



# NOAA FISHERIES

Pacific Islands Fisheries Science Center

## Background and PIFSC Response: Panel Reports of the Protected Species Science Program Review July 27-31, 2015 Honolulu, Hawaii

The following provides an overview of the objectives of the Pacific Islands Fisheries Science Center (PIFSC) 2015 external review, summary of reviewer remarks and our brief response to the review panel's reports. The terms of references, background materials, presentations and the panelist's reports are provided on our webpage at:

[[http://www.pifsc.noaa.gov/do/peer\\_reviews/program\\_review\\_of\\_protected\\_species\\_science\\_2015.php](http://www.pifsc.noaa.gov/do/peer_reviews/program_review_of_protected_species_science_2015.php)]

**Program Review:** NOAA Fisheries constantly strives to improve the quality and timeliness of our science at each of the agency's six science centers and the headquarters Office of Science and Technology. A standardized six-year cycle of peer review and evaluation of our fundamental science programs at both the national and regional level help us to stay at the cutting edge of science and still meet the needs of our stakeholders. Each year of the cycle has a specific thematic focus. In 2015, the focus shifted to protected species stock assessment processes and applied research that are conducted pursuant to the Marine Mammal Protection Act (MMPA), Endangered Species Act (ESA), Magnuson-Stevens Act (MSA) and comparable international agreements.

**Panel:** The PIFSC review was held on July 27-31, 2015 in Honolulu, Hawaii. The review panelists were respected members of the scientific community from across the country:

- David Helweg, DOI Pacific Islands Climate Science Center, Chair
- Douglas DeMaster, NOAA Alaska Fisheries Science Center, Juneau AK
- James Estes, Department of Ecology and Evolutionary Biology, UC Santa Cruz
- Frank Paladino, Chair and Professor of Biology, Indiana University-Purdue University
- Robin Waples, NOAA Northeast Fisheries Science Center, Seattle WA

Thank you to the staff of the PIFSC Protected Species and the Fisheries Research and Monitoring Divisions for their effort and enthusiasm in conducting this program review.

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## **External Program Review of Protected Species Science**

The Pacific Islands Fisheries Science Center (PIFSC) held an External Program Review of Protected Species Science from July 27 to July 31, 2015, in Honolulu, Hawaii. The first 2 days of the review were held at the NOAA offices on Pier 38 on Nimitz Highway, and the remaining 3 days of the review took place at the NOAA Inouye Regional Center. Public presentations of PIFSC's marine mammal and marine turtle research activities were presented from July 27 to July 30 and the panel members reported their preliminary findings on July 31.

The goal of this review was to evaluate current PIFSC scientific programs established to provide information relative to the conservation and management of marine mammals, endangered or threatened wildlife, and species of concern under NMFS jurisdiction. In addition, this review assessed the extent to which current science programs are focused on information needs identified by NOAA Pacific Island Regional Office (PIRO) managers.

Protected species-related science programs addressed in this review included the Hawaiian Monk Seal Research Program (HMSRP), the Cetacean Research Program (CRP), the Marine Turtle Biology and Assessment Program (MTBAP), and the protected species bycatch research conducted by the Fisheries Research and Monitoring Division (FRMD), ranging from species associated with substantial amounts of data to species where data and information are limited.

Presenters and reviewers were asked to emphasize the following five points in their preparation and evaluation respectively:

1. Do current and planned protected species scientific activities fulfill mandates and requirements under the ESA and MMPA and meet the needs of the regulatory partners, PIRO and Office of Protected Resources (OPR)?
2. Are the collaborations that are in place effective? What other opportunities should be pursued?
3. Are the protected species scientific objectives adequate to meet the long-term and short-term goals?
4. Are the protected species studies being conducted properly (survey design, statistical rigor, standardization, integrity, peer review, transparency, confidentiality, etc.)?
5. Are advances in protected species science and methodological approaches being incorporated into PIFSC research? Is PIFSC active in advancing protected species science? Are these advances communicated and applied in NMFS broadly?

The PIFSC, and particularly the Protected Species Division, would like to thank the reviewers for their time, effort, and commitment to this endeavor.

Response:

- The purpose of this review was to evaluate the Center's ability to address the ESA and MMPA mandates for stock assessment and monitoring of protected species. With this approach the panel identified notable gaps in the Protected Species Division's ability to collect information across the expanse of the US Pacific Islands for cetaceans and sea turtles.
- The emphasis of the review on the ESA and MMPA mandates meant little time was spent presenting findings from the Center's protected species ecosystem research and the desire to see this information is reflected in some of the panel comments. Ecosystems Science research will be the focus for next year's review.

In italics are comments from the Chair's summary with clarifying comments from individual panelists marked with a, b, c, etc. PIFSC's response to the recommendations will follow each recommendation and be noted by roman numerals i, ii, iii etc. The comments are divided into general Protected Species Division-wide comments, comments relating to two or more programs, and those specific to: the Hawaiian Monk Seal Research Program (HMSRP), the Cetacean Research Program (CRP), the Marine Turtle Biology and Assessment Program (MTBAP), and the Bycatch research conducted in the Fisheries Research and Monitoring Division (FRMD).

## Protected Species Division - General Recommendations

- 1. Each research team is doing a great job communicating with their external partners. That said, there seems to be ample opportunity for cross-program and cross-divisional information exchange and potentially co-development of science objectives and work plans.*
  - a) Several opportunities are available within the [Protected Species] Division for greater collaboration with the turtle and the monk seal field objectives for cooperative research and assessment in the NWHI. Goals and objectives for the long-term ecological projects will need to be set. Opportunities are also available in the western Pacific with greater collaboration with the cetacean team and possible combined proposals for aerial surveys, ship surveys, and tagging of cetaceans/sea turtles through reimbursable contracts (Navy).
    - i. *The Division will conduct an internal review of current field operations, laboratory needs, and sources of reimbursable funds to identify complementary science objectives and better leverage available resources. Examples of improve leveraging could include actions like coordinating efforts in remote camps to combine surveys for monk seals and sea turtles.*
- 2. For historical reasons, the partitioning of responsibilities between PIRO and PIFSC developed differently here than in other regions. In addition, the legacy programs for monk seals and green sea turtles, which have produced extremely valuable long-term datasets and a wealth of management-relevant information, are at a stage that is ripe for reassessment and, perhaps a course correction. Therefore, this is an opportune*

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*time to take a fresh look at big-picture issues and rethink priorities to ensure that the allocation of limited resources produces maximal benefits.*

- a) The Center should conduct a cost-benefit analysis to quantify the amount of management-relevant information that could be generated under various future scenarios that involve the scaling back of effort. Results of such analyses would provide essential information for any decisions regarding triage.
  - i. A cost-benefit analysis of the current green sea turtle and monk seal work will be conducted to evaluate where modifications of the programs can provide a greater return. As part of this analysis, a common unit of measurement will need to be identified and comparisons employed for the “with” and “without” comparisons.
  
- b) The Center is wholly or partially responsible for producing scientific information to inform management of dozens of protected species, and perhaps >100 total populations or stocks. But the allocation of funds is severely skewed to a couple of species/populations. If the rolling up of PPAs [budget lines] result in greater spending flexibility within the current budget, this will provide an unprecedented opportunity for the Center to take a step back and consider what would be an optimal way to allocate available funds to address key elements in the strategic plans identified by the Center and NMFS. The Center and RO [Regional Office] could then work together to take steps to try to steer implementation of effort toward that desired outcome. As noted above, cost-benefit and ‘bang-for-the-buck’ analyses should play an important role in this exercise.
  - i. Because the future may include greater flexibility in the use of money across budget lines, the PIFSC PSD Director will work with Division program Leads and the PIRO Protected Resources (PR) Assistant Regional Administrator to evaluate current strategic plans and develop contingency plans should it become possible to redirect resources to better meet identified priorities.
  
