

**NOAA Fisheries Pacific Islands Fisheries Science Center**  
**External Review Report**  
24-26 June, 2008

**Review Panel:** George Boehlert, Oregon State University (Chair); John Boreman, NMFS Office of Science and Technology; Mike Fogarty, NMFS Northeast Fisheries Science Center; Bonnie Ponwith, NMFS Southeast Fisheries Science Center; Craig Severance, University of Hawaii, Hilo

## **Introduction and Background**

A review of the Pacific Islands Fisheries Science Center (Center) ecosystem research programs was held during the period 24-26 June, 2008, at the Hawaii Prince Hotel, Honolulu, Hawaii. The principal objectives of the review were to examine the ecosystem monitoring and research programs of the Center, their relationship to NOAA Fisheries' vision of ecosystem research, and to solicit advice, recommendations, and direction on these programs. More detailed information on the objectives and associated questions are contained in Appendix 1 to this report. It should be noted that this review focused on the *insular*, or island-related ecosystem research and monitoring programs as contrasted to *pelagic* programs. Although certain components (e.g., oceanographic research) are difficult to separate between the two, the full ecosystem research program of the Center was not reviewed.

The sessions were attended by Center staff, stakeholders, and the five members of the review team. Specific information on the reviewers and the stakeholders is provided in Attachment 2. Background information for reviewers included the 2007 Annual Report from the Center. The review proceeded with introductory presentations by the Center director and deputy director, and then separate groups of presentations on the *physical environment*, *living marine resources*, and *ecosystem processes and plans*. Time was devoted to deliberations by the review team, including a meeting to gain feedback from Center stakeholders present at the meeting. Reviewers met finally with division directors and with the Center director and deputy director. The review agenda is provided as Attachment 3.

### ***NMFS and Ecosystems***

Because this review focused on ecosystem monitoring and research at the Center within the context of the wider agency ecosystem objectives, it is useful to provide some agency background. Within NOAA Fisheries, ecosystems science is undertaken in the field by the regional fisheries science centers. The Marine Ecosystems Division with the NOAA Fisheries Office of Science and Technology serves as the headquarters focal point for science issues related to living marine resources biology, ecology, fisheries oceanography, climate, coastal ecosystems, large marine ecosystems, ecosystem science for living marine resources management, and other related disciplines required to fulfill NOAA Fisheries' ecosystem science and management mandates.

The Ecosystems Goal within NOAA cuts across all NOAA line offices and is responsible for out-year planning and budgeting for all NOAA activities related to marine

ecosystems. The Goal contains nine programs, each with unique capabilities that address marine ecosystem science, management, and enforcement: aquaculture, coastal and marine resources, ecosystems observations, corals, ecosystems research, enforcement, fisheries management, habitats, and protected species. Many of the comments in this report cast back to these perspectives.

### ***Report Organization***

We note that this is a consensus report of the review committee. It has been drafted and reviewed by all committee members, and the report is organized around the principal questions posed with the review objectives (Attachment 1); we have explicitly added a section on human dimensions of the Center's ecosystem research. All review committee members were free to include a minority position if they disagreed with points within the report. The report also contains our interpretation of feedback from our meeting with the Center's stakeholders present at the meeting and a set of recommendations.

### **Review Team Comments**

#### ***Assessment of Current Balance of Research and its Quality/Adequacy of Scientific Approach***

The mix of scientific monitoring, research and modeling conducted by Center divisions is currently tailored to meet specific mandates under the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act, the Marine Mammal Protection Act, the Endangered Species Act, the Coral Reefs Conservation Act, the Migratory Bird Treaty Act, and several executive orders including the Coral Reef Protection Executive Order, Marine Protected Area Executive Order, and the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve Executive Order. As noted in the previous Center External Review (Perry 2007), the research strategies employed by the Center to meet these mandates are appropriate and often highly innovative, employing state of the art technology and analytical methods. While the overall scientific approach employed in these activities is tailored to specific management needs, a broader ecosystem orientation is evident in many.

