Echolocation Findings and Implications *(TBD)*
  - G. McPherson's work on depredation/bycatch mitigation *(McPherson)*
  - Possible gear modifications
    - Modifying bait acoustic reflection – Alternative #1 (*C. Funderburg*)
    - Modifying bait acoustic reflection – Alternative #2 (*J. Hall*)

Break **10:15 AM**

Discussion Focus (continued): Potential Solutions **10:30 AM**

- Continue presentations, as needed
- Discuss process and protocols for testing near-term gear modifications
- Team discussion on ramifications/next steps
  - May include need for breakout sessions or caucuses

Lunch **Noon**

Discussion Focus: Identifying Promising TRP Measures **1:15 PM**

- Background Briefings *(K. Long)*
  - Revisit key lessons learned/measures from other TRTs
  - Review distinctions between regulatory and non-regulatory measures
- Begin brainstorming initial set of candidate TRP measures
  - May include need for breakout sessions or caucuses

Break **3:00 PM**

Discussion Focus (continued): Identifying Promising TRP Measures **3:15 PM**

- Continue brainstorming initial set of candidate TRP measures
  - May include need for breakout sessions or caucuses

Public Comment **4:40 PM**

Wrap-Up and Preview of Day Three **4:50 PM**

Adjourn **5:00 PM**

DAY THREE, APRIL 8: FULL DAY

Arrival and Greetings **8:45 AM**

Welcome and Overview **9:00 AM**

- Overview of Day Three Agenda and Focus *(Facilitation Team)*
- Questions and Comments from Day Two *(Facilitation Team, PIRO)*

Discussion Focus (continued): Identifying Promising TRP Measures **9:15 AM**

- Continue brainstorming initial set of candidate TRP measures
  - May include need for breakout sessions or caucuses

Break **10:15 AM**

Discussion Focus (continued): Identifying Promising TRP Measures **10:30 AM**

- Continue brainstorming initial set of candidate TRP measures
  - May include need for breakout sessions or caucuses
- Discuss how Team recommendations can achieve Plan goals
  - Need/format of predictive model given TRP measures under consideration
  - NMFS rule-making process
  - Other

Lunch **Noon**

Discussion Focus: TRP Research Recommendations **1:15 PM**

- Report out from Research Needs Work Group (*E. Oleson introduces*)
- Begin developing list of potential research needs to include as TRP recommendations (gear-, false killer whale- and fisheries-related)
  - May include need for breakout sessions or caucuses

Break **3:00 PM**

Discussion Focus (continued): TRP Research Recommendations **3:15 PM**

- Continue developing list of potential research needs
  - May include need for breakout sessions or caucuses
- Identify next steps

Public Comment **4:40 PM**

Wrap-Up and Preview of Day Four **4:50 PM**

Adjourn **5:00 PM**

DAY FOUR, APRIL 9: HALF DAY

Arrival and Greetings **8:45 AM**

Welcome and Overview **9:00 AM**

- Overview of Day Four Agenda and Focus (Facilitation Team)
- Questions, Comments and Reflections from Day Three (Facilitation Team, PIRO)

Discussion Focus: Drafting Take Reduction Plans **9:45 AM**

- Review and consider TRP structure, Table of Contents
  - Include discussion of format for organizing research recommendations
- Map strategy and initial assignments for drafting standard elements of TRP
  - MMPA context; FKW distribution, stock structure and abundance; serious injury and mortality data; FKW biology; longline fishery description
- Consider outreach needs as TRP elements begin to get defined
  - Vetting process – Extent to which Team members shop around and seek feedback (formal or informal) from respective constituencies on evolving draft Plan
- Team discussion on ramifications/next steps

Break **10:45 AM**

Next Steps **11:00 AM**

- Confirm remaining FKWTRT meeting schedule
  - Discuss upcoming meeting focus and logistics
  - Revisit outreach opportunities and needs
- Outline Work Group Activities
  - Review and confirm Work Group activities
  - Identify near-term tasks
  - Likely schedule for interim conf calls/analysis
- Next Steps

Public Comments **11:45 AM**

Adjourn **Noon**

ATTACHMENT 2

Presentation Materials

Day 1: April 6, 2010

- Meeting Purpose and Agenda - CONCUR
- Best available data requirements - Forney
- Catch Efficacy of Large Circle Hooks in the Hawaii-based Tuna Longline Fishery - Curran *(presentation not available)*
- Data Work Group Intro - Forney
- Data Work Group Summary - Read
- Data Work Group New Analyses - Forney
- False Killer Whale Spatio-temporal Plots - Marsik
    - HI Deep-set Longline Effort Monthly 2008-2009 - Marsik
    - HI Deep-set Longline Effort Monthly 2008-2009 (Zoomed in, resequenced) - Marsik
    - HI Deep-set Longline Effort Monthly with interactions 2008-2009 - Marsik
    - HI Deep-set Longline Effort Monthly 2003-2007 - Marsik
    - HI Deep-set Longline Effort Monthly 2003-2007 (resequenced) - Marsik
    - False killer whale and blackfish takes, sightings, and depredation - Marsik
- Draft What-If Tool - Forney

Day 2: April 7, 2010

- Overview of Day 2 agenda - CONCUR
- False Killer Whale Echolocation - Nachtigall
- Historical Depredation and Mitigation - McPherson
- Measures in other TRPs - Long

Day 3: April 8, 2010

- Overview of Day 3 agenda - CONCUR

Day 4: April 9, 2010

- Overview of Day 4 agenda - CONCUR
- Research Needs Work Group Summary - Oleson

Background Documents

- Draft Atlantic Pelagic Longline TRP: Table of Contents
- Gilman, E.L., P. Dalzell, and S. Martin. 2006. Fleet communication to abate fisheries bycatch. Marine Policy 30: 360-366
- Curran, D. and K. Bigelow. 2010. Catch and bycatch effects of large circle hooks in a tuna longline fishery.
- Gilman, E., N. Brothers, G. McPherson, and P. Dalzell. 2006. A review of cetacean interactions with longline gear. Journal of Cetacean Research and Management

8(2): 315-223.
McPherson, G.R., C.I Clague, C.R. McPherson, A. Madry, I. Bedwell, P. Turner, D.H. Cato, and D. Kreutz. 2003. Reduction of interactions by toothed whales with fishing gear. Phase 1. Development and assessment of depredation mitigation devices around longlines. FRDC Project No. 2003/016.
Summary of Clint Funderburg and John Hall's gear modification research

DRAFT 4/8/2010 -- provided to facilitate TRT member evaluation of the usefulness of such a spreadsheet, and to make suggestions for improvement during the coming days at the TRT meeting. We expect that a revised version will be available for broader distribution at a later date, but for now, please consider this spreadsheet 'for team member use only' during the meeting.

ATTACHMENT 3

"What if..." calculations for deep-set longline fishery based on 2003-2009 observer data (excluding vessels involved in research during and after research trips), to examine potential reductions in false killer whale (FKW) mortality and serious injury (M&SI) with changes in each of 4 potential parameters:

From Key Outcomes Memorandum First TRT Meeting	
Need to consider solutions at four different conceptual levels:	**Potential mechanisms (examples)**
1) avoid overlap between FKW and the fishery (in time and space):	Time/area restrictions, reduce total effort
2) avoid interaction (if FKW and longliners are in the same areas):	Reduce depredation rate
3) avoid hookings and entanglements (if interactions occur):	Reduce FKW catch probability
4) avoid serious injuries (if hookings or entanglements result):	Reduce M&SI probability

The purpose of this draft worksheet is to help TRT members test 'ballpark' calculations that will 1) help identify potential suites of options for take reduction efforts and 2) form the basis for discussions and further analyses.
(Please see caveats below)

Background information and PBR goals:				Source
Average annual HI EEZ mortality and serious injury estimate, 2004-2008:			7.3	*1*
PBR for HI EEZ from Final 2009 SAR (= target annual M&SI level):			2.5	*2*
Target reduction in M&SI level for deep-set fishery:			**65.8%**	
Serious injury rate (all observer data)			**89.0%**	*1*
Logbook effort (Deep-set, all areas)	# Trips	# Sets	# Hooks	*3*
2006	1380	16397	34,486,898	
2007	1426	17809	38,825,977	
2008	1380	17881	40,078,613	
2009	1241	16749	37,630,802	
Average 2006-2009	**1357**	**17209**		

Sources	**Reference**
1	*McCracken and Forney PIFSC Working Paper 2010-01*
2	*Final 2009 SAR (Carretta et al. 2009; NOAA-TM-NMFS-SWFSC-453)*
3	PIFSC IMS, Longline Logbook Data

CALCULATIONS BASED ON RATES IN 2003-2009 FLEET-WIDE OBSERVER DATA			
Assumptions (can play around with these):	***'Current'***	*Reduce Catch Depredation by 99%*	*[Enter your own parameters here]*
Deep-set (DSLL) effort (Total sets/yr)	**17209**	17209	
DSLL Depredation Rate (% sets w/ depr.)	**5.69%**	**0.06%**	
DSLL FKW catch rate in sets without depredation	**0.05%**	0.05%	
DSLL FKW catch probability (relative to current)	**100%**	100%	
DSLL FKW serious injury probability if caught	**89%**	89%	
Shallow-set (SSLL) effort (Total sets/yr)	1200	1200	
SSLL FKW catch probability (relative to current)	0.02%	0.02%	
SSLL FKW serious injury probability if caught	89%	89%	

PROJECTED OUTCOMES USING ABOVE INPUT VALUES

Observed DSLL sets (2003-09)	**20724**			
Sets with depredation	1179	979	10	
% with depredation	5.7%			
FKW takes with depredation	19	15.8	0.2	
FKW take rate with depredation	1.61%			
Sets without depredation	19545	16230	17199	
% w/o depredation	94.3%			
FKW takes w/o depredation	9	7.5	7.9	
FKW take rate w/o depredation	0.05%			
TOTAL DSLL FKW TAKES/YR		23.3	8.1	
TOTAL FKW M&SI IN DSLL		20.7	7.2	
Observed SSLL sets (2003-09)				
Sets	**6228**			
FKW takes	1	0.2	0.2	
FKW take rate	0.02%			
TOTAL SSLL FKW TAKES/YR		0.2	0.2	
TOTAL FKW M&SI IN SSLL		0.2	0.2	

Total FKW M&SI (per year)	**20.8**	**7.3**	
Target (reduce M&SI by 65.8%):	**7.1**	**7.1**	

CAVEATS:
The overall analysis gives an indication of fleet-wide activities and rates, but it does not explicitly take into account spatial or temporal heterogeneity. For simplicity, it also assumes sets are independent and within-year observer coverage is constant (or there is a lack of seasonality). The average 2003-2009 annual bycatch estimate in the above table (23.3/yr) is a bit higher than the 2004-2008 average estimate of 15.5 animals/yr presented in McCracken and Forney (2010), based on more sophisticated trip-based methods that take into account uneven sampling probabilities. The difference could be caused by the inclusion of data for 2009 (when a greater number of FKW takes were reported) in the above calculations, or it could be a reflection of one or more unmet assumptions.

Prepared 4/6/2010 by Karin Forney, for discussion at 2nd TRT meeting

ATTACHMENT 4

(As presented by K. Forney at FKWTRT team discussion during April 6-9, 2010, meeting.)

Rationale for TRT target take reduction level

For transboundary stocks such as pelagic false killer whales, where complete bycatch and abundance information is not available on the high seas, stock status is assessed based information for U.S. EEZ waters, i.e., mortality and serious injury (M&SI) within the U.S. EEZ is compared to the PBR calculated for the U.S. EEZ.

Therefore, the target reduction rate for false killer whale M&SI is derived from the U.S. EEZ portion of the stock's range. The most recent estimate of M&SI for pelagic stock false killer whales in HI EEZ waters is 7.3, and the PBR for the HI EEZ is 2.5, so the total Hawaiian Islands EEZ M&SI must be reduced by 4.8 animals/year, or 65.8% of the current level.

Applying this same proportional reduction to the entire HI EEZ and high seas fishing area:

Total M&SI of pelagic stock false killer whales in deep-set and shallow-set fisheries (HI EEZ and high seas; McCracken and Forney, PIFSC working paper):
7.3+5.3 = **12.6 animals/year**

Reducing the above number by 65.8%, the target M&SI for HI EEZ and high seas combined is **4.3/year** (2.5 inside the HI EEZ and 1.8 on the high seas)

At 20% coverage, this would roughly be equivalent to **one** observed false killer whale M&SI for HI EEZ and high seas waters combined.

NOTE: Palmyra Atoll and insular stocks are currently below PBR, and the above calculations assume they remain below PBR.

