Chair's Summary[1] of Program Review of Protected Species Science

Southeast Fisheries Science Center

Miami, Florida

August 24-28, 2015

Review Panel Members

- William Kendall, USGS Colorado Cooperative Fish and Wildlife Research Unit, Chair
- Timothy Ragen, Marine Mammal Commission (retired)
- Lisa Balance, NMFS Southwest Fisheries Science Center
- Gustavo Goni, NOAA Atlantic Oceanographic and Meteorological Laboratory
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Summary of Review

It is clear to all panel members that the task assigned to the Protected Species Program of the Southeast Fisheries Science Center (SEFSC) is daunting, in several ways. The spatial extent of its assigned coverage of water bodies is enormous, from the Texas border with Mexico to Virginia, in addition to U. S. waters within the Caribbean Sea, encompassing varied marine ecosystems, with extensive human activities and numerous anthropogenic threats. Within this large expanse the SEFSC is responsible for monitoring, research, and decision support for six sea turtle species and 90 marine mammal stocks. In addition, the SEFSC's support of resource management involves three fisheries management councils in addition to the SERO and OPR, and interaction/collaboration with numerous U. S. states and foreign countries. Moreover, for the last five years the Center has had to contend with the urgent needs associated with the Deepwater Horizon oil spill. Finally, the SEFSC faces the usual issues of limited base funds to accomplish needed and even required monitoring responsibilities. From this stems the difficulties of maintaining morale when a large percentage of experience staff are not in permanent FTE's, and the difficulties of allocating time to needed long-term research when short-term monitoring needs are pressing.

It is equally clear to all panel members that in the face of these great challenges, the talented staff of SEFSC have been energetic and committed to excellence in their work. They have made strong and innovative contributions, individually and especially for marine mammals also in groups, to protected species research and conservation. They also have made a heroic effort in responding to huge demands in the wake of the Deepwater Horizon oil spill. Nevertheless, from the excellent presentations and discussion during the review, several issues arose in common among the committee members, where we suggest that the SEFSC could improve its efficiency and delivery of science and resource assessment, especially in the face of limited funding.

1. Coordination with SERO and OPR – Communication, coordination, and collaboration with NMFS managers and management biologists already occurs, especially for marine mammals. However, strengthening that relationship further would increase the effectiveness of SEFSC and its management partners. This is especially true for prioritization of research and stock assessment tasks, especially given stocks that are barely or infrequently monitored due to budgetary constraints. An annual meeting between SEFSC and SERO staff would be a good first step toward strengthening this communication.

2. Coordination with multiple potential partners – Especially given limited funding, the strengths of the marine mammal and sea turtle programs can likely be leveraged by increasing interaction with other NMFS labs, including sharing ideas and expertise. In addition, the sea turtle group in particular should look for collaborations among the numerous states, territories, universities, and NGO's studying or monitoring sea turtles in the northwest Atlantic and Caribbean, as well as the DOI (USFWS and USGS). SEFSC and DOI are natural partners in taking the spatially extensive view of sea turtle science and management, given their mandates. The SEFSC role is especially pertinent, since a large percentage of threats to sea turtles in this region are inwater. If an assessment network can be built with these partners, SEFSC field staff could concentrate on a smaller number of intensive sites appropriate to the number of staff available. (b)

3. Coordination of sea turtles efforts within SEFSC - Facilitation of sea turtle partners outside of SEFSC will be enhanced by increased coordination and collaboration within SEFSC. You have a nice variety of expertise and facilities within this group, from modeling, to bycatch reduction, to turtle rearing, to the age and growth lab. A real synergy could be created by working even more closely together. Continuing and expanding the modeling efforts so far could give direction to this collaboration and collaboration with outside partners.

4. Organizational structure and geographical distribution of staff – Two factors inhibit more efficient coordination of efforts devoted to marine mammals and sea turtles within the SEFSC. The first is that staff are distributed across five facilities, and in addition, lines of authority and budget allocation are set up geographically rather than programmatically. The second is that the Protected Resources Division chief, in addition to marine mammals and sea turtles, manages four other units, diluting his ability to be effective. We recommend the creation of a new leadership position, preferably at the Division level, to oversee the marine mammal and sea turtle programs. In addition, all marine mammal and sea turtle personnel should report to this person, regardless of duty station. This would greatly facilitate coordination within and between these two programs. This person could also serve as a liaison in increasing coordination with SERO, OPR, other NMFS science

centers, and for sea turtles, facilitate collaborations with individual states, universities, and NGO's.

