

**NOAA Fisheries Pacific Islands Fisheries Science Center**  
**External Review Report**  
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## **Introduction and Background**

A review of the Pacific Islands Fisheries Science Center (PIFSC) Marine Turtle Program was held on 26-28 July, 2011, in Honolulu. The primary objective of the review was to evaluate the status and progress of the Marine Turtle Research Program (MTRP) and Marine Turtle Assessment Program (MTAP), both under the Protected Species Division (PSD), as well as sea turtle research and monitoring activities that are underway in other PIFSC Programs. The review was especially timely, due to recent budget cuts and elimination of earmark funding that has supported the marine turtle program for several years; thus, the status of existing projects, identification of continuing research needs, and review of program structure can contribute to ongoing discussion of program priorities. This review provided an opportunity for Center staff to present the results of their research activities and to learn more about other marine turtle projects at the Center. Stakeholders from the Pacific Islands Regional Office (PIRO), the Western Pacific Fisheries Management Council (WestPac), the University of Hawaii, and the public were also present and contributed to discussion. Presentations on Days 1 and 2 were followed by discussion and questions from the panel and interested parties. All sessions on Days 1 and 2 were open to PIFSC staff, with the exception of a meeting with stakeholders that took place on the afternoon of Day 1. The Panel met at the Dole Street lab on 28 July to discuss their observations and develop the recommendations outlined in this report. The Panel reviewed their findings with the Center Director Sam Pooley and Deputy Center Director Michael Seki. The Panel then presented draft recommendations to the Division Chiefs, who were given an opportunity to ask questions and provide additional input. Throughout the review, the Panel was impressed by the professionalism and courtesy demonstrated by the Center staff.

This Report includes the Panel's observations and general advice on the Center's marine turtle programs, a summary of stakeholder comments, and a list of recommendations for maintaining and improving program excellence.

## **Panel Observations and General Advice**

### **PIFSC Marine Turtle Research and Monitoring – all Programs**

PIFSC researchers have contributed much to the conservation and biological knowledge of Pacific marine turtles. This has been a highly productive program, even prior to the influx of turtle research funds that followed the emergency closure of the longline fishery. Each program has published numerous technical reports and peer-reviewed publications, and PIFSC scientists are considered the world's experts on sea turtle biology in the Hawaiian Islands and much of the Pacific. Particularly

commendable are the Center's international initiatives, as most sea turtle populations are wide-ranging and a shared responsibility for multiple nations. Work with Japan and Pacific Island nations have been excellent and should be commended and continued. PIFSC research on fisheries interactions and gear engineering to reduce sea turtle bycatch has extended well beyond Hawaii and continues to benefit sea turtle conservation worldwide. The Center's analyses of pelagic habitat and movements of satellite-tagged turtles relative to oceanographic parameters are the most cited in that field.

The current structure and operation of marine turtle research at PIFSC exhibit characteristics of a "flush" program with a large budget: multiple programs with many high quality individual projects, but research that is not always well integrated across divisions or even within divisions, in some cases. This has led to a program that, on the surface, lacks a clear overall strategy with common goals. A review of the Marine Turtle Research Program was conducted a few years ago by a panel that included two reviewers from the Center of Independent Experts (CIE). This review was alluded to but there was not a presentation on progress since that review to evaluate whether recommendations by that panel had been considered in program development and strategic planning. As the budget for marine turtle research has shrunk considerably, defining overall goals and specific objectives of the Marine Turtle Program as a whole will be essential for consolidation and program assessment.

Creative research is often conducted by strong personalities, and the Center's turtle programs are no exception to this rule. It is important for Division Chiefs to assure that differences of opinion and research approaches among investigators do not inhibit necessary collaborations and data sharing. Debate between turtle researchers during the review was cordial and professional but revealed tensions that may affect the communication that is essential for maintaining a top-quality program.

The Program is structurally fragmented, with researchers currently housed in 5 different locations, which results in functional fragmentation of the program. One Division leader expressed enthusiastic astonishment at the quality and quantity of turtle research at the Center following the formal presentations. Clearly, all staff in all Divisions that conduct research on turtles should be aware of Center research on those species! The fragmentation has led, in some cases, to poor communication, issues with data availability, and inefficiency in the research programs. Importantly, evaluation of population status and assessment modeling, key management science that requires collaboration across Divisions, should be a priority.

