



**Report of the
Fifth Meeting of the Protected Species Advisory Committee
April 19-20, 2018
Council office**

1. Welcome and Introductions

Sam Kahng, Acting Chair, welcomed members of the Protected Species Advisory Committee (PSAC) and other meeting participants. Members in attendance were George Balazs, Melanie Hutchinson, David Hyrenbach, Sam Kahng, Jim Lynch, Erin Oleson and Milani Chaloupka. Lyn McNutt was excused. Other meeting participants included Russel Ito, Robert Ahrens, Zach Siders, Nicholas Ducharme-Barth, Summer Martin, Todd Jones, Sarah Ellgen, Kate Taylor, Brian Stock, Catherine Pham, and Thomas Remington. Jim Lynch chaired the meeting on the second day.

Kitty Simonds, Executive Director, welcomed the committee members and provided opening remarks highlighting current issues affecting fisheries in the U.S. Western Pacific region.

2. Approval of Agenda

The agenda was approved without any changes.

3. Status of the Fourth Protected Species Advisory Committee Meeting Recommendations

Asuka Ishizaki, Council staff, reviewed the status of recommendations from the March 30-31, 2017, meeting.

4. Endangered Species Act and Marine Mammal Protection Act Updates

Ishizaki provided updates on Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA) actions on behalf of the PIRO Protected Resources Division. The updates included ESA recovery plans for the North Pacific loggerhead turtles, main Hawaiian Islands (MHI) false killer whales, and corals; ESA critical habitat for MHI false killer whales, green turtles, and corals; ESA final listings of oceanic whitetip sharks and giant manta rays; ESA petition response status for chambered nautilus and seven species of giant clams; MMPA List of Fisheries (LOF); and the MMPA False Killer Whale Take Reduction Plan (TRP).

Ishizaki also provided a brief summary of the False Killer Whale Take Reduction Team (TRT) that met April 10-13, 2018, to review the status of the TRP implementation and discuss improvements to the TRP to further reduce injuries to false killer whales interacting with the Hawaii deep-set longline fishery. The TRP requires the use of weak circle hooks and a minimum branchline width, intended to straighten the hook to release false killer whales without gear remaining while retaining target catch. Among the issues discussed by the TRT were approaches for further weakening the hook or strengthening the branchline to improve success rate of weak hooks straightening (approximately 10% success rate), improving handling guidance, and interaction outcomes resulting in serious injury determinations.

PSAC discussed issues related to the FKWTRP implementation, including existing research on post-hooking mortality rate, types of injuries that may lead to mortality, and whether pulling on the line to straighten the hook produces the best outcome for false killer whales. PSAC members noted that practical technical solutions to reducing interactions and associated depredation are not available despite extensive efforts by Australian and Japanese researchers. PSAC members also noted that species-specific post-hooking mortality rate for false killer whales are not available due to the difficulty of applying tags due to the rare nature of interactions, the cost of tags, the skill required to deploy satellite tags on small cetaceans. One PSAC member suggested broad training and skill transfer to increase opportunities for tagging by the observer program, as it was done for sea turtles. Another PSAC member commented that the jaw is acoustically important for cetaceans, and thus a hook left in the jaw may interfere with behavior beyond the ability to eat.

5. Insular and Pelagic Non-Longline Fisheries Issues

A. Review of the Draft 2017 Fishery Ecosystem Plans (FEP) Annual Stock Assessment and Fishery Evaluation (SAFE) Report for Insular Fisheries

i. Summary of relevant fishery data

Thomas Remington, Council contractor and Annual SAFE Report Coordinator, presented the preliminary data on 2017 insular fishery data, including creel survey performance, shore-based effort trends, boat-based effort trends, and bycatch trends for Guam, CNMI, and American Samoa. Hawaii data for insular fisheries were not available at the time of the meeting.

Effort trends in the Guam insular fisheries have been relatively stable in recent years, with a few exceptions including slight decreases in Guam shore-based cast-net and spear fishing effort after the observed increases in 2016. Remington noted that the Guam SCUBA spear effort that showed a spike in the 2016 data, which PSAC discussed at its 2017 meeting, was also back to baseline levels. It appears there was an error in data for the 2016 effort for these gears. It was also mentioned that the changes in effort in recent years may be connected to the implementation of 24-hour creel surveys by the Guam Division of Aquatic and Wildlife Resources to capture the nighttime fishing effort. CNMI insular fisheries' effort trends appeared to be mostly stable in recent years. There has been no protected species bycatch reported in the Guam and CNMI creel surveys.

Shore-based creel surveys in American Samoa showed that insular fishery effort has been relatively stable in recent years for most gears, emphasizing the slight increase in total gear hours estimated for rod and reel fishing from shore compared to 2016. Effort trends from boat-based surveys in American Samoa generally showed increases across gear types in recent years, with the exception of the mixed bottomfishing/trolling classification. There has been no bycatch (protected species or otherwise) reported in the American Samoa creel surveys for 2017.

