

Chair's Summary of 2017 Economics & Human Dimensions Science Program Review

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Submitted by

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Background

NOAA National Marine Fisheries Service, Northwest Fisheries Science Center convened the panel to undertake a 5-year review of the Economics and Human Dimension Science Program at the Center. The review was based on the Terms of Reference that specifically asked the panel to consider the Program's goals and objectives, integration and linkages, data collection, models and research tools, stakeholder connections, best available science, and communication. In developing our response, the panel considered the presentations and background documents provided by the Center Staff. The Chair's Summary report reflects the observations, findings, and recommendations of the individual panelists. The summary report is organized as follows. First, we present the general observations of the panel followed by overarching summary recommendations. Next we present a summary of the responses to the terms of reference questions and we compile and group the specific recommendations under each of the seven questions.

General Observations

The Economics and Human Dimension Science Program at NWFSC is divided into two sub-programs—an Economic and Social Science Research Program (ESSR) in the Fishery Resource Analysis and Monitoring Division (FRAM)), and a Human Dimensions (HD) Program in the Conservation Biology Division (CB). Currently, there are five FTE economists in ESSR and two FTE economists and two non-economist social scientists on the Human Dimensions team. Both groups utilize a number of contractors to carry out specific research and data collection processes. The number of FTEs represents a significant increase from 1998 when there was one economist at the Center, but at the same time, the demand for economic and human dimension research outstrips the supply.

The panel members were uniformly impressed by the quality and breadth of the use-inspired research agenda of the programs, their engagement with stakeholders, their successfully data collection efforts, and the collegiality across the two programs. As panel member #1 said, “It is impressive what this program has been able to achieve with relatively minimal staffing, a small budget, and federal budgeting realities that lead to funding uncertainty.” A sample of the highlighted research activities include the 5-year catch share review (e.g., FISHEyE), recreational demand modeling and shellfish advisories, linking of the IO-PAC model with management strategy evaluation, cost-effective analysis of salmon habitat restoration, cost-effectiveness of the vessel buy-back program in groundfish, and oral histories of the fishermen, processors, and fishing communities.

The two distinct programs each have clear goals and objectives related to their individual areas of focus. The overarching goal of ESSR is to “examine the impact of West Coast fishing and management on fishers, communities, and regional economies.” The overarching goals of HD are to promote “a better understanding of the human values, actions, communities, and institutions that influence (and are influenced by) marine and anadromous fish, marine mammals, and other marine species and ecosystems in the Pacific Northwest”, and to “conduct economic and sociocultural research supporting ecosystem-based fishery management and conservation and recovery of protected resources.”

The goals/objectives of the two programs are synergistic and frequently interconnected, examples of this interconnectedness include joint work related to the groundfish catch shares program and management strategy evaluations of California Current fisheries. However, there is less evidence that the goals and objectives have been developed jointly and strategically to best capitalize on the capacity of both programs as a whole. The two programs could benefit from a formal, collaborative strategic visioning exercise that would enable both sets goals and objectives to be jointly developed and optimized.

The research in the two programs are clearly reaching their primary audiences and addressing the needs of regional stakeholders. Stakeholder representatives from the North Pacific Management Council, the Northwest Regional Office, the SSC, WA Sea Grant, the Groundfish Management Team, and the WA Department of Fish and Wildlife provided ample testimony that the Economic/Sociocultural Program at the NWFSC has been a tremendous asset in meeting the

needs of stakeholders. These programs have gained wide-recognition among the stakeholders due to heroic ad hoc efforts by the scientists (e.g., participation on Groundfish management team and Council committees) rather than from a coordinated communication plan and effort over the years.

The division of the economists and non-economist into two programs and the current staffing presents a number of opportunities and challenges for the programs moving forward. Panel members highlighted how conditions are right for the Center to consider the organizational structure of the two programs and how to enhance the ongoing integration across them. The two programs have different cultures and different objectives driven by the programs themselves and their location in the two divisions. The ESSR scientists tend to address the current needs of the Council and manage data collection, such as the Economic Data Collection (EDC) program. The benefit of the research in the ESSR is the tight connection with the needs of the stakeholders, including the Regional Office and Council. The demands and timelines of this engagement, however, could easily consume all of the ESSR scientists time leaving them with little ability to develop and maintain more forward-thinking, cutting-edge scientific research. The panel members found that the HD team, who are freed from some of these obligations, had more time and freedom to pursue a more forward-looking research agenda. In the short term, this division of labor might be appropriate but given that each of the scientists career trajectories require them to publish peer-reviewed research over the long-term, this difference could lead to implicit barriers for advancement and two classes of scientists.

The ESSR and to a lesser degree HD programs are doing an exceptional job at data collection, processing, and management, as demonstrated by their very high response rates to voluntary surveys. The management and sharing of the EDC data is noteworthy. As panel member #4 stated, “Fisheye” an online tool that allows the public to query aggregated data on revenues, costs, and landings is perhaps, best public tool of any region or center.” The EDC collection efforts require a substantial amount of time, especially with the 5-year review. Given the uncertainties around budgets each year, panel members were concerned whether such an effort can be maintained over time and how the program will find ways to release the information on a more timely basis (presently the data are released 2 years after they are collected due to data management, processing, and cleaning activities). On a more general note, panel members are uncertain on the incentives to maintain, document, and release publically all of the non-confidential data that are being generated across the two programs.

The panel members were unanimous in the conclusion that the two programs engage in and utilize the best available science. However, there was also concern regarding how implicit (demands on time that prohibit investment in continuing education of the scientists) and explicit (limits on conference participation and travel) barriers might in the long-run erode the ability of the scientists to push the frontier of use-inspired research on the economics and human dimensions of ocean and coastal resources.

Summary Recommendations

- **Develop a Five Year Economics and Human Dimensions Strategic Data Collection and Science Plan.** Development of a strategic plan would help clarify, build, and strengthen integration with the RO, Headquarters, the Council, NGO's, the Ecosystem Assessment team, and, most importantly, between the two programs at the NWFSC. This planning effort would benefit from collaborative input from all stakeholders and would ultimately help the Program position itself to more effectively meet the needs of those stakeholders and emerging issues, such as ecosystem based fishery management.
- **Assess the balance between efforts spent on current management-oriented needs and research on emerging issues for the scientists in the two programs.** This should entail ensuring effective communication and understanding of assigned responsibilities in work plans and how those duties and responsibilities relate to professional growth and promotion expectations within the Center.
- **Provide internal incentives for the scientists to invest in professional development, to encourage integration across economics and human dimension research, and to encourage more interactions between the two programs.** The lack of a strategic plan, demands on time to address current management needs, and formal barriers to allocate time and effort to professional development are threatening the Center's future ability to produce the best available science that also meets the needs of the regional stakeholders.
- **Provide incentives for researchers to maintain and support data archiving and to make the data available as broadly as possible in a timely manner subject to confidentiality concerns.** The two programs are collecting and managing unique data sets of high quality that should be made available to stakeholders and researchers within and outside of NOAA to ensure that the return on investment in these activities is as great as possible.
- **Increase the funding and staff resources and find mechanisms to reduce the year to year variability in resources allocated to the Economics & Human Dimensions Science Program.** The current level of resources and the year to variability do not reflect the relative importance of this research area to NWFSC and NMFS and do not ensure that the Program can continue to develop the best-available use-inspired science.

Summary organized by Term of Reference

Panel responses and more specific recommendations according to the Term of Reference questions are presented below. In many cases, the responses to the specific questions are drawn heavily from the panel responses, especially when there was essentially complete agreement across the panel members. The recommendations from each panel member are presented and organized by theme.

1) Goals and Objectives

- a) Does the Center/ST have clear goals and objectives for an economic and sociocultural science program?

The NWFSC Strategic Science Plan clearly indicates the importance of supporting social science research to better understand commercial and recreational fishing behavior, the benefits that ocean and coastal environments provide to humans, the relationships between human activities and species recovery, and the effect of management measures on human communities.

The economics and human dimensions research programs across the two divisions at NWFSC does not appear to have a strategic plan of its own. The current program is focused around five research theme areas (commercial fisheries economics, recreational fisheries economics, human dimensions social science, ecosystem economics and social science, and protected resource economics). These five research themes generally guide the direction of the program and seem to nest reasonably well under the research themes identified in the NWFSC Strategic Plan.

- b) Do the Center's/ST's Programs provide information to address the priority needs of the Regional Offices, other NOAA managers, Fishery Management Councils, Fisheries Management Commissions, and other stakeholders that require economic and human dimensions -related information to achieve their mission?

While the goals and objectives of the programs are not articulated in a formal strategic plan, the panel members concluded from the presentations and talking with staff members that the Program has a strong understanding of managers and other stakeholder's needs. The connection is due in part to the activities of the Program staff being appropriately driven by statutory drivers and mandates of NMFS, as well as other stakeholder groups that Program staff interact with (e.g., the Council, recreational angler groups, charter organizations, commercial fishing organizations, Puget Sound Partnership, interested public, etc.). The research being conducted by the Program staff certainly align with the goals and objectives of the Center delineated in the NWFSC Strategic Plan.

The demand, however, for this research is outstripping supply and the budget realities create a situation where in the future the programs might not be able to meet the priority needs.

- c) Do the Center's/ST's Programs have a strategic research agenda that anticipates evolving and long-term economic and sociocultural science needs including research to support adapting to climate change and implementation of ecosystem-based fishery management?

While the Center's ongoing research has been highly relevant to current mandates and management needs, and seems to be responsive to pressing management issues (such as catch shares), the economic and human dimensions program lack a strategic research agenda to address evolving and long term economic and sociocultural science needs such as climate adaptation and implementation of ecosystem-based fishery management.

Developing a strategic research agenda would help to guide future research priorities, but it must be acknowledged that generating a research agenda for the future is challenging in the current context of extreme uncertainty about funding and resource availability. A more stable funding environment would facilitate the Center's ability to develop a forward-looking research agenda. The current funding context requires that Center staff take a more opportunistic approach to supporting their research agenda, seeking out yearly grants from the Office of Science and Technology (with no guarantee of funding availability and sometimes shifting funding priorities), as well as other external grant sources through collaborations with partners, some funds from the IEA and Catch Shares funding, or other internal NOAA grant opportunities.

Within ESSR, much time and attention has been devoted to catch shares implementation and evaluation (and excellent data is available to study this topic). While it is important to continue to gather this data, ESSR should assess whether to continue this research focus moving forward, particularly given that future funding may be less available to study catch shares. Aquaculture was cited as an emerging issue that will need more attention moving forward, but there is minimal data collected and ongoing research on this topic currently.

Many research activities under the Human Dimensions program are directly relevant to emerging issues such as climate change and ecosystem-based management. Specific examples include research regarding fishing community vulnerability, human well-being research relating to the California Current IEA, and NSF-funded collaborative research relating to climate impacts on West Coast fisheries.

Overall, the Center's socioeconomics program has done an excellent job in addressing important ongoing and emerging management needs, especially given this highly resource constrained context, and the fact that they operate under considerable uncertainty regarding funding timing and availability.

Q1 Recommendations

Strategic Planning

- The economics program under FRAM and the Human Dimensions program under CB would benefit from clear articulation of their research goals and objectives, and clear integration of these goals and objectives into NWFSC overall goals and objectives. Opportunities for divisions to collaborate on overlapping objectives should be explored.
- Center leadership should consider how socioeconomic activities and objectives relate to other biophysical research goals and objectives at NWFSC and facilitate opportunities for linkages between research teams to facilitate research integration or interdisciplinary opportunities where useful.
- Development of an Economic/Sociocultural Strategic Plan would clearly help clarify, build, and strengthen connections with the RO, Headquarters, the Council, NGO's, the Ecosystem Assessment team, and, most importantly, between the two Divisions at the NWFSC where the economists and non-economist social-scientists reside (Conservation Biology Division and the Fishery Resource

Analysis and Monitoring Division). This planning effort would benefit from collaborative input from all stakeholders and would ultimately help the Program position itself to more effectively meet the needs of those stakeholders and the shift towards ecosystem based management.

- The social and economics research programs would benefit from a strategic visioning exercise that articulates research priorities to address evolving and long-term economic and sociocultural science needs relating to climate adaptation and ecosystem-based fishery management. The programs should do this in close consultation with Center leadership and the office of Science and Technology to ensure that these research priorities can, to the extent possible, be funded by S&T grants or other resources that may be available, and to try obtain some minimum funding commitment to ensure that emerging research priorities can be reliably and successfully pursued.
- ESSR and HD should conduct a formal, joint visioning and strategic planning process, in coordination with stakeholders, to ensure that the goals and objectives of the entire Economics & Human Dimensions Science Program (a) reflect the combined capacity and expertise of both programs, (b) include an appropriate mix of reactive and proactive science, (c) capitalize fully on linkages and interactions between the two programs, (d) focus on reallocation of capacity currently used for the catch shares evaluation to address critical research needs in the region, and (e) address the broader sustainability of human capital with HD and ESSR.
- Consider developing a formal or informal 3-5 year planning document or “memorandum of understanding” between the Council and the Economic/Sociocultural Program to lay out major management-driven research needs and to identify the scope of the management support that the Center can realistically be expected to provide.

Research and Management Portfolio

- A reassessment of the mix of management-oriented versus research activities for members of the Economic/Sociocultural Program is warranted. This should also entail ensuring effective communication and understanding of assigned responsibilities in work plans and how those duties and responsibilities relate to professional growth and promotion expectations within the Center.
- Procedures should be instituted to ensure that ESSR is not so devoted to reactive service to the Region that it precludes longer-term forward-thinking research and planning by staff.
- Economics and Human Dimensions program staff should continue to serve on management committees (such as the GMT, SSC, or others) to ensure effective dissemination of research results to managers and assist in communication and clarification of research outcomes.
- The center should continue to proactively pursue research partnerships (and associated funding and collaborations), such as the NSF-funded research programs, that provide additional resources for research and longer-term research commitments to address emerging issues such as climate change and ecosystem based management.

2) Integration and Linkages

- a) Are the Center's economic and sociocultural programs appropriately integrated with each other and with other science activities within the Center?

There is strong evidence of integration between the two programs (ESSR and HD) and with other activities at the Center. This is a strength of the program as a whole. ESSR and HD, however, are administratively and culturally distinct. One advantage of having economic staff in two separate Divisions is that it may ultimately spur more interdisciplinary research through regular exposure to other disciplines in both the FRAM and Conservation Biology Divisions.

Although this current structure appears to have many advantages and may be optimal, the program is well positioned (with a new director of NWFSC and two relatively new program directors) to conduct strategic evaluations that will ensure that the program is optimally structured and situated to address current, evolving and long-term economic and sociocultural science needs.

- b) Are research efforts integrated, where relevant, with efforts at the regional offices and headquarters?

Yes, there is excellent evidence of integration with efforts and regional offices and headquarters. Activities of the Economics & Human Dimensions Science Program are well coordinated and directly responsive to West Coast Region's economics, social science, and human dimensions needs.

There is also evidence of close coordination with NOAA's Office of Science and Technology. In fact, the Economic/Sociocultural Program at the Center is reliant on headquarters funding to support data collection and research. This reliance creates a year-to-year cycle of funds that often limits the duration of research activities and hence the ability to conduct longitudinal studies. Given that viability of the research program is so closely tied to the budgetary success of headquarters and the ability of the Economic/Sociocultural Program at the Center to win these resources, more diversity in the Program's budget portfolio should be sought. Currently, there seems to be minimal reliance on grant resources or outside contracts to support research projects

Although it is commendable that the program (and ESSR in particular) is so responsive to the needs of the Region, it is also important to leave sufficient capacity to address broader goals and objectives. It appears that there could be room for enhanced communication and integration between the NWFSC and the Southwest Fisheries Science Center (SWFSC), including coordination to enable smoother transfer of data between the two Centers.

Q2 Recommendations

Internal Integration

- Consideration should be given to enhancing integrated research projects between the ESSR and the HD team as well as integrated projects with other programs and teams within the Center through offering incentives such as the prioritization of integrated

projects. At a minimum, provide ‘soft’ incentives (food, beverages) along with a forum for presenting “speed” talks (e.g., 5 minute overviews of active or potential research) or other informal methods to introduce ideas and foster collaboration.