The transition to an Ecosystems Approach to Management (EAM) has been adopted as a high priority NOAA goal. This transition will require integrated, multidisciplinary research in support of management at an ecosystem level. Examples of cross-division cooperation in ecosystem research were provided during the review, often reflecting shared interests of individual researchers or groups of researchers as existing mandates are addressed. Adoption of EAM will require a formal strategy for ensuring full coordination across division lines to meet EAM objectives, as well as consistency with agency practices. This will entail a re-examination of the overall monitoring, research and modeling activities conducted by the Center Divisions to determine if they can be (or should be) modified to meet broader ecosystem research goals.

The review panel recognizes that the existing management mandates will remain in place for the foreseeable future and must be met. Information provided during the review indicates, however, that a more integrative approach across divisions can contribute to

addressing issues that have emerged under the current mandates, including evidence of changes in fundamental productivity patterns and interactions among system components now addressed by different divisions. Accordingly, it will pay immediate dividends to begin the process of assessing how synergy among divisions can be realized.

While EAM is not specifically mandated in existing regulations and executive orders, it is clear that ocean resource management will continue to evolve in this direction. The development of Fishery Ecosystem Plans (FEPs) by the Western Pacific Regional Fishery Management Council provides a framework for evaluating future management requirements that can be used as a blueprint for the Center in an assessment of its overall research approach. These FEPs are place-based and will require the development of ecosystem assessments tailored to the defined ecological regions, drawing on information from each of the existing divisions and other research institutions. The agency has strongly endorsed the development of Integrated Ecological Assessments (IEAs) in support of EAM (Levin et al. 2008). These IEAs will necessarily be tailored to the management objectives in different regions, the data available for each, and the development of models tailored to regional requirements and conditions. The Center can use the IEA concept as a vehicle for integrating information and scientific results across division lines in support of an emerging approach to EAM in the Pacific region. The Hawaiian Archipelago Marine Ecosystem Research (HAMER, 2008) described in the review also represents a good source document for EAM research planning at the Center.

#### ***PIFSC Center organization for ecosystem studies***

The mission of the Pacific Islands Center (see Appendix 4) is broad. Here, we examine whether the Center is organized appropriately for this effort, and whether it has the necessary resources and infrastructure to conduct this work.

*Organizational Structure:* Research and monitoring programs are executed by staff within the five Center divisions. Alternatives to the current structure are numerous. Several were evaluated by the Center directorate before settling on the current structure; while the structure is logical and conducive to meeting the Center's objectives, it clearly requires cross-division collaboration in order to meet EAM objectives. During the review, several examples of inter-division collaboration were evident, and these should be encouraged. Of particular note were i) the collaborations between EOD and the Protected Species Division (PSD), both in turtle distribution work and in Ecopath modeling and ii) the use of CRED mapping data in the generation of integrated bottomfish habitat assessment, a project apparently assigned by the Center director. Although there are mechanisms to promote cooperation, such as the Center's Special Committee on Research (SCOR) and the oceanography working group, many opportunities are being missed. The panel noted that too many "future directions" slides in the review presentations included collaborations with other divisions. These collaborations need to be initiated and strengthened immediately, and strong leadership from the Center directorate may be required to stimulate the collaborations. The review panel discussed several approaches to develop stronger collaboration among the divisions on ecosystem-level research and monitoring, including, but are not limited to:

- 1) Establish a Chief Scientist position with a focus on cross-division integration;

- 2) Establish an Ecosystem Research lead with a focus on advancing progress through enhanced collaborations;
- 3) Establish a team comprised of members of each division to aggressively seek opportunities to leverage collaborations;
- 4) Re-invigorate the Special Committee on Research (SCOR); and
- 5) Explore incentives to promote collaboration among the divisions, such as holding a pool of funds for use on collaborative projects.