- c) Top leaders in the Center and PIRO should work to develop a win-win framework whereby Center scientists can continue to produce cutting-edge research while providing sufficient science support to PIRO. This is a complex topic that is difficult to assess from a brief review such as this, but my impression is that the balance might be skewed too far in terms of producing science support for PIRO. Recent changes in leadership within both the Center and PIRO suggest that this would be an opportune time to seriously engage in discussion of these issues.
  - i. PIFSC PSD Director and PIRO PR Assistant Regional Administrator (ARA) will review current PSD programs and discuss the relative balance in the time spent conducting science support for management vs. advancing research and monitoring capabilities.

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- d) Center staff have been energetic and creative in securing external funding to supplement resources provided by NMFS. However, the expanded capacity for accomplishing specific objectives comes at the cost of flexibility and efficiency. The collaborations might be fragile and might fall apart with turnover of key personnel or changing priorities of collaborators. Often it will be difficult or impossible to implement ideal experimental designs with such collaborations.
  - i. Dedicated base funds are needed to support the science programs so that core research capabilities don't become dependent on reimbursable funds that can abruptly end when the emphasis changes. For this reason, the Division Director will meet with the Regional Assistant Administrator to discuss regional priorities and see where funds can be leveraged for greater return.
  
- e) A long-term strategic planning session should be on the agenda for not just compliance with MMPA and ESA mandates, but also a better long-term plan for the conservation of [monk seals as a] critical member of the marine biodiversity of the Hawaiian Islands and surrounding ecosystems. Possibly convene a workshop that will also help to better define an ecosystem approach and investigative strategy for this highly qualified and dedicated team.
  - i. Much of this review focused on stock assessment and other data types, rather than a comprehensive review of all the research activities being conducted by each program. To that end, much of the ecological work being done was left with little discussion. Understanding the role that environmental and ecological processes play for species' behavior, abundance, and distribution is a priority for all of our protected species programs. However, each program has a different ability and need in terms of how much work should be directed towards these efforts. One example is the Hawaiian Monk Seal Research Program which has completed extensive studies on the diet and foraging behavior of monk seals across the archipelago and has done ecosystem modeling for one critical subpopulation. They have recently turned their efforts towards a collaboration to create an ecosystem model for the main Hawaiian Islands which will benefit many stakeholders. They hope to complete this Atlantis model in FY18.
  
- f) Effort should be devoted to developing a process for the PSD that would: 1) objectively incorporate guidance from NMFS Headquarters, PIFSC, PIRO, and the Council in setting priorities and 2) be easily understood and explained to constituents.
  - i. A succinct description of the priority setting process will be written for constituents to understand the process the Division uses to address the agency mandate in balance with the guidance and feedback from Headquarters, the Regional Office, the Regional Fishery Management Council, and other partner organizations.

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- g) The relationship between protected species leadership at the Center and Region would likely benefit from regular scheduled meetings (e.g., at least annually) that are chaired by a professional facilitator.
  - i. Routine meetings (~ monthly) have been in place for the last few years in coordination between the PSD Director and the Regional office PR ARA on monk seal objectives. Starting November 2015, these meetings will be expanded to include progress on coordination with sea turtle and cetacean issues. The regional office already has plans in place for facilitated meetings of Center and Region staff on specific topics where needed.
- h) If proposed changes to the way PPAs are organized become reality, the Center might have the opportunity to re-allocate resources that previously were narrowly earmarked. Before that happens, it would be prudent for program staff to develop a strategic plan for how any additional resources should best be used.
  - i. PSD Programs will update, or develop, their strategic plans.
- 3. *Protected Species science teams will need additional financial and logistic support (e.g., ship support) to accomplish their mandates. The ship demands for research are greater for this region than for any other region in the U.S. by far. Critical information needs of managers will not be met without allocation of additional days at sea to this Program.*
  - a) Effort should be made on the part of the PIFSC to provide for as many as 200 DAS [days at sea] per year for 3 years out of 5, and 120 DAS per year for the remaining 2 years, using base-funded NOAA ship time, for the PSD.
    - i. An allocation of 200 days at sea (DAS) is twice the highest number of DAS that PSD has received in its best year, although ship time requests have been limited primarily to Hawaii home-ported vessels; e.g., NOAA ships *Oscar Elton Sette* and *Hi'ialakai*. Besides the annual ship time needed to deploy and recover the monk seal field camps, most of the sea time needed would support activities of the Cetacean Research Program. Any additional ship time for cetacean work will also require additional resources to staff the vessels with observers to conduct the surveys. Currently, the sea time for cetacean work reflects the Center's prioritization of surveys conducted in, and fiscally supported by, directed funding for the new National Marine Monuments. The Center strives for greater efficiency, leveraging, and piggybacking of projects in an attempt to free up sea days for other uses, but as the reviewers have identified this will be inadequate to fill the gap in sea days for the region. The Center will expand its efforts to secure ship time through competition for other NOAA research vessels in order to increase overall sea time. This is carried out through a national prioritization process, and PSD is prepared for a larger submission when the next opportunity to submit ship time requests is available. [October 2015]



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4. *Some species or population [segments] occur in the multi-agency overlay Papahānaumokuākea Marine National Monument, working within which presents substantial administrative and logistical challenges.*
  - i. These challenges are from administrative and regulatory requirements that are outside the Science Center realm of influence.
  
5. *Program leadership should work with science teams to identify some portion of the annual work plan to develop analyses and advanced technologies that will allow them to understand population structure and movement not only in coastal waters but also across the full span of open ocean.*
  - a) With NOAA's aging fleet, the prohibitive expenses of building new vessels, and rapidly growing charter costs, I believe the program's greatest challenge will be access to areas over which species and processes of interest occur. Visioning and planning for ways of dealing with this challenge should be a high priority.
    - i. Expanding partnerships and developing technology are the priority strategies for the Division to meet its Pacific Islands mandate. The need is greatest for the Cetacean Research Program which has the largest number of stocks to assess and poses a daunting challenge to succeed. Cetacean population assessments are a challenge for all the regions and developing alternate survey methodology, that is not entirely dependent on ship time, is a national priority for NMFS and perhaps should be a topic for technology development nationally.
  
6. *Protected species leadership and science teams should work together to secure additional resources to address questions related to species ecology and habitat carrying capacity that could in the long run be very influential in addressing concerns related to recovery, conservation, and management.*
  - a) Sea turtles are characterized by Type III survivorship schedules. Because of this, age-specific reproductive values of sea turtles change profoundly from life stage to life stage, in turn strongly influencing the potential influence of anthropogenic influences and any efforts to mitigate these influences by management on different sea turtle life stages. Although this general issue has been addressed for sea turtle management elsewhere, management in the tropical Pacific would benefit from the inclusion of elasticity analyses.
    - i. The MTBAP's research, inquiries from the Regional Office, and potential for funding are becoming more quantitative in nature. Moving forward with research on the abundance, trends, and recovery of 7 potential Distinct Population Segments of sea turtles designated under the ESA (1 hawksbill, 1 loggerhead, 1 leatherback, 1 olive ridley, and 3 proposed greens,) will require PIFSC to grow our quantitative capacity. The MTBAP will be bringing on a

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quantitative ecologist post-doctoral position in FY2016 and will be moving forward on a permanent position to the Program. Our focus moving forward will be parameter-driven research, conducting sensitivity/elasticity analyses of population growth parameters, and using these analyses to guide field research. This approach should and will be performed in close communication with the Regional Office as we continue to meet requirements for species listings and the recommendations from the NOAA/USFWS Recovery and Action Plans.