5. Deep Water Horizon – The DWH spill has created a large drain on SEFSC resources for the last five years. However, it also re-emphasized the value of and need for baseline data against which to evaluate such catastrophic events. The marine mammal and sea turtle programs are encouraged to think strategically about and plan for how funding stemming from this event can be used to establish strong baseline monitoring for the future, and what additional research is needed to evaluate the spill, and anticipate the cumulative effects of future similar events.

In conclusion, the marine mammal and sea turtle staff of SEFSC are to be commended and applauded for the work they are doing, and the information they have provided to resource managers and scientists about this diverse and important region they study. This summary has highlighted suggestions we as a group believe could increase the effectiveness of these programs. In the reports of each individual reviewer you will find these themes in more detail, but also additional comments and helpful suggestions that come from the unique perspective each member has brought to the committee.

Reviewer Report on Program Review of Protected Species Science

Southeast Fisheries Science Center
Miami

August 25-28, 2015

Reviewer #1

General Observations

The SE Fisheries Science Center is responsible for research and management of a vast area, from the Texas border with Mexico to Virginia, including the US Caribbean. The Protected Species Division has responsibility for 90 marine mammal stocks and 6 sea turtle species. The scientists, staff, and contractors of the marine mammal and sea turtle groups are to be commended for many contributions to protected species research and conservation, particularly with regards to the hard and difficult work associated with the Deepwater Horizon oil spill response. Without the SEFSC, our understanding of marine mammal and sea turtle populations, their distributions, fisheries interactions and response to perturbations would be minimal at best. We look to SEFSC for strong science and leadership in protected species research for the Gulf of Mexico and the southeast Atlantic.

The Center appears to be understaffed for size of the region, the intensity of management needs, and undoubtedly diverse demands of 3 Fisheries Management Councils. Protected species research is spread thinly into multiple small laboratories, and isolation is a problem for many scientists. The Protected Species working groups are managed by an overworked Division Leader who has responsibilities to several other programs, leading to "benign neglect", in his own words. This has reduced the ability of the scientists in Protected Species to work effectively to achieve their core mandates, and restructuring is desperately needed.

Much of the science conducted by the marine mammal and sea turtle programs has direct benefits to management of protected species throughout the region. Better communication with management is desirable, however, including at least annual meetings with the SE Regional Office. This is particularly true for the turtle group, which is less connected to management needs in the region than the marine mammal group. Improved communication with Office of Protected Resources is also needed to ensure that research in the southeast is connecting well to the conservation needs for marine mammals and sea turtles across the country.

The marine mammal program appears to be cohesive and well directed, balancing immediate management needs with more general conservation science. The group collaborates well with managers, states, fisheries, Take Reduction Teams, and other science centers, and presents themselves as a team. They have developed a useful framework for prioritizing research activities, based on data gaps and cumulative threats and management needs. Publication rates are good and reflect an integration of rigorous techniques.

Cetaceans are difficult to study and manage because of their broad ranges, complex stock structure, and the fact that they can't really be captured and they don't come on land to breed. The marine mammal group has focused on stock identification and distribution, both of which contribute directly to assessment and management needs. They are using rigorous scientific methods to evaluate data quality and survey results, but are not able to take advantage of the latest advances in genetic analyses and technology due to a lack of resources and personnel. Prioritization of marine mammal research activities has been determined in large part by management needs, including work with Take Reduction Teams established for stocks with significant interactions with fisheries. As elsewhere in the US, reductions in survey support (e.g., ship time) have greatly reduced the Center's ability to determine trends in abundance. Additional emphasis on more cost-effective methods for abundance estimation is paramount and should be supported; consultation and collaborations with SWFSC on this should continue. When vessel surveys can be conducted, integration of environmental and biological sampling can ensure that the value of each cruise is maximized.

The sea turtle program has expertise in assessment-related research, including vital rate estimation and modeling, fishing gear improvements to reduce bycatch, and captive rearing methods for turtles. Development and testing of Turtle Excluder Devices and other gears has involved great collaborations with fishermen in the Gulf of Mexico. The age and growth lab in Beaufort is the only such facility in the country, and research on the humerus bones of stranded sea turtles is providing much needed information on age at maturation, growth rate variability, and habitat use through stable isotope analysis. Modeling efforts by scientists in the group have contributed to Turtle Expert Working Groups and evaluation of fisheries impacts. The assessment and modeling group contains significant talent and expertise in the SE and NEFSC but is currently dysfunctional as a research team. Because of a lack of leadership, scientists are competing with each other for resources instead of working together to meet management needs and produce high quality science. There

is great potential in the group and good work has been done, but there is a need for better direction and a leader who can build a team of productive researchers that communicate well with each other and with sea turtle scientists in other Centers.