- While the housing of social and economics research activities within two different programs does, to some degree present a barrier to integration, it also allows for each program to appropriately integrate economics and social sciences into its respective mandate. The two programs should continue to pursue linkages where applicable. Specific examples of clear areas to pursue greater integration include integrating the social and economics survey results on groundfish, evaluating oral histories from VoF to provide more historical context to economic studies, and integrating data from human well-being work on shellfish into economic models to better understand behavioral drivers. However, consolidating the two programs is not recommended, as their separation allows them the independence to clearly address different management mandates and priorities.
- The Center and headquarters should provide incentives (in the form of stated research priorities and/or associated funding) to encourage collaboration between economists and non-economic social scientists, as well as collaboration between socio-economics research groups and biophysical research groups within the Center.

External partnerships

- Embed plans for cross ESSR-HD efforts within strategic planning exercises as noted above, along with plans for broader linkages to outside partners. Specify areas where beneficial linkages and synergies could be enhanced and develop plans to develop those linkages.
- Over time, develop broader partnerships with scientists at outside organizations (including academic institutions) to supplement in-house expertise, and particularly those that can help the Center leverage outside funding sources to further support goals and objectives, and that can help provide targeted mentorship to newer scientists.
- Enhance coordination and communication between SWFSC and NWFSC to meet the goals and objectives of both Centers.
- The Center should communicate with the Regional Office to identify priority economic and human dimension research needs (perhaps in conjunction with strategic visioning recommended previously) to determine what research and data collection needs might be better addressed and to help ensure that the Center’s economic research efforts are not too narrowly focused on groundfish due primarily to data availability
- Consider further development of cooperative agreements with non-federal organizations to collect data and conduct research that is relevant to the Economic/Sociocultural Program. Centers in other regions have successfully developed cooperative agreements between NMFS and regional organizations (mostly Universities) where researchers jointly identify a relevant research topic that is usually funded exclusively by NMFS, but sometimes with both partner and NMFS dollars. There are many cost savings and other efficiencies that cooperative agreements provide such as low administration costs, substantially reduced overhead rates, and projects are funded under grants and not contracts which may reduce the need for Paperwork Reduction Act approval. Sea Grant funding is another avenue that has been utilized to a degree but there are clear opportunities for improvement.

3) Data Collection

- a) Is the status of data collection related to commercial fisheries, recreational fisheries, fishing participants, and communities adequate to fulfill economic and sociocultural science research needs?

The Economics & Human Dimensions Science Program has been remarkably successful at meeting data needs related to commercial fisheries, recreational fisheries, fishing participants, and communities. The data products provided by the Center are rich and of immense value. The program's capacity to meet data needs is all the more impressive given the resources (FTEs and funding) available to the program.

In general, data provision has been stronger in commercial fisheries than in other areas—this is largely due to funding availability and stakeholder demands. Capacity for data collection in other areas has been less reliable. For example, there is no reliable/permanent funding for ongoing collection of recreational fisheries data, for costs of research related to protected resource benefits and costs, or for work in ecosystem service valuation. This hinders strategic planning and progress in these and other important areas.

The social survey of groundfish fishermen is a valuable source of non-economics social science data that has tremendous potential to inform policy decisions. It would be helpful to see this kind of survey continued and extended to additional fisheries.

The community profiles and community vulnerability indices provide a useful source of data on communities that Council staff say they cite repeatedly. The reliance on secondary data sources for community data collection constrains the Center's ability to look more in-depth at fishing-dependent communities or the effects of management policies on different community groups (who may face different degrees of vulnerability within a geographic area). The fact that these vulnerability indices only focus on commercial fisheries is also a significant constraint on their ability to inform assessments of different community groups engaged in fishing, particularly tribal communities and other under-represented minority groups. The Center has shown interest and is moving towards conceptual models to generate a more nuanced understanding of community and human well-being which will be useful to inform policy. This research direction should continue to be pursued in the future.

- b) Has the Center/ST developed strategies to obtain, manage, and make data accessible?

The Center indicated that they are fully complying with the NOAA-wide PARR process to make data accessible to the Public and interested non-federal researchers. Nonetheless, some of the data collected by the staff are confidential which presents unique challenges when making the data accessible to non-federal researchers and the Public. As an example, staff at the Review indicated that QAQC checks to address confidentiality concerns for data shown in the annual catch share report were not sufficient when the same data were incorporated into the FISHEyE tool – where many more potential combinations of data requests could be queried. This problem is not unique to the FISHEyE tool and presents considerable challenges when

making data publicly available at a level of aggregation that does not violate confidentiality. Sharing federally collected data with university and other researchers is often hindered by the aforementioned confidentiality concern.

- c) Are there barriers that impede data collection and access to data held by other entities (e.g. states, commissions, other federal agencies, etc.) that could be used to support the Center/ST's research, and how can these barriers be overcome?

In general, the Economics & Human Dimensions Science Program has been successful at obtaining necessary data from other entities, although in some cases this has required creative solutions and work-arounds. Other entities (including other areas of the Center) have apparently not always been fully forthcoming with data—this is a challenge in the sciences in general.

The major barriers to primary data collection by the Economics/Sociocultural Program are resource constraints and the Paperwork Reduction Act (PRA) approval process. Numerous staff indicated that obtaining PRA approval often impeded the progress of research efforts. One staff member stated that because longer-term funding options are generally not available (i.e., headquarters funds cover one year), projects that require PRA approval could not be completed within the one-year time cycle required under headquarters funding.

Q3 Recommendations

Data availability

- NWFSC (as a whole) should develop clear guidelines for data-sharing between divisions and programs, if such guidelines do not already exist. These guidelines should recognize the benefits of allowing time for researchers to publish with data prior to its sharing and release, while at the same time recognizing the broader benefits of data sharing, particularly within the Center. If such a plan already exists, it should be revised to ensure it is functioning as intended.
- Communications and interactions should be enhanced between science centers (and particularly SWFSC) to explore means to access data necessary for economics and human dimensions research at NWFSC.
- Staff and the Center as a whole should explore fostering more partnerships through cooperatives and with Sea Grant as a means of leveraging resources for data collection and analysis as well as providing a pathway to future capacity building within NMFS.
- Explore ways to make groundfish data available to managers more quickly, perhaps using a sub-set of data and generating estimates based on available data, which is then updated after the complete data set is available.

Investments

- Continue to add to and enhance the FISHEyE tool (e.g., IO-PAC results, etc.) to reduce the demand for data requests and redundant reporting requirements (ensuring confidentiality concerns are addressed).
- The Economics/Sociocultural Program should consider developing a strategically-driven data collection approach that establishes the highest program-wide data needs.

- Pursue opportunities to expand commercial data collection beyond the groundfish fishery, particularly commercial data relating to salmon and aquaculture. Work with the Council to determine priority data needs for the future.
- If additional staff capacity becomes available, expand data collection efforts related to recreational fisheries.
- As the fishermen social surveys on groundfish and California Current fisheries are analyzed, consider what types of information non-economic social data would be useful to collect on an ongoing basis (to analyze change over time), or to expand to different fisheries. Attain multi-year OMB approval for these surveys to facilitate survey implementation in the future.
- Incorporate data from the groundfish social survey into the FISHEyE tool.
- Continue to move forward in community data collection efforts to generate more nuanced indices for community vulnerability and human well-being.

Data Collection Protocols

- As indicated by staff in the Review, efforts should be made to explore “blanket” OMB cleared questions with headquarters to improve the OMB clearance process.

4) **Models and Research Tools**

- a) Are the Centers/ST using appropriate models and research tools to analyze data and provide management advice?

The Economics & Human Dimensions Science Program is using a suite of appropriate models and research tools to analyze data and provide management advice. These include models and tools that are directly integrated into management evaluations, along with models and tools that provide data to help stakeholders understand the broader implications of management. Approaches applied by ESSR and HD include high-quality workhorse models that are necessary but do not necessarily represent publishable advances in the state-of-the-science, as well as innovative models that provide new perspectives on economics and human dimensions. Both of these are important and should be encouraged.

A particularly notable aspect of the Center’s work is the breadth of different model types that are being developed, in multiple areas (e.g., commercial fisheries, recreational fisheries, protected resources, ecosystem services, fishing communities) and across multiple disciplines. These models and tools often capitalize on multiple areas of expertise and data across the Center. An example is the in-progress bioeconomic model that integrates existing estimates of recreational demand with current stock assessments to predict implications of management for behavior, stock abundance and welfare. Integrated, decision-support tools and models such as BLAST (bioeconomic length-structured angler simulation tool, developed by the Northeast Center) are in high demand by stakeholders, and (important resource constraints aside), the Center is well-positioned to provide models such as these.

There are also potential advantages to the integration of other types of models and data in innovative ways—for example using qualitative data on human motivations and behavior to enhance the specification or to ground-truth the results of quantitative behavioral models (e.g., of fishing commercial or recreational fishing behavior). The Center has not yet fully capitalized on potential collaborative efforts such as these, but such integrated approaches could be a promising area for future work.

- b) Are they developing and using methods and models that contribute to the evaluation and exploration of ecosystem based fisheries management and other emerging issues?

HD staff and a couple of contributing members of the ESSR program have contributed extensively to the development of an IEA approach for the West Coast. The vulnerability and social wellbeing indices and diversification research on fishing vessels and ports have already been incorporated into the IEA approach. Two additional ongoing projects that are contributing to EBFM are the work on the economics of salmon and steelhead conservation and habitat restoration as well as the research on the dynamics of adaption to climate-driven variability in California current fisheries and fishing communities. Furthermore, the Social Indicators for Marine Management (SWIMM) work on developing indicators of human well-being is helping to inform a current conceptual gap in informing ecosystem-based management (both regionally and nationally) and is helping to better inform the development of integrated ecosystem assessments.

- c) Are their barriers to adapting to address emerging issues?

Yes, there are barriers to addressing emerging issues, some but not all of these can be at addressed by efforts at the Center. NOAA/NMFS currently lacks a legislative mandate for EBFM. ESSR is also currently at or over capacity with demands related to current data and modeling needs of the Region and other stakeholders (as discussed above). This leaves limited capacity for proactive planning and research on emerging issues.

Q4 Recommendations

Resource and Staffing Needs

- Seek dedicated funding and resources to encourage research in emerging issues and EBFM, and develop partnerships with outside entities (such as academic institutions) to (a) complement the expertise available at the Center, and (b) seek external funding for work in emerging issues. An excellent example is the recently funded NSF CNH project related to the dynamics of adaptation to climate-driven variability in California Current fisheries. Collaborative work such as this should be encouraged.
- Among these collaborative efforts, ensure that sufficient attention (and resources) are devoted to interdisciplinary work related to behavior under uncertainty, as this is central to many of the emerging issues relevant to NMFS.
- Develop strategic and implementation plans to ensure that researchers have sufficient time and resources that may be allocated to emerging issues.

- During the development of an Economic and Sociocultural Program Strategic Plan an assessment should be undertaken to assess the expertise and capacity of the staff necessary to provide ecosystem-based research.
- Dedicated funding and incentives (either from the Center of S&T) to addressing emerging issues such as climate impacts or ecosystem based management would help facilitate research on these topics.

Activities

- Continue to promote integrated MSE as a means to inform management decisions, and contribute to models of this type.
- Consider whether and how the development of integrated modeling and decision-support models will be useful to stakeholders, along with the resources that will be necessary to develop, maintain and update these models. NMFS should be prepared to support (with funding, FTEs, etc.) these activities – and particularly update and maintenance for which external grant funding is typically unavailable.
- Continue to increase emphasis on emerging issues directly relevant to EBFM and EBM, including climate impacts/adaptation, ecosystem service valuation, fishing community vulnerability, recreational fisheries, and related topics. This research should also strive to clarify linkages between science results and actions that can be taken by NMFS entities (alone or in partnership with others).
- Consider whether continued investment in a bioeconomic model for recreational salmon and groundfish is worth pursuing given resource constraints and perhaps lack of appropriateness of the current modeling approach.
- Continue to pursue the development of human well-being indicators and more nuanced indicators for community vulnerability to inform ecosystem based management and address emerging issues due to climate change.

5) Use of Information

- a) Is the Center's/ST's social and economic information being used in living marine resource management advice?

Yes, managers cited the usefulness of Center research and models for conducting EIAs, for understanding the state of the groundfish fishery and catch shares outcomes, for understanding drivers of shellfish harvesting during health warnings, and in informing the Puget Sound recovery program. Swinomish tribal communities have integrated the outcomes of Melissa Poe's work on assessing human well-being and the potential effects of ocean acidification into community planning.

- b) Are the existing mechanisms sufficient for ensuring this information is used appropriately?

In the vast majority of cases, the information produced by the Economics & Human Dimensions Science Program appears to be used (by stakeholders and other users) appropriately, and for intended and appropriate purposes. Center researchers are aware of the appropriate uses of their

models and data, and are also careful (internally) to avoid misuse and to clarify data limitations. Most stakeholders use and interpret the information provided by the Center properly. Participation of staff on fishery management councils is one of the most effective ways of making sure information from the Center is disseminated and understood by managers.

At the same time, it is difficult to ensure that all data and model results—once provided to external users—will be interpreted and used appropriately in all cases. For example, there is the potential for improper attribution of causality within commercial net revenue trends pre- and post-catch shares as displayed in FishEyE. To a certain extent, misuse or misinterpretation of data by external users cannot be prevented, and is beyond the purview of NWFSC scientists. However, steps can be taken to further increase the probability of appropriate use (and to discourage misuse).

- c) Are there barriers to the uptake of science provided by the Center and what steps can be taken to overcome these?

One barrier managers expressed is that they do not have time to read detailed reports. The presence of NWFSC staff on management bodies helps to bring the research outputs and key results directly to managers. The development of infographics has also been useful and could be put to greater use in research reports and communication pieces.

Q5 Recommendations

Assess utilization of information and strategic planning

- ESSR and HD scientists should collaborate to identify key areas where (a) uptake of information is less than desired, and (b) information is frequently misused or misinterpreted. Particular emphasis should be given to areas where this lack of uptake or misuse can have non-trivial implications for decision-making or management, or where it reduces the potential impact of the Center's science products.
- For these key areas, cost-effective strategies should be developed to enhance uptake and reduce misuse by stakeholders. Possible approaches might include (a) workshops, webinars or other active engagement with stakeholders to introduce data and models, encourage uptake, and discourage misinterpretation or misuse, (b) personal engagement with key stakeholders (e.g., Region and Council staff) to encourage appropriate interpretation and uses, and (c) targeted instructions and warnings on data products to encourage appropriate interpretations and use.
- As part of the strategic planning exercise discussed under question #1 above, identify models or data products that would be of high value to users that could potentially be provided by Center scientists, and consider sources for the funding necessary to provide and maintain those services.

Outreach and activities

- Steps should be taken to facilitate a more interactive process with the Council to improve efficiencies and obtain feedback on ongoing research. This may be through formal memorandums of understanding or through informal arrangements such as lunches or general discussion meetings to improve understanding and lines of

communication.

- Center staff should continue to participate as members of management bodies (such as the SSC and GMT) in order to disseminate and interpret Center research outcomes to inform management.
- Continue to develop infographics and other tools for visualizing key data outcomes without having to read lengthy reports.
- Incorporate non-economic data on groundfish (from the social survey) into FISHEyE for easier dissemination of information.

6) Best Available Science

- a) Is the Center providing the Best Available Science?

The Center appears to be providing the best available science given data and funding constraints. More funding and resources would help to make the good scientific work that they are providing even better. But the scientific work coming out of the economics and human dimensions programs at NWFSC is clearly of very high caliber.

Panel members however were concerned how the minimal resources provided for travel to professional conferences and for training will impact the ability of the Program over the long term. In addition, the annual reporting demands of the catch share program are already significant and will likely grow. Many members of the ESSR Program spend a large portion of their time preparing reports and responding to stakeholder requests for catch share statistics. The increased reporting demand of the catch share program may limit the future ability of some ESSR Program staff to attend professional conferences or even to participate in cutting edge research projects – which is ultimately required in order to incorporate best available science into one's work.