Marine turtle conservation and management is complex and requires collaboration and good communication between the Center and policy entities. In the Hawaiian Islands, PIFSC has a generally good working relationship with the Regional Office (PIRO) and the Fisheries Council (WestPac). The Panel heard from individuals from these offices and other stakeholders (see Stakeholder Comment Summary, below). There are good individual relationships but some tensions naturally occur, particularly with science related to controversial issues such as Hawaiian green turtle status listing and fishery bycatch.

The Center has supported some great collaborations with outside scientists, such as turtle researchers from the SW Fisheries Science Center in La Jolla, academicians from University of Hawaii and other

institutions, and non-governmental organizations such as the Pelagic Fisheries Research Program. Center programs should continue to take advantage of turtle expertise outside of Hawaii and increase their interactions with turtle programs at the Southeast and Northeast Centers.

The impending move to Ford Island raises concerns about communication and collaboration with stakeholders and scientists, particularly at the University of Hawaii. While it will be beneficial to have all Center turtle programs and researchers housed in one place, there is an impending likelihood of increased isolation due to security barriers at the new facility.

### **Marine Turtle Research Program (MTRP)**

This has been a well-established, productive program for many years that has provided some of the most comprehensive biological data on a sea turtle population anywhere in the world. Presenters emphasized a current priority of data organization, availability, and “mining” to address numerous research questions, including those pertaining to turtle life history and population dynamics. This follows recommendations by a data management systems program review conducted in 2010.

Research on the prevalence and epidemiology of fibropapilloma disease (FPD) has been an important component of this Program. A recent collaboration with the Marine Turtle Assessment Program (MTAP) has revealed some interesting patterns of disease occurrence and development of new hypotheses for disease spread. Determining FPD impacts on the Hawaiian green turtle population and an assessment of impacts on green turtle habitat should be considered key products of this long-term research program. The actual epidemiological investigation could be conducted by the CDC or state public health entities, Burns School of Medicine at University of Hawaii, or comparable institutions on the US mainland. Work on the epidemiology of fibropapilloma by other NMFS science centers is conducted at research universities.

As budgets are cut, it is important for the members of this program to take a step back, evaluate goals, and develop research objectives that are clear and hypothesis-driven. Much of the long-term data collection and monitoring of Hawaiian green turtles by this Program are essential to maintain a time series, but what should the priorities be? Evaluating changes in vital rates (reproduction, recruitment, growth, survival) over time as well as abundance is a strong recommendation by the recent sea turtle assessment review by the National Research Council, and is clearly possible to start with existing data. Prioritizing analyses that provide parameters needed for assessment, including growth and size distributions, nesting frequency, maturity-at-size, and recruitment of new adults to the nesting population would be particularly valuable. Close collaboration with members of the Marine Turtle Assessment Program (MTAP) is essential.

Empirical research that was not addressed in the presentations, but could be valuable for green turtle population monitoring, includes continued work on age and growth with humeri collected from stranded animals and development of a turtle condition index based on a variety of physiological characteristics that can be determined in live animals. Continued collection of samples from all turtle species for genetic analysis is likely to be useful, and the genetics lab at the SWFSC should be pressed to complete requested reports.

## **Marine Turtle Assessment Program (MTAP)**

For historical reasons, this Program is separate from the MTRP, which may be one factor affecting communication among the Center's primary sea turtle researchers. Presentations of recent projects were very interesting but would greatly benefit from more internal collaboration at the Center. The Panel also noted that, to date, there has been little progress on actual population assessment, although there are plans for assessment model development that were not elaborated during the review. Given that status evaluation and assessment are the primary duties of this Program, evaluation of biological data and improvement of models of population dynamics should be a priority. Getting some outside help on these tasks from other Centers and experts in population dynamics of data-poor species would be extremely valuable.

Continued collaboration with MTRP and evaluation of existing data from that program is essential. Vital rate estimation for Hawaiian green turtles has already begun, with a re-evaluation of tagging data to determine variance in growth and age at maturity. More parameters can be gleaned, and fitting models to data should be possible with the long time series that are available from MTRP. The fibropapilloma project was a great collaboration; further evaluation of sublethal impacts (growth, reproduction) would also be valuable, and can contribute to population assessment modeling.

This Program will need to carefully evaluate the research necessary to fill in their large tables of turtle presence/absence and status throughout the Pacific. It is unlikely that funds will be available for travel, so finding ways to work with local scientists, fishermen and community leaders will be necessary.