- b) The distribution and abundance of marine turtles have clearly declined, but the extents of those declines over the centuries and millennia are unclear. If recent analyses and conclusions from studies of green turtles in the Caribbean are applicable to the tropical Pacific, marine turtles may have numbered in the millions or even tens of millions of individuals before the region's earliest human occupation. Such knowledge, which should be attainable from the same general methods used by Loren McClenachan and colleagues (*Frontiers in Ecology and the Environment* 2006) would be useful in figuring the potential for marine turtle recovery and for better understanding their ecological roles in tropical Pacific marine ecosystems.
  - i. Mapping the extent of the distribution and abundance of sea turtle populations has begun in many instances including the recent status review of green turtles. The status review team included 2 research members from the MTBAP and historic, grey literature, and unpublished data were used to map nesting areas and abundance throughout the Pacific Islands Region (PIR). Studies on the historic distribution of hawksbill turtles have been published in recent years. While the MTBAP will continue such analyses, where appropriate, we will also move towards analyses of current carrying capacity which may be a more useful metric for comparison to recovery goals. Such studies have been previously published for areas within the main Hawaiian Islands in collaboration with the PIFSC Ecosystems and Oceanography Program and further collaborations are planned.
7. *NOAA's Cooperative Institute for the Pacific Islands Region, the JIMAR (Joint Institute for Marine and Atmospheric Research) at the University of Hawai'i, appears to be central to successful implementation in all three programs (HMSRP, CRP, MTRP [MTBAP]). Every effort should be made to see that it continues to be available into the foreseeable future.*
  - i. The Cooperative Institute (JIMAR) is an essential collaborative component and partner to the functioning of the Science Center and will continue to be a priority going forward, funding permitting.
8. *Focus on within-EEZ [Exclusive Economic Zone] data collection and assessment ignores the biology of many pelagic species that may use these waters during only part of their life history. This may cause an artificial cap on the ability to understand*



*observations of population dynamics and therefore limit the ability to provide science to inform conservation and management. A more holistic ecological perspective that integrates the species of study in both nearshore and pelagic systems (where appropriate), coupled with additional resources to implement this perspective, is needed. At a minimum, some generic evaluations should be conducted of how seriously wrong conclusions about population status might be when they are based on data for only a small (and likely unrepresentative) fraction of the population's range. A good near-term metric of progress on this might be to have substantial attention to this in the upcoming Ecosystems Program Review.*

- i. Our focus on the portion of a stock, within the US Exclusive Economic Zones (EEZs), is drawn directly from the MMPA. Although management could certainly be improved with stock-wide assessment rather than EEZ-wide (or smaller area) assessments, our focus on the EEZ is simply an artifact of the mandate requiring us to prioritize in a situation where the needed funds to cover the full ecoregion are inadequate. Certainly a holistic approach that considers the full range in the life history of the animals under our mandate is preferable but unrealistic given the resources at hand. Recent assessment of the relationships between remotely sensed habitat measured and cetacean occurrence within EEZs has provided some insight into potential distribution and habitat-relationships in regions outside of the EEZ (Forney *et al.* 2014). These models are only as good as the very limited survey data available and much of the model has not been validated because only a single survey exists in a specific area. As survey data increase, the models will improve and eventually may play a critical role in our ability to understand how distribution changes over time in response to oceanographic variability, and, therefore, how seriously wrong we may be in our assessment based only on the EEZ. Some additional insight has been gained from tagging studies which show movements outside of the EEZ but these observations are limited to a few taxa. We are interested in the idea of looking at the uncertainty in a population analysis that is limited to sampling a small fraction of the cetacean's population range. As the data become available to support such an assessment, we will consider whether this may be a good focus for the NMFS MSE initiative.
- a) A somewhat similar problem is that almost all of the effort to monitor cetaceans around the main Hawaiian Islands occurs on the leeward sides, but telemetry data show most occurrence is on windward sides of the islands. It is much easier to say that effort should be shifted to the windward areas than to actually accomplish this, given the difficulties presented by rough seas and high winds. However, it should be possible, in some cases at least, to do an evaluation of just how misleading relying only on the leeward data might be in assessing the distribution and abundance of cetaceans. One or a few targeted, comparative studies might provide information that would allow generalizations regarding unstudied systems.
  - i. Understanding distribution and abundance on the leeward and windward sides (especially for island-associated cetaceans) is a critical need, though in many

cases the telemetry data provide the Cetacean Research Program the greatest opportunity to examine the differences in potential distribution. The CRP has been attempting to survey the windward side of Oahu and Molokai for specific species by targeting likely good-weather windows, but have had little success to date. Incorporating such sampling as modules in larger assessment surveys is more likely to be successful, where timing can be flexible within the period of the larger survey and the large ship can provide the capability to move to the best weather rather than being confined to a specific area where small boat operations are feasible. We plan to allocate some time for focused windward surveys near the main Hawaiian Islands during any upcoming efforts to use NOAA research vessels to survey near Hawaii.

- b) Increasing trends in the [green turtle] population are very encouraging and a major conservation success story. However, in spite of the promising trends, the status review team concluded that the Hawaiian DPS [distinct population segment] still is at significant risk of extinction. The major risk factors are: 1) the number of reproductive females is still relatively small and smaller than in most other DPSs; and 2) nesting is concentrated at a single site to a much higher degree in this DPS (over 90% at FFS) than in any other DPS (no other DPS has as much as 50% at a single site). Project leaders should consider how research conducted in the future can help inform evaluations of the degree to which these risk factors have been alleviated.
  - i. The MTBAP Lead, PSD Director, and PIRO PR ARA are beginning monthly meetings in the coming fiscal year. A goal of these meetings will be to address the recovery plans for sea turtles and specifically the risk factors listed in the recent proposed rule for green turtles. The MTBAP is also beginning research plans in concert with the HMSRP to increase monitoring of sea turtles in the Northwestern Hawaiian Islands (NWHI) including measurements of demographic/vital rate parameters (e.g., hatching success) needed to conduct population growth models including parameter uncertainty and sensitivity analyses. These steps will help inform evaluations of the degree to which these risk factors have been alleviated.
- c) Tagging data provide valuable information about movements of individuals in space and time, but so far they are largely descriptive. Can program staff find ways to integrate this information more fully into assessments of population status? Also, it will be important to find ways to assess non-lethal effects of tags, which likely are hard to detect but could be substantial in long-lived animals like marine turtles.
  - i. The data provided in the review was part of a research initiative still in its infancy. This is a long-term project with funding for multi-year post-doctoral position. Data from many tagged animals are still transmitting. Moving forward we will incorporate this information into habitat use, diel activity, and critical habitat designation (for proposed DPS). The MTBAP is currently the

leader in the field of the ecological impacts from animal-borne instruments on aquatic organisms. We have several published manuscripts and on-going research to assess the impacts in the wild. Please see,

Jones, T. T., K. S. Van Houtan, B. L. Bostrom, P. Ostafichuk, J. Mikkelsen, E. Tezcan, M. Carey, B. Imlach, and J. A. Seminoff. 2013. Calculating the ecological impacts of animal-borne instruments on aquatic organisms. *Methods in Ecology and Evolution*. 4(12):1178-1186. DOI: 10.1111/2041-210X.12109.

Jones, T. T., B. Bostrom, M. Carey, B. Imlach, J. Mikkelsen, S. Eckert, P. Opay, Y. Swimmer, J. Seminoff and D. R. Jones. 2011. Determining transmitter drag and best-practice attachment procedures for sea turtle biotelemetry studies. NOAA Technical Memorandum NMFS-SWFSC-480. <http://swfsc.noaa.gov/publications/TM/SWFSC/NOAA-TM-NMFS-SWFSC-480.pdf>

9. *One major recurrent observation that cross-cut all programs was variability and limitation in data management programs, data structures, resourcing, and connectivity to other internal and external data programs, despite each program's stated dedication to data stewardship.*
  - i. This year PSD will move to centralize its data management across programs. It will accomplish this in a step-wise fashion working backward from the production of data products to the data source in compliance with the White House's new "Public Access to Research Results (PARR) initiative."
    - By Jan 2016, the Division will draft a standard operating procedure for documenting data sources used in the production of new science products (e.g. reports, publications) prior to publication approval. Once an established process with a standardized data format is identified we will know what steps to take to coordinate the Division data streams.
    - An IT/manager is needed as a centralized lead for the Division's data. This person will work with the program Leads to improve the standardization and the efficiency in the processing of data streams. By February 2016, the Division will have scoped out what is needed and will initiate a recruitment (or realignment) to implement a new management process.