PSAC members sought clarifications on species included in the bycatch reports for insular fisheries. One PSAC member commented that changes in CNMI effort and bycatch between 2016 and 2017 may be attributed to the 2016 typhoon that resulted in significant damage to Saipan, as fishery participants may be returning to fish in 2017 after recovery efforts. PSAC members discussed the reliability of the insular fisheries data in discerning trends, and noted that figures presented included a 3-year data smoothing. Noting the appearance of spear fishing effort

after 2006 compared to no effort in previous years, one PSAC member commented that spearfishing in American Samoa was rarely done by Samoans but it was more common practice for Tongans living in American Samoa. Remington responded that the effort after 2006 could also be a result of survey effort to capture night time spear fishing, and indicated that he will clarify this with the Archipelagic Plan Team members.

ii. Protected species section

PSAC reviewed the insular fishery portion of the draft 2017 SAFE report protected species section. Catherine Pham, Council contractor, provided the presentation summarizing this year's draft report. Fishing effort and gear characteristics are used as proxies for monitoring changes in the insular fisheries as these fisheries do not have observer coverage. In general, impacts to protected species in insular fisheries are considered minimal based on ESA consultations and MMPA LOF classifications. NMFS is reviewing information regarding oceanic whitetip shark and giant manta ray interactions in insular fisheries given the final ESA listing of both species in January 2018. There is an ITS of two green turtle mortalities per year from vessel collisions for the MHI bottomfish fisheries, but there has been no reported or observed collisions attributed to these fisheries.

PSAC discussion on the review of this section is summarized under "iii. Discussion and synthesis".

iii. Discussion and synthesis

Discussion stemming from the review of insular fishery portions of the draft Annual SAFE Report protected species section included the following:

- PSAC did not identify any effort or participation trends in the Guam, CNMI or American Samoa fishery data that is likely to affect the potential for protected species interactions in insular fisheries.
- One PSAC member asked whether the ESA listing of giant clams would be a concern for fisheries in American Samoa. It was noted that giant clam harvest data would be captured in the mollusk data category, but it was unclear what the potential impacts would be from the listing.
- One PSAC member explained that ESA-listed scalloped hammerhead sharks use nearshore areas as nursery habitat, but such habitat areas are unknown for American Samoa and Marianas. Philopatry to natal grounds is evident in other regions. Seasonal use of inshore areas has been noted in Hawaii (Hutchinson et al. unpublished data). Habitat use data would be informative for scalloped hammerhead sharks, particularly for identifying important nursery areas.
- PSAC discussed the importance of outreach and education to fishermen as a strategy for improving reporting of fishery data and interactions with species of concern, including programs such as the barbless hook program and outreach to improve species identification.
- PSAC discussed information from stranding data and noted that the stranding data summary for Hawaii green turtles is being updated by PIFSC.

B. Review of the Draft 2017 FEP Annual SAFE Report for Pelagic Non-Longline Fisheries

i. Summary of relevant fishery data

Russel Ito, PIFSC, presented the preliminary MHI troll and handline effort data in terms of the number of fishers and days fished. The MHI troll has the largest fishery participation, but the effort has been gradually declining since 2012 likely due to the economy and fuel prices. The MHI handline effort in days fished had been declining between 2012 and 2016 but slightly increased in 2017. Ito explained that the troll and handline gear may be used in the same trip, so there may be fisher overlap between the two fisheries. Offshore handline shows a gradual decline since 2013 but days fished was slightly higher in 2017 compared to 2016. Ishizaki provided preliminary troll effort data from CNMI, Guam and American Samoa, which showed relatively stable effort in number of trips in the CNMI, variable effort trends in Guam, and slightly increasing in American Samoa.

PSAC members sought clarification on the difference between the MHI handline and offshore handline. Ito indicated that these two fisheries are reported under the same gear code and delineated based on the statistical grids, with the MHI handline fishery including palu ahi and ika shibi within nearshore area of the State of Hawaii statistical grids and the offshore handline fishery using dangles or poles farther offshore primarily around seamounts.

PSAC members also sought clarification on the decline in charter fishery in CNMI. Council staff clarified that this was likely due to the decline in Japanese tourists to which the charter business catered. A PSAC member added that the casinos in CNMI are increasing Chinese tourists, which may influence fish demand in CNMI.

ii. Protected species section

PSAC reviewed the pelagic non-longline portion of the draft 2017 SAFE report protected species section. Pham provided the presentation on the details of this year's draft report. In general, impacts to protected species in these fisheries are considered minimal based on ESA consultations and MMPA List of Fisheries LOF classifications, and there are no reported interactions with protected species in the existing fishery data. NMFS is reviewing information regarding oceanic whitetip shark and giant manta ray interactions in insular fisheries given the final ESA listing of both species in January 2018. There is an ITS of four green turtle mortalities per year from vessel collisions for the Western Pacific troll and handline fisheries, but there has been no reported or observed collisions attributed to these fisheries.

iii. Discussion and synthesis

PSAC did not identify any effort or participation trends in the fishery data that is likely to affect the potential for protected species interactions in the non-pelagic longline fisheries.

PSAC member Melanie Hutchinson provided an overview of her ongoing shark tagging projects working with the Hawaii Island handline fishermen and explained that fishermen are voluntarily reporting shark interactions. Shark catch are not commonly reported in the Hawaii Commercial Marine License (CML) data, suggesting a data gap for shark captures in Hawaii. The tagging project currently provides an incentive to fishermen for releasing oceanic whitetip sharks alive, and the project may be expanded to include other shark species in the future. Shark captures in

nearshore waters show pregnant females, suggesting habitat importance for Hawaii waters. PSAC noted that research on oceanic whitetip sharks caught in fisheries, such as stomach content studies, have not been conducted due to the non-retention requirement.