The Center should consider consolidating their data management practices as a means of improving efficiency and enabling them to more readily plug into national efforts to standardize data management and to make data more accessible to science partners and clients.

*Infrastructure:* The present dispersion of Center staff in different facilities clearly impacts cross-division collaborations. Staff members working on ecosystem research are physically dispersed. The lack of a conference room in the Dole Street building that is large enough for holding meetings with more than one division further inhibits collaborations. The Center also lacks broadband capacity to enable them to fall back on IT solutions to resolve these communications challenges. The completion of the Ford Island facility will resolve both of these infrastructure deficiencies, but the move-in date is still some time away.

*Resources:* Erosion of base funds due to increased costs, particularly labor and fuel costs, have impacted the scientific productivity of the Center (as is unfortunately true with all NOAA Fisheries Science Centers). Another barrier to advancing EAM is that the demands for operational science (e.g., stock assessments, ACLs, RMFOs, pelagics) within the Fishery Biology and Stock Assessment Division (FBSAD) is spiraling upward, leaving less time for advancing the state of the discipline and working on ecosystem models. The Center should thus work to expand outside collaborations with groups like the University of Hawaii, the NOAA Marine Sanctuary program, and others to leverage their resources to the benefit of EAM objectives.

***Priorities; balancing ecosystem-related research with traditional fisheries research***

While EAM-related research is a priority within NOAA fisheries, there is no systematic means of implementing it, nor has significant funding been allocated to date. As is true as most Centers, ecosystem-based science is not, in and of itself, a defined program within the Center. Instead, it is interwoven within the research activities of several Center divisions, and it is most evident in activities related to corals, monk seals, and sea turtles. Cross-pollination of ecosystem-level surveys, analyses, and modeling among divisions needs work. Most evident is the lack of collaboration between the social sciences and the physical and biological sciences. Programs described at this review, such as HAMER and the planned collaborations on CAMEO, show that the Center is moving forward in some areas, but we sensed a general reluctance within Center divisions to re-program existing funds to address ecosystem priorities. If the Center is truly committed to an ecosystem-based approach to its overall science enterprise, then more deliberate collaborations within and among the divisions are needed, potentially using the

mechanisms noted above. In addition, collaborations with the Regional Office and Council will be necessary to ensure that evolution to an ecosystem-based approach in science programs are synchronized with changes in the management process. This is an area that should receive priority attention.

The Panel noted that a large portion of funding in the Coral Reef Ecosystem Division (CRED) is provided from outside NOAA Fisheries, principally in this case from NOS. The danger here is twofold: (1) funds from outside the agency are usually not as stable as internal funds, and a shift in emphasis or direction by the funding agency could spell disaster for the Center; and (2) the Center runs the risk of having the objectives of its research program dictated by the needs of the funding agency. To the extent possible, outside funding should only be accepted if the cooperative research projects are totally aligned with the mission of NOAA Fisheries and the Center, and should not be used to support labor costs. If labor costs are unavoidable, they should only support term appointments and contractors, so there is no implicit understanding of permanent employment if the funding stream is terminated. To date, the Center has taken the latter approach and has been successful, but must remain diligent to avoid these “soft money” problems. Still, the Center should work to persuade their funding agencies like NOS to establish funding cycles and practices that promote more stability in the funded programs.

#### ***Collaboration in the Center’s Ecosystem Research***

As noted above, the Center is organized along more traditional fisheries research lines, and thus EAM research and monitoring requires collaboration. Center scientists work with a broad range of outside collaborators located at academic institutions, other agencies, and internationally. The level of collaboration is appropriate to the ecosystem-related science mission. We note several that demonstrate how the Center extends its resources.