- b) Are the Center/ST's economic and sociocultural research products adequately peer-reviewed?

The Program's staff follow standard NMFS procedures for peer-review. However, there does appear to be a discrepancy in how the procedures are implemented across the two divisions and the time for approval.

- c) Are the appropriate processes being used to ensure that scientific products meet professional standards and are of high caliber?

Yes, appropriate processes are being used to ensure that scientific products meet professional standards and are of high caliber, and the Economics & Human Dimensions Science Program is producing high quality scientific products. For example, many of the work products are reviewed by the Council's Science and Statistical Committee.

Q6 Recommendations

Processes and research management

- Develop an intra-Center dialogue to reconcile review processes and times across divisions, so that similar processes are in place across the center for peer review. These should ensure that science products are high caliber, while minimizing administrative and time burdens on both HD and ESSR scientists.
- Investigate reasons for the slow peer review process within FRAM and determine if there are ways to streamline the process for more timely dissemination of research results.
- The Center should consider ways to ensure that staff commitments to collecting extensive primary data do not negatively affect promotion potential for these researchers.

Investments in professional development

- Promote interactions with scientists outside the Center and the presentation of science results at meetings and conferences via the provision of sufficient travel funding.
- The Economic/Sociocultural Program needs to prioritize conference participation across the two teams of economists and non-economist social scientists. Particular attention should be paid to ensure that members of the ESSR Program have opportunities for training and to attend professional conferences to ensure that their skill set remains current.
- Continue to pursue collaborations with UW faculty and students to increase scientific capacity at the Center and encourage new scientific thinking and feedback on ideas.
- When possible, build on the SWIMM working group model to make use of outside expertise to help push research frontiers.

7) Communication

- a) Does the Center's/ST's program use the best tools to appropriately communicate research results to various managers, partners, stakeholders and the public?

The Center is doing a good job of communicating research results to managers and policy-makers. The presence of Center staff on management bodies has greatly facilitated this process, as have direct presentations by Center staff. One challenge in this regard is that managers are primarily interested in research that is directly relevant to pressing management concerns. Other research regarding emerging issues such as climate change or ecosystem based management appears to receive less attention from managers, primarily due to manager interests and priorities, and limited time available to pursue non-pressing concerns.

There is a concern that the role of the communications program as related to ESSR and HD scientists is not as clear as it could be among Center scientists, and scientists sometimes express confusion regarding how they should interact with communications staff. Some level of formal communications training might help to address this concern.

Panel members also expressed some confusion on the role of the programs websites and their ability to convey information on the research programs. Similarly, the existence of two separate pages has the potential to reduce the impact of the economic and human dimensions research.

Strategic communication planning

- As part of the general strategic planning and visioning process recommended above, ESSR and HD should coordinate with communications staff to (a) identify mechanisms to enhance the transfer of information between scientists and communications staff in an efficient manner, (b) identify key audiences and how these audiences may be effectively reached through communications strategies, (c) discuss the ways the communications staff may best serve the needs of the Center and ESSR/HD, in recognition of the limited time available to all Center staff, (d) help scientists appreciate how communications strategies may be leveraged effectively to enhance the impact and recognition of their work.
- The Economic/Sociocultural Program should work with the Communications Team at the Center to develop a targeted strategy to inform stakeholders of important research and products.
- Researchers should consider the appropriate audience for research findings early in the research phase and should expand engagement of the Center communications staff in visualizing and disseminating research results.
- The Center should pursue additional outlets to disseminate research findings to broader constituencies beyond managers, particularly public stakeholder groups.
- Basic media and communications training for Center researchers would assist in expanding communication potential.

Website

- The Economic/Sociocultural Program should review and update the content of its website to ensure that it conveys the most up-to-date and relevant information about the Program's activities for a wide range of potential stakeholders.
- Work with communications team during the Center website re-design to highlight the role of socio-economic work and the Center and make data more intuitively accessible to the general public.
- Consider developing a joint website that highlights the breadth and impact of the research across the two programs in one location.

Training

- Basic media and communications training for Center researchers would assist in expanding communication potential.

Panel Member #1: Response to Review Questions - 2017 Economics & Human Dimensions Science Program Review Northwest Fisheries Science Center

The Economics & Human Dimensions Science Program is an asset to the Northwest Fisheries Science Center (NWFMC). The work conducted by this program is high quality, connected to stakeholders, and relevant to management issues facing the region. It is impressive what this program has been able to achieve with relatively minimal staffing, a small budget, and federal budgeting realities that lead to funding uncertainty. The economists and other social scientists in the Center appear to be well integrated both together and with other scientists in the Center; and have collegial and effective working relationships that allow them to produce integrated and useful science products. The work at the Center is also closely integrated with NOAA's Office of Science and Technology, and coordinates well with this office to obtain support for important projects.

At the same time, some of program's organizational structure and research priorities are the result of idiosyncrasies such as variations in science culture and the personalities of staff who are no longer at NWFSC. Although many of these structures and priorities may be optimal, the program is well positioned (with a new director of NWFSC and two relatively new program directors) to conduct strategic evaluations that will ensure that the program is optimally situated to address current, evolving and long-term economic and sociocultural science needs, and makes efficient use of staff time and expertise.

As background, the Economics & Human Dimensions Science Program at NWFMC is in fact divided into two programs—an Economic and Social Science Research Program (ESSR) directed by Jerry Leonard (in the Fishery Resource Analysis and Monitoring Division (FRAM)), and a Human Dimensions (HD) Program directed by Dan Holland (in the Conservation Biology Division (CB)). Unless otherwise specified as relevant to ESSR or HD, comments of this review relate to these two programs taken together as a unit, even though they are administratively distinct.

1) Goals and Objectives

- a) Does the Center/ST have clear goals and objectives for an economic and sociocultural science program?

The two distinct programs (ESSR and HD) each have clear goals and objectives related to their individual areas of focus. The overarching goal of ESSR is to “examine the impact of West Coast fishing and management on fishers, communities, and regional economies.” As one might expect, the goals and objectives of ESSR focus primarily on commercial and recreational fisheries, and tend to give greater emphasis to important research necessary to support management. This appears to reflect the surrounding culture of FRAM, in which ESSR is housed. Ecosystem science (including ecosystem service valuation) is also included under ESSR, but thus far has been a nascent area of work at the Center. The overarching goals of HD are to promote “a better understanding of the human values, actions, communities, and institutions that influence (and are influenced by) marine and anadromous fish, marine mammals, and other marine species and ecosystems in the Pacific Northwest, and to “conduct economic and sociocultural research supporting ecosystem-based fishery management and conservation and recovery of protected resources.”

Although HD also provides management that is directly responsive to current stakeholder requests, it gives relatively greater current emphasis to proactive, forward-thinking science that helps stakeholders appreciate broader management implications and address emerging issues. As one might expect, the goals and objectives of HD reflect the research culture of CB, the division in which it is housed.

The administrative and cultural differences between ESSR and HD notwithstanding, the goals/objectives of the two programs are synergistic and frequently interconnected. Two (of many) examples of this interconnectedness include joint work related to the groundfish catch shares program and management strategy evaluations of California Current fisheries. Others are described later in this report. However, because ESSR and HD are administratively and culturally distinct, there is less evidence that goals and objectives have been developed jointly and strategically to best capitalize on the capacity of both programs as a whole. The goals and objectives of the two programs have a somewhat different flavor, with a different balance between reactive and proactive science and products. The two programs could benefit from a formal, collaborative strategic visioning exercise that would enable both sets goals and objectives to be jointly developed and optimized.

- b) Do the Center's/ST's Programs provide information to address the priority needs of the Regional Offices, other NOAA managers, Fishery Management Councils, Fisheries Management Commissions, and other stakeholders that require economic and human dimensions-related information to achieve their mission?

Yes, the two programs (ESSR and HD) provide information that addresses (and is responsive to) the priority needs of Regional Offices, other NOAA managers, Fishery Management Councils, Fisheries Management Commissions, and other stakeholders. The relevance of both ESSR and HD to regional decisions and decision-making is unquestionable. Comments by stakeholders strongly supported the relevance and utility of the program's work, including data products, tools and scientific insights. A few examples of the work highlighted by stakeholders included the Center's broad-spectrum research into the groundfish catch shares program (including support of the 5-year evaluation), economic data collection (EDC) and the FishEyE data visualization tool, and extensive social science work on fishing communities and community vulnerability.

Another aspect of the Center's relevance that was less explored during presentations is the capacity of NWFSC to conduct forward-thinking research that expands the ways that stakeholders and the public understand relationships between humans and marine resources (proactive research, particularly in emerging issues such as EBFM, climate adaptation and ecosystem service valuation, among others), and help stakeholders understand and use a broader range of science models, results and tools to inform decisions. In this area, the two programs function somewhat differently. ESSR appears to be more reactive, with an emphasis on important service research that provides information requested directly by stakeholders. HD is more proactive, providing information that is not always directly responsive to a current stakeholder request, but can help expand the scope of science that is used to inform decisions. Both of these roles are important. Reactive research is often appreciated more directly by stakeholders (because it meets their immediate needs), but

proactive research is essential to enhance the capacity of science to inform decisions and decision-making in the long-term.

With this duality in mind, there is a risk that a program (with limited staff and budget) can become so overburdened with demands required to meet the immediate needs of stakeholders (reactive research) that it lacks the capacity and “breathing space” required to conduct proactive research that will help promote improved decisions in the long run. For example, Erin Steiner and Marie Guldin together appear to have put a heroic effort into commercial fishery economic data collection and the FishEye tool—this work has immense value to stakeholders. Similar efforts have gone into the catch share program evaluation. At the same time, there is a concern that this heavy workload will leave individual staff less able to pursue other activities such as peer reviewed publications in the long run. As an aside, proactive, forward-thinking research is often the most personally satisfying and rewarding to researchers (and also helps with promotion potential, given the publication potential of this work). It is important to achieve an optimal balance of reactive and proactive work within each program (ESSR and HD) and across the Center as a whole.

Careful strategic planning of goals and objectives is particularly important given the resource constraints facing the Center. The staffing and funding available to the Economics & Human Dimensions Science Program are inadequate when viewed in terms of the ambitious goals and objectives of the two programs, and the demands of stakeholders for data, information and tools. This cannot be stated strongly enough - it is remarkable what this program has been able to achieve with a small staff and a meager budget. Within NWFSC there are more federal FTEs associated with many disciplinary sub-fields within biophysical science than those associated with all economics and human dimensions components combined. Clearly, biophysical aspects of the Center’s work are critical, but there is a highly disproportionate allocation of resources to biophysical versus social sciences, reflecting the broader (and frequently recognized) inadequacy of social science support within NOAA as a whole.

There is a related concern that a large proportion of the ESSR and HD workforce is comprised of contractors rather than federal employees. There are more contractors associated with these programs than federal FTEs. These contractors have done excellent work—for example on the 5-year groundfish catch shares evaluation. However, contractors are sometimes “invisible” and lack the stability of the full-time federal workforce. There is a concern that this human capital and expertise might be lost to the Center once the catch share evaluation ends. Among other goals and objectives, the Center should take steps to ensure that human capital and expertise is sustained.

- c) Do the Center’s/ST’s Programs have a strategic research agenda that anticipates evolving and long-term economic and sociocultural science needs including research to support adapting to climate change and implementation of ecosystem-based fishery management?

The Economics & Human Dimensions Science Program is addressing many important emerging issues, including research programs to address climate change, EBFM and ecosystem services. As a whole, however, the Economics & Human Dimensions Science Program does not appear to have developed a cohesive, strategic research agenda. There

does not appear to be a strategic plan for this program apart from the general (and almost expired) plan for NWFMC, and the Center's strategic plan does not provide specific direction related to ESSR and HD (the socio-economic goals and objectives in the 2013 NWFSC strategic plan are relatively generic). There are opportunities for joint visioning and strategic planning between HD and ESSR. This is particularly important given the upcoming conclusion of the 5-year catch share program evaluation. Much of the program's (and particularly ESSR's) effort over recent years has been devoted to the 5-year evaluation of the groundfish catch share program. It is not clear that the program has adequately identified "what is next" when this evaluation concludes (and the associated resources are potentially re-directed to other priorities). This strategic visioning and planning can help the Center identify priorities for research and funding over the next five years, and hence increase the likelihood that adequate funding can be obtained. The strategic visioning and planning process should be conducted in concert with Regional Offices, other NOAA managers, Fishery Management Councils, Fisheries Management Commissions, and other stakeholders (e.g., NGOs, academic institutions, etc.). Planning should not be conducted for the sake of appearance—but rather to enhance the future prospects, productivity and relevance of the Center and its work.

Recommendations

- ESSR and HD should conduct a formal, joint visioning and strategic planning process, in coordination with stakeholders, to ensure that the goals and objectives of the entire Economics & Human Dimensions Science Program (a) reflect the combined capacity and expertise of both programs, (b) include an appropriate mix of reactive and proactive science, (c) capitalize fully on linkages and interactions between the two programs, (d) focus on reallocation of capacity currently used for the catch shares evaluation to address critical research needs in the region, and (e) address the broader sustainability of human capital with HD and ESSR.
- Funding and staff resources allocated to the Economics & Human Dimensions Science Program should be enhanced to reflect the relative importance of this research area to NWFSC and NMFS, relative to biophysical research programs.
- Procedures should be instituted to ensure that ESSR is not so devoted to reactive service to the Region that it precludes longer-term forward-thinking research and planning by staff.

2) Integration and Linkages

- a) Are the Center's economic and sociocultural programs appropriately integrated with each other and with other science activities within the Center?

There is strong evidence of integration between the two programs (ESSR and HD) and with other activities at the Center. This is a strength of the program as a whole. A few of many examples of this integration include (a) development of model linking Atlantis ecosystem model with IO-PAC (involving Jerry Leonard), (b) work of Dan Holland to model various outcomes of the groundfish catch shares program, (c)

protected species work by Robby Fonner linking ecology of salmon restoration with cost-effectiveness analysis, and (d) work by Leif Anderson related to ecosystem science and ecosystem service valuation. Work on fishing communities and community resilience (e.g., involving Karma Norman, Suzanne Russell) and impacts of ocean acidification on fishing communities (led by Melissa Poe) are other excellent examples of work that cross-cuts the focus areas of ESSR and HD. Work on fishery safety related to catch shares (involving Lisa Pfeiffer) is yet another example of research that spans both ESSR and HD focus areas.

This tight integration aside, ESSR and HD are administratively and culturally distinct. The current split of the Economics & Human Dimensions Science Program into ERRS in FRAM and HD in CB is largely the result of past idiosyncrasies such as variations in science culture and the personalities of staff who are no longer at NWFSC. Although this current structure appears to have many advantages and may be optimal, the program is well positioned (with a new director of NWFSC and two relatively new program directors) to conduct strategic evaluations that will ensure that the program is optimally structured and situated to address current, evolving and long-term economic and sociocultural science needs.

Beyond the Center, there are excellent examples of coordination with scientists at academic institutions and other programs. A few examples include the recent NSF CNH project with Arizona State, multiple collaborations with Washington Sea Grant and Pacific States Marine Fisheries Commission (PSMFC). Although partnerships such as those with Sea Grant and PSMFC are long-term and strategic, many of the specific external interactions appear to be planned and coordinated on a case-by-case (and program-by-program) basis, rather than conducted as part of a cohesive strategic and implementation plan. In some areas, the program could also make greater use of partnerships with scientists at outside academic institutions to supplement in-house expertise. For example, the ambitious work on protected resources (by Fonner) and nascent work on ecosystem service valuation (involving Anderson) could benefit from long-term and supportive coordination with outside experts, given a lack of other experts in this specific area of economics within the Center (although the work by Fonner and Anderson is highly complementary, and the Center should capitalize on these synergies).

- b) Are research efforts integrated, where relevant, with efforts at the regional offices and headquarters?