False Killer Whale Take Reduction Team
Meeting #3, June 15-18, 2010
Kahuku, HI

KEY OUTCOMES MEMORANDUM

I. OVERVIEW

The National Marine Fisheries Service (NMFS) held the third meeting of the False Killer Whale Take Reduction Team on June 15-18, 2010, at the Turtle Bay Resort in Kahuku, Hawaii. (See **Attachment 1** for a copy of the agenda.) The meeting focused on the following objectives:

- Provide updates on recent activities
- Foster follow-on discussions to identify candidate Take Reduction Plan measures; begin developing packages of possible actions
- Engage full Team in discussions related to Take Reduction Plan research needs; begin prioritizing among candidate actions
- Initiate review of draft Take Reduction Plan language

This meeting summary is presented in five main sections: Overview, Participants, Meeting Materials, Key Outcomes, and Next Steps. The Key Outcomes section is further segmented into the following:

- ***Welcome, Introduction and Updates.*** This section provides a brief overview of meeting purpose, agenda overview and relevant updates.
- ***Background Briefings and Presentations.*** This section summarizes the various briefings presented at the meeting outset.
- ***Overarching Themes.*** This section summarizes the results of the team's brainstorming and deliberations over the four-day meeting. Any recommendations or actions agreed to by the Team are called out in this section.

Additionally, a number of meeting materials are included as attachments.

II. PARTICIPANTS

The meeting was attended by 16 of 19 Team members or their alternates. Participants included the following: Robin Baird, Hannah Bernard, Brendan Cummings, Paul Dalzell, Roger Dang, Clint Funderburg, John Hall, John LaGrange (for Jerry Ray), Kristy Long, Kris Lynch, David Nichols, Tory O'Connell, Andy Read, Ryan Steen, Lisa Van Atta (for Lance Smith) and Sharon Young. William Aila, Steve Beverly and Paul Nachtigall were unable to attend.

Nancy Young, with the NMFS Pacific Islands Regional Office (PIRO), and Erin Oleson and Karin Forney, with the NMFS Pacific Islands and Southwest Fisheries Science Centers, respectively, also joined in Team deliberations. Scott McCreary and Bennett Brooks from

CONCUR, an environmental dispute resolution firm specializing in marine resource and water issues, served as the neutral facilitators. As well, about 10 people, including staff from NMFS, NOAA Office of General Counsel, NOAA Office of Law Enforcement, the U.S. Coast Guard, and members of the public, attended all or part of the meeting.

III. MEETING MATERIALS

Meeting materials were provided to support the group's deliberations. As possible, meeting materials were sent out ahead of time. However, some documents and nearly all presentation materials were distributed as handouts. All materials are available on the web at http://www.nmfs.noaa.gov/pr/interactions/fkwtrt/).

IV. KEY OUTCOMES

Below is a summary of the main topics and issues discussed. This summary is not intended to be a meeting transcript. Rather, it provides an overview of the main topics covered, the primary points and options raised in the discussions, and areas of full or emerging consensus.

A. Welcome and Introductions

The meeting began with a welcome by Lisa Van Atta, PIRO Assistant Regional Administrator for Protected Resources. This was followed by a brief overview of the meeting purpose, self-introductions, and a review of the meeting agenda. It also included brief updates on the following topics:

- ***Take Reduction Plan (TRP) Goal.*** NMFS staff presented a summary of the TRP goals distributed one week prior to the meeting: reducing the level of mortality and serious injury (M&SI) of the Hawaii Pelagic stock of false killer whales within the U.S. Exclusive Economic Zone (EEZ) of the Hawaiian Islands to below the stock's potential biological removal (PBR) level of 2.5 false killer whales per year. This goal, it was noted, includes two caveats:

    - Reduction in M&SI within the EEZ cannot be achieved by displacing effort to areas outside of the EEZ if that displacement would be expected to result in an increase in M&SI of false killer whales in waters outside the EEZ.
    - Gear modifications or changes in fishing practices should be applied fleet-wide (wherever the fleet operates).

- ***HLA Outreach Effort.*** Ryan Steen provided a brief summary of the fishermen outreach meeting hosted by the Hawaii Longline Association in late April. The meeting was extremely well attended, with as many as 50 fishermen in attendance, and generated significantly increased awareness and interest in the effort and possible solutions. The Team discussed briefly the need for a follow-on survey of fishermen, but agreed that any survey should be driven by specific information needs.

- ***Draft 2010 SAR Status.*** Erin Oleson noted that the draft 2010 Stock Assessment Report (SAR) is still under review and is expected to be published in the next few weeks. N. Young

noted that much of the data from the 2010 SAR has been already been incorporated into draft TRP chapters distributed earlier for Team review.

NMFS staff confirmed that Meeting #4 is to be held at the Moana Surfrider in Honolulu.

B. Background Briefings and Presentations

The meeting included focused presentations on a number of topics. Below is a quick synopsis of the topics covered. (Broader discussion themes based on these presentations are captured in Section C below.) As noted earlier, copies of nearly all presentations are available on-line. (Only the presentations by Adam Bailey (NMFS PIRO) and Keith Bigelow (NMFS Pacific Islands Fisheries Science Center) are not available for posting.)

- ***Spatio-Temporal Patterns of Effort and False Killer Whales.*** Michael Marsik with the NMFS Pacific Islands Region Observer Program presented monthly maps of logbook data highlighting the spatio-temporal patterns of longline fishing effort, overlaid with spatio-temporal data on false killer whale sightings and takes, and marine mammal-caused damage to catch (depredation). One Team member recommended that the false killer whale sightings be expressed and illustrated in terms of sighting per observer hour to normalize for any increases in observer coverage.

- ***Bait Retention Gear Modification Results.*** K. Bigelow presented preliminary results of experimental bait retention gear modifications tested over the past two months. The preliminary results were not encouraging, with data collected and analyzed to-date suggesting the experimental gear provided no appreciable increase in bait retention and may have reduced target catch rates. Team members expressed interest in looking more closely at the change in catch rate by species to determine the effect of the gear modification on catch of target species (e.g., bigeye tuna).

- ***Weak Hooks.*** Two different presentations focused on weak hooks: (1) a presentation on recent hook strength testing by the Hawaii longline fleet; and (2) an overview of recent weak hook research worldwide. Below is a brief summary of both presentations.

    - J. Hall presented a brief summary of hook strength tests conducted on a digital line/hook tester at Pacific Ocean Producers between Meetings #2 and #3. The testing, a look at the pull strength required to bend and open a hook enough for a fish or whale to escape, suggests that certain "weak" hooks have the potential to serve as the weakest link in the gear – a result that appeared promising to many Team members as a strategy for releasing some hooked whales and reducing the severity of their injuries.

    - David Kerstetter (Nova Southeastern University Oceanographic Center) presented an overview of recent and future research in longline fisheries in the Gulf of Mexico and off the coast of North Carolina to study the impact of weak hooks on bycatch and target species rates, noting that the results to-date are inconclusive and require further study. D. Kerstetter also presented data on hook strength testing, and noted that the

New England Aquarium might have limited funding available to support further weak hook testing in the Hawaii longline fleet later this year.

Extensive Team deliberations related to weak and circle hooks are summarized in the *Overarching Themes* section below.

- ***Reducing the Severity of False Killer Whale Injuries.*** K. Forney presented information on potential methods for reducing the severity of hookings and/or entanglements, based on the NMFS Serious Injury Determination Guidelines. She also presented data from the Observer Program to assess the potential for various management actions under consideration to reduce injury severity. Her analysis suggested that at least 38% of past serious injuries could have been reduced to non-serious injuries if hooks and gear had been removed from the animals; the removal of hooks and gear may be facilitated in the future by gear changes (e.g., weak and/or circle hooks) and improved captain/crew training. Some Team members also saw the potential for the severity of the injuries occurring in other situations (e.g., line cut because animal was too active, or line parted) to be reduced by gear modifications and training changes.

- ***Update on Predictive Model***. K. Forney provided an update on the predictive model she developed to support Team deliberations. The model is intended to help Team members assess the impact on false killer whale takes of various gear and fisheries management actions being considered by the Team. Team members' comments and recommendations for improving the model are summarized in the Overarching Themes section below.

- ***Existing Working Training for Marine Mammal Interactions.*** A. Bailey presented an overview of current protected species workshops and suggested possible approaches for incorporating captain/crew training related to false killer whale handling into the existing training. The presentation served as the basis for later Team discussions related to captain/crew training needs.

- ***2010 Hawaiian Islands Cetacean and Ecosystem Assessment Survey (HICEAS) II Focus.*** E. Oleson provided a brief overview of the approach to the planned 2010 HICEAS II survey, emphasizing the new methods being used to improve the accuracy and precision of abundance estimates. Among the most important changes: (1) relying on both visual and acoustic observations; (2) having more observers simultaneously on the bridge during a sighting to better assess group size; (3) including rear-facing spotter to assess vessel-attraction effects; (4) launching a small boat to take photographs when false killer whales are sighted or detected acoustically; and (5) more ship time. She also noted that the HICEAS II survey will have a false killer whale focus.

- ***MMPA Import Provisions and MSA Identification and Certification Procedures.*** Mike Simpkins with NMFS' Office of International Affairs provided an overview of U.S. efforts internationally to reduce marine mammal bycatch in fisheries worldwide. His presentation focused on provisions of both the Marine Mammal Protection Act Section 101(a)(2) and the Magnuson-Stevens Fishery Conservation and Management Act. He also presented information on the Joint Tuna RFMO Bycatch Workshop to be held in late June 2010.

Finally, he encouraged Team members to submit comments on an advance notice of proposed rulemaking (ANPR) that would define U.S. marine mammal bycatch standards and criteria for assessing foreign fisheries that import fish, and describe procedures for applying those standards.

As well, E. Oleson presented an overview of mark-recapture surveys as an alternative method for assessing pelagic stock abundance.

C. Overarching Themes

The Team's deliberations began to flesh out possible elements and chapters of a Take Reduction Plan, as well as crystallizing key issues requiring further discussion. Below is a synthesis of the Team's key discussion points, emphasizing (1) areas of emerging agreement; (2) areas requiring further deliberations; and (3) other topics discussed.

1. Areas of Emerging Agreement

Team deliberations over the four-day meeting demonstrated strong preliminary consensus on several possible aspects of a Take Reduction Plan. These areas, outlined below, still require additional discussion and need to be considered by Team members in the context of a complete Take Reduction Plan. Still, there was strong Team support for the concepts outlined below.

- ***Circle hooks.*** Team members put forward a consensus recommendation requiring the use of small circle hooks (14/0, 15/0, 16/0) in the deep-set longline fishery. The recommendation – provided as **Attachment 2** – stepped out a series of hook characteristics intended to minimize the chance of a false killer whale hooking, or to allow a false killer whale to be released or to release itself if hooked by straightening the hook. Key aspects are summarized below:

    - Wire diameter not to exceed 4.5mm (wire diameter enforced with a gauge)
    - Round wire
    - Pull strength not to exceed 350 pounds
    - 10 degree offset or less.

  Additionally, the Team put forward a recommendation requiring that longline gear for any other fishery that does not meet these standards (e.g., 18/0 circle hooks required in the Hawaii-based shallow-set fishery) must be stowed in a manner inaccessible to fishing during that trip. This language was intended to foster effective enforcement, yet enable boats that engage in both the deep-set and shallow-set fisheries to carry gear for both fisheries.

  Team members broadly endorsed the small circle hook requirement since it appears to result in about a 6% reduction in false killer whale bycatch, without negatively impacting big eye tuna catch rates. Although sample sizes of animals caught previously by small circle hooks were too small for a meaningful statistical analysis (3 false killer whales, two pilot whales, and one unidentified false killer whale or pilot whale), the proportion of animals that were seriously injured or killed was lower for small circle hooks (50-75%, depending on species

included) than for tuna hooks (89-93%). Thus, the use of small circle hooks might reduce the frequency of serious injuries, although this is not certain. Roughly 41% of the current fishing effort already uses circle hooks, and another 24% uses a mix of hooks types including small circle hooks, so there is expected to be less resistance and costs associated with implementing this requirement.

Team discussions highlighted several other points that, while not formally included in the attached consensus recommendation, merit mention:

- The importance of providing early notification to the fleet of any new requirement to ease the gear changeover.
- The use of financial incentives, if possible, to accelerate purchase and adoption of the new gear.
- The need for aggressive outreach with the fleet to underscore the message that circle hooks do not negatively impact target species catch rates.

- ***Terminal tackle.*** For the deep-set fishery only, the Team put forward a consensus recommendation requiring that the fleet use monofilament leaders not less than 2.0 mm diameter. The intent of this requirement is to ensure that the hook is the weakest component of the terminal tackle.