## HMSRP

10. *Reviewers commented that the direction of the HMSRP program appears to be founded on two assumptions, (1) that the species is and always has been limited to the Hawaiian Archipelago, and (2) that monk seal numbers today are much lower than they were in the past. These assumptions, essentially about carrying capacity of the Hawaiian Archipelago and the greater Pacific Basin, require more critical evaluation. An expanded view of ecosystem dynamics should include bottom-up and top-down forcing, indirect interactions, and non-linear functional relationships, all of which are emerging as important processes from studies of other species and ecosystems. Reviewers urge the monk seal research team to reach out to potential*

*collaborators to explore the feasibility of work to address these assumptions, and management implications subsequently addressed.*

- a) The assumptions that the Hawaiian monk seal is and always has been limited to the Hawaiian Archipelago, and that monk seal numbers today are much lower than they were in the past, require critical evaluation. This hypothesis might be tested by examining faunal remains (morphologically and genetically) from midden sites on the larger islands and archipelagos in other Pacific island groups. I would urge the monk seal research team to reach out to potential collaborators to explore the feasibility of such work, which could probably be done with relatively small investments of time and money.
  - i. The HMSRP agrees that this would be an interesting academic investigation and have encouraged partners at the Bishop Museum and University of Hawaii to follow up on this line of inquiry. We will continue to try to facilitate this area of investigation but will not be directing limited funding towards the endeavor.
- b) Although the molecular genetic data (which presumably reflect neutral genetic variation) did not detect any evidence of population genetic differentiation, the different sites have different age-specific patterns of fecundity and reproductive value. These differences could be entirely environmentally driven, but it would be prudent to at least consider the possibility that they have a heritable component, in which case local adaptation might be important. If so, this could have important ramifications for translocation efforts.
  - i. The HMSRP is currently working with collaborators at the American Museum of Natural History (AMNH) and Johns Hopkins University to dig deeper into genetic analysis that can help inform management of Hawaiian monk seals. Two upcoming projects show promise for addressing this issue. 1) The current AMNH PhD student is adding to the previous microsatellite data set and will be investigating parentage and genetic factors that may be associated with reproductive success (primarily neutral factors such as heterozygosity). Our Johns Hopkins collaborators are working to sequence and annotate the Hawaiian monk seal genome which would vastly improve genetic research resources. The genomics work may detect sites under selection that could reveal local adaptation, or at least provide a much broader suite of markers with which to investigate variation and heritability of particular traits.
- c) It would be prudent to consider the possibility that the steady population decline (and consistently high juvenile mortality) at FFS [French Frigate Shoals] reflects a population that has exceeded its carrying capacity, at least under current environmental conditions. This idea should be considered in the context of historical evaluations.

- i. The HMSRP is in general agreement with these comments. Previous publications and investigations in our program have generally concluded that human activities suppressed the French Frigate Shoals (FFS) population, it subsequently rebounded when those human activities abated, then increased rapidly and overshot carry capacity, followed by a crash. Excerpt from Baker et al. (2012):

*At French Frigate Shoals, the seal population was very small when counts began to be collected in the late 1950s. This followed several decades of human activities. Unlike all other NWHI subpopulations examined, the French Frigate Shoals seal population grew very rapidly during the 1960s and through the 1980s until beach counts at this atoll exceeded the combined total of all 5 other sites. Gerrodette & Gilmartin (1990) suggested that this recovery may have been facilitated by the transfer of the Loran station from East Island (important seal pupping habitat) to Tern Island (historically not an important pupping site) in 1952.... Since 1989, the French Frigate Shoals seal population has been declining rapidly as a result of prolonged poor juvenile survival (Craig & Ragen 1999, Baker & Thompson 2007). Craig & Ragen (1999) concluded that the population exceeded carrying capacity and that prey resources also seem to have declined.*

We disagree with the conclusion that the population is still above carrying capacity (K). The population is now much reduced compared to the late 1980s, and has exhibited improved juvenile survival for several years, which is a classic first response of a population below K. A significant remaining threat to pup survival, Galapagos shark predation, is arguably density-independent, and is inhibiting population recovery.

- d) Perhaps the greatest challenge to understanding ecosystem dynamics and their resulting links as demographic drivers in monk seal population dynamics is to put the hypotheses, whatever they might be, to rigorous tests. In my view this can only be done by perturbing the purported drivers, which of course would be both logistically difficult and probably illegal in the case of monk seals. The comparative method offers a reasonable alternative, especially in the case of monk seals which vary demographically in space and time. A careful search of this variation for environmental correlates will almost surely be fruitful.
- i. Agreed. Experimental perturbations might be the most scientifically rigorous, but are also unlikely to occur in the foreseeable future for those reasons (and others) the reviewer notes. Our Hawaiian Monk Seal Research Program has taken advantage of the spatial and temporal variation in several monk seal demographic (and debris entanglement) time series to explore how they relate to environmental correlates. At least 5 papers have been published on the results of some successful investigations. Nevertheless, we still do not understand key drivers of varying productivity and monk seal population trends throughout the monk seal's range. We continue to partner with

oceanographers at PIFSC to explore additional environmental time series which might prove explanatory.

Antonelis et al. 2003. Improved body condition of weaned Hawaiian Monk seal pups associated with El Nino events: potential benefits to an endangered species. *Mar. Mamm. Sci.* 19:590-598.

Donohue and Foley. 2007. Remote sensing reveals links among the endangered Hawaiian monk seal, marine debris, and El Niño. *Mar. Mamm. Sci.* 23: 468–473.

Baker et al.2007. Effect of variable oceanic productivity on the survival of an upper trophic predator, the Hawaiian Monk Seal *Monachus schauinslandi*. *MEPS* 346:277-283.

Parrish et al. 2011. Estimating the carrying capacity of French Frigate Shoals for the endangered Hawaiian monk seal using Ecopath with ecosim. *Mar. Mamm. Sci.* 28(3):522-541.

Baker et al. 2012. Relative influence of climate variability and direct anthropogenic impact on a sub-tropical Pacific top predator, the Hawaiian monk seal. *MEPS* 469:175-189.

- e) A calculation of the carrying capacity of the NWHI and a greater ecosystem like approach on the reasons and factors for continued decline in the NWHI despite 30+ years of conservation and protection. Analysis and publication of the differences in diving and foraging behavior of monk seals on different NW islands and also comparison to main island individuals. A use of more modern field ecophysiological techniques to investigate the energetic and nutritional status of the different habitats in the NWHI and MHI [Main Hawaiian Islands].
  - i. These are high priority areas for research by the HMSRP and it has been actively pursuing these questions for several years. There was little opportunity in the review to discuss any of HMSRP's numerous research projects in depth, including our foraging ecology, energetics, and ecosystem research. The program has conducted foraging behavior research across the archipelago using satellite, GPS, cellphone telemetry tags, and seal-mounted video cameras. We have used accelerometers to help determine the energetics of foraging. We have also employed a number of dietary analyses to determine prey across the range.

Some of these data have fed into an ecosystem model of French Frigate Shoals and more will be added to help develop an ecosystem model for the main Hawaiian Islands.

We are also working to understand how large-scale climatic/oceanographic events such as El Niño and the Transition Zone Chlorophyll Front impact monk seal survival. We know that they are beneficial but the biological mechanism is unclear. Is it more abundant or accessible prey? Change in competitors' behavior? It will be important to understand these relationships in order to assess how monk seal abundance and survival may be affected by future climate change.