C. Council Fishery Actions on Insular and Pelagic Non-Longline Fisheries

Marlowe Sabater, Council staff, provided updates of regulatory actions for insular fisheries. These included the final 2016 ACLs for all island areas; final 2017 ACLs for all island areas; MCPs for PRIA, AS, Guam and CNHI; final 2017-2018 ACL for Hawaii deep-7 bottomfish fishery; final 2017 Hawaii kona crab ACL, and the Ecosystem Component (EC) amendment. Sabater explained that the Council is in the process of designating EC, which would narrow down the management unit species (MUS) in the archipelagic FEPs to the territory bottomfish species, MHI deep-7 bottomfish species, uku, some precious corals, Kona crab, and deepwater shrimp. EC species would remain in the FEP for monitoring and ecosystem management consideration purposes, but without requirements to specify maximum sustainable yield or essential fish habitat. When the EC amendment is finalized, monitoring of protected species interactions would also be limited to the remaining MUS.

6. Council's Research Priorities

A. Five-year Research Priorities

Ishizaki provided a brief overview of the 5-year research priority document and noted that the Council will develop the 2020-2024 priorities next year. PSAC reviewed the existing protected species priorities and progress made by PIFSC and the Council, identified additional projects that address priorities, discussed specific projects needs for the next 1-2 years, and any minor modifications to the priorities. PSAC discussion summary and modification to the priorities are included in Appendix A.

B. Cooperative Research Priorities

Ishizaki provided a brief overview of the existing cooperative research priorities and explained that the Council annually revises the priorities.

PSAC recommended the following changes:

- Add a new priority under protected species, or modify the existing shark priority under pelagics as follows: Mark and recapture studies of reef and pelagic sharks to determine residency time and migration (*Rationale*: data on sharks, including ESA-listed sharks are limited, and cooperative research projects working with fishermen to tag sharks provides a platform for data collection that is otherwise unavailable)
- Add a new priority under protected species, or modify the existing post-hooking mortality of marlin priority under pelagics to include false killer whales and other cetaceans with potential for fishery interactions (*Rationale*: data collection approaches for evaluating post-hooking mortality rates of false killer whales are limited; however, working with fishermen to increase the photo ID catalog would improve the ability to track injuries over time)

7. Public Comment

There were no public comments at the conclusion of day 1.

8. Pelagic Longline Fisheries Issues

A. Review of the Draft 2017 FEP Annual SAFE Report

i. Summary of relevant fishery data: 2017 Hawaii and American Samoa Logbook Reports

Russell Ito, PIFSC, provided a summary of the 2017 logbook data for Hawaii and American Samoa longline fisheries, including participation, effort, spatial distribution and catch trends.

The Hawaii longline fishery's effort and participation in 2017 was the highest seen in the fishery, with the primary effort increase occurring on the high seas. Ito highlighted the spatial distribution changes in 2017 compared to the previous ten years, which showed reductions in both the deep-set (DSLL) and shallow-set (SSLL) effort in the western extent likely attributed to the monument expansion in 2016.

The American Samoa longline fishery participation and effort has been on a decline, and the number of active vessels in 2017 reduced to 15. In contrast, CPUE of albacore and other tunas have been relatively stable. Ito also provided information about the fishing effort inside the Large Vessel Prohibited Area (LVPA) exemption area for 2017.

One PSAC member asked whether the difference in the seasonal peaks of the swordfish quarterly CPUE for the SSLL and DSLL were due to vessels switching gear types, and whether there were any fishery operation changes associated with the apparent shift in the alignment of the peaks at a certain point in the time series. Ito explained that the difference in seasonal peaks were due to the seasonality in spatial distribution of the fishery. Ito also noted the regulatory change for swordfish retention in DSLL, but indicated was not likely to have substantially changed retention behavior. The member also asked if CPUE is tracked separately inside and outside of EEZ, noting that the bigeye tuna catch appears to have been high in 2017 toward the southwest and wondered if CPUE showed similar trends. Ito indicated that CPUE can be generated for inside and outside of EEZ.

In response to a PSAC member's question regarding the SSLL fishery being one loggerhead turtle interaction away from a hard cap closure, Ito explained the financial risk of departing on a SSLL trip close to a hard cap closure given that vessels are required to return to port when the hard cap is reached before they can reconfigure to DSLL.

ii. 2017 Protected species section

PSAC reviewed the Hawaii and American Samoa longline portions of the draft 2017 SAFE report protected species section. Ishizaki provided a presentation summarizing the 2017 draft report.

Oceanic whitetip shark and giant manta rays were added to the report following recent listings under the ESA. Interaction trends remained relatively stable for most species of sea turtles, marine mammals, seabirds, and elasmobranchs, with interaction levels below applicable incidental take statements (ITS) and potential biological removal (PBR) in most cases. Several trends were highlighted for additional discussion, including loggerhead turtle, olive ridley turtle, and Guadalupe fur seal interactions in the Hawaii SSLL fishery; olive ridley turtle and black-

footed albatross interactions in the Hawaii DSLL fishery; and green turtle interactions in the ASLL fishery.