The SE region is home to nearly all sea turtle nesting areas in the US and by far the largest fisheries interactions with sea turtles. SEFSC should be a leader in sea turtle research and a hub for collaborative efforts by states, DOI, academic groups, NGOs, and local conservation groups and commissions. Currently, the strandings program is serving this role for the Sea Turtle Stranding and Salvage Network (a critical source of long-term, region-wide data), but needs more resources to do so effectively (e.g., monthly or quarterly meetings with state coordinators). The strandings data have not been fully tapped for their potential contribution to understanding changes in population composition over time and response to management actions; it is an important time series with a wealth of information that should be fully accessible to researchers. Turtles are difficult animals to study and manage because of the collaboration required to understand their life history, as individuals cover hundreds or thousands of miles and multiple habitats over their lifetimes. Projects to evaluate population dynamics for species in the SE require collaborations with Canada, Mexico and European and Caribbean nations, Department of Interior, state park and wildlife agencies, non-governmental organizations, fishing industries that interact with turtles, and even local community groups that support the care and monitoring of nests and stranded animals. It is not an easy task to bring these elements together cooperatively, and it takes time to build trust. Integration of data and information from state, regional and international partners was listed as high priority in the 2013 Sea Turtle Research and Assessment Needs document, as well as other review documents. Facilitation of these partnerships may be difficult, but should be the highest priority for new leadership for the turtle research group.

The research efforts of the marine mammal group and the sea turtle strandings group were "hijacked" by the Deep Water Horizon disaster in 2010, as were the day-to-day efforts by many at SEFSC. This is appropriate, given the severity of the emergency, and the new knowledge gained from surveys and sampling during that event is valuable. However, the time lost from data entry (e.g., sea turtle strandings group), assessments (e.g., mammal group), and other regular duties was substantial and suggests that SEFSC scientists are stretched thin for completing the work required by management mandates. There is undoubtedly much to be learned from DWH about management and research capacity of the agency, as well as the critical science needs that should be addressed in the future.

Many of the needs for surveys, ocean habitat analysis and mapping, data analysis, and modeling are shared by the marine mammal and turtle groups. Thus, a new division leader could work with both groups, thereby increasing efficiency and promoting collaborations among scientists. Continued and enhanced communication with protected species researchers at other science centers can also contribute to innovations, and may be particularly critical as restricted travel budgets reduce opportunities for scientists to attend national and international meetings.

There is always a tension between the research and analysis needed for immediate management needs and science needed to anticipate future problems. The Deep Water Horizon crisis has highlighted the critical need for baseline data and time series of information about population status and distribution of protected species to determine what was harmed and how the system has been affected. Monitoring is essential, if boring, but also expensive; all Centers need to be thinking hard about which indicators of population and ecosystem change can be measured accurately and which are most likely to show effects when large scale impacts occur. Management Strategy Evaluation models under construction at NEFSC and SEFSC by turtle program researchers and their partners should be very helpful for this. Because some competitive funding is necessary for operations, science projects for protected species should more clearly link to potential improvements in meeting core mandates, such as stock assessments and impact evaluations. Examples include research into cost effective sampling techniques for marine mammals, use of existing data such as size and age information from strandings of mammals and turtles, and additional validation of humerus bone work for growth rates and remigration intervals in sea turtles.

The American public cares deeply about these animals. All Centers should do more outreach to make people aware of the conservation needs for the species and the innovative science that is underway to understand and protect them. Web sites are informative for school science projects but don't capture the attention of the general public; if we want to convince lawmakers that this is a good use of taxpayer dollars, more effort should be made to link research activities to outcomes that matter to the public and showcase the conservation successes and fascinating discoveries that Center scientists are making every year. Mammal and turtle sightings and strandings reports can be honed into citizen science projects that increase awareness and goodwill. This will require additional resources but could be dollars well spent if some effort is made to ensure that the data collected are useful.

Facilitation of good protected resources science under considerable budget constraints is difficult, particularly for species that range widely across a very large area. Coordination and collaboration within the Center, across Centers, and with other agencies are the key to better science with fewer dollars. With the potential for new resources for research and monitoring that have stemmed from the Deep Water Horizon settlement, SEFSC has an opportunity to consider a new

organizational structure to facilitate that research, partnering with states and agencies around the Gulf. There are many challenges to come, and more emphasis on environmental correlates to population trends and distribution is desperately needed, as is research to better understand the food web and ecosystem processes that affect protected species. These have not been a priority because groups are spread too thinly and need more direction. Creative solutions can stem from groups that work well together and "think outside the box", but some leadership is needed to identify priorities and partnerships.