The MTAP presentations were stimulating and showed a great amount of creativity, but also raised a number of questions about scientific rigor. The brevity of the presentations may have precluded a thorough discussion of alternative hypothesis evaluation and development of null models (although the latter was mentioned with regards to the climate change analysis). For example, historical reconstructions of population abundance are fraught with potential errors if assumptions are not carefully considered and vetted with experts. Support of an attractive hypothesis with one data set, but not others, may lead to accusations of "cherry picking". Meta-analysis or compilation of data from multiple sources requires a thorough understanding of the caveats of those data. The best way to avoid these criticisms is to work extensively with Center experts and data holders throughout a project, from hypothesis formulation through analysis and manuscript preparation.

## **Marine Turtle Research and Monitoring in other Divisions**

### **Turtle Bycatch Engineering (Fisheries Research and Monitoring Division)**

This has been an extremely successful effort. Turtle catches by the Hawaiian longline fishery are now negligible, and the gear modifications are being transferred to other nations. Future emphasis could focus on delayed health impacts (although this is very difficult to determine) and continued export to nations with high turtle bycatch, particularly those in the Pacific that impact turtles that are constraining U.S. fishing operations (Japanese loggerheads and Pacific leatherbacks). The value of this program could be increased if data on bycatch and mortality rates from participating nations could be collected and

contribute to a more accurate assessment of turtle bycatch Pacific-wide. Prioritization of projects will need to carefully consider the relevance of the work to Center goals and mandates.

### **Turtle Habitat Identification and Utilization (Ecosystem and Oceanography Division)**

This program has provided some of the best analyses of pelagic turtle behavior and habitat classifications currently available. The TurtleWatch outreach product is a good communication tool and may reduce turtle interactions, even when used on a voluntary basis. Moving from tagging animals to refining habitat models as well as using turtle movements and behavior to evaluate their relationships to oceanographic productivity changes and habitat patchiness should be a priority for this group.

### **Turtle Ecosystem Monitoring (Coral Reef Ecosystem Division)**

This group has the weakest tie to the marine turtle programs, but that could be strengthened. As green turtles become increasingly abundant in nearshore waters, their impact on algae and associated organisms will become more apparent. Monitoring “turtle effects” and continued counting of turtles on transect tows should be encouraged, although abundance estimates from the latter are strongly affected by turtle behavior.

### **Prioritization of Future Program Funding**

With current budget cuts and anticipation of a much leaner budget for turtle research in the future, all Division leaders will need to evaluate the costs and benefits of various projects and prioritize them. One way to do this objectively would be to devise a qualitative assessment protocol to determine the “value” of projects to several objectives, including:

- Management especially status determination
- Turtle conservation and recovery
- Science quality
- Outreach
- Capacity-building, partnerships
- Division integration, cross-cutting research

However, Division Chairs will also need to consider feasibility – can a rigorous evaluation be made with the funding and turtles available?

### **Stakeholder Comments**

The Panel met with about 10 stakeholders on Day 1. PIFSC staff were excluded from the meeting to facilitate a candid discussion. Participants included representatives from the SWFSC, Office of Protected Resources, PIRO, WestPac, and the University of Hawaii.

Themes that surfaced during the discussion primarily revolved around funding and improving collaborations in a tight budget environment. Collaborations with SWFSC on genetics, tagging, and other projects will continue but the roles and responsibilities of each Center should be clarified and codified to avoid any future funding or research overlap issues. Because PIRO and WestPac also fund sea turtle

research, it is important to improve communication among these groups to assure efficient use of limited funds. Members of these two groups expressed some dissatisfaction with Center communication and interactions with particular Center staff, although in general the Center has a reputation for collaboration and research excellence. Some suggestions were made about collaborating to obtain external funding from Foundations or other entities.

Access to data, turtles, and permits were issues raised by multiple stakeholders. Currently, there is only one true research permit holder for sea turtle handling in the Hawaiian Islands, and this was viewed as an impediment to research, collaborations, and new initiatives. Data availability has been raised in previous reviews and should be a high priority. Data use and sharing among stakeholder groups was also a source of concern and is in need of some discussion.

Finally, there is considerable concern about the future of Center turtle research with the cuts in budgets, particularly by collaborators who have benefitted from earmark funding in recent years. Stakeholders need to know how Center research priorities will be set and have concerns about funding, research domains, and future collaborations.