PSAC discussion on the review of this section included the following:

- A higher level of loggerhead turtle interactions have been observed in the SSSL fishery since late 2017 and into 2018. The data in the draft SAFE report do not reflect the higher level of interactions due to the use of the Observer Program annual reports as the data source, which use vessel arrival date rather than observed interaction date for the annual summaries. PSAC members indicated preference for using the observed interaction date to tally the annual summaries and suggested providing sufficient clarification in the report regarding the date used for the annual summary data as an interim solution for this year's report.
- Regarding the olive ridley turtle interactions in the SSSL and DSLL fishery, PSAC noted the ongoing data analysis project (see agenda item 8.A.iv) and suggested continued review of the trend in future SAFE reports.
- Guadalupe fur seal interactions were first observed in the SSSL fishery in late 2015 and three additional interactions were observed in 2017, coinciding with the unusual mortality event of this species in California. PSAC noted that the PBR for this population is large so the amount of observed interaction is not a substantial concern at this time, but will continue to monitor the interactions in future years through the SAFE report review process. Members also discussed that the recent observations of pinnipeds in the SSSL fishery may be related to changes in fishery distribution or potential northward shift in pinniped distribution.
- PSAC members requested interaction trend figures for false killer whale to be included in the review presentation, noting that false killer whale interactions overall appear to be increasing. PSAC also requested false killer whale issues to be highlighted at its next meeting.
- PSAC noted that the observer program data collection for oceanic whitetip sharks could be improved to gather data on release condition and handling, as well as to collect size and sex data for all oceanic whitetip shark interactions consistent with other protected species interaction data rather than for every third fish.
- PSAC noted that the green turtle CPUE in the ASLL fishery in 2016-2017 were at similar levels to the CPUE in years prior to the measure requiring gear configuration aimed at setting hooks deeper than 100 meters. PSAC recommended at its 2017 meeting an analysis evaluating the effectiveness of the gear measures, but this analysis has not been conducted by PIFSC, citing low statistical power due to the small number of observed interactions. PSAC acknowledging that data are limited for conducting a statistical evaluation of the measure effectiveness, and noted the need for considering other best practices, such as larger circle hooks, to reduce sea turtle interaction rates in the ASLL fishery. Ishizaki explained that the Council previously funded a study to evaluate the effects of larger circle hooks on target and non-target catch rates. One PSAC member commented that the green turtles in the ASLL fishery are small, and thus larger circle hooks may not result in substantial reduction in interactions.

iii. 2017 Albatross Workshop Report

David Hyrenbach provided a report of the Workshop on the Factors Influencing Albatross Interactions in the Hawaii Longline Fishery, convened by the Council in November 2017 stemming from past SAFE report reviews. The workshop explored the potential drivers, and implications of higher black-footed albatross interaction rates observed in 2015-2016, in the context of longer-term oceanographic variability, shifts in fishery effort and distribution, changes in albatross at-sea distribution, areas of local productivity and albatross demography and population trends. Analysis prepared for the workshop indicated that fleet dynamics combined with environmental variables (Pacific Decadal Oscillation and east-west winds) were associated with the higher sighting rates in 2015-2016. Population modeling conducted for the workshop also indicated that the black-footed albatross population may experience decline only if high levels of interaction continue over all north Pacific longline fleets. The full workshop report is currently in preparation as a NOAA Technical Memorandum.

A PSAC member applauded the comprehensiveness of the workshop, and asked about the impact of plastics on albatross populations. Hyrenbach provided information on ongoing work regarding plastics and indicated that plastics have not been connected to direct mortality in albatrosses.

iv. Olive ridley and leatherback turtle analysis

Nicholas Ducharme-Barth and Zach Siders, University of Florida, provided a presentation on the olive ridley turtle analysis project resulting from the 2017 PSAC recommendation and jointly funded by the Council, PIFSC and PIRO. Ducharme-Barth and Siders provided an overview of the project and preliminary data review conducted to date since the project was initiated in March 2018. Siders described the model framework, which incorporates temporal, environmental, spatial datasets. A series of preliminary data characterizations were presented, which show that olive ridley turtle interactions are observed throughout the range of effort, environmental and species factors. While interactions are observed across a wide range of sea surface temperature (SST), interactions were concentrated in a narrower temperature band in higher interaction years. Interactions tended to occur south of the MHI when there are effort in that area. However, these patterns are driven largely by the concentration of interactions observed in 2016-2017. Olive ridley interactions also show co-occurrence with bigeye tuna catch. Machine learning predictions using random forest was able to predict interactions south of the MHI pretty well, but showing poor predictions for interactions in American Samoa. Analysis conducted so far has not identified any variables as a strong predictor of where interactions are occurring. It was noted that the project is part of a larger ecosystem-based effort to apply to other species and will bring in socioeconomic variables.

A PSAC member asked about the error associated with random forest. The presenters responded that the error was around 20 percent, which is low. The PSAC member suggested using other approaches such as a conditional inference tree may be more appropriate for the dataset.

In response to a question regarding timeline for the remainder of the project period, the presenters indicated that they are planning for a second work session with PIFSC in the fall, with final results expected in about a year. Additional data and factors that will be considered to improve the model include more oceanographic/environmental data, prey dynamics, and other species that may have association with olive ridley turtles.

PSAC members discussed that it would be useful to look at vertical structure given that olive ridley turtles are deep diving species, and suggested using operational characteristics as a proxy data for depth. PSAC members also suggested looking at eddy kinetic energy, removing the American Samoa data to improve reliability of the Hawaii DSLL results, and considering regulatory changes that may influence changes in fishery operations.

v. Developing a standardized metric to monitor protected species interactions

Pham presented on options for developing a standardized metric to monitor PS interactions in the annual SAFE report as well as for other potential applications for monitoring and managing protected species interactions under the FEPs. Pham provided examples from four types of approaches, including standard thresholding, adaptive thresholding, modelling, and trend detection. Pham also discussed how these approaches may be incorporated as management tools through control charts, which establishes limits associated with specific management responses.