  During the Team deliberations, several participants raised concerns that the diameter of monofilament leaders may change after use – a condition that could impact both enforcement and line-breaking strength. To address this concern, Team members J. Hall and C. Funderburg agreed to test line stretching after the meeting to inform final TRP language. Possible strategies for amending the language include tying the line diameter language to "when new" requirements and incorporating an after-use minimum diameter requirement based on the results of the tests.

  N. Young is to draft and distribute to the Team updated language to reflect any new requirements regarding monofilament diameter.

- ***Weak hook experiment.*** Team members put forward a consensus recommendation calling for a near-term pilot study and large-scale weak hook trials to assess the impact of different hook strengths on target species catch rates. The recommendation – also included in **Attachment 2** – centers around the following aspects:

  - Near-term pilot study: compare both 4.0mm and 4.2mm "weak" hooks with 4.5mm hooks; limit the trial to 8 trips (4 trips per comparison); provide compensation to participating vessels; use trial results to select the smallest diameter hook that does not adversely affect target catch rates as the "weak" hook to test in large-scale trial.
  - Large-scale trial: hook strength comparison should be determined by the results of the pilot study; number of sets to be determined by power analysis; provide compensation to participating vessels.

Team members broadly supported the research recommendation as an essential next step to balance (1) the apparent potential for weak hooks to result in lower marine mammal mortality and serious injury rates, with (2) the need to demonstrate to industry that weak hooks will not negatively impact target species catch rates. There was also broad support for using experimentation to identify the weakest hook possible to be used in the fishery.

Next steps associated with this recommendation include determining logistics and confirming funding for initial weak hook trials, and working to secure funding for a large-scale trial. Team member A. Read is to assess the potential of securing near-term funding.

- ***Captain/Crew Training.*** Team members put forward a consensus recommendation intended to broaden captain and crew awareness of the benefits of and strategies for releasing false killer whales in a manner that does not result in a serious injury to the whale. Specific aspects of the recommendation center on the following:

    - Requiring via regulation a marine mammal component of the existing Protected Species Certification Program. Owners and captains would be required to complete the training annually. In the first year, training would need to be completed in-person; subsequent years could be done on-line. Training would be optional but recommended for crew.

    - Calling for NMFS to develop course content focused around the following topics: regulatory overview, species identification, marine mammal handling and release techniques, and best practices for reducing marine mammal bycatch and injury. Team members emphasized the importance of structuring course content in a manner that makes clear to fishermen the benefits of facilitating non-serious injuries (i.e., healthy populations and less bycatch may have fewer impacts on industry). They also called on NMFS to (1) use the Team as an ongoing sounding board for any course content developed; (2) translate materials into Vietnamese and Korean; and (3) incorporate the new components into existing trainings as quickly as possible (i.e., before a final TRP is formally implemented). There was also interest in using the training to garner owner/captain interest in participating in false killer whale photo-identification studies.

    - Modifying the existing Hawaii marine mammal placard to more closely mimic the look and feel of the Atlantic Pelagic Longline placard. Include language on the placard calling for the crew to notify the captain in the event a marine mammal is hooked or entangled. The intent of this recommendation is to ensure that a well-trained individual is overseeing efforts to safely release a marine mammal, since Team members broadly agree that the methods used to handle a hooked or entangled marine mammal are likely to have a significant impact on whether the interaction results in a serious or non-serious injury.

    The recommendation is to be drafted into proposed TRP language for review by a Work Group between Meetings #3 and #4 and then by the full Team at Meeting #4. Among the issues still to be resolved: (1) whether and where placards are to be posted on vessels; and (2) whether crew are to be encouraged or required to notify captains in the event of a marine mammal hooking or entanglement.

- ***Long-Term Research Priorities.*** Team members developed a consensus list of long-term research priorities. The list, developed through a ranking exercise conducted by all Team members, identified the overall research priorities across four broad categories: longline gear-related, false killer whale biology, false killer whale assessments, and kakaline/short line fisheries. Below are the top research priorities ranked by at least 80% of Team members as being of "high" priority (in descending order):

    - Evaluate impact of circle hook/weak hooks on FKW bycatch rates (*Longline Gear*)
    - Conduct regular Hawaiian EEZ surveys (*FKW Assessments*)
    - Understand impact of weak hooks on target species catch rates (*Longline Gear*)
    - Continue research into FKW abundance using towed and stationary acoustics (*FKW Assessments*)
    - Develop methods for fleet to use acoustic recorders to determine FKW presence prior to setting (*Longline Gear*)
    - Determine number of vessels that use shortline and kaka line gear; begin data collection on when and how fishing *(Shortline/kaka line)*
    - Distinguish FKW calls from other odontocete species *(FKW Biology)*

    Team members recommended that only the above research priorities be highlighted in the main body of the eventual TRP, so as to focus attention and interest on the top needs identified by the Team. At the same time, the Team recommended including the category-by-category research ideas in the TRP appendix ,as there may be funders interested in providing research monies at some future date to support valuable but lower-priority activities. As well, some entities may allocate funds for a specific research category, given their own programmatic priorities. Team members also recommended that final TRP language underscore the importance of ongoing support for those research activities already being undertaken by NMFS.

    Based on the discussion, R. Baird and CONCUR and NMFS staff are to prepare draft TRP language for Team review and comment. The results of the overall and category-by-category rankings conducted at the meeting are included as **Attachment 3**.

2. Areas Requiring Further Discussion

As described above, the Team made significant progress identifying specific actions to include in an eventual TRP. Still, there were several critical areas where Team views diverged significantly. These topics, summarized below, necessitate further discussion both within and across caucuses.

- ***Near-Term Weak Hook Implementation.*** While the Team saw great potential for using weak hooks to reduce false killer whale bycatch and voiced strong, consensus support for conducting weak hook trials, Team members differed in their views of the approach to incorporating deep-set weak hook requirements (i.e., weaker than the hooks that are currently used in the fishery) in the Plan at this point.

The primary divergence centered on whether or not the TRP should include an upfront requirement related to weak hooks. Conservationists stepped out a proposal with the following aspects:

- Provide funding and conduct research in the very near-term (prior to TRP rule-making) to assess whether the use of weak hooks (4.2mm) negatively impacts bigeye tuna catch rates more than 5%.
- If the research is conducted and bigeye tuna catch rates are reduced by less than 5%, require 4.2mm weak hooks in the Hawaii-based deep-set longline fishery.
- If the research is conducted and bigeye tuna catch rates are shown to be reduced by more than 5%, the fleet would be required to fish with a maximum of 4.5mm weak hooks. However, as a fallback provision, the proposal would require the fleet to shift to 4.2mm hooks if a false killer whale is observed to be caught on a 4.5mm hook that did not straighten.

Those advocating this approach said it had several advantages. For one, it relies on the latest research to inform the Plan. Secondly, it acknowledges that the fishery needs additional information before it can fully convert to weaker (4.2mm) hooks. Lastly, proposal backers characterized the fallback provision as essential since they see the shift to weak hooks as a "leap of faith" given the promising but uncertain impact on marine mammal bycatch rates.

Industry members expressed several concerns with the content and sequencing of this proposal. Most importantly, they voiced reluctance to agree to any upfront weak hook requirements without knowing the results of the weak hook tests on target species catch rates. Moreover, they said it would be extremely difficult to convince the broader fishery to accept the requirement without better information. Additionally, several participants said industry would be effectively taking its own leap of faith regarding the potential impact of weak hooks on target catch rates.

As well, there were concerns voiced by some Team members (both researchers and industry representatives) regarding the pragmatic reality of tying implementation of future actions to research results. For one, several Team members suggested that the weak hook target should be informed by testing; why, as one person said, stipulate a 4.2mm weak hook when even weaker hooks may be viable (i.e., lower marine mammal bycatch rates without hurting target catch rates). Better, they said, to test first and devise a management strategy later. Others voiced concern about tying a future management decision to research results that, among other things, have no identified funding sources and are likely to prove difficult to interpret. There were also concerns that research would not be conducted in a timely enough fashion. And one Team member said it would be important to assess the reason for a take on a weak hook before simply implementing a contingency plan. "We need to know what happened," this Team member said.

All participants agreed that any use of weak hooks needs to be accompanied by training to ensure vessel owners, captains and crew are aware of practices that make it easier or harder for a marine mammal to free itself from a weak hook, and that reduce or increase the severity of injuries to the marine mammal. Training also needs to address safety-at-sea issues.

Finally, there was a recommendation from some Team members that future efforts to assess impact on target catch rates need to show value per hook and not just overall catch rates.

- ***Contingency Plan.*** Team members continued the discussion started during Meeting #2 regarding potential contingency plans if the combination of gear modifications, captain/crew training, and other potential initial management actions are insufficient to meet Plan goals. While all parties agreed on the need for a contingency plan, Team members had divergent views on the aspects of such a plan. Below is a summary of the two primary contingency plans put forward.

    - One approach, put forward by a conservation advocate, looks to use fishing effort reductions sufficient to bring M&SI of Hawaii pelagic false killer whales in line with the Team's goals: below 2.5 within the EEZ around the Hawaiian Islands and no increases from current levels on the high seas. In this approach, an effort cap within the EEZ and on the high seas (west of 135° W longitude; areas within the likely range of the Hawaii pelagic stock of false killer whales) would be put in place when an agreed-upon trigger (i.e., a certain number of M&SI takes) was surpassed. Deep-set longline effort would not be restricted in areas outside the range of the pelagic stock (preliminarily described as approximately east of 135° W longitude and north of 32° N latitude).

    - Several fishery representatives said it was not tenable to accept effort reductions at this point, citing uncertainty in the current PBR, the likelihood of updated abundance estimates based on the upcoming 2010 survey[1] and the potential for painful economic impacts (lost income, lost market share). As one Team member put it: "For fishermen, it's tough to agree to a fishery closure based on old data." Another fishery representative noted that the plan to limit effort on the high seas would be counter-productive, suggesting that the foreign fleets operating in the same waters would simply increase their effort (and do so with less concern for marine mammal takes). This same person noted that shifting effort east of 135° W longitude (outside the area of effort restrictions) also triggers safety considerations for smaller vessels. Instead, fishery interests recommended that – in the event M&SI surpass some agreed-upon trigger – the Plan require the Team to reconvene and hammer out new management actions. This approach, they said, would ensure that the Team's deliberations are informed by the latest data collected in the 2010 survey. This approach was not seen as viable by a number of Team members who said any contingency plan needed to incorporate concrete mechanism for reducing takes and not just call for further discussions.

    The deliberations also surfaced other considerations related to the crafting of possible contingency plans. These included the following: (1) support for accelerating the Team's access to and use of the latest abundance data (i.e., after (expedited) SRG review but before it is formally incorporated into the latest SAR); (2) interest (if possible) in tying take reduction targets to a percentage of PBR, so the Plan remains current even as abundance numbers and PBR are updated; (3) concerns about the enforceability of various measures; and (4) the

[1] K. Forney and E. Oleson noted that the 2010 survey is unlikely to significantly change the new abundance estimate. Moreover, they said, there's no way to anticipate now whether the new abundance will be higher or lower.

benefit of increasing observer coverage within the EEZ to reduce uncertainty in take estimates (an important consideration given the rarity of false killer whale take events).

Finally, NMFS staff emphasized that, given the uncertainty associated with the gear and training actions discussed to-date, it expects to put forward some type of contingency plan in any proposed rule it develops.

Though participants were not yet able to reach agreement, participants indicated their willingness to consider new options. Fishery interests emphasized the need for additional internal caucuses before engaging in more detailed discussions on the topic.

- ***Insular Stock.*** Team members considered a proposal put forward by a conservationist member of the Team recommending that the current February-September longline exclusion boundary be maintained year-round – a move that would push the fleet farther out from the Hawaiian Islands in the fourth quarter but eliminate most of the overlap between the Hawaii longline fleet and the insular stock. This move was projected to displace the 3 to 6 percent of the fleet's effort. Another option was to craft an exclusion zone that mimicked the updated range of the insular stock proposed in the draft 2010 Stock Assessment Report delineated on a map presented by E. Oleson. (See **Attachment 4**.)

  The proposal was not seen as viable by fisheries representatives on the Team. Most problematically, they said, the bigeye tuna harvested closest to the island is of extremely high value; in other words, while the harvest may represent just a small percentage of the annual catch volume, its dollar value to the fleet is said by fishermen to be significantly higher. Moreover, several Team members questioned the underlying logic of the proposal, suggesting that there is little evidence to-date to suggest interactions between the deep-set longline fleet and the insular stock.[2] And at least one Team member questioned the accuracy of the Agency's delineation of the insular stock range.