Key (Specific) Findings and Recommendations

Theme 1: Data Collection and Outputs

Marine mammals

Strengths:

Standardized methods, QA /QC is high priority
Focus on evaluation of quality of the data in terms of precision and accuracy.
AMAPPS surveys provide standardized, large scale abundance and ocean condition information
Match of platform and analysis methods to habitat
Partnerships with other NOAA entities, BOEM, Navy
Critical research on Northern right whales, Bryde's whales, spotted and bottlenose dolphins

Innovation:

Plans to integrate acoustics with Ship and aerial surveys.
Habitat-density mapping for spatial planning

Challenges:

Quantification of uncertainty in vessel-based abundance data requires more surveys
Need more frequent surveys for trend analysis
Rare species are difficult, need funding to find innovative survey techniques (e.g., passive acoustics).
Need more data analysis capacity to keep up with management needs.

Recommendations:

Continue to push for funding for back-to-back or double vessel survey needed to quantify uncertainty in abundance estimates.
Emphasize habitat preference evaluations for probabilistic distribution mapping.
Conduct power analysis for trends, improve survey techniques.
More work with technologies like HD video, photography, acoustic monitoring (SWFSC collaborations)

Sea Turtles

This is a large group (18 FTE) spread across the labs. Emphases include life history and assessment work tied to mandates given in review documents, quantification of fisheries interactions, strandings network data entry and coordination, fishing gear improvements (Pascagoula) and captive rearing (Galveston). Coordination across these labs does not seem to be happening regularly, at least.

Strengths:

Proximity to sea turtle nesting and feeding areas
Interactions between SE and NE;
Collaborative data collection and analysis
Strandings network – long term data
Emphasis on vital rate estimation, especially growth, sex ratio

Innovations:

Gear modifications to reduce bycatch
Age and growth analyses and validation using humerus bones
New explorations with AUV, Didson to count turtles in the water

Challenges:

Unclear match of research to management needs
Prioritization of research emphasis and projects is unfocused
Lack of dedicated staff for some key projects
Lack of emphasis on long term data collection beyond strandings
Required partnerships with land-based agencies and academics conducting in-water work are not a priority
Little work focused on distribution and habitat

Recommendations:

New leadership; improve working group connectivity

Better integration with states, academic researchers, especially with regards to plans for in-water surveys

Regular meetings with USFWS needed for assessments, research needs prioritization

Move towards vital rate monitoring, not just point estimation (rates change in space and time)

Work together on research prioritization instead of competing for funding

In-water survey development must be carefully panned and integrated with existing projects to be successful; given funding constraints, other data analyses and methods to obtain trends in abundance and vital rates may be a better path. See what can be gleaned from an in water project before committing substantial funds to set up your own (e.g., further review and/or analysis of St. Lucie power plant data, long term in water surveys from NC, Indian River, etc.)

Theme: Stock Structure (mammals only)

This is an MPA mandate driven effort. Focus has been on delimiting coastal vs offshore stocks of dolphins, especially on east coast.

Strengths:

Focus on management needs (PBR calculations, TRT response)

Emphasis on data quality evaluation

Biopsies are multi-purpose, get the most from every sample

Plans to better understand habitat correlations for distribution mapping

Strong collaborations

Challenges:

Many stocks of unknown status

Biopsy collections are often opportunistic for the most part, few dedicated collection trips due to limited resources and personnel

Keeping up with new technologies

Limited capacity to expand

Recommendations:

Facilitate collaborations with SWFSC, provide funding to update equipment and training in new methodologies.

Focus on baseline data needs to handle the next DWH

Theme 2: Fisheries Interactions

Marine Mammals and Sea Turtles

Clearly management driven: PBR, jeopardy evaluation. Fisheries are very diverse across the region and require different analysis techniques due to low catch rates. CVs are good for some fisheries that have been reasonably well covered over a long time period, including trawl and pelagic longline. Collaborators on analytical methods include NEFSC, long time driven by TRT process for mammals. Well established group working on bycatch reduction technologies with industry partners.