PSAC members provided the following comments on moving forward with a standardized approach:

- Visualization of data over time using cumulative frequency curves showing the baseline in relation to the current year would be useful.
- Comparison of a few different time scales may be informative (e.g., last 5 years to reflect recent changes; longer term to capture oceanographic and environmental changes; and entire time series)
- Improved understanding of trends would be useful; however, fitting a trend line to protected species interactions that may be influenced by environmental factors may be difficult due to natural oscillations
- Consider normalizing data for sampling effort to reduce noise
- Consider ways to standardize for gear and other management changes that may influence interaction rates
- Population increase would expect to result in increased interactions of that species; consider approaches that would account for population changes (MMPA PBR approach is one example of a reference point tied to abundance)
- Use confidence bounds where applicable (e.g., use color coding in the data visualization when there is undersampling)
- Use a biplot approach to plot data against two dimensions, which may identify outliers that may not be apparent when plotted against a single dimension; however, such an approach would require understanding of underlying factors, which are likely to differ by species

B. Council Fishery Actions on Pelagic Longline Fisheries

i. Framework for Managing Sea Turtle Interactions in the Hawaii Shallow-set Longline Fishery

a. Overview of the action

Ishizaki provided an overview of a Council action considering a framework for managing sea turtle interactions in the Hawaii shallow-set longline fishery. The fishery has been subject to 100% observer coverage since 2004, and gear requirements implemented in 2004 successfully reduced sea turtle interactions in the shallow-set longline fishery by approximately 90 percent.

The shallow-set longline fishery targeting swordfish is highly seasonal, with effort typically increasing in October and peaking in March. The fishery is currently managed under a loggerhead and leatherback turtle hard cap. Loggerhead turtle interactions in the Hawaii shallow-set longline fishery since the start of the current fishing season (2017 fall through 2018 summer) were higher than levels observed since the fishery reopened in 2004 through 2016. The existing management measures do not provide for early detection of and response to higher interaction rates, hotspots, or fluctuations that may indicate a potential for higher impacts to sea turtle populations or a fishery closure early in the calendar year.

The Council is considering a management framework that includes a) specification of hard caps; b) in-season measures to implement a temporary closure when a certain proportion of the loggerhead or leatherback limit is reached; c) real-time spatial management measures to monitor and manage interaction hotspots and fluctuations; and d) establishment of a fleet communication program to facilitate implementation of real-time spatial management measures and dissemination of interaction information to the fleet. The SSC at its March meeting recommended consideration of non-regulatory industry-led bycatch avoidance programs and transferrable quota systems.

One PSAC member expressed concern for individual quotas, which would likely result in small quota (e.g., one turtle per vessel) that is restrictive, and expressed support for a pilot program. Another member responded that a small individual quota would in turn incentivize the industry to manage the quota on their own. A PSAC member also suggested looking at historical data to identify individual vessels that may have more frequent sea turtle interactions. PSAC also discussed the importance of considering whether individual limits would be allocated to vessels, permits, or captains, as captains could move to other vessels.

b. Characterization of loggerhead turtle interactions in the Hawaii shallow-set longline fishery

T. Todd Jones, PIFSC, presented a characterization of the observed loggerhead turtle interactions in the Hawaii shallow-set longline fishery. The presentation covered the spatial distribution of interactions and overlap of the TurtleWatch temperature band (17.5-18.5°C), observed loggerhead size, and loggerhead nesting trends. The preliminary characterization of the loggerhead interactions did not show the recent shallow-set longline effort or loggerhead size to be anomalous compared to previous years. However, available information on the nesting trends and size data from the longline captures suggest that the recent increase in the loggerhead turtle interactions may be associated with the increased hatchling production at the nesting beaches over the last ten years.

PSAC discussed the potential use of TurtleWatch as a dynamic management tool and how it may be operationalized as a non-voluntary tool. Jones noted that location data from vessels could be used to monitor location in relation to the temperature band. It was also noted that evaluation of species association would also be informative and the olive ridley analysis tool could be useful to apply to the shallow-set fishery data.

c. Review of sea turtle impacts assessment approaches

Summer Martin, PIFSC, provided an overview of fisheries impact assessment approaches used in Section 7 consultations. The assessments extinction risk faced by turtle populations, with the current or proposed level of Hawaii longline bycatch. The general approach used in the Population Viability Analysis (PVA), in which the probability that the population will fall below the quasi-extinction threshold is estimated. PIFSC typically uses a stochastic exponential growth model and fit the model using the best available data and estimate the intrinsic growth rate to project the population trajectory. The Annual Nester Equivalents (ANE) approach is used to estimate relative reproductive value as nesting female abundance is the only available population data. The assessment for the 2012 Hawaii SSSL fishery Biological Opinion (BiOp) used Monte Carlo simulation to estimate impact from fishery action in terms of the risk of dropping below quasi-extinction in 100 years. Martin also discussed improvements for assessments in the future to incorporating parameter uncertainty, including incorporating sex ratio specific to interactions to assess climate impacts, estimated takes pulled from length frequency distribution, and stage-based natural mortality.