11. *Time series have been used to generate a “silver BB” post-hoc analysis of individuals that had been rehabilitated and released. This analysis is used to validate investment and effort. However, the program failed to capitalize on the same time series to conduct a Monte Carlo-type analysis of the same potential population effects of a random sample of individuals. This would provide a baseline against which the relative investment in actions centered around manipulation of individual animals could be compared.*

- i. While this analysis did mention the earlier rehabilitation/release program (Gilmartin et al. 2011), the primary focus, and all of the new analyses, dealt with seals that were the subject of direct interventions to remove an immediate life-threatening risk. Those interventions, as listed in the publication, included such actions as removing serious entanglements, freeing seals from entrapments, and reuniting pups with maternal females. Interventions, corresponding to these types, were categorized according to their severity and only those incidents in which there was a high likelihood of mortality without the interventions were included in the analysis. Accordingly, the appropriate baseline for comparison was not how these seals compared to other seals in the population, but rather how much they contributed relative to what they would have contributed without intervention. Because the HMSRP assumed that these seals would have died, their contribution without the life-saving interventions would have been nil.

A Monte Carlo analysis, in which the performance of randomly selected seals would be used to assess the contribution of treatment seals vs. non-treatment seals, could be conducted. However, the results of such an analysis would inform us only as to whether the treatment seals had dissimilar demographics relative to the population at large but would not be informative with regards to the benefits of interventions for which the subjects had little or no chance of survival. The only other statistically suitable control group for this analysis would be to forego these interventions for a subset of seals in each category to test the assumption that they would have indeed succumbed to the presenting risk. However, that would clearly be inadvisable from a recovery perspective, especially given that these types of interventions are conducted incidental to regular population assessment activities and thereby proceed at little to no additional cost to the program.

### CRP

12. *The program is using or developing state-of-the-art advanced passive acoustics technology to address information needs related to distribution and abundance. This is a very cost-effective approach and should be encouraged.*

- a) The CRP should continue to work toward using passive acoustic methods to supplement traditional Line Transect and Mark-Recapture methods for providing estimates of abundance, consistent with the requirements of the NMFS PBR [Potential Biological Removal] protocol.

- i. The Cetacean Research Program is increasing its capability in passive acoustics through the recruitment of an acoustician to develop new approaches to use acoustic data sets toward cetacean stock assessment. This new position, within the program, will be the first position at PIFSC dedicated to advancing our capability in passive acoustic technology, data collection, and assessment. This recruitment is unlikely to identify a single person technically capable of advancing acoustic technology and data analysis as well as advancing survey design and quantitative assessment using acoustic techniques. More quantitative and survey design expertise is a critical need for the CRP before we can fully leverage our acoustic technology to advance cetacean stock assessment beyond detection of animals during at-sea surveys or describing animal distribution using the passive acoustic network. As additional resources become available CRP will look to recruit a quantitative ecologist that is capable of developing new survey design and other novel analysis tools for incorporating acoustics into cetacean assessments.

*13. PIFSC and PIRO should work together to address the Council's concerns related to estimation of Potential Biological Removal (PBR) level for pelagic false killer whales, including explication of uncertainty in computing estimates.*

- a) Assessment of bycatch and its population-level influences on false killer whales (and possibly other species of cetaceans) will need to be resolved with as much objectivity and analytical rigor as possible. Two areas of further research might improve this effort. One of these is documenting the fate of individuals that are hooked in the longline fishery and released alive. If these individuals were tagged or instrumented prior to release, their eventual fate might be determined with greater confidence and objectivity.
  - i. The CRP agrees that post-release mortality requires additional study and understanding the fate of hooked false killer whales (FKW) would improve our assessment of population status in the face of current bycatch levels. However, placing tags on agitated false killer whales hooked or entangled in fishing gear, in the dark, by inexperienced fishing crews or observers is not only dangerous for the animal and people, but also unlikely to be successful. Several groups have evaluated whether tagging studies could be implemented from fishing boats and have found that current tag deployment methods require too much training to be implemented by observers, animals are not accessible enough to be reliably tagged even by trained staff, and tagging animals is generally incompatible with the reality of the trying to release a whale from a fishing hook. As new tags and tagging methods develop we will revisit the potential for using tag technology to assess the fate of hooked false killer whales. We will also continue to work with the FKW Take Reduction Team to brainstorm alternative approaches to assessing post-hooking mortality.

- b) The necessary background information should be provided to the Council and adequate lead time provided for the Council to be able to provide comments to the CRP on draft SARs, as requested. Recommendations from the Council should be incorporated or otherwise addressed prior to finalizing the SAR.
  - i. The current process for drafting and review of stock assessment reports (SAR) explicitly provides the opportunity for the Council and all other interested parties to provide feedback and comments on all aspects of the SAR before it is finalized. Updated or new SARs must be reviewed by the Pacific Scientific Review Group before those SARs are available in Draft form. Once published as Draft, there is a 90-day public comment period. All comments received are addressed before the SAR is finalized. CRP staff commonly provide briefings to Council staff, the Council's Science and Statistical Committee, and the Council itself on any changes to SARs or the content of new SARs during the public comment period, and commonly provide in-depth briefings on changes in stock boundaries, assessment procedures, and recently completed surveys.

### Marine Turtle Biology and Assessment Program

*14. The MTRP [MTBAP] needs to shift focus from being a service program to becoming a center of excellence for marine turtle research in the Pacific. The Turtle budget line has been successful in studying green turtles, but the program as presented is much more than Hawaiian green turtles. Re-branding is needed to show the new breadth with research across 5 species of marine turtles in the Pacific.*

- i. The MTBAP is striving to better align research and engage with NOAA Office of Science and Technology and Office of Protected Resources. The MTBAP is also beginning a campaign to showcase our research through PIFSC science blog and submitting pictures and write-ups from field research and stranded turtle activities for the media. Along with these activities, the MTBAP will be looking inwardly into current data streams and long-term data sets and hire students through RFPs and University collaborations to analyze and publish the data.

Furthermore, the MTBAP will continue innovative research into animal-borne instrument drag, validation of techniques such as accelerometers to determine bioenergetics of free-ranging turtles, validation of blood metabolites to estimate fasting/nutritional state of turtles, and modeling resource requirements and distributions of populations to name a few. This research and vast regulatory activities need to be showcased within PIFSC, throughout NOAA, and with the stakeholders and public.

The external review was largely focused on stock assessment; but a read through of the MTBAP list of publications shows the full breadth and extent of research.

*15. With regards to green turtles, while there is a long standing study, this team also has been the home for the very expensive but necessary stranding network. This is of*

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*diminishing scientific significance and much of these costs and activity should be absorbed and covered by PIRO.*

- i. The MTBAP and PSD leadership are beginning dialogue for monthly meetings with PIRO PR ARA to discuss management needs, how the research from the MTBAP aligns with these needs, and the stranding and salvage program. The MTBAP is also looking inwardly at the stranding program for data mining, level of sampling, and the future role of rescue and rehabilitation within the program. For instance, the MTBAP leadership has begun communication with local stakeholders to increase the role of the private sector and volunteers in rehabilitation and animal care.

The data from the stranding program and necropsies from longline bycatch provide valuable samples for our understanding of population level interactions through genetics, age and growth studies through bone and scute sampling, information on diet through gut and stable isotope analysis sampling, and post-interaction mortality through biotelemetry studies to name a few. These data have also produced many master and PhD theses. The costs of the stranding program and roles in response to stranded turtles will be discussed with PIRO; however, the MTBAP will maintain its role as the ultimate depot for stranded turtles to continue necropsies to determine threats/cause of stranding and biological sampling to promote studies into the ecology of marine turtles from the PIR and high seas.