Strengths:

Long term data for some fisheries

Careful consideration of different gear types in bycatch analysis, e.g., separation of bottom longline gears with different target species

TED development is legendary, technology adopted worldwide

Fishermen on gear development teams

Challenges:

Observer coverage is low

No nearshore observers

New gear types need evaluation, e.g., skimmers, but funding has not been provided for this

Desperate need for inshore fisheries interaction assessments and bycatch estimates.

Small vessels not able to take observers, hard to monitor

Recommendations:

More resources and emphasis on unknown near and inshore fisheries, innovative technologies to monitor.

Focus research efforts on unknown mortality, e.g., small Kemp's strandings

Continue development of threshold-based analysis for evaluation of fisheries impacts on turtles

Theme 3: Stock Assessments

Marine Mammals

Many (many!) stocks, difficult to get a handle on near- and in-shore groups, particularly. Excellent framework for prioritization of research activities. Nice integration of genetics and abundance estimation shown for pilot whales and dolphins. Moving towards habitat correlation analysis for probabilistic distribution mapping and risk assessment. Survey planning is good, given limited resources.

Strengths:

Integrated approach abundance, genetics, habitat mapping.
Taking advantage of other surveys, e.g., piggyback on tuna trips.
Collaboration with BOEM, academics, states, Navy
Survey procedures provided to partners to ensure data-quality and comparability.

Innovations:

Framework for prioritization of research: cumulative threat score plus data availability and quality score.

Challenges:_

Transboundary stocks require international collaborations, data sharing.
Survey frequency is inconsistent
No local data on vital rates (reproductive parameters) or g (0) sight-ability for vessel surveys

Recommendations:

Power analyses needed for abundance and trend information
Focus on identification of baseline data needs
Support data analyst position (could share with turtles)
Export prioritization model to sea turtle group!

Sea Turtles

Sea turtle assessments have been supported by SEFSC for many years, going back to the first Turtle Expert Working Group formed in 1995. While some progress has been made, we still lack models that can be used to evaluate perturbation impacts and predict population change through time accurately. Vital rate estimation (means, variance and changes over time and space) is key to better assessment modeling. Funding through the Toolbox project (analytical tool development and sharing) is helpful but not currently targeted at critical assessment needs. Some data sources remain untapped, e.g., size distributions of bycatch and strandings, growth rate variability obtainable from humerus bones. Collaborations with NEFSC and pooling talent across all Centers will lead to progress.

Strengths:

Quantitative skills
Access to bones through the strandings network
Large data sets (strandings, bones)

Innovations:

Current mapping for distribution predictions
MSE development

Challenges:

Data needed for models requires collaborations with many entities
Simple management models not yet available
Research needs not prioritized

Recommendations:

Work across Centers and with outside advice on prioritization of data analysis and modeling techniques needed for assessment model improvement; get input from marine mammal and fisheries assessors. Work better with management to identify the most pressing needs.

Theme 4: Strandings Programs
Strandings are high profile events that provide critical information on nearshore impacts to protected species and sample collection opportunities. The latter may be underutilized; tissues for genetics, contaminants, isotope analysis, sex ratios and age and growth could be collected regularly to create databases for the region and contribute to assessments. Data for turtles has been collected for many years and is a valuable source of information for demographic analyses; data would be better utilized if made more broadly available to researchers. Strandings programs require strong communication and collaboration with states and local community groups; more work on technological innovations may improve coverage and data collection.

Marine Mammals
Strengths:
- Collaborative and responsive
- Close ties to SERO, good teamwork
- Coordination with pathologists

Innovations:
- UME response and investigation protocols

Challenges:
- Large area, short on personnel to get to carcasses quickly
- Coordination with local entities
- Variable effort

Recommendations: Work with analysts to determine utility of data with unknown and variable effort. Research new technologies for searches of dead animals in remote areas (mammals and turtles).

Sea Turtles
Strengths:
- Long term data set, since 1980
- Detailed information on each animal, standardized report form
- Training programs

Innovations:
- New program for incidental catch at piers

Challenges:
- More IT support needed for database improvements, keeping up with data entry
- Variable effort
- No funding for state coordinator meetings
- Biological sample collection by special request only, not standard procedure

Recommendations: Support database improvements and ways to speed up data entry. Provide funding for annual meeting of stranding coordinators. Prioritize and standardize tissue collections across the region. Basic data should be available online (number by state or fishing zone, species, size, sex).

Theme 5: Deep Water Horizon
The DWH disaster had a major impact on SEFSC, and the nation owes much to the Center for its rapid response, data collection, animal rescue operations, and continued impact evaluation. The data gaps identified by questions raised during and after the disaster can serve as guides for continued and future research needs. In particular, a better understanding of distribution and habitat needs for mammal and turtle stocks is needed to anticipate recovery and future impacts.