  The Team did not identify any specific next steps, though further discussions are anticipated at Meeting #4.

- ***Triggers.*** Team members only briefly discussed triggers as part of its deliberations related to contingency plans. While no firm proposals were put forward, given the low PBR within the EEZ (2.5 animals per year), participants agreed that very few observed takes would be required to trigger contingency plans. One conservationist suggested that a single observed mortality or serious injury take might be too low as a trigger, given the randomness of the events, but that two mortalities or serious injuries in a year might be a better indicator. Several speakers emphasized the need to distinguish between triggers that indicate the goal isn't being met versus those that show the gear isn't working. More discussion on this topic is needed.

[2] R. Baird suggested it is difficult to assess the presence or absence of false killer whales on the windward side of the islands. For one thing, he said, it is not appropriate to fully extrapolate from the tagged data of individuals to the behavior of a much larger group. Additionally, he said there is much less sampling on the windward side of the islands, a fact that could make the distribution appear more asymmetrical than it really is.

3. Other

The meeting generated discussion on a range of additional topics. Below is a summary of these additional themes.

- ***Strategies for strengthening predictive model.*** As noted earlier, while both supportive and appreciative of the predictive model, Team members offered several suggestions for strengthening the model, including: (1) incorporating other existing management constraints (bigeye quota, turtle caps, etc.); (2) analyzing and reporting catch results by both hooks rather than (or in addition to) sets; (3) revising the summary table to show M&SI relative to both the TRT target and current take levels; (4) running the predictive model with the Palmyra data included to serve as a sensitivity test; and (5) allowing the vessels that were excluded following participation in 2003-2006 research trips (because they retained the experimental gear configurations) to be added back into the data base after a certain period of time. Some Team members also voiced cautions regarding the model, noting it assumes that whale behavior would not change if the fleet changed operations . Additionally, Team members asked NMFS staff to present data from the model in a manner that teases out important findings and implications, but leaves the interpretation of the data to Team members.

- ***Value of mark-recapture research.*** Team discussions highlighted several advantages of mark-recapture research (and more general photo identification) for the Hawaii pelagic stock, including: (1) offering an additional method to generate, confirm and/or revise abundance estimates; (2) providing a mechanism to refine serious injury determinations; and (3) generating data to sharpen knowledge of stock boundaries and population structure. Deliberations also noted some significant limitations, including: (1) the need for training to get usable photos; (2) the limited time captain and crew have to spot false killer whales; and (3) the number of photos needed to generate a meaningful catalogue. Based on both the potential and the constraints, Team members broadly recommended that NMFS recruit the voluntary participation of interested captains - this is best done, several Team members said, by making sure captains understand the benefits to the fishery – and provide them with appropriate training and equipment. The Team also suggested that observers be provided better equipment to support their efforts.

- ***Kaka line/Shortline.*** D. Nichols presented information on State of Hawaii kaka line and shortline data collection protocols to the Team. Team members expressed continued interest in getting better information on the kaka line and shortline fisheries, including vessel numbers, catch volume and value, bycatch, depredation and marine mammal interaction information. Interest in this data is particularly high given the disconnect between state data records and anecdotal information regarding marine mammal takes. Additionally, Team members noted that while much of the information about the kaka line and shortline fisheries is anecdotal, there does seem to be value (from a joint fact finding perspective) to keeping a focus on assembling available data and refining and ground-truthing this information. As one Team member observed "Each time we talk about this, we seem to realize that we have just a little bit more information." Finally,

Team members noted that the research agenda does include two items aimed at strengthening the information base on these fisheries.

- ***International bycatch provisions.*** Team members offered several observations regarding the merits and challenges inherent in weighing in on the international bycatch front. These included: (1) species characterized as "bycatch" in the U.S. are often not characterized as bycatch in other nations; (2) the rigor and effectiveness of other nation's marine mammal assessment and/or bycatch reduction programs vary widely; (3) stakeholders have low expectations that the U.S. will meaningfully implement existing provisions; and, (4) a recognition that there has been little systematic work done on transfer effects (though one participant noted a study of transfer effects when the Hawaii-based shallow-set swordfish-target fishery was closed due to sea turtle bycatch). One Team member suggested an alternate approach to working with other nations. In this proposed approach, the U.S. would project each foreign fleet's bycatch rate using U.S. bycatch rates. This approach would effectively shift the burden of proof onto other nations to refute the U.S. forecast. Finally, R. Steen and B. Cummings agreed – time permitting – to draft a proposed Team comment letter on the ANPR for draft MMPA international provisions. Team members also noted that they will be submitting individual comments.

- ***Other.*** Below is a listing of other comments and suggestions put forward during the meeting:

    - Further assess the results of C. Funderburg's gear modification experiment to assess the impact on species-specific catch rates.
    - Work with P. Nachtigall to design an experiment using Kina (a captive false killer whale) that assesses whether the recently tested bait retention gear modification acts as a deterrent or an attractant ("dinner bell effect).
    - Revise Observer Program forms to allow data collection on set-splitting (short sets), as this will enable NMFS to track the possible impact of set-splitting in future years.
    - As more fleet activity shifts east, NMFS will need to better understand the dividing line for classifying takes as part of the Pelagic rather than the Eastern Pacific stock. This is important to Team members, since the Team's goal, as defined by NMFS, doesn't allow for effort shifts if it results in increased takes in the Pelagic stock.
    - Assess Observer Program data from 2010, 2007 and 2005 to understand any trends that might have contributed to a lack of takes in the first six months of each year.

Finally, at several junctures during the meeting, NMFS staff emphasized the value and importance of Team consensus, noting that agreement on a draft TRP carries significant weight with the Agency and greatly increases the likelihood that plan elements will be adopted in a proposed rule. Without Team consensus, they noted, the Agency will be forced to develop its own proposed management measures.

V. NEXT STEPS

Team deliberations over the course of the four-day meeting identified a number of next steps. Below is a summary of these follow-on tasks.

A. Meeting Timeline

The Team's meeting schedule is as follows:

- Meeting #4: July 13-16 [four full days; Moana Surfrider, Honolulu]

Team members sought clarification from NMFS regarding the potential to push back the July 19th deadline for submitting a draft TRP. L. Van Atta clarified that NMFS does not have the authority to change the deadline and strongly advised the Team to conclude its deliberations in time to meet the July 19th deadline. To that end, Team members were encouraged to attend Meeting #4 in-person or identify Team members who could serve as their proxy.

B. Draft Take Reduction Plan Language

Team members agreed on several next steps to translate the areas of emerging agreement into draft TRP language for further Team review and discussion. Specific steps agreed to are as follows:

- **Circle and weak hooks.** PIRO staff are to update the draft language developed by the Team to incorporate new language that addresses concerns related to (1) the potential for line-stretching; (2) the importance of maintaining the hook as "the weakest link;" and (3) the need to fold in language addressing deep-set vessels carrying shallow-set hooks. Additionally, C. Funderburg and J. Hall are to test monofilament line stretching to assess the potential impact on line-diameter effectiveness and enforcement. As well, A. Read is to explore funding potential for near-term weak-hook experiments, and PIRO staff are to garner input from the NOAA Office of Law Enforcement regarding circle and weak hook enforcement considerations.

- **Captain/crew training.** K. Long is to develop, based on the Team's discussions, draft language related to captain/crew training addressing false killer whale-related issues. Specifically, she is to prepare the following draft materials: (1) draft TRP language on captain/crew training and on-board handling placard; (2) an outline to guide captain/crew training to be incorporated into NMFS' existing Protected Species Workshops; and (3) information to be included in a false killer whale-related on-board placard (modeled on the Atlantic pelagic longline placard).

- **Research Priorities.** R. Baird is to develop draft TRP language based on the Team's discussions and prioritization of research-related priorities. The draft is to include both the Team's overall priorities, as well as a listing of the top priorities within each of the four categories discussed: false killer whale assessments, false killer whale biology, longline gear modifications, and kaka line and shortline fisheries.

- **MMPA International Provisions.** As time permits, R. Steen and B. Cummings are to draft a letter from the Team providing comment on the ANPR for draft MMPA International Provisions. Team members are also expected to submit comments on the ANPR individually.

Additionally, Team members are to provide feedback on draft TRP chapters 1-5 prepared by N. Young. Comments are to be forwarded, via email, to N. Young by Friday, June 25. She will then compile them into an integrated set of comments for distribution back to the Team. Additionally, NMFS and CONCUR are to prepare drafts, as possible, for chapters 6-9 for preliminary review by the Team prior to Meeting #4.

C. Captain/Crew Training Work Group

A Work Group is to review and comment on the draft captain/crew training language to be developed by K. Long. If there are no or few substantive comments, the Work Group will confirm and revise the draft solely via email. If discussion is needed, the Work Group is to meet, via teleconference, on Wednesday, June 30, at 2:30 p.m. (EST), 11:30 a.m. (PST) and 8:30 a.m. (HST) to develop new language for consideration by the full Team at Meeting #4. Work Group members are: R. Baird, K. Lynch, K. Long, J. LaGrange, R. Steen, D. Nichols, H. Bernard, and S. Young.

D. Potential TRP Actions/Contingency Plans

Fisheries representatives are to meet within-caucus to assess the contingency plans and other potential TRP actions discussed during the meeting to assess the viability of the alternatives and develop strategies for follow-on Team discussions. Team members may also engage in cross-caucus talks on these issues prior to Meeting #4, but no firm plans were agreed to (pending the outcome of the fishery caucus deliberations).

E. Other Next Steps

The meeting generated a handful of other next steps. These actions are listed below:

- **Predictive Model.** K. Forney is to distribute the updated predictive model input specification sheet to all Team members and let them know that she is available to run additional model scenarios during the weeks prior to Meeting #4. She is also available to provide assistance to Team members (within and across caucus), as needed.

- **Additional Analyses.** Based on Team discussions, M. Marsik will continue efforts to obtain plots of the distribution of takes, depredation, and fishing effort relative to monthly sea surface temperatures, to allow an examination of any patterns that might have contributed to a lack of takes in the first six months of 2005, 2007 an 2010 or the increase in takes during 2009; and, as possible, (2) further analyze observer data to identify any additional hook-type effects (i.e., assess where there were straightened hooks). Additionally, K. Bigelow is to continue analyzing the results of C. Funderburg's gear modification experiment to assess the impact on species-specific catch rates.

- **Meeting Materials.** N. Young is to post on the Team website presentations not provided prior to the meeting.

Questions or comments regarding this summary should be directed to Bennett Brooks (212-678-0078 or *bennett@concurinc.net*) or Scott McCreary (510-649-8008 or *scott@concurinc.net*).

ATTACHMENT 1

False Killer Whale Take Reduction Team Meeting
June 15-18, 2010: Turtle Bay Resort, Kahuku, Hawaii

AGENDA

MEETING OBJECTIVES

- Provide updates on recent activities
- Foster follow-on discussions to identify candidate TRP measures; begin developing packages of possible actions
- Engage full Team in discussions related to TRP research needs; begin prioritizing among candidate actions
- Initiate review of draft Take Reduction Plan language

DAY ONE, JUNE 15: FULL DAY

Arrival and Greetings **8:45 AM**

Welcome and Introductions **9:00 AM**

- Welcome and Meeting Purpose *(L. Van Atta)*
- Self-Introductions
- Agenda Review *(Facilitation Team)*

Updates *(Facilitation Team leads, with others as noted)* **9:15 AM**

- Clarifying PBR Goal *(PIRO)*
- HLA Outreach Meeting *(R. Steen)*
- 2010 SAR status *(K. Forney/E. Oleson)*
    - Findings, review status, and release dates
- Follow-up on Meeting #2 Requests
    - Meeting #4 location
    - Funding to support near-term weak hook testing
    - Fishermen Survey
- Meeting #$ Hotel Logistics
- Other

Discussion Focus: Identifying Possible TRP Measures **10:00 AM**

- Report out from Predictive Model Work Group *(K. Forney)*
- Report out from Team members on relevant interim discussions

Break **10:30 AM**

Discussion Focus (continued): Identifying Possible TRP Measures **10:45 AM**

- Additional report out, as needed
- Presentations (*K. Forney introduces/sets context*)
    - Updated spatio-temporal plots (*M. Marsik*)
    - Bait retention gear modification results *(K. Bigelow and C. Funderburg)*
    - Weak hook strength testing (*J. Hall*)

Lunch **Noon**

Discussion Focus (continued): Identifying Possible TRP Measures **1:15 PM**

- Presentations (*continued*)
    - Continue presentation from morning, as needed
    - Reducing the severity of FKW injuries in the Hawaii LL fishery *(K. Forney)*
    - Existing Marine Mammal Handling Training (*A. Bailey*)
    - Detailed presentation and discussion on development of and revisions to the "Predictive" and "What If" models? *(K. Forney)*