- *Oceanographic modeling*: The EOD conducts several programs that employ oceanographic models in fisheries oceanography, collaborating with the University of Maine, NASA, and CSIRO in Australia. The strategy taken is wise, using models developed by others and evaluated for the purposes required – and evolving to new models as situations dictate.
- *Coral reef research*: CRED collaborates through contracting with many different scientific entities to achieve its objectives and extend the scientific expertise available to the program.
- *Collaborative research programs*: The Center is engaged in many collaborative research programs. Of particular note is the involvement in two CAMEO proposals, CRED involvement in the Census of Marine Life, and EOD’s historical involvement in GLOBEC. In addition to extending the scientific impact of Center programs, these collaborations engage strong scientific expertise and raise the profile of NOAA scientists. The Center’s strong history of leadership in Northwestern Hawaiian Islands research has continued with the convening of the HAMER program and the publication of the HAMER plan. The panel notes, however, that there is a compelling need to continue leadership in forging the next steps for HAMER to

proceed. The appropriate next step is in convening meetings of the advisory group to oversee HAMER's development.

Of particular note in outside collaborations is the beneficial relationship with the University of Hawaii. The Joint Institute for Marine and Atmospheric Research (JIMAR) serves as a key facilitator of the relationships, and the collaboration cuts across nearly all Center divisions. It was explicitly noted in the stakeholder discussions that the Center sought out the genetics expertise at the Hawaii Institute of Marine Biology to address research priorities rather than establishing its own genetics program, and the Center directorate should be congratulated for taking this approach. Several Center scientists have adjunct appointments at the University of Hawaii, which facilitates cooperation. As noted below in stakeholder feedback, the UH has aspirations to develop a program in fisheries. The Center should play a major role in assisting the development of this program as it moves forward. Given the current emphasis on training of future NMFS workforce and the agency's strong relationship with minority serving institutions, the Center should also work to attract native Pacific islanders and other under-represented groups to such a fisheries program at the university. We note that the University of Hawaii's Kewalo Marine Laboratory has an established, NSF-supported program (Undergraduate Research Mentoring) that attracts students from throughout the US Pacific Islands, and this may be an opportunity for collaboration..

Finally, one cautionary note about the relationship with the UH -- the panel was concerned that the Center's move to Ford Island will reduce the ability to have frequent face-to-face interactions with University colleagues. Plans should be made to overcome the obstacle of distance, perhaps through video conferencing, internet-based broadcasting of seminars in both directions, opportunities for graduate students at the future facilities, and other approaches.

### ***Opportunities and areas deserving greater emphasis***

Throughout the review, the panel was generally impressed by the breadth of the Center's programs. Specific areas, however, might be emphasized or modified to increase the reach of the Center's programs. Here, we identify several areas we believe the Center should emphasize.

A consistent comment raised during the review was that the management-related scientific products from the Center are highly regarded, with the principal example being the turtle watch information for the longline fishing industry. Translation of the Center's ecosystem science into concrete management products is an important step, but it is only beginning to occur. We expect that the current development of an online tool for modeling larval dispersion in the NWHI will be similarly well regarded.

The Center has been a key player in the NMFS Fisheries and the Environment (FATE) program, which worked to develop leading ecological indicators. The Council on Environmental Quality, Office of Science and Technology Policy, and the Office of Management and Budget have jointly issued a call and policy to develop ecosystem indicators. Although the initial guidance to develop these "National Environmental

Status and Trends” (NEST) indicators is for fresh water, the Center should anticipate the expansion of this program and use its substantial data and monitoring assets to participate. This represents an excellent opportunity for the Center to highlight many of the programs it has and to further develop specific indices that meet this need, bringing national attention to the Center and the central Pacific.