Overall Recommendations

1. Hire a Division Leader for turtles and mammals through an external search process.

2. Identify real strengths in the program and restructure as needed to support those strengths.
3. Improve communication with management, especially for sea turtles. Support annual meetings with SERO, OPR, DOI and state agencies.
4. Support long term data sets, especially strandings, as well as repositories for tissue samples.
5. Scientists should meet regularly across divisions within SEFSC and with other Science Centers to compare method advances.
6. Consider options for management with 90+ stocks of cetaceans. What are the critical management issues with mixed stock PBRs and identification of stock of origin?
7. To the extent practicable, expand emphasis on habitat and ecosystem conditions to marine mammal and sea turtle distribution and vital rates.
8. Identify burning conservation issues and act on those in funding proposals, not just "cool stuff". Provide link to core mandates in those proposals, e.g., stock assessment improvement.
9. Provide proposal development advice to scientists competing for SAIP, Toolbox, other external funds; encourage collaborative rather than competitive proposals.
10. Push for baseline environmental and species information as part of Gulf of Mexico restoration. Need help to spin this: not esoteric science, but key research and monitoring needed to understand how the system works and varies.

Southeast Fisheries Science Center
Protected Resources Science Program

25-28 August 2015
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The following recommendations and comments are based on a review of the marine mammal, sea turtle, and several related programs of the Southeast Fisheries Science Center. Among other things, the Center is responsible for conserving marine mammals and sea turtles over a vast region extending from the mid-Atlantic around the southern tip of Florida to the southwest Texas border, plus U.S. waters in the Caribbean. The coastal and pelagic waters of this region are subject to the effects of extensive human activities that, if not well managed, pose serious threats to the marine ecosystem.

On a daily basis the Center and its staff are called upon to conduct extensive research with few resources to understand marine mammals and sea turtles and help managers restore the health of the region's marine ecosystems. They also were called upon, and responded heroically, to the 2010 Deepwater Horizon oil spill, which drew national and international attention. Even in the absence of such compelling events, they have demonstrated their commitment to excellence and an unwavering persistence in fulfilling their responsibilities.

To the staff and Center Director, I recommend that you—

1. Recognize your contributions to marine mammal and sea turtle research, and celebrate the important work you have accomplished. You are routinely breaking new ground in your research and you deserve the region's and, indeed, the nation's gratitude.

2. Clarify your vision. The day-to-day or year-to-year work you do is part of a long-term effort— even struggle— to conserve marine mammals and sea turtles, and the ecosystems of which they are a part, in the face of multiple risks (i.e., human activities). Your current research situation far from ideal and the most important resource you will have in improving it is a clear vision of the ideal situation. That vision should be sufficiently flexible to account for typical and—as we just learned— atypical circumstances (e.g., the DeepWater Horizon spill). At the least, it must include the ideal organizational structure, staff, infrastructure, budget, and partnerships. You will not achieve that vision overnight, but as you seek to improve your program and your work, and as opportunities present themselves, you should know the directions you need to go to move closer to your vision.

3. Engage agency leadership to hold them accountable for contributing to your leadership. Your allocation of resources is determined by the Service's Headquarters, NOAA, the Department of Commerce, the Administration, and Congress. Collectively, these organizations form a "bureaucratic ecosystem" that can facilitate or limit your work. Those agencies are rarely called to account for their contributions to this work, but they should be. Managers and decision-makers should be called on to explain their allocations and they need to view themselves as partially responsible for the success of your work. In my view, you are not given adequate resources to do your work and therefore, your accomplishments are that much more remarkable.

4. Review your organizational structure to ensure adequate supervision, clear lines of authority and communication, opportunities for advancement, and strong programmatic focus and efficiency. Given the maturation of these programs over the past years, this appears to be a good time to optimize your organizational structure. I would especially encourage you to consider how to avoid that isolation that may occur as a result of the wide geographic dispersion of the Center's laboratories.

5. Optimize your interactions with other regions. Interact with and learn all you can from your counterparts in other regions. You are all facing similar challenges and you will do better collectively if you maintain a good exchange of ideas. This is particularly important for the nation's sea turtle programs, as those programs are developing rapidly but facing extensive challenges.