## **Review Panel Recommendations**

1. Prioritize research that follows the recommendations laid out by the NRC report.

Assessment and status determination for sea turtles occurring in Hawaiian waters is mandated by the agency. As such, efforts to obtain the data needed for assessment and development of rigorous models to evaluate recovery and population impacts should be a priority. Monitoring vital rates (growth, survival, reproduction) for change over time is the most efficient way to detect environmental or anthropogenic factors affecting local populations. For Hawaiian green turtles, the MTRP has accumulated a goldmine of data that can be used to evaluate status and trend for that species. If recent personnel changes and budgets allow, hiring a data analyst with experience in population dynamics who would facilitate comprehensive use of those data. For Japanese loggerheads and Pacific leatherbacks, vital rate information must be acquired with assistance from other researchers and nations; PIFSC can contribute significantly to evaluation of fishery impacts on these species, even in the absence of detailed demographic information.

2. Increase outreach to stakeholders.

PIFSC sea turtle programs have done a good job of collaborating with stakeholders and keeping them informed of research results, but communication can be improved. PIFSC representatives on fisheries and other policy-related committees should be aware of all research programs at the Center and provide consistent information about the status of those projects and their purpose. This will reduce redundancy and potential conflicts with projects funded by other groups. An annual Sea Turtle Summit with PIRO, WestPac, U. Hawaii collaborators, and others should be organized to: a) Present project results; b) set goals and research priorities, c) determine a schedule for calls for proposals, and d) discuss data access and sharing

3. Improve integration of turtle programs within PS Division.

Division Chiefs and all scientists working on sea turtles should be familiar with all aspects of PIFSC turtle programs to improve opportunities for knowledge and data sharing, collaboration, and critical review of projects and products. A logical first step would be to combine MTRP and MTAP; this should be a functional integration of the programs and their objectives. Assessment scientists need to get into the field and work with field biologists to understand how the data are collected and potential sources of bias; biological scientists need to understand how models work and how they incorporate empirical data. Increased interaction with the monk seal assessment team may be fruitful as well (another data poor species problem!).

Other programs at the Center have useful data collection and expertise to share: the Coral Reef Ecosystems Division could better integrate sea turtle impacts on habitat through algae monitoring, and efforts are underway to include turtle counts on transects. The Fisheries Research and Monitoring Division includes quantitative scientists that can offer suggestions for data analysis and model building, and should start an exploratory evaluation of observer data on turtle sightings and catches. Finally, the Ecosystems and Oceanography Division should continue their integration efforts and rely on sea turtle experts in other Divisions to help prioritize future projects.

4. Evaluate the costs and benefits of continuing research on gear engineering, biology, distribution prediction, and satellite tagging projects. While monitoring projects are ongoing, specific research projects should have well defined goals and endpoints.

Dwindling budgets will force some tough choices of what research to continue, and what research to wind down. What are the key unanswered questions? How does research relate to U.S. management needs, Pacific turtle recovery/conservation?

5. Determine how to maintain contact and collaborations with university, other outside entities after the move to Ford Island.

Although consolidation of Center sea turtle programs will benefit from the move, isolation is a major concern for collaborative research and training. The most productive Fisheries Science Centers are adjacent to universities or research institutes, specifically to enhance scholarship and research integration. Determine how outsiders can gain access to the new facility, consider more training opportunities for students, and enhance distance communication technologies. If possible, maintain a presence at University of Hawaii.

6. Continue to support peer reviewed publication of existing data and past projects.

Budget reductions are likely to reduce funding for field work and travel. An efficient use of staff time during this period would be to focus on analysis of existing data and getting more results into the peer-reviewed literature to provide better science advice for management.

The internal review process at the Center should be reviewed, following concerns about data use and interpretation that were raised by stakeholders. When data from outside sources are used, professional courtesy requires discussing the data and how it will be used with the original data holders. A more thorough review of turtle-related products by turtle experts in different Divisions or Science Centers would also be helpful.

7. Host or participate in methodology workshops with other Centers, with universities, or at scientific meetings.

Topics could include field data analysis and interpretation, assessment techniques, metadata development and dissemination, and incorporation of socioeconomic information in management strategy evaluation.

8. Evaluate constraints on data collection and collaboration, e.g., permits.

PI's and collaborators who need to handle turtles should be included on permits to optimize data collection opportunities. Ensure a fair and transparent permit evaluation process with reasonable access for legitimate scientific investigations.

## Opportunities

The bycatch engineering program has resulted in productive collaborations internationally. While the Pacific Island region is large, the Center's jurisdiction is limited to the state of Hawaii and the wide ranging US territories. Pacific sea turtle populations are generally distributed outside of the PIFSC jurisdiction. Continuing cooperation with regional fishery management organizations or region wide science organizations, e.g. the North Pacific Marine Science Organization (PICES), may provide an opportunity to obtain sea turtle data and conduct collaborative research on sea turtle populations managed by the US.