Break **3:00 PM**

Discussion Focus (continued): Identifying Possible TRP Measures **3:45 PM**

- Continued presentations and discussion, as needed
- Initial Team discussions
    - May include need for breakout sessions or caucuses

Public Comment **4:40 PM**

Wrap-Up and Preview of Day Two **4:50 PM**

Adjourn **5:00 PM**

Happy Hour **5:30 PM**

DAY TWO, JUNE 16: FULL DAY

Arrival and Greetings **8:45 AM**

Welcome and Overview **9:00 AM**

- Overview of Day Two Agenda and Focus *(Facilitation Team)*
- Questions and Comments from Day One *(Facilitation Team, PIRO)*

Discussion Focus (continued): Identifying Possible TRP Measures **9:15 AM**

- Presentations *(continued)*
  - Recent research on weak hooks (*D. Kerstetter*)
- Initiate Team discussions on identifying possible TRP measures; issues to consider include:
  - What are promising candidate measures?
  - What candidate measures can be implemented in the near-term?
  - How can the Team/NMFS assess the expected benefits of potential measures?
  - What additional information is needed to assess potential measures?
- May include need for breakout sessions or caucuses

Break **10:15 AM**

Discussion Focus (continued): Identifying Possible TRP Measures **10:30 AM**

- Continued Team discussions on identifying possible TRP measures
  - May include need for breakout sessions or caucuses

Lunch **Noon**

Discussion Focus (continued): Identifying Possible TRP Measures **1:15 PM**

- Continued Team discussions on identifying possible TRP measures
  - May include need for breakout sessions or caucuses

Break **3:00 PM**

Discussion Focus (continued): Identifying Possible TRP Measures **3:15 PM**

- Continued Team discussions on identifying possible TRP measures
  - May include need for breakout sessions or caucuses

Public Comment **4:40 PM**

Wrap-Up and Preview of Day Three **4:50 PM**

Adjourn **5:00 PM**

DAY THREE, JUNE 17: FULL DAY

Arrival and Greetings **8:45 AM**

Welcome and Overview **9:00 AM**

- Overview of Day Three Agenda and Focus *(Facilitation Team)*
- Questions, Comments and Reflections from Day Two *(Facilitation Team, PIRO)*

Discussion Focus: TRP Research Recommendations **9:30 AM**

- Background briefings (*E. Oleson introduces/sets context*)
  - Report out from Research Work Group (*E. Oleson*)
  - Overview of mark-recapture survey *(K. Forney/E. Oleson)*
  - Update on 2010 survey focus *(E. Oleson)*
- Take first cut at prioritizing among list of potential research needs to include as TRP recommendations
  - May include need for breakout sessions or caucuses

Break **10:30 AM**

Discussion Focus (continued): TRP Research Recommendations **10:45 AM**

- Continue discussion related to prioritizing among list of potential research needs to include as TRP recommendations
  - May include need for breakout sessions or caucuses

Lunch **Noon**

Presentation: International Bycatch Provisions **1:15 PM**

- Presentation on MMPA Import Provisions and MSA Identification and Certification Procedures (*M. Simpkins*)
- Team discussions

Break **2:30 PM**

Discussion Focus: Building Packages of Potential Candidate Measures **2:45 PM**

- Initiate discussion among Team members regarding possible packages of candidate actions; focus on both regulatory and non-regulatory actions
  - May include need for breakout sessions or caucuses

Public Comment **4:40 PM**

Wrap-Up and Preview of Day Four **4:50 PM**

Adjourn **5:00 PM**

DAY FOUR, JUNE 18: FULL DAY

Arrival and Greetings **8:45 AM**

Welcome and Overview **9:00 AM**

- Overview of Day Four Agenda and Focus (Facilitation Team)
- Questions, Comments and Reflections from Day Three (Facilitation Team, PIRO)

Discussion Focus (continued): Building Packages of Candidate Measures **9:15 AM**

- Continue discussion among Team members regarding possible packages of candidate actions; focus on both regulatory and non-regulatory actions
    - May include need for breakout sessions or caucuses

Break **10:30 AM**

Discussion Focus (continued): Building Packages of Candidate Measures **10:45 AM**

- Continue discussion among Team members regarding possible packages of candidate actions; focus on both regulatory and non-regulatory actions
    - May include need for breakout sessions or caucuses

Lunch **12:15 PM**

Discussion Focus: Draft Take Reduction Plan Language **1:30 PM**

- Review draft TRP language provided to Team
    - Focus conversation around substantive issues necessitating Team discussion; specific edits to be submitted via email
- Identify next steps for crafting additional section
    - Timeframe and drafting groups

Next Steps **2:45 PM**

- Confirm remaining FKWTRT meeting schedule
    - Discuss upcoming meeting focus and logistics
    - Revisit outreach opportunities and needs
    - Consider draft TRP ratification strategy given July 19 deadline
- Outline Work Group Activities
    - Review and confirm Work Group activities
    - Identify near-term tasks
    - Likely schedule for interim conf calls/analysis
- Next Steps

Public Comments **3:45 AM**

Adjourn **4:00 PM**

ATTACHMENT 2

(Preliminary consensus language developed by False Killer Whale Take Reduction Team during Meeting #3. To be updated for consideration at Meeting #4.)

Hook requirement

For the deep-set longline fishery, the TRT recommends the required use of circle hooks with the following characteristics, or any other hook certified by NMFS: wire diameter not to exceed 4.5 mm; round wire; pull strength not to exceed 350 pounds; 10 degree offset or less. Longline gear for any other fishery that does not meet these standards must be stowed in a manner inaccessible to fishing during that trip.

The wire diameter will be enforced with a gauge.

Terminal tackle

For the deep-set longline fishery, the TRT recommends the required use of monofilament leaders not less than 2.0 mm diameter. The intent of this requirement is to ensure the hook is the weakest component of the terminal tackle.

Weak hook experiment

The TRT recommends that initial weak hook trials be conducted as soon as practicable. Two sets of hook comparisons would be made: 4.0mm vs 4.5mm hooks, and 4.2mm vs. 4.5mm hooks. The initial trial would include 4 trips of each comparison (8 trips total), with a preferred experimental design of sequentially alternating hook types, and equal numbers of hooks deployed per longline set. Vessels would receive compensation per set, and both control and experimental hooks (preferably from the same manufacturer) would be provided to the vessels. At the end of the initial trials, a qualitative assessment would be used to determine the candidate weak hook for a large-scale trial.

A large-scale trial would compare weak hooks (4.0mm or 4.2mm, whichever is selected following the initial trail) versus standard hooks (4.5mm). The number of sets to be conducted will be based on a power analysis to ensure there is sufficient power to determine whether there is a change in catch rates between hook types. Preferred experimental design is sequentially alternating hook types, and equal numbers of hooks deployed per longline set. Vessels would receive compensation per set, and both control and experimental hooks (preferably from the same manufacturer) would be provided to the vessels.

Next steps include determining the logistics and confirming funding for initial weak hook trials, and work to secure funding for a large-scale trial.

ATTACHMENT 3

Detailed Research Ideas Listing, By Category

The FKWTRT developed a list of 35 research recommendations over the course of several meetings and during several conference calls. These research questions/activities were then grouped into one of four general categories: 1) false killer whale biology; 2) longline gear and fishing; 3) shortline and kaka line fishing; and, 4) false killer whale assessment.

During the June meeting, the 14 FKWTRT members present scored each research question/activity within each of the four categories as one of high, medium or low priority. One TRT member not present also provided scores. Scores were based primarily on the importance of the research activity to trying to address the TRT's goals while also taking into account the feasibility and costs, and with an attempt to assign balanced scores (e.g., not everything within a category being scored "high" or "low").

In order to prioritize the research recommendations for the FKWTRT as a whole, the scores of high, medium and low were converted to numerical values of 2, 1, or 0 respectively, and values were summed. With this ranking scheme, scores could range from 0 (if all scored a research activity as low) to 30 (if all scored a research activity as high).

Below are the detailed results of these rankings – provided both within and across categories.

Ranking of research recommendations by category

FALSE KILLER WHALE BIOLOGY	**Scores**
Distinguish FKW calls from other odontocete species	22
Telemetry studies to examine range and movements of FKWs	20
Evaluate FKW acoustic behavior near longlines using recorders on fishing gear	18
Determine range at which a hook in a fish can be acoustically detected by FKW	16
Carry out underwater observations of FKW foraging behavior to understand mechanisms of depredation	16
Mine existing acoustic data from Cross Seamount and elsewhere to assess frequency of FKW occurrence	15
Evaluate where FKWs are caught within a set and why	14
Evaluate acoustic differences between insular vs. pelagic FKWs	12
Assess impact of hook density on FKW ability to follow line	11
Understand FKW foraging and acoustic behavior using acoustic tags	10
Evaluate FKW capability to see floats, as well as monofilament line of different colors and width	7
Conduct vessel sound playbacks to FKWs to determine the distance of reaction and whether insular individuals react	7
Assess FKW response to compounds found in oil fish and other fish species that FKWs do not depredate	4
Test FKW visual acuity using different types of lights	3
Study adaptive learning, particularly by young FKW	2

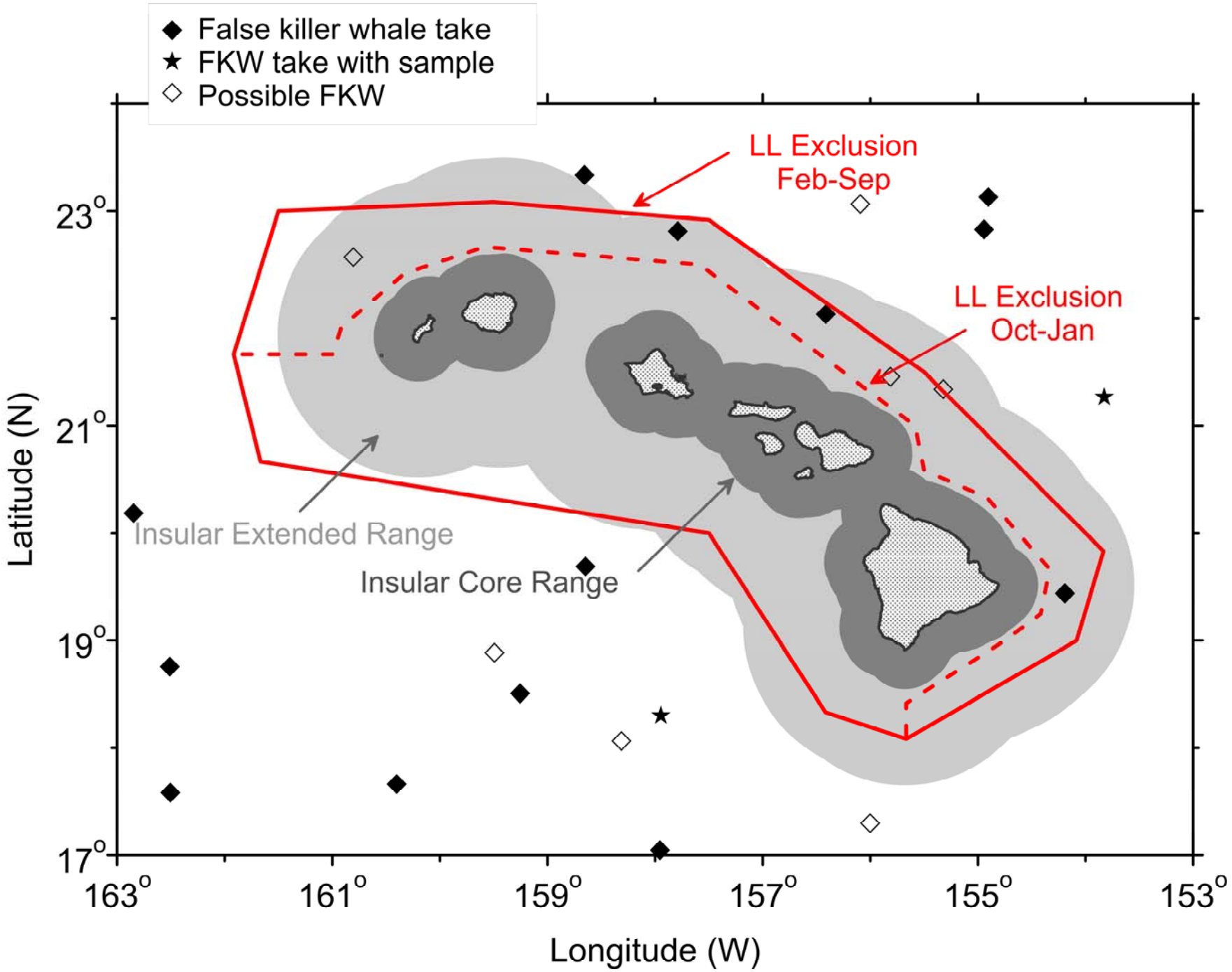
LONGLINE GEAR AND FISHING	
Evaluate impact of weak hooks on FKW bycatch rates	30
Understand impact of weak hooks on target species catch rates	29
Develop methods for fleet to use acoustic recorders to determine FKW presence prior to setting	23
Survey all longline vessels to identify commonalities among those with high depredation rates	16
Evaluate effectiveness of wire loops on hooks as a method to reduce depredation on bait, catch and takes of FKWs	15
Record acoustic profile during setting, soaking, and hauling to assess potential cues to FKWs	11
Assess potential for hooks to be modified (foam coating, etc.) to increase or decrease detection range	10
Record individual sound profile of longline vessels	9
Evaluate potential to use killer whale/other playbacks as deterrents	5
Evaluate feasibility of using moored listening stations (FADs, etc) to determine FKW occurrence before a trip	5
SHORTLINE AND KAKA LINE FISHING	
Determine number of vessels that use shortline & kaka line gear	23
Begin data collection on when and how shortline and kaka line fishing occurs	20
Form an observer program to assess level of FKW and other cetacean bycatch in shortline and kaka line fisheries	18
FALSE KILLER WHALE ASSESSMENT	
Regular Hawaiian EEZ survey (at least every 5 years) to estimate abundance	29
Continue research into FKW abundance using towed and stationary acoustics	24
Collect additional FKW genetic samples to assess population structure	20
Evaluate alternative methods for estimating FKW abundance, with emphasis on improving precision	19
Develop methods to pro-rate "blackfish" bycatch	16
Develop predictive habitat models of FKW density	13
Evaluate degree of genetic differentiation between insular and pelagic FKW stocks	13