6. Establish regional priorities. In the course of your careers, you will not have all the resources you would like or need. Prioritizing your work is the only way to proceed under such conditions. Priorities should be based on, or reflect, —

- a general directive to "do no harm" (at the very least, we must ensure that the species we study and manage are not subject to irreversible changes)
- an analysis of risks to the various stocks (the primary focus must go to those situations in greatest need)
- the cornerstone importance of stock structure (to have meaning, demographic parameters must be linked to reliably identified biological stocks)
- a heavy emphasis on baselines and trends (the underlying concern in conservation is that we are causing harm to the stocks in our charge; baselines and trends are essential for assessing such harm)
- a wise use of empirical versus reductionist approaches (by their nature, scientists tend to be reductionists, seeking to understand the complex mechanisms that determine stock persistence or decline; such detailed understanding may not always be possible, and you may be better served by identifying or relying on empirical measures of change even if you can't explain the detailed mechanisms)

7. Seek and nurture partnerships. Programs of this nature can provide expertise and leadership, but they cannot resolve all problems on their own. In many respects, the problems you face are deeply rooted in regional culture and your best hope for long-term resolution is to seek, engage, educate, and form partnerships with the states, localities, industries, conservation organizations, and schools that can help you achieve your vision. You will have a far most lasting effect if you can get others to share your vision and efforts to achieve it. Data sharing should be an important aspect of any good partnership.

8. Communicate frequently and regularly with your management counterparts and focus your work on management needs. You are working for the taxpayers and their objectives are set forth in our various laws. Your colleagues in management are responsible for implementing those laws and they depend on the information you can provide. Ensure, with every activity you undertake, that you can describe a clear line from scientific project to management action and conservation objective – your science must be "actionable" – that is the very essence of applied science.

9. Use the burden of proof. In many respects, the burden of proof is about incentive. NMFS cannot be responsible for all the resources needed to protect the marine environment —it can provide expertise but is sorely limited with regard to resources. Action agencies and industries must assume the burden of demonstrating that their activities do not cause harm. Assuming that burden generally increases the incentive for research. Some agencies and industries are moving in that direction (e.g., Navy, BOEM) and their efforts must be welcomed, facilitated, and encouraged. Assuming the burden of proof should be a normal cost of doing business.

10. Establish performance measures but don't confuse them with desired outcomes. Performance measures are necessary to assess progress; they should reflect the steps you will take to achieve your desired outcome. In contrast, outcomes should be based on your conservation goals. Never confuse the two, that is, don't equate a performance measure to a desired outcome.

11. Revise your thinking on tiers and start thinking in ecological terms. The "tier" structure idea was useful for characterizing different levels of proficiency, but we need to start thinking in ecological terms if we are to deal with the indirect, ecological effects of human activities on marine mammals and sea turtles. Importantly, you should not consider your understanding of a stock to be "adequate" if you do not understand its ecology. In addition, beware that the moment you use the term "adequate" to describe your understanding, that is the moment that decision-makers and funders dismiss your requests for additional support.

12. Describe lessons learned from the Deepwater Horizon event and develop clear objectives to take advantage of DWH funding. As severe as it was, this event is now an opportunity to establish new standards for ecosystem science as it applies to marine mammals and sea turtles. Make your needs clear by preparing the necessary proposals for the work that otherwise will not be done. You are not taking undue advantage of the situation – you are simply fighting for interests of marine mammals and sea turtles, and the ecosystem at large. This is an opportunity to raise standards and reset the course of solid ecosystem science and management.

13. Assume responsibility for your decisions and actions but subject yourself to regular review. Use a broad-based, consistent set of reviewers with a small amount of periodic turnover to ensure a balance between continuity and new thinking. As hard as such reviews are and as much time as they require, they should provide important support and insights if they are done well.

14. To the sea turtle program, find your confidence and assume your responsibilities. Sea turtle programs do not have the history of marine mammal programs and they have much work to do to catch up. But the programs I have seen have good, solid scientists conducting research essential to sea turtle management and conservation. Learn what you can from marine mammal science and management programs, but know that those programs progressed when their scientists and managers who were facing new ground found their confidence and stepped up to assume responsibility for moving their programs forward. You must do the same. Ask for help when you need it, but find and develop your own strengths as well.

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Many, many thanks for all you do. You deserve our respect and gratitude.

Review of Marine Mammal and Turtle Science Conducted by NOAA Fisheries' Southeast Fisheries Science Center – Report from Panelist #4

28 August 2015

Introduction and Background

On 25-28 August, 2015, the Southeast Fisheries Science Center (SEFSC) of NOAA Fisheries conducted a review of its marine mammal and turtle science. This review was part of a larger cycle of reviews that NOAA Fisheries is conducting to maintain and improve its science enterprise. Each review year focuses on a theme and 2015 focuses on science in support of the Marine Mammal Protection and Endangered Species Acts (MMPA and ESA, respectively).