Yes, there is excellent evidence of integration with efforts and regional offices and headquarters. Activities of the Economics & Human Dimensions Science Program are well coordinated and directly responsive to West Coast Region's economics, social science, and human dimensions needs. There is also evidence of close coordination with NOAA's Office of Science and Technology. Although it is commendable that the program (and ESSR in particular) is so responsive to the needs of the Region, it is also important to leave sufficient capacity to address broader goals and objectives—including the type of proactive research described above. It appears that there could be room for enhanced communication and integration between the

NWFSC and the Southwest Fisheries Science Center (SWFSC), including coordination to enable smoother transfer of data between the two Centers.

Recommendations

- Embed plans for cross ESSR-HD efforts within strategic planning exercises as noted above, along with plans for broader linkages to outside partners. Specify areas where beneficial linkages and synergies could be enhanced and develop plans to develop those linkages.
- Over time, develop broader partnerships with scientists at outside organizations (including academic institutions) to supplement in-house expertise, and particularly those that can help the Center leverage outside funding sources to further support goals and objectives, and that can help provide targeted mentorship to newer scientists.
- Enhance coordination and communication between SWFSC and NWFSC to meet the goals and objectives of both Centers.

3) Data Collection

- a) Is the status of data collection related to commercial fisheries, recreational fisheries, fishing participants, and communities adequate to fulfill economic and sociocultural science research needs?

The Economics & Human Dimensions Science Program has been remarkably successful at meeting data needs related to commercial fisheries, recreational fisheries, fishing participants, and communities. The data products provided by the Center are rich and of immense value. The program's capacity to meet data needs is all the more impressive given the resources (FTEs and funding) available to the program. As noted above, many of these recent efforts have been centered on the catch shares evaluation. Notable products include but are not limited to commercial fisheries cost and earning survey data, FishEye, and the provision of economic impact modeling, among others.

At the same time, there are some data needs that cannot be met, not due to any shortcoming in the program, but due to the fact that the program can only do so much with limited FTEs and funding. In general, data provision has been stronger in commercial fisheries than in other areas—this is largely due to funding availability and stakeholder demands. Capacity for data collection in other areas has been less reliable. For example, there is no reliable/permanent funding for ongoing collection of recreational fisheries data, for costs of research related to protected resource benefits and costs, or for work in ecosystem service valuation. This hinders strategic planning and progress in these and other important areas.

- b) Has the Center/ST developed strategies to obtain, manage, and make data accessible?

The Economics & Human Dimensions Science Program has been successful at obtaining, managing and making data available. Examples include FishEyE, results from IO-PAC, and results from community vulnerability studies. However, along with a lack of strategic planning in general, there is a lack of a clear, cohesive programmatic plan to obtain, manage, and make data accessible. Successes in this area (and there are many) have occurred piecemeal, without a clear guiding vision and plan.

- c) Are there barriers that impede data collection and access to data held by other entities (e.g. states, commissions, other federal agencies, etc.) that could be used to support the Center/ST's research, and how can these barriers be overcome?

In general, the Economics & Human Dimensions Science Program has been successful at obtaining necessary data from other entities, although in some cases this has required creative solutions and work-arounds. Other entities (including other areas of the Center) have apparently not always been fully forthcoming with data—this is a challenge in the sciences in general. In some cases there may be legitimate reasons for this, but in other cases it may be due to concerns over scientists' desire to use the data first for their own publications, prior to dissemination (or the simple work required to prepare data for distribution). While these are legitimate concerns, too often they are used as an excuse for protracted delays in data availability or outright refusal to share data. This is something that could be addressed (at least within the Center) by clear policies and procedures (and enforcement of these policies) related to data sharing and availability. There is some anecdotal evidence that integration between efforts at the SWFSC and NWFSC could be improved to reduce or eliminate access for some types of commercial fisheries data held at SWFSC (e.g., HMS data)—or at least make it clear why certain types of data cannot be shared or the steps required to do so.

Recommendations

- NWFSC (as a whole) should develop clear guidelines for data-sharing between divisions and programs, if such guidelines do not already exist. These guidelines should recognize the benefits of allowing time for researchers to publish with data prior to its sharing and release, while at the same time recognizing the broader benefits of data sharing, particularly within the Center. If such a plan already exists, it should be revised to ensure it is functioning as intended.
- Communications and interactions should be enhanced between science centers (and particularly SWFSC) to explore means to access data necessary for economics and human dimensions research at NWFSC.
- Many of the recommendations under questions #1 and #2 above are also directly relevant to the Center's data collection efforts, and should be considered here as well.

4) Models and Research Tools

- a) Are the Centers/ST using appropriate models and research tools to analyze data and provide management advice?

Yes, across the board, the Economics & Human Dimensions Science Program is using a suite of appropriate models and research tools to analyze data and provide management advice. These include models and tools that are directly integrated into management evaluations (e.g., I-O results used as part of various types of regulatory reviews and evaluations by the Region), along with models and tools that provide data to help stakeholders understand the broader implications of management (e.g., models to evaluate the potential benefits of bycatch risk pools; models to evaluate fishing safety implications of catch shares; models evaluating recreational site choice subject to site closures). Approaches applied by ESSR and HD include high-quality workhorse models that are necessary but do not necessarily represent publishable advances in the state-of-the-science, as well as innovative models that provide new perspectives on economics and human dimensions. Both of these are important and should be encouraged.

A particularly notable aspect of the Center's work is the breadth of different model types that are being developed, in multiple areas (e.g., commercial fisheries, recreational fisheries, protected resources, ecosystem services, fishing communities) and across multiple disciplines. These models and tools often capitalize on multiple areas of expertise and data across the Center. An example is the in-progress bioeconomic model that integrates existing estimates of recreational demand with current stock assessments to predict implications of management for behavior, stock abundance and welfare. Integrated, decision-support tools and models such as BLAST (bioeconomic length-structured angler simulation tool, developed by the Northeast Center) are in high demand by stakeholders, and (important resource constraints aside), the Center is well-positioned to provide models such as these. There are also potential advantages to the integration of other types of models and data in innovative ways—for example using qualitative data on human motivations and behavior to enhance the specification or to ground-truth the results of quantitative behavioral models (e.g., of fishing commercial or recreational fishing behavior). The Center has not yet fully capitalized on potential collaborative efforts such as these, but such integrated approaches could be a promising area for future work.

- b) Are they developing and using methods and models that contribute to the evaluation and exploration of ecosystem based fisheries management and other emerging issues?

Yes, the Economics & Human Dimensions Science Program is developing a set of innovative models and methods to evaluate EBFM and other emerging issues (e.g., effects of climate change, ocean acidification, etc.). Interactions between HD and ESSR can be particularly productive in these emerging areas of work at the Center. Emerging issues represent a promising area of current and potential collaboration across the quantitative and non-quantitative social sciences. An example of current work that integrates qualitative and quantitative methods is the effort on vulnerability to climate change and ocean acidification impacts across different fisheries and non-fisheries sector. Ecosystem services valuation is another area in which the integration of qualitative and quantitative science can be particularly useful.

Promising and relevant areas of research in emerging areas include those evaluating tradeoffs related to protected species – for example those protected under different statutes (MMPA vs. ESA) and where protection one may entail losses to others (e.g., marine

mammals that prey on ESA-listed salmonids). Nascent efforts in ecosystem service valuation, protected resources and climate impacts/adaptation are particularly relevant and should be encouraged. Work in recreational fisheries is also important—examples of promising work in this area is research linking bioeconomic modeling to discrete site choice models, as well as recreational demand for shellfish harvesting under site closures. Support for this work is particularly important given that the scientists working on these issues are newer to the Center. In the past, work on issues directly related to climate change and variability has been a relatively small part of the ESSR and HD focus, and it is encouraging to see increasing focus in this area. Finally, although there have been many calls to incorporate comprehensive management strategy evaluations (MSEs) including appropriate economic and social components, these models have not yet been broadly adopted by managers to provide insight for management—this provides an important avenue to incorporate socio-economic information in an integrated way.

c) Are their barriers to adapting to address emerging issues?

Yes, there are barriers to addressing emerging issues, some but not all of these can be addressed by efforts at the Center. NOAA/NMFS currently lacks a fully developed capacity and jurisdiction to accomplish EBFM (much less EBM)—at the current time many aspects of EBFM are aspirational. This can indirectly limit the direct relevance of some research results, because NOAA lacks the direct jurisdiction and/or capacity to act on these results. ESSR is also currently at or over capacity with demands related to current data and modeling needs of the Region and other stakeholders (as discussed above). This leaves limited capacity for proactive planning and research on emerging issues.

Many of the emerging issues relate to decision-making subject to risk and uncertainty (e.g., uncertain climate impacts). These are areas in which economics and social science models often struggle—modeling decision-making under uncertainty is notoriously difficult. Hence, success in some of these areas will require advances in the science. Research in many of these areas is also frequently expensive (e.g., ecosystem services valuation), leading to a need to obtain additional resources. Moreover, once a model is developed (e.g., IO-PAC, BLAST), the effort required to maintain and update the model is often considerable and under-appreciated. Sufficient time and funding must be available to support both model development and support/updates.

Recommendations

- Seek dedicated funding and resources to encourage research in emerging issues and EBFM, and develop partnerships with outside entities (such as academic institutions) to (a) complement the expertise available at the Center, and (b) seek external funding for work in emerging issues. An excellent example is the recently funded NSF CNH project related to the dynamics of adaptation to climate-driven variability in California Current fisheries. Collaborative work such as this should be encouraged.
- Among these collaborative efforts, ensure that sufficient attention (and resources) are devoted to interdisciplinary work related to behavior under uncertainty, as this is central to many of the emerging issues relevant to NMFS.

- Develop strategic and implementation plans to ensure that researchers have sufficient time and resources that may be allocated to emerging issues.
- Continue to promote integrated MSE as a means to inform management decisions, and contribute to models of this type.
- Consider whether and how the development of integrated modeling and decision-support models will be useful to stakeholders, along with the resources that will be necessary to develop, maintain and update these models. NMFS should be prepared to support (with funding, FTEs, etc.) these activities – and particularly update and maintenance for which external grant funding is typically unavailable.
- Continue to increase emphasis on emerging issues directly relevant to EBFM and EBM, including climate impacts/adaptation, ecosystem service valuation, fishing community vulnerability, recreational fisheries, and related topics. This research should also strive to clarify linkages between science results and actions that can be taken by NMFS entities (alone or in partnership with others).

5) Use of Information

- a) Is the Center's/ST's social and economic information being used in living marine resource management advice?

Yes, there is heavy use of the economic and social information produced by the Center to inform living resource management. Many examples are provided above. Uses include uses for various direct types of management evaluation, as well as uses to help expand considerations of emerging issues such as climate impacts, community vulnerability and EBFM. The information produced by the Center is responsive to stakeholder needs.

- b) Are the existing mechanisms sufficient for ensuring this information is used appropriately?

In the vast majority of cases, the information produced by the Economics & Human Dimensions Science Program appears to be used (by stakeholders and other users) appropriately, and for intended and appropriate purposes. Center researchers are aware of the appropriate uses of their models and data, and are also careful (internally) to avoid misuse and to clarify data limitations. Most stakeholders use and interpret the information provided by the Center properly. At the same time, it is difficult to ensure that all data and model results—once provided to external users—will be interpreted and used appropriately in all cases. Existing mechanisms are not sufficient (nor can they be sufficient) to guarantee that data and results will never be misused or misinterpreted. An example is the misinterpretation of economic impacts (e.g., from IO-PAC) as appropriate measures of social welfare or economic benefits—this is a common issue that extends far beyond the Center. NWFSC scientists are aware and (in general) correctly communicate this information and its interpretation—however, there is pervasive misunderstanding among stakeholders surrounding this issue. Another example is the potential for improper attribution of causality within commercial net revenue trends pre- and post-catch shares as displayed in FishEye. To a certain extent, misuse or misinterpretation of data by external

users cannot be prevented, and is beyond the purview of NWFSC scientists. However, steps can be taken to further increase the probability of appropriate use (and to discourage misuse).

- c) Are there barriers to the uptake of science provided by the Center and what steps can be taken to overcome these?

In general, stakeholders appear to be receptive to the science provided by NWFSC and are eager to incorporate it into management decisions, where possible. There appears to be excellent uptake of the Center's models and information. However, uptake of information is not always even across information (model and data) types—and this sometimes relates to the (sometimes misinformed) preconceived notions of stakeholder groups and the public. For example, stakeholders often seek and prefer economic impact results over measures of economic welfare (true economic benefits and costs)—despite broad consensus among economists that the latter are more appropriate for informing management decisions. Similarly, there is a perception that economic benefits realized through markets (e.g., commercial fisheries net revenues) are somehow more relevant or “real” than economic benefits realized outside of markets (e.g., recreational consumer surplus or some types of ecosystem service values)—this can create an implicit barrier to the uptake and use of non-market valuation results, even though these results are directly relevant to many management decisions and emerging issues. The Center could (and should) address barriers such as these through targeted education of stakeholder groups and the public.

Recommendations

- ESSR and HD scientists should collaborate to identify key areas where (a) uptake of information is less than desired, and (b) information is frequently misused or misinterpreted. Particular emphasis should be given to areas where this lack of uptake or misuse can have non-trivial implications for decision-making or management, or where it reduces the potential impact of the Center's science products.
- For these key areas, cost-effective strategies should be developed to enhance uptake and reduce misuse by stakeholders. Possible approaches might include (a) workshops, webinars or other active engagement with stakeholders to introduce data and models, encourage uptake, and discourage misinterpretation or misuse, (b) personal engagement with key stakeholders (e.g., Region and Council staff) to encourage appropriate interpretation and uses, and (c) targeted instructions and warnings on data products to encourage appropriate interpretations and use.
- As part of the strategic planning exercise discussed under question #1 above, identify models or data products that would be of high value to users that could potentially be provided by Center scientists, and consider sources for the funding necessary to provide and maintain those services.

6) Best Available Science

- a) Is the Center providing the Best Available Science?

Yes, Economics & Human Dimensions Science Program appears to be using the Best Available Science. The Center's use and application of science is particularly impressive given limitations in funding and FTEs. Partnerships within and outside of the Center encourage the use of cutting-edge science. The Center's ESSR and HD scientists are among the leaders developing new methods in their disciplines (e.g., work in fisheries economics by Dan Holland) and are developing/using cutting-edge methods. The sophistication of work by the Center's newer researchers (e.g., Robby Fonner) is also notable. Across the board, the Best Available Science is generally being applied in the Center's current economic and social science work. The Center has demonstrated strength in both qualitative and quantitative social scientists, although FTE limitations obviously constrain the depth of expertise in individual areas—the Economics & Human Dimensions Science Program has considerable breadth but minimal depth (almost entirely due to FTE and funding constraints).

In some cases, integration across researchers (in and outside of the Center) could help further improve the science that is used, and ensure that Best Available Science continues to be used into the future. Moreover, as in many areas of science, methodological improvements are always possible, and Center scientists should strive to continually improve their models and methods. Active engagement within and outside of the Center can help encourage this continual improvement, and ensure that the Center's work remains state-of-the-art.

- b) Are the Center/ST's economic and sociocultural research products adequately peer-reviewed?

Yes, the research products are adequately peer reviewed, via both internal processes and external (e.g., when results are published). The process appear to be rigorous and appropriate—focusing on the science methods while not altering the policy implications. As noted above, a related issue concerns whether ESSR and HD staff are given sufficient time to pursue the publication of peer reviewed journal publications, and are encouraged to do so. These publications are important not only for enhancing the reputation and impact of the Center, but also for the promotion potential of staff. Many staff in both ESSR and HD are publishing at a rate of about 1 peer reviewed journal publication per year (most in mid-tier journals or higher)—which seems to be a reasonable level, amidst all of the other work that is being done. Some are publishing at a higher level. However, there is the concern that some staff, particularly in ESSR, are so overburdened by service research and ongoing data collection that they lack the time to pursue peer reviewed journal publications. An aspirational goal might be a publication rate of two or more peer reviewed journal articles per year, on average, for a typical ESSR or HD scientist. However, goals such as this should be determined by the Center itself through a collaborative planning process.

- c) Are the appropriate processes being used to ensure that scientific products meet professional standards and are of high caliber?