Ranking of all research recommendations

Research Activity	Scores
Evaluate impact of weak hooks on FKW bycatch rates	30
Understand impact of weak hooks on target species catch rates	29
Regular Hawaiian EEZ survey (at least every 5 years) to estimate abundance	29
Continue research into FKW abundance using towed and stationary acoustics	24
Develop methods for fleet to use acoustic recorders to determine FKW presence prior to setting	23
Determine number of vessels that use shortline & kaka line gear	23
Distinguish FKW calls from other odontocete species	22
Telemetry studies to examine range and movements of FKWs	20
Begin data collection on when and how shortline and kaka line fishing occurs	20
Collect additional FKW genetic samples to assess population structure	20
Evaluate alternative methods for estimating FKW abundance, with emphasis on improving precision	19
Evaluate FKW acoustic behavior near longlines using recorders on fishing gear	18
Form an observer program to assess level of FKW and other cetacean bycatch in shortline and kaka line fisheries	18
Determine range at which a hook in a fish can be acoustically detected by FKW	16
Carry out underwater observations of FKW foraging behavior to understand mechanisms of depredation	16
Survey all longline vessels to identify commonalities among those with high depredation rates	16
Develop methods to pro-rate "blackfish" bycatch	16
Mine existing acoustic data from Cross Seamount and elsewhere to assess frequency of FKW occurrence	15
Evaluate effectiveness of wire loops on hooks as a method to reduce depredation on bait, catch and takes of FKWs	15
Evaluate where FKWs are caught within a set and why	14
Develop predictive habitat models of FKW density	13
Evaluate degree of genetic differentiation between insular and pelagic FKW stocks	13
Evaluate acoustic differences between insular vs. pelagic FKWs	12
Assess impact of hook density on FKW ability to follow line	11
Record acoustic profile during setting, soaking, and hauling to assess potential cues to FKWs	11
Understand FKW foraging and acoustic behavior using acoustic tags	10
Assess potential for hooks to be modified (foam coating, etc.) to increase or decrease detection range	10
Record individual sound profile of longline vessels	9
Evaluate FKW capability to see floats, as well as monofilament line of different colors and width	7
Conduct vessel sound playbacks to FKWs to determine the distance of reaction and whether insular individuals react	7
Evaluate potential to use killer whale/other playbacks as deterrents	5
Evaluate feasibility of using moored listening stations (FADs) to determine FKW occurrence before a trip	5
Assess FKW response to compounds found in oil fish and other fish species that FKWs do not depredate	4
Test FKW visual acuity using different types of lights	3
Study adaptive learning, particularly by young FKW	2

ATTACHMENT 4

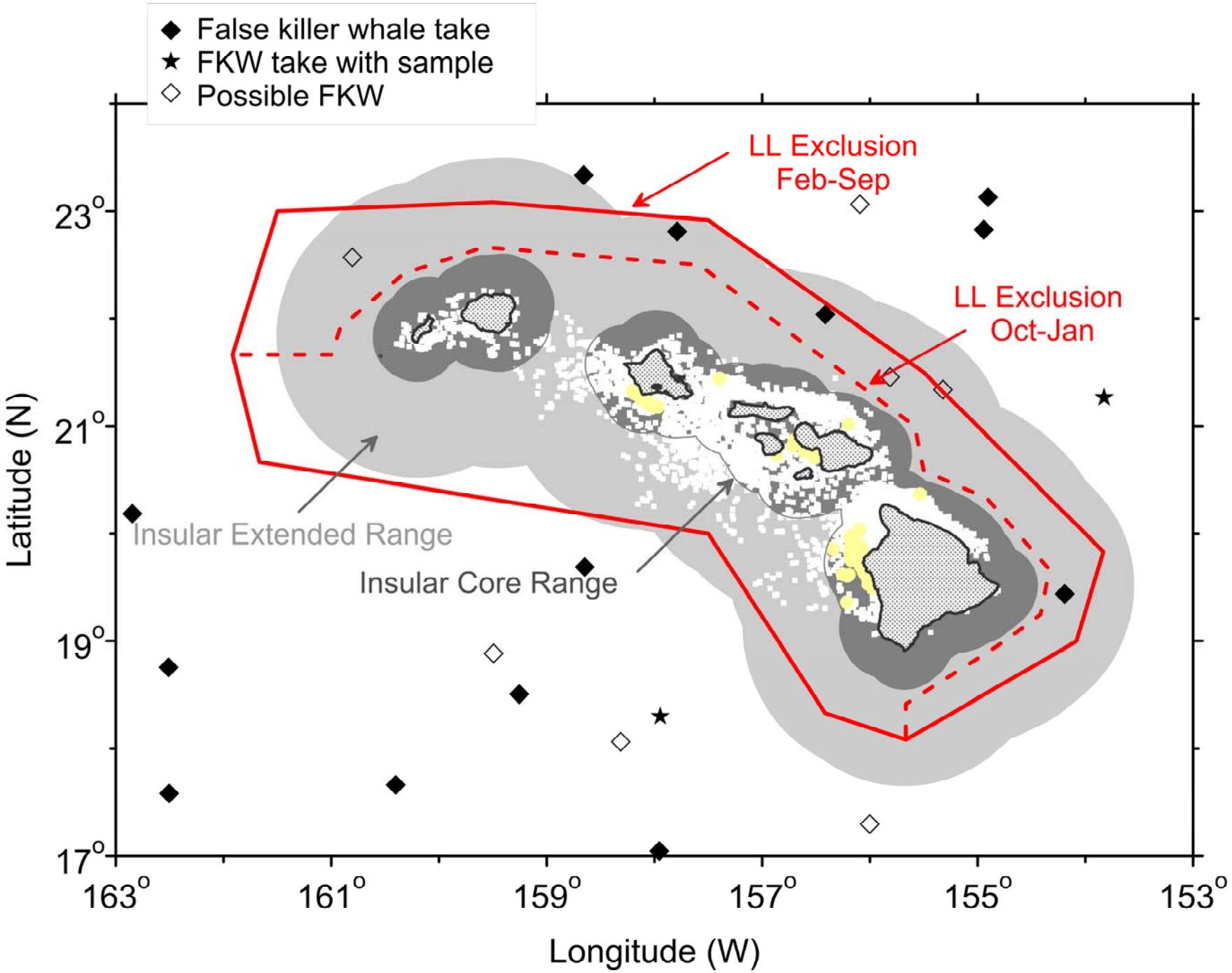
The following pages contain information presented to the False Killer Whale Take Reduction Team to inform its discussions of insular stock during the June 2010 meeting. The maps provide information regarding insular stock range relative to the Hawaii longline exclusion zone and FKW takes.


False killer whale take
FKW take with sample
Possible FKW
LL Exclusion
Feb-Sep
LL Exclusion
Oct-Jan
Insular Extended Range
Insular Core Range
Latitude (N)
23°
21°
19°
17°
163°
161°
159°
157°
155°
153°
Longitude (W)

Year	Longline sets within 140-km extended range of insular false killer whales (from logbook data)
2003	935
2004	1018
2005	1100
2006	821
2007	955
2008	668
2009	618

Ballpark:

~3-6% of total annual longline effort (DS & SS)


False killer whale take
FKW take with sample
Possible FKW
LL Exclusion
Feb-Sep
LL Exclusion
Oct-Jan
Insular Extended Range
Insular Core Range
Latitude (N)
Longitude (W)
23°
21°
19°
17°
163°
161°
159°
157°
155°
153°

False Killer Whale Take Reduction Team
Meeting #4, July 13-16, 2010
Honolulu, HI

KEY OUTCOMES MEMORANDUM

The accompanying Draft Take Reduction Plan serves as the Key Outcomes Memorandum for Meeting #4. No other meeting summary is provided.

APPENDIX C

Ground Rules

False Killer Whale Take Reduction Team
FINAL GROUND RULES

(Ratified unanimously at February 17-19, 2010, False Killer Whale Take Reduction Team kick-off meeting.)

The following ground rules have been informed by CONCUR's professional experience, discussions with NOAA Fisheries, directives in the Marine Mammal Protection Act, and confidential interviews conducted with the primary Take Reduction Team (TRT) members. These ground rules are intended to foster and reinforce constructive interaction and deliberation among TRT members. They emphasize clear communication, respect for divergent views, creative thinking, collaborative problem solving, trust building, working towards consensus, and the pursuit of mutual gains. The TRT may decide to reconsider and revise these ground rules if they appear not to be serving the TRT process.

1. Membership: TRT members have been invited to serve by NOAA. TRT members were selected based on professional expertise or experience in the areas of conservation or biology of marine mammal species or fishing practices which result in the incidental mortality and serious injuries of such species. TRT members were also selected for their diversity of interests, geographic location, communication network, capability to work with diverse viewpoints, and commitment to developing a consensus-based Take Reduction Plan in the prescribed timeframe. Membership reflects a balance by interest, region, and sector.

   TRT members have also been recruited based upon their ability to ably represent the views of an important constituency. TRT members should work to keep their constituencies informed of the TRT's efforts and to reporting relevant feedback to the TRT. In reporting back, TRT members will strive to integrate the views of their constituency rather than resorting to a "lowest common denominator" portrayal.

2. Alternates: Primary TRT members will make every effort to attend all TRT meetings. For those members unable to attend a meeting due to scheduling conflicts, a designated alternate is invited to attend and speak on behalf of the member. Each team member may have one alternate. Names of candidate alternates are to be submitted at least one month in advance of the next meeting for approval by NMFS. Alternates should represent the same organization or constituency as the primary representative, be knowledgeable and able spokespersons, and be committed to work collaboratively towards a consensus agreement. (Note: If an alternate has already been formally appointed by NMFS, there is no need to reconfirm approval.)

   A Team member who needs to send an alternate is requested to notify NMFS at least two weeks in advance that the approved alternate will attend for them. Primary TRT members will work with their alternates to ensure that they are up to speed on TRT deliberations. This will enable alternates to step in effectively and keep the project from "backsliding." If neither the member nor alternate can participate, another individual is welcome to attend the meeting as an observer.

3. Collaboration. Below are a series of ground rules intended to foster collaborative, effective and respectful Team deliberations.

   - **Active, focused participation**. Every participant is responsible for communicating his/her perspectives. Everyone is encouraged to participate; no one dominates. Only one person will speak at a time and only after being recognized by the facilitation team (CONCUR). Everyone will help stay on track.

   - **Respectful interaction.** Participants will respect each other's personal integrity, values and legitimacy of interests. Participants will assist each other in creating an effective atmosphere by: using microphones; turning off cell phones; refraining from sidebar conversations; and using computers for TRT-related work only.