The panel also recognizes the opportunities presented for the Center’s EAM research by taking advantage of the monitoring and mapping data collected by CRED. The monitoring to date has created a treasure trove of information. It is time to decide what subset of monitoring should be continued over the long term and to concentrate on getting out products. The approach presented for bottomfish integrated habitat assessment is an excellent example, and integration of catch and effort data from the Fisheries Monitoring and Socioeconomics Division (FMSD) could help FSBAD move towards tier 3 stock assessments, which are akin to integrated ecosystem assessments. The approach could also be expanded and used for turtle and monk seal habitat assessments. Combining efforts among divisions to capitalize on the scientific and creative abilities of the different divisions can lead to cost-effective scientific and management products that have major impacts from an EAM perspective. The state of assessment science in the Center will benefit greatly from the development of fishery-independent monitoring programs to complement existing fishery-dependent programs. The broad geographical area of responsibility for the Center presents special challenges in implementing cost-effective fishery-independent monitoring. However, in the course of the review, the panel heard proposals for several monitoring options to meet this need. These options should be carefully considered and an evaluation of cost-effectiveness undertaken. Any fishery-independent monitoring program implemented should be developed from an ecosystem perspective and not focus solely on economically important species.

As noted above and reiterated in the stakeholder feedback, UH is interested in developing a fisheries program. This would, in the long term, benefit the Center through education of future employees who have a strong commitment to Hawaii and professional professional training of staff already on board. Because the Center has the best fisheries expertise in the state, development of such a program should be an effort that the Center should nurture and help to expand.

Finally, while it was not a focus of the review, it was inferred that demands from development of RFMOs further detracts from the ability to keep pace with insular research and monitoring. The prominence of international fisheries management in the MSRA, combined with the heavy responsibilities in this arena by the Center, represents additional “unfunded mandates” and an opportunity for the Center to stress the need for new resources. Existing resources could then be used to regain effort on insular ecosystems.

### ***Economics and Human Dimensions***

The Center’s Economics Program and Human Dimensions Program contribute needed research products for understanding the economic and social value of fisheries and the

impacts of regulation on fishery sectors and fishing communities. They have the potential to contribute more to forwarding the NOAA agenda for an ecosystem approach to management. Both programs are currently too small to be combined into a separate division. Housing the economic and non-economic social scientists within FMSD may be the most logical and appropriate choice at present.

Both programs have responded to queries and demands from management by developing baseline socio-cultural and economic assessments and profiles and completing useful products such as the fishing communities definitional exercises and cost-earnings studies. They have also been involved in some educational outreach and training. Both programs have also obtained outside funding and effectively utilized University of Hawaii students. They have collaborated on a problem-by-problem basis with other divisions and with outside entities.

Given the brief time the review panel has had on-site, it is unclear as to whether the internal collaborations and involvement in particular research projects are fully focused on integration and planning for EAM. It is also unclear whether scientists in some of the other divisions fully recognize the need for and value of social science research. For example, were members of these economics and human dimensions programs adequately involved in evaluating interactions of expanding monk seal populations in the main Hawaiian Islands with humans, or in designing the HAMER research plan? It appears that of the four participants in the focus group for the HAMER theme on human interactions only one was a social scientist. Clearly, humans are an integral part of the ecosystem. It must be recognized that the full integration of the social sciences in EAM will be essential to its success. The Human Dimensions and Economics programs could and should capitalize on the opportunity to engage more directly in integrative planning for collaborative research with scientists in the other divisions, the university and outside agencies.

Should a greater recognition of the importance of economic and socio-cultural data and monitoring for baseline ecosystem assessments and projections of future trends develop within NOAA and at the Center, the potential contribution of these programs could be enhanced with additional staffing and funding. Given that significant additional funding is unlikely to occur within the immediate future, additional effort is needed to more fully integrate the research planning, design and capability of these two programs into the overall research efforts of the Center. This effort needs to be assertive and needs to come collectively from the leadership of the Center, the leadership of the five research divisions, and the leadership of the two programs. Such effort should strive for a more synergistic and comprehensive recognition of the necessity of integrating the human element into ecosystem monitoring and assessment and modeling. Such an effort does not take substantive new resources, but does take greater internal communication, and greater cross-discipline understanding, appreciation and respect. The effort needs to overcome prevailing stereotypes of different kinds of science and of the nature of doing ecosystem science. It needs to recognize that qualitative and descriptive baseline socio-cultural and economic profiling is somewhat analogous to the older descriptive natural history approach to species interactions and even trophic relations. It is part of the

needed first step in building comprehensive and effective quantitative research designs and eventually larger scale models of integrated social and natural ecosystems.