16. *Working with PIRO and PSD leadership, the MTRP [MTBAP] should evaluate the scientific merits related to protected species management and fisheries management provided by existing fishery observer programs.*

- i. Please see response above to 15.
- a) As practicable, the proportion of funding of these programs from protected species budget lines (i.e., PPAs) should reflect the importance of these data to the research programs of PSD. The remainder of funding should come from fishery budget lines. At present, funding from PSD to support observer coverage seems arbitrary, especially in light of the value of these data for fisheries management.
  - i. The origin for much of the funding for sea turtle work came about through Congressionally directed appropriations during the time when concern over the high frequency of interactions between the Hawaii-based shallow-set longline fishery and sea turtles resulted in the closure of the fishery. Among the conditions set when the fishery reopened was the requirement for 100% observer coverage of fishing effort; to this end, \$1 million was allocated to help ensure the observer coverage would be met.
- b) The Fisheries Bycatch team was strong and gave excellent talks but did not really fit into this overall scheme of the science center research program. Since these folks were out in the Fisheries division I suspect we had these presentations

because the salary lines were imbedded in the Turtle budgets due to the historical funds coming from the closure of Hawaiian fisheries due to turtle bycatch. While excellent I would recommend the shifting of positions into the fisheries budgets so that reporting and responsibility were more connected with function. Alternatively give them completely over to the science teams and have a better communication and strategic planning coordination.

- i. See 16a above. When much of the sea turtle funds were appropriated, bycatch and fishery interactions were research priorities and the expertise for research in those areas resided with the Science Center's fishery programs. Over time the focus for sea turtle science priorities have shifted and while the question of where the best fit for the bycatch turtle program lines has been pondered and status quo has prevailed, we will continue to assess the priorities and efficiencies in the context of the larger holistic Science Center vision.

### Bycatch

*17. Program staff currently are making considerable progress in mitigating bycatch rates by the integration of visual and auditory cues into fishing gear without adversely affecting catch rates of target species. Efforts are underway to optimize this approach through the use of multiple sensor modes. These efforts should be continued.*

- a) Further work is encouraged in the following three areas: accommodation, demographic impacts, and attraction.
  - i. We appreciate the Chair's and external reviewer comments on our sensory-based bycatch reduction technology (BRT) work. In particular, we appreciate the External reviewer's encouragement to follow up our work in three areas (accommodation, demographic impacts, and attraction). With regards to changes of sea turtle behaviors to visual alerts over time, be it a short time frame (e.g., accommodation or adaptation) or over a longer period of time (e.g., habituation), we have been very cognizant of the potential long-term behavioral effects of sensory cues. While much of this has been discussed in terms of marine mammal behavioral changes to acoustic deterrent devices (ADDs), this is certainly a topic of great interest and one in which we have built data sets over time that may help elucidate this issue. We have already begun examining our long-term data sets with this in mind.

In addition, understanding how any BRT may have varying demographic impacts is of great interest. In most of our studies, we do a preliminary examination of this issue, though we can certainly examine these issues more closely. As such, we will certainly follow up on examining the demographic effects of our tested BRTs and ensure a more robust analysis will be incorporated in upcoming studies. With regards to attraction, in particular how visual cues may affect other bycatch species and other target species, this is an

area in which we've already begun to put substantial effort. Unfortunately, our presentation did not have the time frame to go into much detail on this subject.

We greatly appreciate the comments and do plan to review previous data sets to follow up on accommodation/habituation questions, demographic impacts, and effects (attraction/reduction) on other species as well as incorporate these lines of inquiry for all ongoing and future projects.

- b) Program staff currently make it a priority to establish long-term relationships with international partners relative to mitigating the impacts of bycatch of sea turtles associated with artisanal fisheries. Such efforts, while demanding considerable logistical effort and long-term planning, are important because they provide a basis for trust, as well as cost-effective partnering. These efforts should be continued.
  - i. We appreciate the Chair's and external reviewers' comments on our efforts to establish long-term relationships with international partners. As sea turtles, sea birds, marine mammals, and many other protected species are often highly migratory species, the coordination of international jurisdictions, conservation interests, and fishery efforts are often required to ensure that anthropogenic impacts on these animals are minimized. We plan to continue with our fruitful international collaborations (e.g., collaborations in Peru, Mexico, Indonesia, and Japan) as well as foster additional collaborators in countries that have high interactions with sea turtles and other bycatch species.

*18. It is very difficult to evaluate the impact of anthropogenic removals to a population without adequate information on population size. Additional effort is needed to use all available information to attempt to improve on abundance estimates on a population specific basis to better evaluate the impact on recovery of bycatch in fisheries managed by the PIRO.*

- a) A significant threat to leatherback turtles in particular is bycatch in the shallow-set longline fishery. Data on the absolute numbers of bycaught turtles declined sharply with closure of this fishery in 2000, and has since remained relatively low (even after the fishery was reopened in 2004), thus suggesting that detrimental impacts of bycatch on leatherback populations has been greatly reduced. I am not convinced that this is the case, and would urge that the data be reanalyzed to scale bycatch loss to per capita, based on the best estimates of leatherback adult abundance over this time period.
  - i. please see c below
- b) The age- and sex-composition of anthropogenic removals has a significant effect on how the population responds to such removals. This appears to be of potential interest to most of the NMFS Science Centers. While referred to as "adult nester equivalence" in this review, similar issues are common (e.g., take of juvenile king



salmon as bycatch in the groundfish fisheries in the Bering Sea). A Working Group of experts should be identified nationally and asked to review Center specific research programs in an effort to ensure a best-practices approach.

- i. please see c below
- c) Additional effort is needed to use all available information to attempt to improve on abundance estimates on a population specific basis to better evaluate the impact on recovery of bycatch in fisheries managed by the PIRO.
  - i. PIFSC, PIRO, and the WPRFMC have convened a Leatherback Interaction Working Group to discuss the issues outlined in a-c above. Many species of turtle that interact with Hawaiian and American Samoan longlines nest and range outside of US EEZs; thus, the effort to improve abundance estimates is an international effort that includes researchers from multiple NOAA Science Centers and international collaborators. This will remain a priority and an on-going effort by the MTBAP.

**The following are additional recommendations from individual reviewers that did not fit neatly under a recommendation summarized in the Chair's report.**

### 19. Staffing:

- a) PSD leadership should enter into discussions with other NMFS Science Centers or NOAA laboratories regarding the possibility of the PSD hosting non-PIFSC staff for short details (e.g., 1-3 months).
  - i. PSD appreciates this suggestion and will begin discussing such possibilities with PIFSC Leadership. In particular, such details could provide valuable training opportunities for CRP and MTBAP staff and students, as both programs are short on quantitative survey design and analysis capability.
- b) The CRP team is the most underfunded group in the region with an enormous mandate and responsibility and absolutely inadequate personnel. I am amazed with the products already produced and it will be a challenge to keep these folks from not collapsing from overwork. Recommendations to address issue: Funding and personnel. This team needs more funding and quality people to accomplish the requests from the regional office.
  - i. This need is widely recognized and although we have identified it as a priority we have yet to find a source of adequate funds to address the gap.

20. Recovery Goals: For a small population that has been steadily declining for several decades, it is understandable that efforts have focused on short-term interventions to reduce mortalities. However, it is also important to evaluate these actions in the broader context of long-term recovery goals—in particular, to make sure that short-term actions do not preclude future options. Based on information we were given, it

seems that the current recovery goals are generally not considered to be very realistic or meaningful. If that is the case, perhaps the Center should initiate an effort to develop more meaningful viability targets.

Given the considerable amount of research and information gained since the Recovery Plan was finalized, it should be update or revised. This is a PIRO responsibility. However, the monk seal program would benefit, as would the Agency, from effort directed at revising the recovery criteria such that they better reflect a more comprehensive understanding of the current habitat and how climate change and global warming may interact to influence the recovery of this species.