Yes, appropriate processes are being used to ensure that scientific products meet professional standards and are of high caliber, and the Economics & Human Dimensions Science Program is in general producing high quality scientific products. However, the length of the review process appears to differ between ESSR and HD, with a longer internal process required for approval of ESSR products. It is unclear whether this is required or whether it leads to higher

Mcaliber products—the limited feedback we received suggests that this additional review burden does not necessarily increase quality, but can reduce productivity.

A related concern is that there are insufficient funds to support scientists travel and interaction outside of the Center (e.g., at conferences and meetings). Ongoing interactions with outside scientists—including the presentation of research results at conferences—are absolutely essential to obtain feedback and ensure that the Center’s work is of high caliber. NMFS and the Center should work together to ensure that sufficient resources are available to support the interaction of Center scientists with outside experts at meetings and conferences.

Recommendations

- Develop an intra-Center dialogue to reconcile review processes and times across divisions, so that similar processes are in place across the center for peer review. These should ensure that science products are high caliber, while minimizing administrative and time burdens on both HD and ESSR scientists.
- Promote interactions with scientists outside the Center and the presentation of science results at meetings and conferences via the provision of sufficient travel funding.

7) Communication

- a) Does the Center’s/ST’s program use the best tools to appropriately communicate research results to various managers, partners, stakeholders and the public?

The Center’s communications program appears to use appropriate and effective tools to communicate research results. The communications program has generated many useful products for multiple audiences, beyond what scientists could produce on their own. Many of the scientists’ core audiences (e.g., managers at the Region and elsewhere) benefit most from ongoing personal interactions with scientists, not formal products of the communications staff. However, many audiences require specialized communications products (e.g., infographics) to understand and appreciate the science. The Center’s scientists are not equipped (without assistance) to generate these products. This is an important role of the communications staff.

However, there is a concern that the role of the communications program as related to ESSR and HD scientists is not as clear as it could be among Center scientists, and scientists sometimes express confusion regarding how they should interact with communications staff. For example, some scientists do not seem to know the formal role of the Press Release or Rollout check boxes on the publications database, and scientists sometimes fail to update the database in a timely manner. Mechanisms for the transfer of information between scientists and the communications program are also not as efficient as they could be. This is a common challenge in research institutions of all types, and is in evidence here. There seems to be a lack of general appreciation among Center staff for the different ways that communications expertise can be targeted to reach different audiences, or why it is important to do so.

Recommendations

- As part of the general strategic planning and visioning process recommended above, ESSR and HD should coordinate with communications staff to (a) identify mechanisms to enhance the transfer of information between scientists and communications staff in an efficient manner, (b) identify key audiences and how these audiences may be effectively reached through communications strategies, (c) discuss the ways the communications staff may best serve the needs of the Center and ESSR/HD, in recognition of the limited time available to all Center staff, (d) help scientists appreciate how communications strategies may be leveraged effectively to enhance the impact and recognition of their work.

Panel Member #2: Reviewer Report on Program Review of Economics and Human Dimensions Program

**Northwest Fisheries Science Center
National Marine Fisheries Service
Seattle, WA
Aug 7-10, 2017**

Introductory Comments:

The North West Fisheries Science Center (NWFSC) economists and social scientists are clearly invested in providing the best social science research and services possible to meet the Center's mission to support its stakeholders and in conducting cutting edge research to address emerging issues from climate change and advances in ecosystem science. The two teams of economists and social scientists at the Center have diverse educational backgrounds and experience that should help provide the expertise necessary for meeting these emerging management requirements. While the economists are separated across two divisions, the harmonious environment at the Center seems to foster a fair amount of collaboration between members in both divisions. It is clear that the Economic/Sociocultural Program at the Center takes considerable pride in the work that they conduct – whether it is professional research, fulfilling data requests by stakeholders, or providing management support to the Council or the Regional Office.

The NWFSC economists and social scientists have a multitude of stakeholders that impose many demands on their time. The group also has limited base and discretionary funding which makes it extremely difficult to meet all of the stakeholder requirements with an FTE staff of nine social scientists and a growing demand for its products. As NMFS' budget situation is not likely to improve in the near future, the social scientists at the Center are faced with finding a way to continue to provide basic management support necessary for meeting legislative requirements while at the same time developing new models/tools to support climate change and ecosystem-based research with likely no net increase by NMFS in labor or research funds.

Overall, the research and products produced by the Economic/Sociocultural Program to inform management activities are closely aligned with regional stakeholder needs. This is a testament to the Program's high level of engagement with stakeholders as well as their vision for positioning themselves to address emerging issues as they arise. However, to ensure that the Program undertakes the most relevant research path to inform managers and other stakeholders, more thoughtful consideration and articulation is needed to connect the goals and objectives of the Program to stakeholders and to the mission and objectives of the NWFSC and NMFS as a whole. The Program will also need to address growing demands for their time and products that will likely exceed available resources. This will require a reassessment of the Program's workload in terms of the types of products and services the Program will provide, and increased efforts to exploit research opportunities and leverage resources from non-NMFS partners (e.g., academic institutions and other Federal agencies with common interests).

Overarching Questions for Reviewers:

1. *A. Does the Center have clear goals and objectives for an economic and sociocultural science program?*

The NWFSC Strategic Science Plan clearly indicates the importance of supporting social science research to better understand commercial and recreational fishing behavior, the benefits that ocean and coastal environments provide to humans, the relationships between human activities and species recovery, and the effect of management measures on human communities. The word “human” is mentioned more than a dozen times throughout the document. While the Center’s current Strategic Plan expires in 2018, the NWFSC Annual Guidance Memorandum Fiscal Year 2017 indicates that ecosystem science will guide the revision to the current strategic plan. Thus, the importance of identifying clear goals and objectives for social science research in the revised strategic plan will be more important than ever.

The Annual Guidance Memorandum Fiscal Year 2017 also indicates that there were 277 employees at the Center in 2016. Currently, there are five FTE economists in ESSR and two FTE economists and two non-economist social scientists under the Human Dimensions team. Thus, the economic and social science teams comprise just over 3% of the Center’s staff. This imbalance is not unique to this Center, but it’s worth recognizing that the demands for economic and human dimension inputs to the management process and by external stakeholders is going to increase with a shift to ecosystem based management – and that the appropriate balance of biophysical and social science personnel should be considered by the Center in future planning exercises.

The Economic/Sociocultural Program at the NWFSC does not appear to have a strategic plan of its own. In lieu of an Economic/Sociocultural Strategic Science Plan, the program is focused around five research theme areas (commercial fisheries economics, recreational fisheries economics, human dimensions social science, ecosystem economics and social science, and protected resource economics). These five research themes generally guide the direction of the program and seem to nest reasonably well under the research themes identified in the NWFSC Strategic Plan.

While the goals and objectives of the Economic/Sociocultural Program are not articulated in a formal strategic plan, it was obvious from the presentations and from talking with staff members that the Program has a strong understanding of managers and other stakeholder’s needs. This is because the activities of the Program staff seem to be appropriately driven by statutory drivers and mandates of NMFS, as well as other stakeholder groups that Program staff interact with (e.g., the Council, recreational angler groups, charter organizations, commercial fishing organizations, Puget Sound Partnership, interested public, etc.). The research being conducted

by the Program staff certainly align with the goals and objectives of the Center delineated in the NWFSC Strategic Plan.

B. Do the Center's Programs provide information to address the priority needs of the Regional Offices, other NOAA managers, Fishery Management Councils, Fisheries Management Commissions, and other stakeholders that require economic and human dimensions -related information to achieve their mission?

It is clear that the research being performed by the Center's Economic/Sociocultural Program is meeting many of their regional stakeholder needs. Stakeholder representatives from the North Pacific Management Council, the Northwest Regional Office, the SSC, WA Sea Grant, the Groundfish Management Team, and the WA Department of Fish and Wildlife provided ample testimony that the Economic/Sociocultural Program at the NWFSC have been a tremendous asset in meeting the needs of stakeholders. Examples include the considerable amount of time and effort devoted to supporting the Groundfish Catch Review, use of the IO-PAC model to inform the biennial groundfish specifications, input into the CA Current IEA, the work on fishing communities and social indicators, and the efficiencies created through the development of the FishEye Tool. At the same time, however, there may be room for improvement through more integration on management planning teams, and through improved communication and integrated planning with stakeholders (particularly for the Human Dimensions team).

This has both advantages and disadvantages. Additional exposure to emerging management issues and improved communication between stakeholders would create stronger links between the Program and stakeholders. While the ESSR program is now well integrated into the management process, through the catch share program, the HD team has no direct links to the Council process. To the credit of the HD team, this detachment has been recognized and efforts have been made to stay abreast of emerging management issues (e.g., the HD team lead is a member of the SSC). In at least one case, this interaction also seems to have triggered new research that was used to inform management needs. Nonetheless, the level of participation at management meetings takes time away from research activities.

Another question of interest is the mix of research versus management-oriented activities across members of the Economic/Sociocultural Program. The ESSR staff are primarily focused on providing management-related stakeholder support associated with the EDC data and the catch share program. While members of the ESSR program seemed to be fully committed to addressing as many stakeholder needs as possible, this has the detrimental effect of reducing the amount of time available to pursue original research which in turn feeds back into the management process. The importance of time for professional development cannot be understated. Having the time to improve the knowledge base, foster academic collaborations, and publish in scholarly journals is imperative to keeping up-to-date and providing the best available science. Additionally, promotion potential is evaluated, in part, through the publishing of original research. This puts the ESSR at a distinct disadvantage to the HD team, whose

members appear to have very little, if any, direct management responsibilities at this time. As a result, the HD team has considerably more time to pursue original research which is reflected in the list of publications provided to the Review Panel. While this sentiment was not expressed by any of the staff during the review, it is likely an issue that warrants further attention.

C. Do the Center's Programs have a strategic research agenda that anticipates evolving and long-term economic and sociocultural science needs including research to support adapting to climate change and implementation of ecosystem-based fishery management?

As mentioned above, the NWFSC Annual Guidance Memorandum Fiscal Year 2017 indicates that ecosystem science will guide the revision to the current strategic plan. The Guidance Memorandum indicates that the Center will pursue an integrated approach in the delivery of information and services to stakeholders “that incorporates the entire ecosystem, including **humans**, into resource management decisions, responds to a changing marine climate, and is guided by an adaptive management approach.”

The Economic/Sociocultural Program also recognizes that stakeholder needs and expectations are changing due to climate change and the shift to ecosystem-based management. Research to inform these emerging needs is underway at the NWFSC. Examples include the work on developing community-level indices of vulnerability and community-level connections to fishing which were included in the CA Current Integrated Ecosystem Assessment and in the WA state marine spatial plan. Additional research activities contributing to EBFM at the NWFSC include developing integrated models to inform cost effective selection of salmon habitat restoration projects and new collaborative efforts supported by a grant from the National Science Foundation to create a coupled ecological-economic simulation model of West Coast fisheries. While this work appears to be high level, extremely informative research, because the Program does not have an Economic/Sociocultural Strategic Science Plan of its own, it is unclear whether the Program is positioned properly to be able to meet these emerging needs (e.g., Will this require additional training for some staff or adjustments in capacity somehow to position the Program to be able to meet these new demands?)

Recommendations:

- Development of an Economic/Sociocultural Strategic Plan would clearly help clarify, build, and strengthen connections with the RO, Headquarters, the Council, NGO's, the Ecosystem Assessment team, and, most importantly, between the two Divisions at the NWFSC where the economists and non-economist social-scientists reside (Conservation Biology Division and the Fishery Resource Analysis and Monitoring Division). This planning effort would benefit from collaborative input from all stakeholders and would ultimately help the Program position itself to more effectively meet the needs of those stakeholders and the shift towards ecosystem based management.

- A reassessment of the mix of management-oriented versus research activities for members of the Economic/Sociocultural Program is warranted. This should also entail ensuring effective communication and understanding of assigned responsibilities in work plans and how those duties and responsibilities relate to professional growth and promotion expectations within the Center.
- Consider developing a formal or informal 3-5 year planning document or “memorandum of understanding” between the Council and the Economic/Sociocultural Program to lay out major management-driven research needs and to identify the scope of the management support that the Center can realistically be expected to provide.

2. *A. Are the Center’s economic and sociocultural programs appropriately integrated with each other and with other science activities within the Center?*

Economists and social scientists at the Center are members of the Economic Social Science Research Program (ESSR) in the Fishery Resource Analysis and Monitoring Division and the Human Dimensions (HD) team within the Ecosystem Science Program in the Conservation Biology Division. Although the ESSR and HD economists and social scientists are housed in two different divisions, there is evidence of integration of research and collaboration between the groups (e.g., recent vessel buyback work). The two groups also appear to be somewhat integrated with other units at the Center, particularly the work the HD team is conducting on Ecosystem-based Management, which is being done jointly with other members of the Conservation Biology Division.

There are potential advantages and disadvantages of being housed in two separate divisions. The ESSR Program is the primary link between the Center’s economists and its management-driven stakeholders. Therefore, the HD team is provided relatively more time to conduct original research – although at the expense of their ESSR counterparts. The research that is generally conducted by the ESSR Program seems to be based on more management-oriented activities (applied research) while the HD team pursues more “theoretical” research. Additionally, having economic staff in two separate Divisions may ultimately spur more interdisciplinary research through regular exposure to other disciplines in both the FRAM and Conservation Biology.

There appears to be some level of regularly scheduled contact between the two teams as well as engagement with other appropriate Divisions at the Center. Given that there is relatively new leadership in both the ESSR and the HD teams as well as at that Center Directorate level, this may provide a unique opportunity to implement mechanisms that encourage more interdisciplinary research at the Center.

B. Are research efforts integrated, where relevant, with efforts at the regional offices and headquarters?

The Regional Office (RO) currently employs one economist who conducts all of the direct regulatory support in the form of baseline assessments, analysis of management alternatives, and impact assessments of management actions initiated by NMFS and the PFMC. The RO economist is also responsible for the certification of compliance under such actions. Therefore, the Economic/Sociocultural Program at the Center does not employ any direct regulatory management support to the RO. In terms of integration with headquarters, there is some reliance on products and services produced by headquarters – where staff have provided input (e.g., recreational fishing expenditure data), but it's not apparent whether collaborative research is being undertaken with headquarters.

The Economic/Sociocultural Program at the Center is clearly reliant on headquarters funding to support data collection and research, however. Since there is no base funding at the Center for research, virtually all research is supported by headquarter funding. This is clearly a problem because the year-to-year cycle of these funds often limits the duration of research activities and hence the ability to conduct longitudinal studies. Given that viability of the research program is so closely tied to the budgetary success of headquarters and the ability of the Economic/Sociocultural Program at the Center to win these resources, more diversity in the Program's budget portfolio should be sought. Currently, there seems to be minimal reliance on grant resources or outside contracts to support research projects (a few exceptions are cooperative research conducted with UW studying the potential impacts of IFQ programs on shorebased processors, Voices from the West Coast Preserve America Initiative Grant, and the dynamic adaptation climate change work funded by the NSF). Of course, this is not an easy task and will take time to build this type of funding stream, but procurement of external research funds should be considered given the continued likely uncertainty of obtaining headquarters funding.

Recommendations:

- Consideration should be given to enhancing integrated research projects between the ESSR and the HD team as well as integrated projects with other programs and teams within the Center through offering incentives such as the prioritization of integrated projects. At a minimum, provide 'soft' incentives (food, beverages) along with a forum for presenting "speed" talks (e.g., 5 minute overviews of active or potential research) or other informal methods to introduce ideas and foster collaboration.
- Consider further development of cooperative agreements with non-federal organizations to collect data and conduct research that is relevant to the Economic/Sociocultural Program. Centers in other regions have successfully developed cooperative agreements between NMFS and regional organizations (mostly Universities) where researchers jointly identify a relevant research topic that is usually

funded exclusively by NMFS, but sometimes with both partner and NMFS dollars. There are many cost savings and other efficiencies that cooperative agreements provide such as low administration costs, substantially reduced overhead rates, and projects are funded under grants and not contracts which may reduce the need for Paperwork Reduction Act approval. Sea Grant funding is another avenue that has been utilized to a degree but there are clear opportunities for improvement.