Should the Center be able to hire a Chief Scientist or one of the other approaches for enhancing ecosystem science as recommended elsewhere in this review, that person should have a broad understanding of both the natural and social sciences and the need for focused synergistic research designs for developing integrated ecosystem assessments and for modeling and forecasting ecosystem changes. The person's visionary role would be partly to create linkages between different individuals both within and outside the center. The panel recognizes that collaborations cannot be easily forced, but they can be facilitated and encouraged by a broader sharing of information. These linkages could facilitate cross-disciplinary integrative approaches to immediate management problems and to longer-term ecosystem modeling and assessment at a variety of scales

### **Stakeholder Feedback**

*Center Strengths:* Quite positive comments were made about the management utility and public outreach value of various products from EOD. Turtle Watch was noted as an especially good product from the perspectives of bycatch mitigation and exposure to litigation. It developed from one staff member's initiative. One stakeholder noted that all the oceanography products are real gems. The Center has been very productive about ground truthing logbook, observer and market data. The Center has also been responsive in providing needed data in pelagic fisheries, and this is critical because of the data requirements of being party to the WCPFC and the anticipated future monitoring of RFMO quotas. In spite of jurisdictional issues there has been good cooperative work with the state of Hawaii on deep corals and on bottomfish. CRED priorities are conservation, monitoring and research. The Division does a good job but could get the products (i.e., American Samoa) out in a more timely fashion and integrate better with fisheries catch and effort data from FMSD.

By and large there has been a very productive collaboration between Center scientists and research programs at the University. The Center and HIMB have worked cooperatively to avoid duplication of efforts and the genetics work done through HIMB has contributed significantly to understanding issues of connectivity. The monthly brown bags and semi-annual meetings facilitate an integrated cooperative approach. Future planning will enhance this collaboration in further developing ecosystem based science.

The willingness of Center staff to teach and serve on committees in the proposed fisheries graduate program at the University of Hawaii was noted very positively. There was general discussion of the need to get the recent national survey of such fisheries science programs out of DOE and OMB, so it could be used to justify the real need for training new fishery scientists to the appropriate deans at the University of Hawaii.

*Areas of Possible Refocusing and Improvement:* There has been a lack of dedicated staff in the non-pelagics area, though the Center has recently geared up to do what it can to provide the science needed for management. Hawaii bottomfish stocks have been a

critical area of Council and State concern. There are still issues with defining species complexes, age structure, and the lack of fishery independent data. For all targeted species there has been little recreational data until recently, and catches may be significant. For many species it is probably a matter of depletion rather than overfishing. Adequate funding for data management was viewed as a critical need for all areas, and especially for coral reef monitoring and assessment.

It was noted that CRED's funding stream is different than the rest of the Center's program and is very much a proposal driven process to NOS. Funding has been on a project by project basis, and this has been a constraint to developing a more integrated and ecosystem-based approach. It was noted that the national coral reef conservation program was just externally reviewed, and that there was a push for the program to be more management driven than science driven; this jeopardizes the future of CRED. It was also noted that longer term planning, including staff from other divisions, would allow the research to be more focused, selective, and integrative.

The coral reef program has made some biomass estimates but has not incorporated the existing time series of effort data for Hawaii or American Samoa. The CRED has used human population as a proxy for fishing effort and for impacts to corals and reef ecosystems. It was suggested that the CRED could reverse this approach and begin to forecast impacts on human communities from changes in the condition of coral reefs. Monitoring has been seen as the goal and people have not been seen as full components of the ecosystem. An additional constraint to developing a comprehensive ecosystem science based research program for the Northwest Hawaiian Islands is that the permit review process continues to be problematic.