   - **Integration and creative thinking.** Participants will strive to be open-minded and integrate members' ideas and interests. Participants will attempt to reframe contentious issues and offer creative solutions in a timely fashion to enable constructive dialogue.

   - **Adherence to ground rules.** As a set of mutual obligations, TRT members will commit to adhere to these ground rules once they are adopted. TRT members are encouraged to help uphold and enforce these ground rules.

   - **Negotiating in good faith.** In their formal capacity as TRT members, appointees are asked to negotiate in good faith at and between TRT meetings. Nothing in these Ground Rules limits Team members' abilities to take action in other fora. However, Team members are asked to be mindful of how their actions elsewhere will likely impact the collaborative process and the Team's collective efforts to reach consensus.

4. Meeting Materials: NMFS staff and CONCUR commit to provide, to the extent practicable, all primary meeting materials at least two weeks ahead of time in order to give TRT members ample time to review the relevant information. All TRT members will have equal access to meeting materials. Members are expected to review meeting materials beforehand to foster informed deliberations. Members also are asked to bring their binders to each TRT meeting.

5. Information Sharing: TRT members recognize that the False Killer Whale TRT project depends on using the best readily available information. TRT members commit to identify information needs in a timely fashion and to contribute in framing needs for additional research and analysis. TRT members commit to share, and not withhold, relevant information. Likewise, NMFS will strive to share information to the greatest extent possible consistent with existing legal and regulatory constraints. Preliminary information will be treated as such. Analyses will be presented in a manner that distinguishes interpretation and inference from underlying data.

6. Meeting Participation. Meeting deliberations are focused among TRT members only. Members of the public are invited to participate at set times during the meetings. As appropriate, NMFS may invite comment from designated liaisons to the non-English-speaking elements of the longline fleet in order to foster effective outreach efforts. Also, as needed, the convenors or

facilitators may ask NMFS staff and other experts in attendance to fold in relevant expertise and information.

7. Multi-interest Work Teams and Interest Group Caucusing: NOAA Fisheries staff and CONCUR expect that cross-interest group work teams may be an important way to develop constructive, integrative work products during and between TRT meetings. The aim of such work teams is to encourage multi-interest options and work products rather than work products put forward by a single bloc or interest group. It is anticipated that between-meetings work teams will meet by teleconference. As appropriate, opportunities will be provided during TRT meetings for caucusing within and across interest groups.

8. Decision-Making: The False Killer Whale Take Reduction Team (TRT) will seek to develop consensus recommendations where possible. In this context, "consensus" means that the recommendation in question is supported by all TRT members present at the meeting; this does not necessarily mean that each TRT member likes everything about the recommendation, but that each member is willing to accept and support it. Where consensus cannot be reached in the time available, the range of possibilities considered by the TRT will be presented, including the views of both the majority and minority.

   In order to assist the Team in building broader consensus and help the Agency understand and characterize the extent of common ground, the facilitators may opt to use straw votes during the process to gauge the extent to which Team members support various items under discussion. Meeting summaries will not attribute votes to specific Team members.

9. Meeting Summaries: The facilitation team will prepare and distribute to Team members Key Outcomes Memoranda (KOM) following each meeting. The KOM will endeavor to summarize key decisions made, issues discussed, and the next steps identified. It will not serve as a meeting transcript nor will it typically attribute comments or suggestions to specific individuals. As well, to the extent the Team relies on straw votes, the KOM will not record each Team members' vote. In general, the KOM will characterize the extent of consensus reached on important management options. In such instances, the summary will make clear the degree of consensus across various groups and not just present a straight numeric tally.

   In the event TRT members believe the KOM significantly misrepresents particular decisions, issues, or next steps, they are requested to notify the project facilitators or convenors in a timely fashion. The project facilitators or convenors will review the matter and use their professional judgment to determine if revisions are needed. If so, they will prepare a revised KOM and distribute it in a timely fashion to all TRT members.

10. TRT Communication Protocols: TRT members wishing to send email correspondence or documents to the full TRT are asked to send these through the facilitation team or convenor. To the extent TRT members email documents to their constituents to elicit feedback, Team members are asked to make clear that the materials are being provided to support Team deliberations and not targeted for general distribution.

11. Media Contact: The Team recognizes that members may be contacted by press during the course of the Team's deliberations. To the extent Team members are contacted, we agree to the following:

    - TRT members agree not to attribute particular comments to particular individuals, nor to characterize others' views;
    - TRT members agree not to portray ideas as consensus before the TRT has explicitly agreed on them;
    - TRT members inform PIRO when False Killer Whale Team and/or issues appear to be the primary focus of the media contact

12. Project Website: NMFS Office of Protected Resources (OPR) will prepare a password-protected website to support Team deliberations. This website is intended to facilitate the sharing of draft or interim work products by the TRT. Similar to the discussion under the Communication Protocols ground rule, to the extent TRT members wish to provide others affiliated with their organization access to the password-protected website in order to foster broader input, Team members are asked to make clear that the materials on the website are being provided to support Team deliberations and not targeted for general distribution. Additionally, NMFS OPR and PIRO have established public web pages that will serve as repositories of and links to agendas, KOM and other meeting materials.

13. Role of Facilitation Team. The facilitation team is non-partisan and will not act as an advocate for particular outcomes. CONCUR will strive to enforce the ground rules in a consistent, fair and firm manner and ensure that the meeting stays on track. CONCUR will keep a list of those waiting to speak, but may opt to take speakers out of turn to foster focused discussions on a particular topic. The facilitation team may, at its discretion, call for breaks to refine meeting strategies to foster effective TRT deliberations. The facilitators may also recommend the use of within- and across-interests, small-group breakout sessions.

    In addition to drafting the Key Outcomes memoranda, the facilitation team will serve as the primary secretariat in assisting parties to develop the draft Take Reduction Plan. The Take Reduction Plan will be subject to detailed review and approval by all TRT members.

14. Public Comment: Members of the public may provide comment at designated times on the meeting agenda.

APPENDIX D

Team Web Pages and Listing of Materials Prepared/Distributed to Support Deliberations

TEAM WEB PAGES AND LISTING OF MATERIALS PREPARED/DISTRIBUTED TO SUPPORT DELIBERATIONS

NMFS developed two websites to keep the public apprised of information and activities related to the TRT:

NMFS Pacific Islands Regional Office, False Killer Whale TRT website
http://www.fpir.noaa.gov/PRD/prd_FKW_take%20reduction%20team.html

NMFS Office of Protected Resources, False Killer Whale TRT website
http://www.nmfs.noaa.gov/pr/interactions/trt/falsekillerwhale.htm

NMFS also developed and maintained a publicly accessible Team planning website, where meeting materials, presentations, and other interim work products were posted:

NMFS Office of Protected Resources, False Killer Whale TRT planning website
http://www.nmfs.noaa.gov/pr/interactions/fkwtrt/

Below is an outline of the materials and documents that are available on the Team's planning website. These documents were used to support the Team's deliberations.

Pre-TRT Public Meeting (November 19-20, 2009, Honolulu, HI)

- Handouts and Reference Material
    - Agenda
    - Frequently Asked Questions
    - List of Background Documents
- Presentations
    - Agenda Overview and Meeting Protocols - CONCUR
    - Overview – L. Smith
    - MMPA Take Reduction Process Overview – K. Long
    - FKW-specific overview – N. Young
    - MMPA SAR process – K. Forney
    - SAR Overview – E. Oleson
    - Assessing M&SI – K. Forney
    - Observer Program - no videos – J. Marchetti. & M. Marsik
    - Interactions big picture – K. Forney
    - Overview HI LL fisheries – R. Ito
    - Overview HI Shortline Fishery – P. Dalzell
    - M&SI Determinations – K. Forney
    - FKW biology - no movies – R. Baird
    - False Killer Whale SAR – E. Oleson
    - Synthesis of TRT Starting Point – N. Young
    - Next Steps – N. Young
- Meeting Summary

Meeting 1 and Orientation (February 17-19, 2010, Honolulu, HI)

- Agenda
- Orientation materials and presentations
    - Orientation Documents (binder – *see website for full list*)
    - Presentations
        - MMPA & Take Reduction Process Overview – N. Young
        - Stock Assessment Overview – K. Forney & E. Oleson
- Meeting materials and presentations
    - Meeting 1 background documents (binder – *see website for full list*)
    - Handouts and Reference Material
        - Barlow & Rankin 2007 - FWK Abundance and Density
        - Barlow 2006 - Cetacean abundance in Hawaiian waters
        - Chivers et al 2007 - Genetic variation and evidence for population structure
        - False Killer Whale TRT Websites
        - GAMMS I report
        - Marine Mammal Handling and Release Placard (2010-02-09)
        - Meeting Timeline & Focus
        - Observer forms for all FKW and Unidentified cetacean interactions
        - Observer Forms (blank)
        - Observer Manual
    - Presentations
        - Meeting purpose, agenda, & groundrules - CONCUR
        - FKW Take Reduction Process Overview – N. Young & K. Long
        - TRT Scope – N. Young
        - False Killer Whale Assessments – E. Oleson
        - False Killer Whale Biology – E. Oleson
        - Overview of Day 2 agenda - CONCUR
        - Fishery Observer Program & Interactions Overview – K. Forney
        - Stakeholder Assessment - CONCUR
        - Hawaii Longline Fishery – P. Dalzell
        - Lessons Learned – E. Oleson
        - Lessons Learned from Other TRTs – K. Long
        - Atlantic Pelagic Longline Take Reduction Team – L. Engleby
        - Observer Data Patterns – K. Forney
        - Overview of Day 3 agenda - CONCUR
        - Research Needs – E. Oleson & K. Forney
        - Meeting Schedule & Website - CONCUR
- Post-Meeting Follow-up Documents
    - Observer Data Fields
    - Observer Program Species Codes (pre-2010)
    - Bayse and Kerstetter 2010 - Assessing bycatch reduction potential of variable strength hooks
    - NMFS 2008 - Project Report for Gulf of Mexico Pelagic Longline Bluefin Tuna Mitigation Research (weak circle hooks)

  - NMFS 2009 - Update on Gulf of Mexico Pelagic Longline Bluefin Tuna Mitigation Research (weak circle hooks)
- Key Outcomes Memorandum

Meeting 2 (April 6-9, 2010, Lahaina, HI)

- Agenda
- Meeting materials
  - Draft Atlantic Pelagic Longline TRP: Table of Contents
  - Gilman, E.L., P. Dalzell, and S. Martin. 2006. Fleet communication to abate fisheries bycatch. Marine Policy 30: 360-366
  - Curran, D. and K. Bigelow. 2010. Catch and bycatch effects of large circle hooks in a tuna longline fishery.
  - Gilman, E., N. Brothers, G. McPherson, and P. Dalzell. 2006. A review of cetacean interactions with longline gear. Journal of Cetacean Research and Management 8(2): 315-223.
  - McPherson, G.R., C.I Clague, C.R. McPherson, A. Madry, I. Bedwell, P. Turner, D.H. Cato, and D. Kreutz. 2003. Reduction of interactions by toothed whales with fishing gear. Phase 1. Development and assessment of depredation mitigation devices around longlines. FRDC Project No. 2003/016.
  - Summary of Clint Funderburg and John Hall's gear modification research
- Presentations
  - Meeting Purpose and Agenda - CONCUR
  - Best available data requirements – K. Forney
  - Catch Efficacy of Large Circle Hooks in the Hawaii-based Tuna Longline Fishery – D. Curran (presentation not available)
  - Data Work Group Intro – K. Forney
  - Data Work Group Summary – A. Read
  - Data Work Group New Analyses – K. Forney
  - False Killer Whale Spatio-temporal Plots – M. Marsik
  - Draft What-If Tool – K. Forney
  - Overview of Day 2 agenda - CONCUR
  - False Killer Whale Echolocation – P. Nachtigall
  - Historical Depredation and Mitigation – G. McPherson
  - Measures in other TRPs – K. Long
  - Overview of Day 3 agenda - CONCUR
  - Overview of Day 4 agenda - CONCUR
  - Research Needs Work Group Summary – E. Oleson
- Post-Meeting Follow-up Documents
  - Experiments in the Gulf of Mexico to Evaluate Bluefin Tuna Bycatch Mitigation Measures in the Yellowfin Tuna Fishery (Dan Foster, NMFS Pascagoula Lab)
  - Data Analysis Update 4-23-10 (Forney, Marchetti, and Curran)
- Key Outcomes Memorandum

Meeting 3 (June 15-18, 2010, Kahuku, HI)