- i. All monk seal recovery efforts are focused, ultimately, on the long-term goal of delisting the species. The HMSRP has clearly articulated short-, medium- and long-term goals to achieve NOAA's recovery goals for monk seals. For instance, in the short-term we focus on recent (last 3 years) survival rates of different age classes to design intervention activities (i.e., translocations) to maximize the survival of pups and juvenile seals from year  $n$  to year  $n+1$ . This is geared towards improving age-sex structures and increasing reproductive potential of the population in the medium-term. The cumulative benefits of these interventions, public engagement, and mitigation of various threats will move the species toward recovery goals in the long-term.

It has been 8 years since the most recent update of the Recovery Plan for Hawaiian Monk Seals, in which our current recovery goals were set. In that time NMFS has learned much in terms of the species biology and ecology and the impacts of the environment and threats to survival. It may be reasonable to reassess whether current recovery goals are still supported by the best available science given that the knowledge base has grown over the last 8 years. . However, HMSRP must defer to our partners at PIRO to direct us if that is one of their information priorities.

21. The different vital rates at different sites suggest that seals at these different sites are demographically independent populations/subpopulations. Some thought should be given to how to integrate these data into an overall risk assessment. More broadly, program staff should attempt an overall assessment of the status of this species that incorporates information from both NWHI and main island population components. Methods exist for combining disparate types of data into overall risk assessments; for an example, see Drake et al. (2010).
  - i. The HMSRP agrees and continues to develop and refine our population assessment strategies. For instance, this year we are planning on producing our first comprehensive single population estimate for the species across its entire range.
22. I would recommend an intensive "citizen science" outreach and training program coordinated by the monk seal team to establish a minimum standard for the data set

obtained by these “volunteers”. A standard data collection routine and datasheet should be created with maybe photo ID and or some other library of demographic information and a normalization of this new, important and emerging database with the survey data obtained from the field camps of the past 30 years. Possible shifting of some team personnel to main islands for the long term inclusion of quality and comparable data on the expanding population there into a long-term demography data set.

- i. While the HMSRP and PIRO currently work with a number of volunteer organizations to collect data on Hawaiian monk seals in the eight main islands, we are working to make this data collection more rigorous and standardized, as well as working to better train volunteers and make our citizen science program more inclusive. In the near-term we are working to develop a standardized data form to be used as the backbone for seal reporting/data collection from all of our collaborating volunteer organizations. In the future, we intend to make this data entry form available in the form of a smartphone app (with additional development to encourage user engagement and provide feedback and information about seals). The availability of an app will allow us to appeal to a broader range of public participants, and will provide a useful interface for collaboration with school groups. Currently, the expense of quality app development is one of the barriers to completing this project.
23. There should be a greater collaboration with other international monk seal teams and investigators. These collaborations and genetic comparisons may help with long term health and survival issues that are of concern to the team such as a vaccination program and other general health issues. In addition the possibility of establishment of a captive breeding program, especially in collaboration with the new facilities associated with the TMMC should be explored as a possible conservation tool.
  - i. The HMSRP agrees completely and wishes there had been more time in the review to discuss these topics as we have already been making significant plans and progress on all these fronts. In April, the HMSRP hosted the International Collaboration for the Conservation of Monk Seals (ICCMS). The workshop included nine Mediterranean monk seal researchers and managers from programs in Spain, Mauritania, Madeira and Greece. There was a week of discussing the biology, ecology and conservation initiatives for both species and finding common research grounds on which to collaborate. The second week was spent in the field capturing and handling Hawaiian monk seals for research and cross training participants. The ICCMS is intended to be a long-term partnership for the benefit of both species.

One of our current focuses is assessing the feasibility of captive breeding for monk seals. While the Marine Mammal Center hospital would be an inappropriate facility for the activity we are working with other partners that could support this type of activity. Currently, we are working with the Minnesota Zoo and

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International Union for Conservation of Nature Conservation Breeding Specialist Group to assess the feasibility of captive breeding for monk seals.

24. Data on group size and social affiliations [of cetaceans] are interesting but at present not well integrated into overall assessments. How best to do this deserves some thought.
  - i. Social affiliation networks form the basis for stock delineation for some island-associated stocks in Hawaii and will likely play an important role in stock delineation in other Pacific Islands Region stocks. In a recent NMFS-wide assessment of potential lines of evidence useful for delineating stocks, social affiliation was judged to be a strong indicator of stock structure for certain taxa (albeit misleading or uninformative for others) and other sociality factors such as group-size variation between stocks is likely to have similar weight in stock delineation assessments. However, the CRP does agree that there's more we could make of this data. We'll continue to evaluate how to most effectively use all of our datasets for stock assessments, especially as traditional data sets for assessment are not likely to be available for many of our stocks.
25. The CRP should complete an analysis of the likelihood of the pelagic false killer whale population being depleted, based on a stock structure of animals only in the US EEZ and best estimates of abundance and anthropogenic removals.
  - i. The Council has funded an independent group of quantitative ecologists (the Independent Assessment Team) to develop a tier system for PBR. One aspect of their simulations is to evaluate whether the PBR input used for Hawaii's false killer whales are too conservative. The CRP feels it's likely that the tools developed by the IAT may be informative in addressing the question posed here, or at least may identify an appropriate analytical path toward assessment of whether pelagic false killer whales may be depleted. Given the IATs considerable work on this effort to date, we feel we should see what they produce, and then develop a follow-on set of analyses as appropriate.
26. The long-line observer program run by the PIRO in the PIR should report all cetacean bycatch to the NMFS IWC Whale Team coordinator (Melissa Garcia).
  - i. The Observer Program in this region resides within the Regional Office, and as such reporting of such data would be primarily their responsibility. We have shared this recommendation with the Regional Office and are prepared to assist with reporting to the International Whaling Commission if requested.
27. The MTRP [MTBAP] has made as a priority long-term collaborations with partners in the PIR outside of Hawaii. This effort is very important in terms of cost-effective research in areas where logistics are both difficult and expensive, training local community members to carry out important components of a research program, and trust between researchers, managers and local community members. This effort should be continued as a priority.

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- i. We agree whole-heartedly with this comment. The MTBAP is committed to continuing our collaborations with partners in the PIR and providing training and technical expertise to produce long standing partners, projects, and data streams. The MTBAP will continue to find alternative means to fund this initiative through RFPs and Reimbursable monies.

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Recommendation	Action	Date
Engage in cross-program and cross-Division information exchange (#1)	Conduct internal review of field operations, lab needs, and sources of funding to identify complementary objectives	November 2015
Take a fresh look at partitioning of responsibilities between PIFSC and PIRO, rethink priorities to ensure allocation of resources produces maximal benefit: The Center should conduct a cost-benefit analysis to quantify amount of management-relevant information that could be generated under various future scenarios that involve scaling back of effort (#2)	PSD Director will work with Program Leads and PIRO PR ARA to evaluate current plans and develop contingency plans should it become possible to redirect resources	February 28, 2016
Top leaders in the Center and PIRO should work to develop a win-win framework whereby Center scientists can continue to produce cutting-edge research while providing sufficient science support to PIRO (#2)	PSD Director and PIRO PR ARA will review current PSD programs and discuss balance of time spend conducting science for management vs. advancing research and monitoring capabilities	Ongoing monthly meetings starting November 2015
Conduct a long-term planning session for the conservation of the marine biodiversity of the Hawaiian Islands and surrounding ecosystem (#2)	HMSRP has established a working group to develop an Atlantis ecosystem model for the main Hawaiian Islands	Completion of model in FY18.
Write (and make available to constituents) a succinct description of the priority setting process the Division uses to address Agency mandates (#2)	A white paper will be written and made available to the public	April 2016