Staff turnover has been problematic in the area of cetacean research and more cetacean expertise is needed, especially if the humpback whale NOAA Marine Sanctuary begins to incorporate additional living marine resources within their purview. It was suggested that center research on traditional ecological knowledge could also be useful.

When stakeholders were asked if the Council Fishery Ecosystem Plans could be used to set ecosystem research priorities for the Center, the answer was a qualified "yes" though it was noted that jurisdictional issues continue to be a constraint.

### **Concluding Comments**

As the newest Center in NOAA Fisheries, the PIFSC has developed rapidly and grown in both mission and size. The Center has a strong history of creative ecosystem-relevant research with multiple collaborators, beginning with the Northwestern Hawaiian Islands project in the 1970s-80s, and continuing to this day. The panel was impressed with the breadth of research relevant to ecosystem approaches to management, but noted several areas where improved collaboration can take advantage of opportunities to significantly strengthen the programs. We thank the Center and its staff for a stimulating three days of reviewing the programs.

## Summary of Recommendations

### *Organization and Collaboration*

- Meeting ecosystem objectives will require new collaborative approaches.
  - Cross-division collaboration should be improved. Leadership and incentives are required to promote improved communication and collaboration among Center divisions; organizational changes are not necessarily required, but we recommend several mechanisms to explore, ranging from new positions to financial incentives (see *Organizational Structure* section).
  - The Center should expand collaborations with the University, the NOAA Marine Sanctuary program, and others to leverage resources to the benefit of EAM objectives.
  - Collaborations with the Regional Office and Council will help assure that EAM research is linked to the management process.
- The CRED should transition from monitoring and mapping to use of the data for scientific and management purposes in collaboration with other divisions in the Center. The CRED objective of contributing to integrated ecosystem assessments is to be strongly encouraged.
- There is an immediate need to develop improved communication mechanisms (high bandwidth internet, video conferencing) among the dispersed Center facilities to improve cross-division interactions.
- HAMER needs an advisory panel and a convenor to assure that the partners meet to keep the program moving forward. If no one steps forward, then Center Directorate should fill this role simply to keep the partnerships alive.
- The Center should work closely with the University of Hawaii to help develop a fisheries program and examine developing training opportunities for native Pacific islanders and other underrepresented groups.
- The Center should make a concerted effort to engage the human dimensions and economics researchers in comprehensive planning efforts with other divisions and vice versa. The Center should thus work to expand outside collaborations with groups like the University of Hawaii, the NOAA Marine Sanctuary program, and others to leverage their resources to the benefit of EAM objectives.

### *Funding*

- The Center should be judicious in pursuing soft money (e.g., non-NMFS funds), assure that they are consistent with the Center's mission and vision, and avoid relying on them for personnel support.
- The Center should work to persuade funding agencies like NOS to establish funding cycles and practices that promote more stability in the funded programs.

### *Management Relationships and Products*

- The Center should actively participate in the development of Fishery Ecosystem Plans within the Councils schedules and evaluate how Center research priorities can be established to meet the needs of EAM in the region.

- The Center should explore consolidating their data management practices as a means of improving efficiency and enabling them to more readily plug into national efforts to standardize data management and to make data more accessible to science clients.
- The Center should work with constituents and stakeholders to examine additional products or ecosystem-level indices that follow on successful products already developed.

## **References**

HAMER, 2008. Hawaiian Archipelago Marine Ecosystem Research (HAMER). NOAA Technical Memorandum NMFS-PIFSC-14. 39 pp + appendices.

Levin, P.S., M. J. Fogarty, G. C. Matlock. 2008. Integrated Ecosystem Assessments (White Paper).

<http://www.nwfsc.noaa.gov/publications/displayallinfo.cfm?docmetadataid>

Perry, R.I. 2007. Pacific Islands Fisheries Science Center External Review. 6-8 March, Honolulu. Hawaii.

## **Appendices**

1. Review Objectives
2. Review Team and Stakeholders
3. Review Agenda
4. PIFSC Vision