## Concluding Comments

The panel applauds the overall productivity of the sea turtle research programs of the PIFSC. All the presentations were well done and informative and reflect a committed staff resulting in a productive research program. It is clear that there is considerable and diverse expertise throughout the Center that will result in a program that continues to be highly productive. Given new additions to staff it is expected that provocative research questions will continue to be raised with results provided through innovative sampling and analytical approaches. Rigorous peer review of products must be included as new approaches for data analysis are developed to insure defensibility of results.

Sea turtle research over the past 4 decades at the PIFSC has been supported by a long period of limited resource availability and more recently by increased funding. The establishment and continuation of long term data collection programs which were initiated when resources were limited is, in itself, remarkable.

Some projects within the program are more mature than others and the continuation of mature projects needs to be evaluated in light of likely reductions in funding. At what point should programs end? This decision can be facilitated by developing measures that describe an end point to the project. An example would be for the long line gear engineering project which seems to have come to a conclusive, productive, and positive end point. The next steps for this program is in technology transfer and outreach in implementing the solutions.

The recent NRC review of sea turtle status and trends provides guidance on data needs and approaches to assessing sea turtle stocks. The NMFS recognized this as a high priority for the agency in meeting its Endangered Species Act mandates and invested funds to complete the review through the National Academy of Sciences. Stock assessment research should be considered a high priority and the Center needs to determine what level of funding is needed to accomplish assessments and work with agency leadership to find the necessary resources. Because turtle stocks in the Pacific range well outside of US jurisdiction, collaborations with other countries to collect data and conduct assessments should be extended. Using current relationships established such as via gear engineering studies or international bodies such as IATTC or science organizations such as PICES or through the Western Pacific Fishery Management Council could be helpful in building these relationships even if they remain informal. The goal of achieving stock assessments for sea turtles provides a framework for investments particularly when resources are limited.

The increased capacity in quantitative expertise reflects the Center leadership's understanding of the need to work towards completing stock assessments. However, scientists should be directed away from investing valuable time on projects that may be of lower priority. For example, current work on fibropapilloma is both interesting and important but requires considerable expertise in epidemiology. For NMFS and in the context of stock status and condition, the impact of this disease on vital rates and productivity is the desired information.

Optimally, the sea turtle program is a single unit which encourages collaboration within it and between other PIFSC programs. We understand there is a historical reason why there appear to be two programs within a single division but there needs to be a clear reason to continue with this structure if it is a barrier to full collaboration between turtle researches and/or other PIFSC programs. Minimally there needs to be a liaison between the programs who can reach out to both programs and others within the PIFSC. As a single program, researches that are primarily in the field and those who are analysts can work more closely together with analysts spending time in the field to better interpret the data and their results.

The current location of the PIFSC next to the main campus of the University of Hawaii has resulted in strong relationships and collaboration with scientists and students from the university. The PIFSC move to Ford Island on a NOAA campus may become a barrier to these collaborations or negatively impact the ability of the PIFSC scientists to work with university faculty and students. The location of NOAA laboratories adjacent to university campuses was originally intended to encourage this collaboration. A solution to sustain this relationship needs to be implemented, such as placing NMFS scientists on the university campus perhaps taking advantage of the NOAA cooperative institute.

Accomplishing the research program which provides science advice for management of sea turtles requires a strategic vision and plan that recognizes that funding will wax and wane over time. A plan that recognizes what research can be completed when there is significant funding and when there is limited funding will provide the guidance needed to set priorities and plan for subsequent fiscal years. While there appear to be 4 entities with pots of sea turtle funding (PIFSC, SWFSC, WestPac, PIRO), there needs to be greater coordination between all four to optimize the research agenda. There may be hard choices over the next few years as funding is limited or decreases and this may include structural changes to optimize program function and productivity.

The history of the sea turtle research program in Hawaii demonstrates that even with limited funding, this program can be highly productive and place management on a stronger scientific foundation. The existence of long term data bases can be mined to develop new information or hypotheses for future research as recognized by PIFSC staff. The increased capacity in expertise and enthusiasm and energy of all the scientists involved is laudable and needs to be nurtured and sustained.

Finally, all of the panel members express their appreciation and extend their thanks to the staff of the PIFSC who provided the support needed to make our job as easy as possible.