A PSAC member asked when the last Center of Independent Experts (CIE) review was conducted on the assessment approaches. Martin and Jones responded that the take impact portion of the model in the 2012 BiOp was not CIE reviewed, but the based model for the climate-forcing model used in the BiOp was published and there was later a rebuttal published. Jones indicated that the 2002 Chaloupka and Wetherall models were CIE reviewed. The PSAC member also suggested conducting a review of modeling approaches used in ESA consultations in different NMFS regions, and additionally suggested looking at methods used for other species by NMFS and approaches used by other agencies such as the FWS and USGS.

Jones explained that the upcoming SSSL consultation modeling will be developed collaboratively by a team consisting of PIFSC and SWFSC scientists, and the plan is to have the model peer reviewed. The team will consider all available data, will meet in May to review all earlier models used in past consultations for the fishery, and will develop the technical details of the proposed approach by mid-May. The models will be then be run by two of the team members. Jones also explained that the modeling request that PIFSC received for the consultation is to do a population projection and estimate the probability of population decline over a range of time periods (5-100 years).

A PSAC member asked if sea level rise impacts would be considered in the model. Jones responded that it will likely be considered qualitatively in the BiOp rather than in the mode. Ishizaki asked whether the increase in reproductive output resulting from conservation projects at nesting beaches would be considered in the mode. Jones indicated that data would be needed to consider such parameters in the model, and encouraged PSAC members to provide him with any information that the modeling team should review and consider by mid-May.

ii. Other actions

Eric Kingma, Council staff, provided updates of pelagic fisheries management actions. These included the AS longline permit modifications, AS LVPA, and 2018 Territory bigeye catch limit specification. Kingma explained that overall, these actions are not expected to change protected species interactions, although some changes in effort may occur.

C. Discussion on Emerging Issues, Data Gaps and Research Needs

PSAC made the following suggested revisions to the data gaps and research needs section as a result of the review of the draft 2017 SAFE report (changes underlined):

Insular:

- Improve the precision of commercial and non-commercial fisheries data to improve understanding of potential protected species impacts.
- Define and evaluate innovative approaches to derive robust estimates of protected species interactions in insular fisheries.
- Update analysis of fishing-gear related strandings of Hawai`i green turtles.

Pelagic:

- Research on at-sea foraging behavior of albatross species to improve understanding of interaction rates in the Hawai`i longline fisheries;
- Identify zones to develop a regional look at environmental and oceanographic factors for area outside of the EEZ that may focus on areas of high-interactions. Develop metrics to characterize environmental data, effort, and bycatch rates at these regional scales (e.g. leatherback, olive ridley, albatrosses);
- Ecosystem considerations on catch and bycatch in the DSLL fishery (e.g., bigeye tunas, albatrosses, leatherback, and olive ridley turtles) as they relate to environmental and ecological drivers of changing species distribution and aggregation; and
- Evaluation of spatial and temporal representation of observer coverage compared to non-observed effort. While vessel behavior may be motivated by various factors, an assessment of sampling bias may be warranted.
- Improve observer data collection for oceanic whitetip shark in longline fisheries to record release condition, handling, trailing gear, size and sex for every observed interaction.
- Improve data collection for oceanic whitetip shark capture data in non-longline pelagic fisheries.

9. Public Comment

There were no public comments at the conclusion of day 2.

10. Committee Discussion and Recommendations

1. PSAC recommends the Council consider additional turtle mitigation measures in the American Samoa that may provide further reduction in green turtle interactions in the fishery without having negative impacts on fishery operations. PSAC noted that the green turtle interaction rates in the ASLL fishery have returned to pre-turtle mitigation measures implemented in 2011. PSAC noted that the fishery uses small circle hooks, and a previous study had suggested no significant operational impacts in increasing the hook size from the commonly used 14/0 to 16/0.

2. PSAC supports the use of TurtleWatch as a tool to facilitate SSSL fishermen further mitigate loggerhead turtle interactions. PSAC recommended that the Council consider fairness to all fishermen in the SSSL turtle management framework assuming an allocation approach is taken given the randomness of the events and financial investments made by the vessels. PSAC

recommended the Council base its allocation decision based on review and analysis of available data with respect to individual vessel effects and other potential factors.

3. PSAC recommends that the Council work with the PIRO Observer Program to streamline the process of accessing observer data to facilitate data access. PSAC noted that the issue of data cutoff date (i.e., vessel arrival date versus interaction date) has not yet been addressed. PSAC recommends staff explore opportunities to obtain preliminary data to potentially address this issue.

4. Regarding the standardized metric for monitoring protected species interactions for the SAFE report, PSAC supported the approach of using a simple anomaly-detecting standard approach for the purpose of identifying potential outliers in the SAFE report data that would warrant revising in the following years, with additional thresholds identified for multiple years of outlier data that would trigger examination of further analysis. PSAC recommends that staff further develop the standardized metric for inclusion in the 2018 SAFE report.