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Recommendation	Action	Date
<p>In the event of PPA reorganization, program staff should produce strategic plans for how additional resources would best be used (or reduced resources would be handled) (#2)</p>	<p>Programs will develop, or update, strategic plans</p>	<p>September 30, 2016</p>
<p>Effort should be made on the part of PIFSC to provide for as many as 200 DAS per year for 3 years out of 5, and 120 DAS for the remaining 2 years, using base-funded NOAA ship time for PSD (#3)</p>	<p>PSD will continue to request greater amounts of ship time through the range of sources continuing in FY16</p>	<p>October 2015</p>
<p>Program leadership should work with science teams to identify some portion of the annual work plan to develop analyses and advanced technologies that will allow them to understand population structure and movement across the full span of open ocean (#5)</p>	<p>The CRP is dedicated to using advanced technologies to the fullest extent possible to provide data across species ranges. New staff recruitments will be focused on this goal.</p>	<p>Ongoing</p>
<p>Secure additional resources to address questions related to species ecology and habitat carrying capacity (#6)</p>	<p>The HMSRP is funding the development of an Atlantis ecosystem model for the main Hawaiian Islands. Applications are in for additional funding for post-doctoral research to complete the model by FY18.</p> <p>The MTBAP will apply current and additional resources in hiring a permanent quantitative ecologist position in FY16. The position will help the MTBAP increase its quantitative capacity to answer questions of carrying-capacity and population growth modeling</p>	<p>Ongoing</p> <p>FY16</p>

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Recommendation	Action	Date
Secure additional resources to address questions related to species ecology and habitat carrying capacity (#6) - Continued	While new permanent resources have been difficult to come by, we've taken advantage of broader ecosystem funding initiatives to advance our work towards understanding protected species ecology and habitat; e.g., through the 'Integrated Ecosystem Assessment' program and other NOAA RFPs. We also embrace partnerships with other agencies, offices, and non-governmental entities who share research interests, and remain committed to diligently track and pursue these opportunities to secure additional resources.	
Effort should be made to see that JIMAR continues (#7)	Agreed	Ongoing
The risk of seriously wrong conclusions about population status using data for only a small fraction of the population's range should be evaluated (#8)	Continue development (with SWFSC) of predictive habitat-based assessments of likely distribution and abundance across broader regions. This may form the basis of assessments of bias when assessments are limited to EEZs only	Ongoing
Conduct comparative studies of cetacean abundance off windward vs. leeward sides of the islands (#8)	Will allocate dedicated survey effort in windward areas during upcoming Hawaii assessment surveys	First survey in summer F2016 To continue through 2018
Turtle Program Leader should evaluate degree to which risk factors to green sea turtles have been alleviated (#8)	Beginning monthly meetings with the MTBAP Lead, PSD Director, and the PIRO PR Director in November 2015	Continue throughout FY16
Turtle program staff should find ways to integrate tagging data into population status, and also assess non-lethal effects of tags (#8)	The MTBAP is bringing on a post-doctorate researcher in December 2015 primarily to work on spatial-temporal analyses and population dynamics of Guam/CNMI surveys, capture, and tagging.	Expansion of tag data analysis – December 2015

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Recommendation	Action	Date
Turtle program staff should find ways to integrate tagging data into population status, and also assess non-lethal effects of tags (#8) - Continued	The MTBAP has published several papers assessing the drag associated with animal-borne instruments and ecological impacts to the animals. This research is ongoing with future analyses of field/lab tagging data.	Assessing non-lethal effects of tags - Ongoing
Address data management variability and limitations (#9)	PSD will draft a standard operating procedure for documenting data sources	January 2016
	A Division IT/Data Manager position will be established	February 2016
<b>Hawaiian Monk Seal Research Program</b>		
Reach out to collaborators to explore what coalescence modelling can do to inform whether monk seals have always been rare in Hawaii (need help reworking this, from #10)	Continue working with collaborators at the American Museum of Natural History and Johns Hopkins University. Genetic analyses are ongoing.	January 2017
<b>Cetacean Research Program</b>		
Continue use and development of passive acoustic technology to address distribution and abundance (#12)	We are currently recruiting an Acoustician to join the CRP.	January 2016
	Request quantitative ecologist position to develop new survey design for incorporating acoustics into cetacean assessments for CRP in FY17 staffing plan. If funding allows, fill position.	July 2016

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Recommendation	Action	Date
Marine Turtle Biology and Assessment Program		
Rebrand the turtle program to show new breadth of research across five species of marine turtles in the Pacific (#14)	The MTBAP is working to engage with NOAA F/ST and F/PR; also, the MTBAP is beginning a campaign to showcase its research through the PIFSC science blog, taking an active role in press releases, and submitting pictures and captions from field research and stranded turtle activities for social and news media.	Ongoing
Shift turtle stranding program to PIRO (#15)	The PSD Director and MTBAP Lead are beginning monthly meetings with PIRO to discuss the stranding program.	November 2015
Reanalyze data on leatherback bycatch to scale bycatch loss to per capita (#18)	The PIFSC, PIRO, and WPRFMC have convened a Leatherback Interaction Working Group to address interaction rates in the Hawaiian and American Samoa longline fisheries and the associated impacts on the western Pacific population.	Ongoing
Bycatch team from FRMD		
Evaluate scientific merits related to protected species management and fisheries management provided by the existing fishery observer program (#16)	The Fishery Observer Program provides valuable information regarding fishery interactions as well as opportunities to collect biological samples (including deploying tags). Observer data is managed through the Science Center, and PIFSC staff meet regularly with the observer program on sampling protocols, data collection, and training.	Ongoing

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Recommendation	Action	Date
Shift turtle fisheries bycatch team onto fisheries funding lines, or move the positions into the Protected Species Division (#16)	PIFSC Leadership will look and assess these possibilities in light of the review and recent realignment of the Center Divisions and consolidation of the marine turtle programs.	November 2015
Further bycatch research in the areas of Accommodation, Demographic impacts and Attraction (#17)	Will incorporate and expand where needed	Ongoing
Continue to develop long-term relationships with international partners relative to mitigating the impacts of bycatch of sea turtles associated with artisanal fisheries (#17)	Will continue to foster our international collaborations (e.g. Peru, Mexico, Indonesia, Japan) and develop additional collaborations with countries that have high bycatch rate of sea turtles and other protected species	Ongoing
Additional Recommendations not neatly fitting under Chair's report (but from Individual Reviews)		
PSD host non-PIFSC staff for short details to help alleviate staffing shortages (#19)	Determine what program challenges could benefit from a detail of expertise (e.g., Data management, alternative survey design)	February 2016
Increase funding and staff for Cetacean Research Program (#19)	PSD will request additional permanent funds to support the Cetacean Research Program (please see action from Recommendation #12 for further detail)	July 2016 (addition of quantitative ecologist, and request for associated funding, to the staffing plan for FY17 for CRP)
Develop more meaningful recovery targets for the Hawaiian Monk Seals (#20)	That recommendation will be passed on PIRO to see if they want to request us to do so?	December 2015
Integrate data on the two subpopulations of HMS into an overall risk assessment for the species (#22)	The HMSRP will be working with PIRO to ensure that data quality collected by volunteers is improved and maintained. HMSRP will also be developing a web-based application for citizen scientist data entry.	Meeting with PIRO to ensure data needs – February 2016 Web application – November 2016

## NOAA PACIFIC ISLANDS FISHERIES SCIENCE CENTER

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<b>Recommendation</b>	<b>Action</b>	<b>Date</b>
Standardize data collection by volunteers (#22)	The HMSRP will be working with PIRO to ensure that data quality collected by volunteers is improved and maintained. HMSRP will also be developing a web-based application for citizen scientist data entry.	Meeting with PIRO to ensure data needs - February 2016 Web Application - November 2016
Develop greater collaboration with other international monk seal teams and investigators	The HMSRP is currently leading the International Collaboration for the Conservation of Monk Seals and are regularly engaged with our Mediterranean monk seal counterparts.	Ongoing
The turtle program should continue to make long-term collaborations with partners in the PIR, outside of Hawaii, a priority (#27)	The MTBAP is committed to continuing our collaborations with partners in the PIR and providing training and technical expertise to produce long standing partners, projects, and data streams.	Ongoing