3. *A. Is the status of data collection related to commercial fisheries, recreational fisheries, fishing participants, and communities adequate to fulfill economic and sociocultural science research needs?*

A large segment of the commercial fleet, first receivers, and processors are now required to fill out cost and earnings surveys as a result of the transition to the West Coast Groundfish Trawl Catch Share Program in 2011. This Economic Data Collection (EDC) Program forms the basis of the commercial fishing data collected by the ESSR program. This EDC program has resulted in a robust and diverse time series of commercial fisheries economic data that rivals any data collection program in the country. The data from the EDC program have been essential for research and assessments associated with the Catch Share Program, for developing economic and vulnerability performance indicators, and for extensive analysis of the progress of the Catch Share Program towards meeting its goals and objectives in the MSA-mandated 5-year review.

The Economics/Sociocultural Program has broad coverage of recreational catch and effort data through the RecFIN Program and WA and OR sampling programs. Angler expenditure data are collected through a headquarter's program and data used to estimate recreational demand are collected by the Economics/Sociocultural Program on an as needed basis. Charter boat cost/earnings surveys have also been carried out by the Center. These recreational data collection efforts can be hindered by OMB requirements and are reliant on the ability to compete and win headquarters funding. Nonetheless, the data collected to date are clearly adequate to fulfill management needs.

B. Has the Center developed strategies to obtain, manage, and make data accessible?

This was largely answered under question 2.B. above and the subsequent recommendations. The Center also indicated that they are fully complying with the NOAA-wide PARR process to make data accessible to the Public and interested non-federal researchers. Nonetheless, some of the data collected by the staff are confidential which presents unique challenges when making the data accessible to non-federal researchers and the Public. As an example, staff at the Review indicated that QAQC checks to address confidentiality concerns for data shown in the annual catch share report were not sufficient when the same data were incorporated into the FISHEyE tool – where many more potential combinations of data requests could be queried. This problem

in not unique to the FISHEye tool and presents considerable challenges when making data publicly available at a level of aggregation that does not violate confidentiality. Sharing federally collected data with university and other researchers is often hindered by the aforementioned confidentiality concern.

The FISHEyE tool also provides an opportunity to release staff from the sometimes onerous task of responding to repetitive data requests and likely will result in elimination of some of the baseline statistics provided in the annual Groundfish Catch Share Reports.

C. Are there barriers that impede data collection and access to data held by other entities (e.g. states, commissions, other federal agencies, etc.) that could be used to support the Center research, and how can these barriers be overcome?

The major barriers to primary data collection by the Economics/Sociocultural Program are resource constraints and the Paperwork Reduction Act (PRA) approval process. Numerous staff indicated that obtaining PRA approval often impeded the progress of research efforts. One staff member stated that because longer-term funding options are generally not available (i.e., headquarters funds cover one year), projects that require PRA approval could not be completed within the one-year time cycle required under headquarters funding.

Overcoming resource constraints will be equally challenging. The recommendation provided above for Q.2. is applicable here. Enhancing/developing cooperative agreements with non-federal organizations, including Sea Grant, may provide an avenue to overcome some of these constraints. As was mentioned at the Review, these types of partnerships also sometimes support student research and provide a feeder system for future staff recruitment.

Recommendations:

- Continue to add to and enhance the FISHEyE tool (e.g., IO-PAC results, etc.) to reduce the demand for data requests and redundant reporting requirements (ensuring confidentiality concerns are addressed).
- As indicated by staff in the Review, efforts should be made to explore “blanket” OMB cleared questions with headquarters to improve the OMB clearance process.
- Staff and the Center as a whole should explore fostering more partnerships through cooperatives and with Sea Grant as a means of leveraging resources for data collection and analysis as well as providing a pathway to future capacity building within NMFS.
- The Economics/Sociocultural Program should consider developing a strategically-driven data collection approach that establishes the highest program-wide data needs.

4. *A. Are the Centers using appropriate models and research tools to analyze data and*

provide management advice?

The suite of models/tools developed by the staff for research and management support are impressive. Most were designed to evaluate and predict the descriptive effects of catch share programs on various outcomes using qualitative (the voices research) and quantitative approaches such as the fleet restructuring research, the assessment of market functionality, the vulnerability indices, research that predicted the effect of catch shares on risk-taking and fishing safety, the Pacific groundfish fishery social study, the industry buy-back study, as well as many more. Decision support tools were also designed/used to explicitly inform catch share management as well such as FISHEyE and the IO-PAC model. Much of this research and the decision support tools that were designed by the staff played a critical role in describing the effects of the catch share program for the 5-year review. The balance of models/tools produced by the staff in response to implementation of the catch share program in 2011 is impressive. HD staff have also contributed extensively to the development of an IEA approach for the West Coast. The vulnerability and social wellbeing indices and diversification research on fishing vessels and ports have already been incorporated into the IEA approach. Additionally, work is underway to incorporate community recreational dependence and community vulnerability to ocean acidification in the IEA approach. Two additional ongoing projects that are contributing to EBFM are the work on the economics of salmon and steelhead conservation and habitat restoration as well as the research on the dynamics of adaption to climate-driven variability in California current fisheries and fishing communities.

B. Are they developing and using methods and models that contribute to the evaluation and exploration of ecosystem based fisheries management and other emerging issues?

This is addressed above under 4.A. The HD team and a couple of contributing members of the ESSR program at the Center are developing coupled models in concert with others in the Conservation Biology Department (see above and the coupled work completed between Atlantis and IO-PAC). These interdisciplinary models seem to be highly relevant to the issues in the CA Current Ecosystem.

While the HD team is actively pursuing ecosystem and climate change science, there seemed to be general consensus that resources (both fiscal and human) are not sufficient for meeting these emerging needs.

C. Are their barriers to adapting to address emerging issues?

The primary barrier is the lack of a clear legislative mandate for EBFM. However, NMFS has identified EBFM as a National priority and is actively engaged in supporting the development of tools used in ecosystem-based and climate change research.

Recommendations:

- During the development of an Economic and Sociocultural Program Strategic Plan an assessment should be undertaken to assess the expertise and capacity of the staff necessary to provide ecosystem-based research.

5. *A. Is the Center's social and economic information being used in living marine resource management advice?*

This was addressed under Q.1. and Q.4. Virtually all of the ESSR Program's work is used to support management activities as well as some of the research and products produced by the HD team.

B. Are the existing mechanisms sufficient for ensuring this information is used appropriately?

Based on the comments made by staff, Council representatives, and SSC members at the Review, there's obviously a considerable amount of interaction and communication about the products and services provided by the staff for management-related activities. The level of interaction seems to be sufficient to ensure that the information is used appropriately. The staff also seem to be fully invested in ensuring that the information provided to stakeholders is accurate and used appropriately.

C. Are there barriers to the uptake of science provided by the Center and what steps can be taken to overcome these?

The demand by the Council and the SSC for economic and social information seems to exceed the supply. Thus, from a management perspective there doesn't appear to be any barriers preventing the incorporation of social science data into management activities. However, there may be room to improve the interaction between the staff and the Council to be more effective in communicating the research that the staff is undertaking and the data that are available.

Recommendations:

- Steps should be taken to facilitate a more interactive process with the Council to improve efficiencies and obtain feedback on ongoing research. This may be through formal memorandums of understanding or through informal arrangements such as lunches or general discussion meetings to improve understanding and lines of communication.

6. *A. Is the Center providing the Best Available Science?*

Currently, the answer is undoubtedly yes. However, in considering my response I'm wondering how the minimal resources provided for travel to professional conferences and for training will impact the ability of the Program over the long term. In addition, the annual reporting demands of the catch share program are already significant and will likely grow. Many members of the ESSR Program spend a large portion of their time preparing reports and responding to stakeholder requests for catch share statistics. The increased reporting demand of the catch share program may limit the future ability of some ESSR Program staff to attend professional conferences or even to participate in cutting edge research projects – which is ultimately required in order to incorporate best available science into one's work.

B. Are the Center economic and sociocultural research products adequately peer-reviewed?

The Program's staff follow standard NMFS procedures for peer-review.

C. Are the appropriate processes being used to ensure that scientific products meet professional standards and are of high caliber?

Previous response seems applicable here as well.

Recommendations:

- The Economic/Sociocultural Program needs to prioritize conference participation across the two teams of economists and non-economist social scientists. Particular attention should be paid to ensure that members of the ESSR Program have opportunities for training and to attend professional conferences to ensure that their skill set remains current.

7. *A. Does the Center's program use the best tools to appropriately communicate research results to various managers, partners, stakeholders and the public?*

A tool referenced during the Review for communicating research results was the ESSR Program and HD Team websites. This is likely the first place many stakeholders will seek to obtain information about the Program's activities. Towards this end, the EDC FISHEyE tool on the ESSR page is a wonderful tool for stakeholders. However, there isn't much else provided on the ESSR website. No specific information is provided about ongoing or recently completed studies by members of the ESSR. Current areas of focus are shown, but these descriptions are very concise. There's really no way to determine from the website what the type of work the group undertakes. The site seems to be set up for the benefit of groundfish trawlers that are required to complete EDC forms each year. Seems as though the ESSR site could use some updating.

The Human Dimensions Page provides a little more information about the research undertaken by the group and provides links to actual research being conducted by the

group. However, it is hard to tell if many of the studies that are listed are still ongoing or have been completed. The dates provided for some of the studies seem to imply that the study should be complete, but no link to a completed report or publication is provided – just a description about the study.

Staff at the Review also indicated a need for some level of formal communications training and there doesn't appear to be a strong Economics/Sociocultural communication strategy beyond the normal publication process. It was also clear that the Program staff are not generally familiar with overall Communications Team Strategy at the Center.

Recommendation

- The Economic/Sociocultural Program should review and update the content of its website to ensure that it conveys the most up-to-date and relevant information about the Program's activities for a wide range of potential stakeholders.
- The Economic/Sociocultural Program should work with the Communications Team at the Center to develop a targeted strategy to inform stakeholders of important research and products.

Panel Member #3: Response to Review Questions - 2017 Economics & Human Dimensions Science Program Review Northwest Fisheries Science Center

Introduction

The Economics and Human Dimensions Science Programs at the Northwest Fisheries Science Center (NWFSC) have clearly done an impressive job of producing high quality social science while facing numerous constraints in terms of funding availability, funding predictability, and a very small staff in relation to research needs. The program staff and directors should be commended on their success in producing management relevant research with very limited resources. This report will provide an assessment of the quality and relevance of the science program towards meeting management needs in the region, following the overarching questions provided to the review panel for the program review. Where relevant, recommendations for program improvement (relevant to the overarching questions) and directions for moving forward will also be provided.

1) Goals and Objectives

a) Does the Center/ST have clear goals and objectives for an economic and sociocultural science program?

The social science program goals for NMFS are clearly articulated in the document provided to the panel: *Vision and Strategy: Supporting NOAA's Mission with Social Science* (2015). These include:

Goal 1: NOAA's impact on society is defined and measured

- Quantify and promote the value and impact of NOAA's products and services in serving communities and meeting its mandates.
- Strengthen the impact of investment by valuing improvements in NOAA products and services.

Goal 2: NOAA's products and services strengthen societal decision-making.

- Incorporate social science research in management decisions to increase community resilience.
- Use social science methods to assess and communicate risk while reducing vulnerability to changing environmental conditions.
- Consistently collect social science data and information to strengthen the implementation of ecosystem-based management.

The activities undertaken by the NWFSC economics and human dimensions programs directly address these goals and objectives. However, the Center itself does not appear to clearly articulate the goals or objectives that it has for its own regional economic and sociocultural science program. Clearer articulation of these goals might assist in the integration of NWFSC socioeconomic research with biophysical and other research activities, provide clearer connections for linkages across divisions, and allow for more carefully designed interdisciplinary research activities.

b) Do the Center's/ST's Programs provide information to address the priority needs of the Regional Offices, other NOAA managers, Fishery Management Councils, Fisheries Management Commissions, and other stakeholders that require economic and human dimensions -related information to achieve their mission?

This is an area in which the NWFSC socioeconomics program clearly excels. The Center has generated data, models, and analyses that feed directly into ongoing fisheries management, as well as assessing management policies such as the implementation of catch shares. The data collected by FRAM on groundfish in relation to the catch shares program, and the recent catch shares program review, were tremendously helpful to a number of managers including the regional office, the GMT, and the Fishery Management Council. The ongoing data collection efforts are impressive and highly valuable both in evaluating the status of the fishery, as well as for evaluating the outcomes of management actions.

The Council and SSC representatives cited the value of the IO-PAC model and FISHEyE for decision-making and EIS purposes, that the community profiles produced by the Center are repeatedly used, and that the research on the effects of the catch share program on risk taking behavior have been highly relevant to Council work. A GMT representative also emphasized the value of the Center's work in going beyond an analysis of catch numbers to truly understand the value of catch, not only to fishermen, but also to processors and the broader community.

Center research has also been very valuable to the Puget Sound Partnership, and the Center's interaction in this initiative has brought additional credibility to the partnership process. The Center's engagement with tribal communities has also been seen as valuable. The fact that Jerry Leonard and Dan Holland hold positions on management committees (the GMT and the SSC) was also cited repeatedly by managers as useful in facilitating interactions between the Center and the management community and is seen as highly valuable by managers on those management bodies.

- c) *Do the Center's/ST's Programs have a strategic research agenda that anticipates evolving and long-term economic and sociocultural science needs including research to support adapting to climate change and implementation of ecosystem-based fishery management?*

While the Center's ongoing research has been highly relevant to current mandates and management needs, and seems to be responsive to pressing management issues (such as catch shares), the economic and human dimensions programs lack a strategic research agenda to address evolving and long term economic and sociocultural science needs such as climate adaptation and implementation of ecosystem-based fishery management. Much time and attention has been devoted to catch shares implementation and evaluation (and excellent data is available to study this topic). While it is important to continue to gather this data, the Economics program under FRAM should consider whether this should continue to be its primary (and almost sole) research focus moving forward, particularly given that future funding may be less available to study catch shares. Aquaculture was cited as likely to be an emerging issue that will need more attention moving forward, but there is minimal data collected on this topic currently.

Many research activities under the Human Dimensions program are directly relevant to emerging issues such as climate change and ecosystem-based management. Specific examples include research regarding fishing community vulnerability, human well-being research relating to the California Current IEA, and NSF-funded collaborative research relating to climate impacts on West Coast fisheries. The program should continue to pursue these areas of research in the future, with a specific research focus on a Council identified

need to better understand what might facilitate (or hinder) the development of “robust communities.”

Developing a strategic research agenda would help to guide future research priorities, but it must be acknowledged that generating a research agenda for the future is challenging in the current context of extreme uncertainty about funding and resource availability. A more stable funding environment would facilitate the Center’s ability to develop a forward-looking research agenda. The current funding context requires that Center staff take a more opportunistic approach to supporting their research agenda, seeking out yearly grants from the Office of Science and Technology (with no guarantee of funding availability and sometimes shifting funding priorities), as well as other external grant sources through collaborations with partners, some funds from the IEA and Catch Shares funding, or other internal NOAA grant opportunities such as the PAIG. Given this highly resource constrained context, and the fact that they operate under considerable uncertainty regarding funding timing and availability, the Center’s socioeconomics program has done an excellent job in addressing important ongoing and emerging management needs.

Recommendations:

- The economics program under FRAM and the Human Dimensions program under CB would benefit from clear articulation of their research goals and objectives, and clear integration of these goals and objectives into NWFSC overall goals and objectives. Opportunities for divisions to collaborate on overlapping objectives should be explored.
- Center leadership should consider how socioeconomic activities and objectives relate to other biophysical research goals and objectives at NWFSC and facilitate opportunities for linkages between research teams to facilitate research integration or interdisciplinary opportunities where useful.
- Economics and Human Dimensions program staff should continue to serve on management committees (such as the GMT, SSC, or others) to ensure effective dissemination of research results to managers and assist in communication and clarification of research outcomes.
- The social and economics research programs would benefit from a strategic visioning exercise that articulates research priorities to address evolving and long-term economic and sociocultural science needs relating to climate adaptation and ecosystem-based fishery management. The programs should do this in close consultation with Center leadership and the office of Science and Technology to ensure that these research priorities can, to the extent possible, be funded by S&T grants or other resources that may be available, and to try obtain some minimum funding commitment to ensure that emerging research priorities can be reliably and successfully pursued.
- The center should continue to proactively pursue research partnerships (and associated funding and collaborations), such as the NSF-funded research programs, that provide additional resources for research and longer-term research commitments to address emerging issues such as climate change and ecosystem based management.