5. In response to the recent ESA-listing of the oceanic whitetip shark, PSAC identified the following shark data gaps and research needs, and recommends that the Council work with NMFS and other appropriate partners to address these needs:

- Improve data collection for oceanic whitetip shark capture data in non-longline pelagic fishery
- Outreach to fishermen to improve species identification for shark species to facilitate improved accurate catch data reporting
- Identify nursery ground habitat for ESA-listed scalloped hammerhead sharks unknown for AS and Marianas
- Improvements to observer program shark data collection:
 - Record release condition, handling and trailing gear
 - Sex and size for ESA-listed oceanic whitetip sharks to be collected for every observed interaction, rather than every third fish

6. PSAC recommended the following specific projects to be implemented in the next 1-2 years to address the 5-year research priorities:

- Meta-analysis of sea turtle post-hooking mortality rate studies
- Studies to evaluate post-hooking mortality for marine mammals difference depending on amount of remaining gear (including the use of model or cadaver to improve understanding of the impacts of pulling gear to straighten weak hooks)
- Identifying nursery areas for Indo-Pacific scalloped hammerheads for American Samoa and Marianas
- Expand shark interaction studies with small-scale commercial fishers to improve baseline biological, ecological studies for oceanic whitetips.
- Evaluate level of current shoreline interaction take of Hawaii green turtles as a proxy for evaluating potential level of sustainable take

PSAC identified the following SAFE report work items to be addressed in this year's report:

- Add commercial fisheries to insular research need #1 in SAFE Report

- Incorporate PSAC meeting discussions into data/research needs section and circulate back to PSAC [*see section 8.C*]

PSAC identified the following SAFE report work items for next year:

- Present FKW CPUE figure

PSAC identified the following presentations/discussion topics of interest for the next PSAC meeting:

- FKW issues including overall interaction increase in the DSLL, information on injuries in the insular population, and Take Reduction Team implementation issues.
- Stranding and necropsy data presentation
- Insular FKW interaction indicator project (addresses SAFE report needs)

11. Other Business and Next Meeting

PSAC chair suggested that the committee meet in conjunction with SSC to alleviate travel for members who serve on both committees and allow interested SSC members to potentially observe the PSAC meeting. Ishizaki explained that the PSAC meeting timing is constrained by the SAFE report draft review schedule so there is limited flexibility for moving the meeting, but may be able to consider an interim meeting in conjunction with the October SSC meeting. If the SAFE report review timing can be shifted earlier with timing for data availability addressed for various sections of the report, it may be possible to hold the PSAC meeting in conjunction with the SSC.



**WPRFMC Five-year Research Priorities under the MSRA
2014-2019**

Review of Research Needs under the Protected Species Theme by the Protected Species Advisory Committee

The Council’s Protected Species Advisory Committee (PSAC) reviewed the progress of the 2014-2019 WPRFMC Five-year Research Priorities under the MSRA at its April 2018 Meeting. PSAC reviewed the status document summarizing progress made by PIFSC and the Council, identified additional completed or ongoing projects that address priorities, discussed specific projects needs for the next 1-2 years, and any minor modifications to the priorities. This document summarizes the output of the PSAC discussion.

TABLE. Status of Research needs under the Protected Species theme in order of priority

RANK	RESEARCH NEED (PSAC modifications to priority <u>underlined</u>)	PSAC DISCUSSION SUMMARY
1	<p>Evaluate fishery interactions and post-hooking mortality rates: NMFS’ existing post-hooking mortality rates are based on outdated and incomplete information that needs to be updated so as to provide science-based assessments of conservation or management measures under consideration.</p> <p>Currently we only have a minimum estimate of fishing interactions and mostly only those associated with recreational shore-based fishing. We need to work on quantifying and describing all fisheries interactions and associated mortality and develop mitigation strategies where appropriate.</p>	<p>Additional completed or ongoing projects addressing priority:</p> <ul style="list-style-type: none"> • PIFSC ongoing shark post-release project in ASLL and HILL (targeting 4 species); long-term tags on oceanic whitetip sharks to assess effectiveness of RFMO non-retention measure and assess delayed mortality; identifying handling and best practices. • EU provided funding to IATTC to assess post-release mortality rates for silky sharks • Workshop on post-hooking mortality for sharks and follow-up tagging projects in other areas to replicate Hutchinson study (coordinated by Shelly Clark) • Several new sea turtle post-hooking mortality studies available in the last five years, including olive ridley and loggerhead post-hooking mortality rate study by Yonnat Swimmer • Cascadia Research Collective mouthline injuries to assess injury rate <p>Specific project needs for the next 1-2 years:</p> <ul style="list-style-type: none"> • Meta-analysis of sea turtle post-hooking mortality rate studies • Studies to evaluate post-hooking mortality for marine mammals difference depending on amount of remaining gear (including the use of model or cadaver to improve understanding of the impacts of pulling gear to straighten weak hooks)