- Agenda
- Meeting materials
    - Draft TRP Chapters 1-5
    - Chivers et al. 2010. Evidence of genetic differentiation for Hawaii insular false killer whales (Pseudorca crassidens) [pdf] NOAA Tech. Memo. NMFS-SWFSC-458. 49p.
    - Email from Lisa Van Atta (6/4/10) regarding Team's take reduction goal
    - Hamer, D.J., S.J. Childerhouse, and N.J. Gales. 2010. Mitigating operational interactions between odontocetes and the longline fishing industry: a preliminary global review of the problem and of potential solutions. IWC Meeting Document SC/62/BC6
    - Spatio-temporal plots of deep-set fishing effort, FKW takes and sightings, and marine mammal damaged sets
    - Preliminary Results of Hook Strength Test- John Hall
    - ANPR on MMPA Fish Imports (75 FR 22731)
    - Progress Report on MSRA Title IV Implementation
    - Background Information on the Kobe II bycatch workshop
    - WPRFMC Options Paper for Management of the HI Shortline Fishery
    - WPRFMC Options for TAC Seamount Monchong and BET on Cross Seamount
- Presentations
    - Meeting purpose & agenda- CONCUR
    - PBR goal – N. Young
    - Bait retention and gear modification- K. Bigelow & C. Funderburg
    - Hook Strength Test Results- J. Hall
    - Reducing the severity of injuries to hooked or entangled FKW – K. Forney
    - Existing workshop training for marine mammal interactions – A. Bailey
    - Overview of the predictive model for evaluating potential mitigation strategies – K. Forney
    - Predictive Model Input Specification Form – K. Forney
    - Overview of Day 2 agenda- CONCUR
    - Weak hook research in the Atlantic – D. Kerstetter
    - Hawaiian Islands Cetacean Ecosystem Assessment Survey (HICEAS) II – E. Oleson
    - Mark-recapture: an alternative method for assessing Pelagic stock abundance – E. Oleson
    - International aspects of marine mammal bycatch – M. Simpkins
    - Overview of Day 3 agenda- CONCUR
    - FKWTRT timeline – K. Long
    - Overview of Day 4 agenda- CONCUR
    - Information on Insular stock- E. Oleson & K. Forney
- Key Outcomes Memorandum

Work Groups

- Data Analysis
    - March 23, 2010 call summary
    - Within-set patterns of depredation/ hooking
    - March 8, 2010 call summary
- Outreach
    - March 24, 2010 call summary
    - March 5, 2010 call summary
- Potential Solutions
    - March 19, 2010 call summary
- Predictive Model
    - May 14, 2010 call summary
    - May 7, 2010 call summary
- Research Needs
    - Research Needs by Category (updated May 19, 2010)
    - May 5, 2010 call summary
    - March 24, 2010 call summary

APPENDIX E

Serious Injury Determination
Background Information and Criteria

SERIOUS INJURY DETERMINATION BACKGROUND INFORMATION AND CRITERIA

The MMPA section 117 requires NMFS to prepare stock assessment reports (SAR) for all stocks of marine mammals that occur in waters under the jurisdiction of the United States. These reports summarize human-caused mortalities and serious injuries to marine mammals by source. In addition, MMPA section 118 requires commercial fisheries to reduce mortality and serious injury of marine mammals to insignificant levels approaching a zero mortality and serious injury rate. This charge requires that NMFS distinguish between injuries that are serious and those that are not serious. NMFS defined "serious injury" in regulations (50 CFR 229.2) as "any injury that will likely result in mortality." However, the MMPA and its legislative history do not provide guidance on how severe an injury must be to qualify as "serious."

To promote national consistency for interpreting the regulatory definition of serious injury, NMFS convened a workshop in April 1997 to discuss available information related to the impact of injuries to marine mammals incidental to commercial fishing operations (Angliss and DeMaster, 1998). Since 1997, additional information has been collected on human-caused injuries to marine mammals and survival rates of certain individual and/or species of marine mammals. For this reason, NMFS convened a Serious Injury Technical Workshop on September 10-13, 2007, with the primary objectives to: 1) review the recommendations and guidance from the 1997 workshop; 2) review new information obtained since the first workshop; and 3) discuss the use of, and necessary changes to, existing guidance for distinguishing serious from non-serious injuries.

The 2007 workshop consisted of two sessions: an open session (Days 1-3) attended by over 65 federal and non-federal participants, and a closed session (Day 4) attended by 36 federal participants. NMFS invited workshop participants based on their expertise in marine mammal serious injury issues, including marine mammal management, policy, marine mammal biology, pathobiology, and veterinary medicine. The primary purposes of Days 1-3 were to present a synthesis of new science and to gather new information on injured marine mammals. The information from Days 1-3 was also used to provide a scientific basis for recommendations by government officials in the closed session on Day 4. The primary purpose of the closed session (Day 4) was to draw on Days 1-3 presentations and discussions to consider potential changes to the existing serious injury guidance and associated administrative approaches.

The Technical Memorandum resulting from the workshop (Andersen et al. 2008) and guidance therein contains recommendations of Federal Government participants and the workshop Steering Committee concerning the guidance and process for distinguishing serious from non-serious injuries. These recommendations do not represent official NMFS policy. However, three working groups have been formed to develop official NMFS policy on serious injury determination: a Process Working Group to discuss policy issues, a Determination Working Group to evaluate injury criteria in practice, and a Veterinarian & Pathologist Working Group. A final serious injury policy is expected in 2011.

Below is Table 1 from Andersen et al. (2008), the updated recommended serious injury criteria for different taxonomic groups, that are currently being used by NMFS scientists to make injury determinations.

Anderson et al. (2008), Table 1.
Recommended Serious Injury Criteria for Different Taxonomic Groups *

SI = Serious Injury; **NSI** = Not Serious Injury; **CBD/case specific** = Potential SI, but either 1) insufficient information about the impact of a particular injury, or 2) additional factors must be considered on a case-by-case basis to determine the severity; **n/a** = not applicable; **TBD**= To Be Determined; __ = areas lacking near-complete agreement among Day 4 participants				
Criterion	**Injury/Information Categories**	**Large Cetaceans**	**Small Cetaceans**	**Pinnipeds**
Pre-Existing Guidance (included in Angliss and DeMaster (1998) and/or NEFSC publications, retained with no changes)				
1	Ingestion of gear or hook	SI	SI	SI
Modified Criteria (some aspects retained from guidance provided in Angliss and DeMaster (1998) and/or NEFSC publications, with some changes or additions)				
2	A free-swimming animal observed at a date later than its human interaction, exhibited a marked change in skin discoloration, lesions near the nares, fat loss, or increased cyamid loads, etc.	SI	SI	SI
3	Gear constricted on any body part, or likely to become constricting as the animal grows	SI	SI	SI
4	Uncertain whether gear is constricting, but appendages near the entanglement's point of attachment are discolored	SI	SI	SI
5	Anchored/immobilized (not freed)	SI	SI	SI
6	Head trauma (including eye injuries)	SI	SI	SI
7	Hook in mouth (excluding case 9 below), no trailing gear	CBD/case specific	SI	SI
8	Hook confirmed in head (excluding mouth), no trailing gear	NSI	SI	CBD/case specific
9	Hook confirmed in lip only, no trailing gear	n/a	CBD/case specific	CBD/case specific
10	Gear attached to free-swimming animal with potential to 1) wrap around pectoral fins/flippers, peduncle, or head; 2) be ingested; or 3) accumulate drag	CBD/case specific	SI	SI
11	Animal freed from gear and released without gear	CBD/case specific	CBD/case specific	CBD/case specific
12	Social animal separated from group or released alone	CBD/case specific	CBD/case specific	CBD/case specific
13	Dependent animal (e.g., calf, pup) alone post-interaction	SI	SI	SI
14	Wrap(s) of gear around pectoral fin/flippers, peduncle, head, abdomen, or chest	CBD/case specific	SI	SI

New Criteria				
15	Deep, external cut or laceration to body	CBD/case specific	CBD/case specific	CBD/case specific
16	Body cavity penetration by foreign object or body cavity exposure	SI	SI	SI
17	Visible blood loss	CBD/case specific	CBD/case specific	CBD/case specific
18	Loss or disfigurement of dorsal fin	CBD/case specific	CBD/case specific	n/a
19	Partially severed flukes (transecting midline)	SI	SI	n/a
20	Partially severed flukes (not transecting midline)	CBD/case specific	CBD/case specific	n/a
21	Partially severed pectoral fins or flippers	CBD/case specific	CBD/case specific	CBD/case specific
22	Severed pectoral fins or flippers	CBD/case specific	CBD/case specific	SI
23	Entanglement, immobilization or entrapment of a certain duration before being freed (TBD, species-dependent)	SI	SI	SI
24	Body trauma not covered by cases 6, 15, and 16 above (e.g., broken appendages, hemorrhaging)	CBD/case specific	CBD/case specific	CBD/case specific
25	Detectable fractures	SI	SI	SI
26	Hook in appendage, without trailing gear or with trailing gear that does not have the potential to wrap, be ingested, or accumulate drag	NSI	NSI	NSI
27	Animal brought on vessel deck following entanglement/entrapment	n/a	SI	CBD/case specific
28	Vertebral transection	SI	SI	SI
29	Collision with vessel of certain minimum size (TBD, species-specific)	SI	SI	CBD/case specific
30	Collision with vessel traveling at a certain minimum speed (TBD, species-specific)	SI	SI	CBD/case specific
31	Collision with vessel below a certain size threshold (TBD, species-specific)	CBD/case specific	CBD/case specific	CBD/case specific
32	Collision with vessel traveling below a certain speed threshold (TBD, species-specific)	CBD/case specific	CBD/case specific	CBD/case specific
33	Dog Bites°	n/a	n/a	CBD/case specific

***** See section 8.0 for additional details on the intent and purpose of Table 1.

° This criterion was not included by the Day 4 Participants. The Workshop Steering Committee added this criterion for clarity. About ¾ of the Day 4 participants preferred subsuming dog bites under criteria 6, 15, 16, or 24 (depending on the injury inflicted by the dog bite). The pinniped experts generally preferred to include dog bites in a separate category, because of the additional potential for inter-species disease transmission.

APPENDIX F

Spatio-temporal Plots of Deep-Set Longline Fishing Effort

SPATIO-TEMPORAL PLOTS OF DEEP-SET LONGLINE FISHING EFFORT

Monthly spatio-temporal plots of Hawaii-based deep-set longline fishing effort, false killer whale takes, false killer whale sightings, and marine mammal damage, for the period January 2003-March 2010, are available for download as a PDF [15.94 MB] at the following website:

http://www.nmfs.noaa.gov/pr/interactions/fkwtrt/meeting3/spatiotemporal_plots.pdf

APPENDIX G

Potential Management Actions Considered but Not Recommended in the TRP

POTENTIAL MANAGEMENT ACTIONS CONSIDERED BUT NOT RECOMMENDED IN THE TRP

Over the course of its deliberations, the Team identified numerous candidate actions to reduce mortality and serious injuries in false killer whales. Some measures were considered but not included in the Plan. Below is a listing of these additional ideas.

- Strategies to foster longline fleet awareness and avoidance of false killer whales
  - Use of hydrophones attached to oceanographic buoys (NMFS, naval, other) to detect false killer whale presence
  - Use of hydrophones from longline vessels and/or gear to detect false killer whale presence and/or depredation
  - Spotters (air or vessel-based)
- Strategies to reduce false killer whale chances of locating longline vessels
  - Annual haul-out to reduce vessel noise profile (change rudder, cutlass bearing, etc.)
  - Degaussing of steel boats (demagnetize)
  - Direct current through vessel hull to eliminate electric profile
  - Revised rules to allow fishermen to retain gills/guts on board
  - Offal processed on-board into an on-vessel commodity
  - Limits on line length and/or soak time
  - Set-splitting/gaps between baskets
  - Eliminating hooks in center of basket
  - Effort reduction strategies: time/area closures; effort caps; fleet buyouts
  - Decoy buoys or gear to attract false killer whales away from fishing vessels and diminish reward signals
  - Playback of vessel noises to attract false killer whales away from active fishing vessels
  - Playback of killer whale or other noises to deter false killer whales from approaching fishing vessels
- Strategies to minimize active depredation
  - Small solid structures (i.e., plastic beads) to alter acoustic target profile of bait/catch
  - Streamers deployed alongside hook to change acoustic target profile of bait/catch
  - Different leaders to change acoustic target profile
  - Use of nails/metal tabs in bait tail to change acoustic target profile
  - Line changes (color, coating, diameter, snaps) to change detectability of gear
  - Center basket illumination
  - Noise and taste deterrents
  - Encasement of catch
- Strategies to prevent/reduce serious injuries and mortality
  - False killer whale sedation (to foster gear removal)
  - Use of barbless hooks
- Captains filling out marine mammal observer data form