2) Integration and Linkages

- a) *Are the Center’s economic and sociocultural programs appropriately integrated with each other and with other science activities within the Center?*

The housing of the economics and sociocultural programs at NWFSC in two different divisions (FRAM and CB) creates a challenge to integration. Research priorities are also directed in two very different directions, with the Economics program under FRAM oriented primarily towards collecting and analyzing data relating to groundfish and the catch share program, and the Human Dimensions program under CB more broadly oriented towards ecosystem and socio-cultural research directions. Susanne Russel's ongoing surveys of groundfish fishermen has provided one important link between the two programs. The programs have already begun to link the data collected through the social study and the economic data collection in the Catch Share Five Year Review. Opportunities exist (and are being pursued) to integrate these two sources of data in future analysis and potentially provide better information on human behavior and motivations to inform economic models. Potential also exists to make use of the oral histories collected through the Voices of the Fisheries project to provide social and historical contextual analysis for the groundfish fishery and outcomes of catch share program implementation. Another potential area of linkage would be to integrate findings from Melissa Poe's work on the cultural importance of shellfish with Leif Anderson's study on the effects of closures on shellfish harvests. Putting these qualitative studies together with the economic studies could help to better inform behavioral drivers, for example moving Anderson's work beyond "willingness to pay" to understanding motivations and constraints for stated and observed behavior.

The bioeconomic modeling that is being undertaken for groundfish is a good example of integration with other science center activities, as is the ongoing social indicator development work being conducted as part of the California Current Integrated Ecosystem Assessment. Fonner's cost-benefit analysis research on salmon habitat restoration also provides a strong example of inter-disciplinary collaboration between different programs within the Center.

b) Are research efforts integrated, where relevant, with efforts at the regional offices and headquarters?

Research efforts appear to address management and research priorities of the regional office for the most part. Greater effort could be devoted to determining ecosystem based management priorities and the emerging economic and human dimensions needs of fishery ecosystem plans. Research at the center tends to go where the data is available, which for this region is groundfish. This has produced extensive center research available for groundfish, but other species are covered only minimally.

Efforts seem to be well integrated with efforts at NOAA headquarters. This is facilitated by the fact that an ongoing source of discretionary funding comes from headquarters S&T office, and thus funds research activities that are considered a headquarters priority. The NWFSC has also worked to address nation-wide social and economic initiatives under NFMS, including the development of fishing community profiles, community vulnerability indexes, integrated ecosystem assessments, and bioeconomic models.

Recommendations:

- While the housing of social and economics research activities within two different programs does, to some degree present a barrier to integration, it also allows for each program to appropriately integrate economics and social sciences into its respective mandate. The two programs should continue to pursue linkages where applicable. Specific examples of clear areas to pursue greater integration include integrating the social and economics survey results on groundfish, evaluating oral histories from VoF to provide more historical context to economic studies, and integrating data from human well-being work on shellfish into economic models to better understand behavioral drivers. However, consolidating the two programs is not recommended, as their separation allows them the independence to clearly address different management mandates and priorities.
- The Center should communicate with the Regional Office to identify priority economic and human dimension research needs (perhaps in conjunction with strategic visioning recommended previously) to determine what research and data collection needs might be better addressed and to help ensure that the Center's economic research efforts are not too narrowly focused on groundfish due primarily to data availability.
- The Center and headquarters should provide incentives (in the form of stated research priorities and/or associated funding) to encourage collaboration between economists and non-economic social scientists, as well as collaboration between socio-economics research groups and biophysical research groups within the Center.

3) Data Collection

- a) *Is the status of data collection related to commercial fisheries, recreational fisheries, fishing participants, and communities adequate to fulfill economic and sociocultural science research needs?*

Commercial fisheries: Data collection related to groundfish is extremely impressive. This has allowed for in-depth economic analyses of groundfish, the development of IO-PAC and the FISHEyE visualization tool, and a thorough evaluation of the outcomes associated with the 5-year review of the catch shares program for groundfish. Data collected for other commercial fisheries remains somewhat limited. Many fisheries relevant to the West Coast are state fisheries, which are outside of the NWFSC's purview, and the SWFSC focuses on highly migratory species and coastal pelagic species. Data collection related to salmon is challenging given the multi-jurisdictional nature of the fishery, but this is one area where data collection could be improved. Currently only one staff member is working on salmon fisheries, while multiple permanent and contract staff focus primarily (or completely) on groundfish. Aquaculture is another area where very little research or data collection is taking place, although this has been identified as an emerging priority by the Council and NOAA leadership. As catch shares become a less critical issue (given that the program is now well-established and the status of groundfish fisheries has improved), and the likelihood that less funding will be associated with collecting and analyzing data on the catch shares program in the future, the program might consider an increased focus on aquaculture given the large gap in data available on this topic.

Recreational fisheries: Recreational data collection is limited, primarily due to limited staff (one FTE and one contract staff working half time on recreational fishing). This is clearly

an area where the Center could use extra capacity, but there seems to be less interest in this area from regional managers.

Fishing participants: The social survey of groundfish fishermen is a valuable source of non-economics social science data that has tremendous potential to inform policy decisions. It would be helpful to see this kind of survey continued and extended to additional fisheries. The West Coast fishery survey funded under the NSF CHNS grant also has the potential to serve as a useful source of information on participants in diverse fisheries, as well as fishing reliance and motivation.

Communities: The community profiles and community vulnerability indices provide a useful source of data on communities that Council staff say they cite repeatedly. The reliance on secondary data sources for community data collection constrains the Center's ability to look more in-depth at fishing-dependent communities or the effects of management policies on different community groups (who may face different degrees of vulnerability within a geographic area). The fact that these vulnerability indices only focus on commercial fisheries is also a significant constraint on their ability to inform assessments of different community groups engaged in fishing, particularly tribal communities and other under-represented minority groups. The Center has shown interest and is moving towards conceptual models to generate a more nuanced understanding of community and human well-being which will be useful to inform policy. This research direction should continue to be pursued in the future.

b) Has the Center/ST developed strategies to obtain, manage, and make data accessible?

The center has clear data management policies and has worked to make data accessible to managers and the public. One of the strongest examples of this is the FISHEyE tool, which managers cited as highly useful, and which also saves staff time in responding to individual data requests. The fishing community profiles are also publically available, and the fishing community vulnerability visualization tool is available online. The groundfish social survey data is not yet publically available, but is likely to generate considerable interest once it is available. Linking data from the social survey into the FISHEyE tool is one potential way to make this data more easily accessible to the broader public.

One challenge is the 2 year time delay in making groundfish data available to managers. While it is impossible to make the complete dataset available in a more timely way given data collection constraints, it might be useful to make a sub-set of data available to managers more quickly, and then update the data once the data collection is completed, for more timely management-decision-making.

c) Are there barriers that impede data collection and access to data held by other entities (e.g. states, commissions, other federal agencies, etc.) that could be used to support the Center/ST's research, and how can these barriers be overcome?

There seem to be minor bureaucratic barriers to obtaining State fishery data for the West Coast Region, but the Center appears to have done a good job in meeting the required bureaucratic demands when they need the data and has data sharing agreements in place for certain species. Obtaining HMS and CPS data from SWFSC appears to have been a challenge in the past and it should not be, as data sharing between two NOAA Science Centers should be seamless. It is worth pursuing the collection of CPS and HMS data for

conducting multi-fishery analyses, particularly to improve the IO-PAC model, and to establish processes to facilitate the smooth transfer of data between the two centers for more holistic ecosystem analyses. Obtaining data from Alaska also appears to be challenging due to state regulations, but the center has managed to overcome this in some cases when the research being conducted is relevant to Alaska fishery management needs.

Recommendations:

- Pursue opportunities to expand commercial data collection beyond the groundfish fishery, particularly commercial data relating to salmon and aquaculture. Work with the Council to determine priority data needs for the future.
- Explore ways to make groundfish data available to managers more quickly, perhaps using a sub-set of data and generating estimates based on available data, which is then updated after the complete data set is available.
- If additional staff capacity becomes available, expand data collection efforts related to recreational fisheries.
- As the fishermen social surveys on groundfish and California Current fisheries are analyzed, consider what types of information non-economic social data would be useful to collect on an ongoing basis (to analyze change over time), or to expand to different fisheries. Attain multi-year OMB approval for these surveys to facilitate survey implementation in the future.
- Incorporate data from the groundfish social survey into the FISHEyE tool.
- Continue to move forward in community data collection efforts to generate more nuanced indices for community vulnerability and human well-being.

4) Models and Research Tools

a) Are the Centers/ST using appropriate models and research tools to analyze data and provide management advice?

The IO-PAC model has been cited by managers as a useful model for management decision-making. The FISHEyE data visualization tool has also been cited as extremely useful for better understanding data collected on groundfish. The current initiative to use the BLAST model for recreational groundfish may not be appropriate, given the significant time and effort that has been (and will continue to be) involved in developing and maintaining the model once it is completed. The multi-species nature of the groundfish fishery also makes the BLAST model perhaps inappropriate for West Coast management issues and needs. The research going into cost-effectiveness of salmon habitat restoration also has potential to be extremely useful for management decision-making in terms of funding allocations, although it is still in the development stage.

b) Are they developing and using methods and models that contribute to the evaluation and exploration of ecosystem based fisheries management and other emerging issues?

The program has been proactive in developing methods and models to address emerging issues, and fortunately the IEA has provided structure and some funding for ecosystem-based research. Karma Norman's work on community vulnerability is important in the context of climate change and changing management scenarios, and the Social Indicators for Marine Management (SWIMM) work on developing indicators of human well-being is helping to inform a current conceptual gap in informing ecosystem-based management

(both regionally and nationally) and is helping to better inform the development of integrated ecosystem assessments. Lisa Pfeiffer's work on the effects of catch shares on risk-taking behavior is also very useful in understanding how management policies influence human decision-making and safety. The multi-species inter-disciplinary research currently underway on climate-driven variability in CA Current fisheries and fishing communities also has the potential to be ground-breaking in addressing the complex and emerging outcomes of climate change.

c) *Are there barriers to adapting to address emerging issues?*

The primary barrier to addressing emerging issues is the lack of funding availability and funding uncertainty. As mentioned previously, it is difficult to plan strategically to address emerging issues when funding is uncertain (in both availability and timing) and must be pursued opportunistically. Also, while ecosystem-based management is a stated priority, current management mandates do not dictate policies in this direction, and so there is not yet a clear mandate for immediate or ongoing research in this direction. These are also new research directions and many methods are still under development. The NWFSC has been innovative in working to develop new approaches to addressing climate impacts and conducting integrated ecosystem-based research approaches.

Recommendations:

- Dedicated funding and incentives (either from the Center of S&T) to addressing emerging issues such as climate impacts or ecosystem based management would help facilitate research on these topics.
- Consider whether continued investment in a bioeconomic model for recreational salmon and groundfish is worth pursuing given resource constraints and perhaps lack of appropriateness of the current modeling approach.
- Continue to pursue the development of human well-being indicators and more nuanced indicators for community vulnerability to inform ecosystem based management and address emerging issues due to climate change.

5) Use of Information

a) *Is the Center's/ST's social and economic information being used in living marine resource management advice?*

Managers cited the usefulness of Center research and models for conducting EIAs, for understanding the state of the groundfish fishery and catch shares outcomes, for understanding drivers of shellfish harvesting during health warnings, and in informing the Puget Sound recovery program. Swinomish tribal communities have integrated the outcomes of Melissa Poe's work on assessing human well-being and the potential effects of ocean acidification into community planning.

b) *Are the existing mechanisms sufficient for ensuring this information is used appropriately?*

Having Jerry Leonard and Dan Holland on fishery management councils has been cited as one of the most effective ways of making sure information from the Center is disseminated and understood by managers. The FISHEyE tool has also been very useful for management purposes. Managers stated that they have access to and make use of community profile

data and community vulnerability data. Some studies seem to have been disseminated less effectively, such as the industry-funded buy-back analysis.

One significant challenge is that the groundfish fishery economic data is not available until approximately two years after the fact. This is due primarily to unavoidable delays (fishermen must first complete their own books before providing data, then data must be cleaned and analyzed). See previous recommendation regarding pursuing ways to make a sub-set of this data, or data estimates, available in a more timely manner.

- c) *Are there barriers to the uptake of science provided by the Center and what steps can be taken to overcome these?*

One barrier is that managers expressed that they do not have time to read detailed reports. The presence of NWFSC staff on management bodies helps to communicate the important take-aways from the research efforts directly to managers. The development of infographics, which highlight key data take-aways, has also been useful and could be put to greater use in research reports and communication pieces.

Recommendations:

- Center staff should continue to participate as members of management bodies (such as the SSC and GMT) in order to disseminate and interpret Center research outcomes to inform management.
- Continue to develop infographics and other tools for visualizing key data outcomes without having to read lengthy reports.
- Incorporate non-economic data on groundfish (from the social survey) into FISHEyE for easier dissemination of information.

6) Best Available Science

- a) *Is the Center providing the Best Available Science?*

The Center appears to be providing the Best Available Science given data and funding constraints. More funding and resources would help to make the good scientific work that they are providing even better. But the scientific work coming out of the economics and human dimensions programs at NWFSC is clearly of very high caliber.

- b) *Are the Center/ST's economic and sociocultural research products adequately peer-reviewed?*

The peer review system at NWFSC is adequate to ensure high quality research. The Center's internal tech memos and reports undergo multi-level peer review before publication. Center researchers have published their results in numerous peer-reviewed academic journals, and the appropriate institutional incentives exist to encourage researchers to continue to produce high-quality research that can be published in peer-reviewed journals. Time for peer review appears to differ tremendously between divisions within the Center. Publications produced by the Human Dimensions group (under CB) generally go through review in a way that is conducive to timely publication. Economic publications under FRAM take a much longer time to go through peer review, which may slow dissemination of research results, and may also serve as an obstacle to staff promotion. FRAM staff also face additional challenges of dealing with extensive primary data collection and management, which makes it more challenging to do data analysis and publish in peer reviewed journals, although their primary data collection is

necessary and highly relevant to management needs. The Human Dimensions program does less primary data collection, although the groundfish social survey has likely been a time-consuming effort in terms of data collection and effort.

- c) *Are the appropriate processes being used to ensure that scientific products meet professional standards and are of high caliber?*

The processes at the center encourage the development of high caliber scientific products. The center could take greater advantage of outside resources to stay up to date on the latest scientific methods and findings, in particular through enhanced interaction with nearby academics (professors and PhD students) at the University of Washington. Center staff have sponsored round-table discussions between Center staff and relevant UW professors and students and is working to increase these interactions in the future.

The Social Well-being Indicators for Marine Management (SWIMM) working group, sponsored in part by the Center, provides a good example of a way to expand the knowledge of Center staff and to explore new research domains by bringing in outside expertise, particularly in social science fields not well-covered by current Center staff (e.g. political science, geography, sociology). SWIMM was a particularly productive effort that broke new ground in developing indicators for human well-being relevant to the California Current IEA and resulted in 3 peer-reviewed journal articles in *Environmental Science and Policy* and in *Science*.

Recommendations:

- Investigate reasons for the slow peer review process within FRAM and determine if there are ways to streamline the process for more timely dissemination of research results.
- The Center should consider ways to ensure that staff commitments to collecting extensive primary data do not negatively affect promotion potential for these researchers.
- Continue to pursue collaborations with UW faculty and students to increase scientific capacity at the Center and encourage new scientific thinking and feedback on ideas.
- When possible, build on the SWIMM working group model to make use of outside expertise to help push research frontiers.