1	<p>Estimate species-specific demographic parameters including annual survival and breeding probabilities for marine mammal species with known or possible interactions with fisheries (e.g., false killer whales, Pantropical spotted dolphins, pilot whales, rough-toothed dolphins): Current abundance estimates of marine mammal stocks in the region do not use species-specific or Hawaii-specific demographic data. Research is needed to determine Hawaii-specific demographic rates, including annual survival and breeding probabilities, to inform abundance estimates and for use in stock assessments.</p>	<p>Additional completed or ongoing projects addressing priority:</p> <ul style="list-style-type: none"> • None identified <p>Specific project needs for the next 1-2 years:</p> <ul style="list-style-type: none"> • None identified.
3	<p>Interaction reduction and mitigation methods: Further experimental research into reducing interactions between protected species and fishery activities and gears.</p>	<p>Additional completed or ongoing projects addressing priority:</p> <ul style="list-style-type: none"> • New seabird mitigation technology testing ongoing (e.g., hook pod) <p>Specific project needs for the next 1-2 years:</p> <ul style="list-style-type: none"> • None identified.
3	<p>Population and status assessments and evaluation of risk factors affecting stock recovery including changes to important reproductive habitat: To date NMFS has emphasized fishery regulations to recover protected species however research has shown that in many cases terrestrial or non-fishing impacts to protected species are greater than fishery impacts. Understanding the relative sources of various impacts will allow the development of the most effective (and cost-effective) recovery plans and actions. Research to augment the knowledge regarding biogeographic distribution and abundance of ESA-listed coral species are also needed, with particular priority placed on areas potentially affected by the American Samoa and Mariana FEP fisheries.</p>	<p>Additional completed or ongoing projects addressing priority:</p> <ul style="list-style-type: none"> • PIFSC ongoing: Updating stranding records for Hawaii green turtles for various mortality sources • Continued exploration of deeper reefs, which have found some species that are rare at shallower depths that are more abundant in deeper depths; each new study expands known biogeographic distribution of coral species • Coral and habitat mapping ongoing by Scripps, TNC, HIMB and others <p>Specific project needs for the next 1-2 years:</p> <ul style="list-style-type: none"> • Identifying nursery areas for Indo-Pacific scalloped hammerheads for American Samoa and Marianas.

<p>3 - reranked</p>	<p><u>[RERANKED TO HIGHER PRIORITY; FORMERLY RANKED “7”]</u> Shark population, demographics, status and effects on Western Pacific fisheries: Research into shark depredation and bycatch in Western Pacific fisheries with regards to decreasing shark bycatch and reducing shark depredation on target stocks. <u>Identification of areas of biological importance is also needed.</u></p>	<p>Additional completed or ongoing projects addressing priority:</p> <ul style="list-style-type: none"> • None identified <p>Specific project needs for the next 1-2 years:</p> <ul style="list-style-type: none"> • Expand shark interaction studies with small-scale commercial fisheries to improve baseline biological, ecological studies for oceanic whitetips.
<p>6</p>	<p>Genetic structuring of key species to allow for scientifically robust designation of “discrete population segment” and “stocks”: ESA allows for designation of “discrete population segment (DPS)”, and MMPA requires the management of populations by “stocks”. Genetic data are often used as key scientific evidence for the basis of DPS and stock designations. Robust scientific research on the genetic structuring of protected species interacting with fisheries is necessary to allow for effective management of such species.</p>	<p>Additional completed or ongoing projects addressing priority:</p> <ul style="list-style-type: none"> • Publication on founding genetic population of Molokai population of Hawaii green turtles • Oceanic whitetip shark tissue sampling study for improved global population structure • Coral taxonomy evolving with each new study (uncertain whether these studies will impact ESA-listed species). <p>Specific project needs for the next 1-2 years:</p> <ul style="list-style-type: none"> • None identified.
<p>7</p>	<p>Impacts of global climate change, ocean acidification and sea level rises on protected species: Research is needed on the potential impacts of global climate change, such as sea level rise; increase in average ocean temperatures; and ocean acidification, may have on the ocean environment such as changes in trophic structure and prey base, alteration in oceanographic patterns, changes in feeding and migratory pathways, among others and linking these to changes in fish resources</p>	<p>Additional completed or ongoing projects addressing priority:</p> <ul style="list-style-type: none"> • NFWF proposal to look at past history of coral habitat at French Frigate Shoals (funding and project status unknown). • Seabird sea level impacts in NWHI, winter storm and tsunami inundation studies; efforts also ongoing to established higher elevation colonies. <p>Specific project needs for the next 1-2 years:</p> <ul style="list-style-type: none"> • None identified.
<p>8</p>	<p>Potential for permitted takes of sea turtles: Research is needed to determine whether limited takes</p>	<p>Additional completed or ongoing projects addressing priority:</p> <ul style="list-style-type: none"> • None identified

	of sea turtles for cultural or other purposes would significantly affect the recovery of sea turtle populations.	<p>Specific project needs for the next 1-2 years:</p> <ul style="list-style-type: none"> Evaluating level of current shoreline interaction take of Hawaii green turtles as a proxy for evaluating potential level of sustainable take
9	<p>Evaluation/improvement of turtle conservation projects: A scientific evaluation of the effectiveness of terrestrial turtle conservation projects is needed to identify data gaps, successes or failures and priority projects to be continued or established. This would include developing and identifying science-based success criteria for the appropriate populations and would allow identification of the types of projects that provide the best conservation benefits in the most cost effective manner.</p>	<p>Additional completed or ongoing projects addressing priority:</p> <ul style="list-style-type: none"> None identified <p>Specific project needs for the next 1-2 years:</p> <ul style="list-style-type: none"> None identified.
10	<p>Examine conservation banking and offsets (credits): As recognized by the USFWS, conservation banking and credits can encourage improved monitoring, conservation and management of listed species by allowing the public to offset some of the adverse impacts of their actions on these species. Failing to allow such offsets has been observed to result in the destruction of protected species or the denial of interactions with them. Research into this issue will determine whether positive impacts would be likely to result for listed species under the purview of NMFS.</p>	<p>Additional completed or ongoing projects addressing priority:</p> <ul style="list-style-type: none"> None identified <p>Specific project needs for the next 1-2 years:</p> <ul style="list-style-type: none"> None identified.