7) Communication

- a) *Does the Center's/ST's program use the best tools to appropriately communicate research results to various managers, partners, stakeholders and the public?*

The Center appears to be doing a good job of communicating research results to managers and policy-makers. The presence of Center staff on management bodies has greatly facilitated this process, as have direct presentations by Center staff. One challenge in this regard is that managers are primarily interested in research that is directly relevant to pressing management concerns. Other research regarding emerging issues such as climate change or ecosystem based management appears to receive less attention from managers, primarily due to manager interests and priorities, and limited time available to pursue non-pressing concerns.

The Center's communications team has worked actively with economics and human dimensions staff to disseminate research results to press outlets, publish summaries

on the Center website, and create infographics and other communications tools. One impressive example was the considerable press coverage given to Lisa Pfeiffer's piece on the effects of catch shares implementation on risk-taking behavior. The process of involving the Center's communication staff is triggered either by the acceptance of a publication, or by researchers reaching out to communications staff. The communication of results might be increased if economics and human dimensions research staff and directors more actively consider who the relevant audiences are for their research, and actively seek assistance in communicating research findings earlier in the process, particularly in the development of infographics and other presentation and communication tools. Staff training in communications might also assist this process.

It is not entirely clear that research results are reaching broader stakeholder groups, including fishermen and fishing communities (beyond some industry representative groups). It would be worthwhile to consider new ways of reaching these broader public constituencies, particularly groups who contribute data to data collection efforts. In particular, the incorporation of additional social indicators from the groundfish social survey into FISHEyE might make data more available and facilitate the communication of data to these harder-to-reach groups. Improving the Center website to be more user-friendly for the public would also help in reaching broader stakeholder audiences.

Recommendations:

- Researchers should consider the appropriate audience for research findings early in the research phase and should expand engagement of the Center communications staff in visualizing and disseminating research results.
- The Center should pursue additional outlets to disseminate research findings to broader constituencies beyond managers, particularly public stakeholder groups.
- Basic media and communications training for Center researchers would assist in expanding communication potential.
- Work with communications team during the Center website re-design to highlight the role of socio-economic work and the Center and make data more intuitively accessible to the general public.

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Summary Impressions of Presentations

The Center has two groups of economists/social scientists that interrelate well with each other. One group focuses more on long term applied research, and the other group focuses more on the short term needs of fisheries managers.

Since 1998, the Center's economic and human dimensions groups have grown from 1 full-time equivalents (FTE) to 10 FTEs and 11 contractors/non-federal associates.

Center staff is addressing a diverse range of issues including Input-Output Analysis, Catch Shares, Communities, Ecosystem and Climate Change Analysis, Protected Resource Economics, and Recreational Demand/Valuation.

Center research activities include nationally unique projects: vessel safety and effects of ocean acidification on the health and well-being of tribal communities.

Much of the research activity revolves around the support of the Pacific Council's groundfish fishery and in particular the Pacific Groundfish Trawl Rationalization Program. In recent years, the Center has developed four major databases: Community Profiles of West Coast Communities, Pacific Groundfish Social Survey, Cost Earnings of Catch Shares participants, and Voices of the Past.

In response to an emerging research area, a fifth database is under development, to support a project "The Dynamics of Adaptation to Climate Driven Variability in California Current Fisheries and Fishing Communities" a survey of 2800 fishery participants was undertaken to assess the determinants of participating in various fisheries. This survey has a remarkable response rate (50%) as do all the other recent data collection efforts. High response rates are indicative of proper planning, extensive outreach and pre-tests, and trust by the respondents.

Exemplary examples of outreach include:

"Fisheye" a public web based tool that allows the public to query aggregated cost-earnings data,

Infographics that in one page, capture all the key facets of particular groundfish sector, and

The Five Year Catch Share Review which among other things, shows annual estimates of the net benefits to the nation of the Catch Shares Program. A highly readable, understandable, and complete document.

Center economists and social scientists are doing cutting edge research on vessel safety and effects of ocean acidification.

They are also doing forward-thinking, collaborative research on:

How to integrate human aspects in ecosystem assessments,

How to characterize the social vulnerability of fishing communities to environmental change

How to prioritize habitat restoration decisions for endangered salmon,

How to assess the effects of environmental closures on recreational fisheries.

The Center's economists and social scientists are not afraid to take on controversial topics as evidenced by the Center's analysis of the industry funded vessel buyback program.

They have successfully competed in various Request for Proposal competitions.

Increases in base funding and FTE's would enhance the success of the Center as well as allow more analysis of collected data and more behavioral modeling.

Economists and social science staff are collaborating with others as evidenced by their IEA work and by the many publications that are co-authored by non-economists with the Center and outside the Center as well as by collaboration with Academia.

NWFSC is doing best available science.

All their publications undergo a rigorous internal review process.

Many of their publications appear in peer-review journals.

Staff keeps up to date through involvement in science workshops such as American Fisheries Society and International Institute for Fisheries Economics and Trade.

Some staff are associate editors for journals and staff are in leadership and planning positions such as planning the next IIFET program in Seattle.

Pacific Fishery Management Work products undergo review by the Council's highly renowned Science and Statistical Committee and the Council's general public process. This process includes industry, non-governmental organizations and a sprinkling of scientists providing public comment.

Staff, in many instances, undertake work in collaboration with the other Science Centers and HQs, either expanding or adapting models to the Northwest fisheries.

Council presentations and noted publications undergo a communications outreach strategy. The Center's Communications Group helps publicize research via websites, press releases, etc.

Center staff also present their research in scientific and fish management/ecosystem conferences.

The Center has developed a well-documented Input-Output model that supplanted a controversial undocumented IO model used by the Council; this model is now widely accepted by fish managers and others.

The Center has developed four major data bases: Cost earnings, fishing community profiles, social science catch shares, and Voices of the Past.

A fifth data base is under development that captures participation data on about 50% of the 2800 West coast fishermen is also under development.

Although Protected Species and Recreational economics are very important, the Center can only afford to devote a combined 2 FTE's to research in these areas.

The Center's economists and social scientists are producing valuable work products but are they stretched too thin?

The Center has done a great job of hiring good staff.

Work products are high quality. Presentations skills are high quality.

Collaborations within the Center and outside the Center are significant and noteworthy, but there does need to have additional support from cutting edge experts in addition to folks like Hilborn, Chis Anderson, Phil Levin, etc.—maybe via post-docs.

The Center is doing a great job at data collection and dissemination.

Response rates to voluntary surveys are quite high.

The use of infographic is impressive.

On-line availability of aggregated data and results is very noteworthy. "Fisheye" an online tool that allows the public to query aggregated data on revenues, costs, and landings is perhaps, the best public tool of any region or center.

However, it may be desirable to have a better on-line query tool for finding specific publications.

Center should continue to emphasize catch shares work as cost earnings data collection supports not only groundfish decisions but other fisheries as well. IEA work is also a high priority.

Questions

1) Goals and Objectives

- a) Does the Center/ST have clear goals and objectives for an economic and sociocultural science program?

No

The Center and the Office of Science and Technology have planning documents that may have economic and socio-cultural goals and objectives. However, there is although there is no specific planning document for Center's program.

- b) Do the Center's/ST's Programs provide information to address the priority needs of the Regional Offices, other NOAA managers, Fishery Management Councils, Fisheries Management Commissions, and other stakeholders that require economic and human dimensions -related information to achieve their mission?

Yes

Once resource limitations (budget and FTE's) are recognized, the program has few weaknesses to highlight. Weaknesses include no research on aquaculture, the need for data on fishing crew to understand future participation in fisheries, additional fishing processor data to understand effects on processors and thus fishermen, and few behavioral models that take advantage of collected data and used to predict changes in economic and social variables.

- c) Do the Center's/ST's Programs have a strategic research agenda that anticipates evolving and long-term economic and sociocultural science needs including research to support adapting to climate change and implementation of ecosystem-based fishery management?

Yes

The Center is undertaking research efforts related to climate change and implementation of ecosystem-based fishery management. The Center has a series of emerging Integrated Ecosystem Assessment related Projects:

Community Recreational Dependence and Engagement Indices

Coastal Community Vulnerability to Ocean Acidification Risk Analysis

Ocean Recreational Expenditures Survey

The Dynamics of Adaptation to Climate-Driven Variability in California Current Fisheries and Fishing Communities

2) Integration and Linkages

- a) Are the Center's economic and sociocultural programs appropriately integrated with each other and with other science activities within the Center?

Yes

Center's economic and socio-cultural programs are supporting, among other things, Center activities associated with harmful algal blooms, and integrated ecosystem assessments.

- b) Are research efforts integrated, where relevant, with efforts at the regional offices and headquarters?

Yes

The Center participates on HQs teams, contributes to national projects, directly supports NMFS WCR in its catch share and regulatory analysis efforts.

The Center also indirectly supports the WCR indirectly by supporting the Pacific Fishery Management Council via analyses, participation on Council Teams, and providing scientific advice, to the Council and WCR Council representatives.

3) Data Collection

- a) Is the status of data collection related to commercial fisheries, recreational fisheries, fishing participants, and communities adequate to fulfill economic and sociocultural science research needs?

Commercial fisheries and community data collection efforts are more than adequate, especially given the Center's cost -earnings data collection program is quite possibly the best in the nation.

Social science data collection is quite extensive too.

The one area of weakness concerns the collection of economic data for recreational fisheries. This data collection is limited by the lack of steady funding and by the number of FTE's (1.5) devoted to recreational research.

b) Has the Center/ST developed strategies to obtain, manage, and make data accessible?

Yes and Maybe

Given the limits of confidentiality and other issues, this appears to be a Center goal. The Center and ST have several shared databases on economic and social science indicators and data managed by ST. At some level, these databases are accessible to the public.

Regarding managing data, presentations did not include explicit information.

c) Are there barriers that impede data collection and access to data held by other entities (e.g. states, commissions, other federal agencies, etc.) that could be used to support the Center/ST's research, and how can these barriers be overcome?

Yes

Funding would aid increase collection of recreational data.

The Center's access to data held by other entities may require increased conversations between the entities and Center staff to identify the what data is needed and barriers. The west coast states are responsible for the collection of most of the commercial and recreational landings data are collected by the states. Each state has unique confidentiality regulations, and therefore, there is no "one size fits all" approaches to sharing of data.

Other than recreational data, there did not appear to any significant data collection/access issues raised by Center staff.

4) Models and Research Tools

a) Are the Centers/ST using appropriate models and research tools to analyze data and provide management advice?

Yes

Models and tools appear current or on the "cutting edge" regarding the future.

b) Are they developing and using methods and models that contribute to the evaluation and exploration of ecosystem based fisheries management and other emerging issues?

Yes

As indicated previously, the Center staff are working on ecosystem projects now and appear to be expanding their efforts in the future.

c) Are their barriers to adapting to address emerging issues?

Yes

As with recreational efforts, the protected resource efforts are largely predicated on one FTE with limited funding.

5) Use of Information

a) Is the Center's/ST's social and economic information being used in living marine resource management advice.

Definitely

Center Staff are on Pacific Fishery council management, technical, and scientific committees.

WCR relies on Center staff and their work products to address NEPA, Magnuson Act, and other legal requirements.

Especially in the area of Catch shares, Council, WCR, and Center Staff have worked together on design and implementation of the program, and now Center staff have are the lead on the economic and social analysis contained in the "Five Year Catch Shares Review."

b) Are the existing mechanisms sufficient for ensuring this information is used appropriately?

Yes

The Pacific Council uses many of the Center's products.

The Pacific Council processes provide Center staff with opportunities to comment on the use their data and models by others.

As evidenced by the NWFSC website, Center staff document their data collections, databases, and models.

- c) Are there barriers to the uptake of science provided by the Center and what steps can be taken to overcome these?

Barriers to uptake do not appear to be significant.

Uptake is the ability of managers and public to absorb and understand the Center's research efforts. The Center does try to publicize its research efforts, but it's difficult for various communication processes to keep up with number and diversity of research products and efforts.

There has been significant improvement in the Center's websites to communicate research and research stories in interesting and "plain English" way.

Via Council processes, the Center helps fish managers understand the Center's research through written documents, presentations. Extra agenda time is often requested by the Center when the Center knows it is presenting a difficult topic to the Council.

6) Best Available Science

- a) Is the Center providing the Best Available Science?

Yes

The Center is either developing analyses and models based on an adaption of similar analyses and models used by other Centers or Center staff are developing analyses and models that other Centers are turning to determine "best available science."

Center analyses and models are often tested in the public comment phases of NEPA and via public comments on proposed fishing regulations and associated lawsuits. Center efforts have survived these challenges.

- b) Are the Center/ST's economic and sociocultural research products adequately peer-reviewed?

Yes

The Center has a formal internal review process for all tech memos and publications. Many of the Center's publications are in academic journals with peer review processes

- c) Are the appropriate processes being used to ensure that scientific products meet professional standards and are of high caliber?

Yes

Many of the Center's work products are reviewed by the Council's Science and Statistical Committee to assure that the Council has before it analyses that are "best available science," professional, and high caliber.

Center staff interact with other scientists to support their efforts to provide best available science and to meet professional standards.

Center staff present results at academic conferences. Some serve as contributing editors to a few major marine resource journals. Some are adjunct professors at various universities. Many staff review of research proposals that reflect current research interests of other scientists.

7) Communication

- a) Does the Center's/ST's program use the best tools to appropriately communicate research results to various managers, partners, stakeholders and the public?

Yes

Center staff are taking advantage of latest in data presentation- infographics, or developing websites with interactive tools such as "Fisheye."

Noted tech memos and journal articles are flagged for the Center's Communications Team to develop press releases.

Many of the Center's Catch Shares research efforts and findings are summarized in the "Five Year Catch Shares Review" a document that has been widely reviewed and will serve as the foundation for future adjustments to the Program. The Center is responsible for much of lead the document's content.

Recommendations

Develop a Five Year Human Dimensions and Economics Plan

Presentations at the Panel Review did give a sense of the Center is headed in future research projects. Although these presentations form an implicit plan, there is need to for such a plan to prioritize research, analysis, and database development/management efforts. Center staff are highly self-motivated and highly curious. They are making great contributions, but they may be stretched too thin and perhaps could be more productive with fewer projects. A related concern is potential job burnout.

In the development of this Plan, use Council and Other Processes to Inform the Plan.

The Council develops a research and data needs assessment document every five years. The chief author of this document is the SSC, a body of scientists that typically includes one academic, one NWFSC and one SWFSC economist. However, the document does undergo a formal Council review. Many of the Council's needs are being addressed based on a quick review of the document. However, these priorities were set prior to much of the Center's Catch shares and Ecosystem efforts. New directions in these areas imply additional need for Center support.

Develop a West Coast Econ/Social Science/Management Team to inform the Plan and for Communication of Research.

In the development of this Plan, develop a West Coast Econ/Social Team that meets periodically. When there were few west coast economists and little data outside fish tickets (catch and revenue) and logbooks, there were periodic informal meetings attended by center, regional, commission, and council staff to discuss data and analysis needs. Now that the number of economists and social scientists, it may be useful to start this process again, if only for the Center staff to inform others of all their key research projects and recent data collections. Such collaboration would also aid the development of future projects the Center submits to various RFPs.

Consider “Centers of Excellence” where the NWFSC and SWFSC can Prioritize Research and FTEs.

Both Centers have too few FTE's involved in regional impact modeling, recreational economics, and protected resource issues. Both Centers service a single Region (WCR) and Council (PFMC). To avoid duplication of research, save time and travel funding for staff, and increase focus, it may be useful to delegate the lead for regional impact modeling to single Center. Creation of Centers of Excellence for recreational and protected resource responsibilities are not that clear cut given the diversity of fisheries, but there may be some benefits to having a single center as the lead in these areas.

Send more Representatives to the PacFIN and RecFIN Committees

These are committees associated with the collection and coordination of commercial and recreational statistics. They include representatives from the states, Council, centers, tribes, and the West Coast Region. Here contact can be made with the chief data collectors and thus issues concerning collecting new data or accessing existing data addressed.