Details regarding the SEFSC review (agenda, presentations, supporting materials, review panel composition, review terms of reference) can be found on the SEFSC website:

http://www.sefsc.noaa.gov/program_reviews/2015/default.htm

The review panel was charged with reviewing the SEFSC's marine mammal and turtle science with the following overarching questions in mind:

1. Do current and planned protected species scientific activities fulfill mandates and requirements under the ESA and MMPA, and meet the needs of the regulatory partners?
2. Are there opportunities to be pursued in conducting protected species science, including shared and collaborative approaches with partners?
3. Are the protected species scientific objectives adequate, and is the best suite of techniques and approaches to meet those objectives?
4. Are the protected species studies being conducted properly (survey design, statistical rigor, standardization, integrity, peer review, transparency, confidentiality, etc.)?
5. How are advances in protected species science and methodological approaches being communicated and applied in NMFS?

Challenges

The SEFSC is tremendously challenged for a number of reasons. Three are particularly significant. 1) The geographic scope is large and encompasses three Large Marine Ecosystems with diverse characteristics and a broad array of anthropogenic perturbations. These are the Gulf of Mexico, the Atlantic coast and Exclusive Economic zones (EEZ), and the Caribbean. 2) The center responds to/provides science for three different fishery management councils, and while these councils are primarily concerned with commercial fisheries, the impact of incidental bycatch that marine mammals and turtles can have on these fisheries can be significant. Additionally, council activities require a tremendous amount of time for the center leadership. 3) The ecosystems for which the SEFSC have jurisdictional responsibility are

heavily impacted by anthropogenic perturbations. The coastline is densely populated; fisheries are intense and diverse; oil exploration and extraction is prevalent.

An additional challenge pertains to marine turtles because jurisdictional responsibility is jointly held between NOAA Fisheries and the U.S. Fish and Wildlife Service (USFWS). The various states in which these turtles nest are also involved in science-based management. The number of agencies, at both Federal and State level, is therefore high. Strong collaboration, effective communication, and clarity of roles and responsibilities are, therefore, critical.

The Deep Water Horizon (DWH) event and subsequent activities deserve special mention. Staff of the SEFSC (not only in mammal and turtle programs, but clearly, throughout the center, Southeast Regional Office [SERO], and NOAA Fisheries' Office of Protected Resources [OPR]) deserve huge credit for their Herculean efforts associated with the DWH response. This reviewer is awed and inspired by their dedication and sheer force of will to respond to the huge and diverse demands placed on them (in addition to existing demands associated with their full-time jobs prior to the spill, demands which are huge, diverse, and ongoing).

Overarching Observations

Scientists in both marine mammal and turtle programs are geographically dispersed. Marine mammal scientists are located in four facilities, turtle scientists in five.

The reporting structure (with respect to supervision) and budget allocation process is based on geographic structure rather than programmatically. Specifically, marine mammal and turtle scientists report to multiple supervisors, depending on where they (the scientists) are geographically based. Mammal and turtle funding appears to come through multiple chains of command.

We received details (research foci, FTEs) for the Protected Resources and Biodiversity Division in the Miami facility. The scope of this division (taxonomically and with respect to disciplinary focus) is broad. It includes marine mammal and sea turtle biologists, as well as scientists that appear to focus on 7 other research/taxonomic areas. Additionally, it appears that the reporting structure within this division is flat (no supervisors), so that the Division Director is responsible for supervising all FTEs in the division.

Given the demands for marine mammal and turtle science, the staffing levels could be characterized as skeletal.

Maintenance of critical baseline data that form the core components for addressing critical science needs associated with the MMPA and ESA (abundance, trends in abundance, population structure, estimates of mortality) have not been supported. This was particularly clear in the response to DWH.

The scientists in the marine mammal program are clearly talented, motivated, innovative, hard-working, and closely attuned to management needs - in some cases, extraordinarily so. The review provided many examples of this through multiple sessions.

The scientists in the marine turtle program are also talented and innovative but seem to be less coordinated internally, and could benefit from stronger leadership with focus, and vision. Additionally, the level of understanding, communication, coordination, and collaboration with other entities responsible for sea turtle science and management seems to be relatively low.

The level of communication between mammal and turtle scientists in the SEFSC, and managers, both within SERO and OPR, varies with taxonomic focus and individual staff. At a high level, this communication appears to be tighter in the mammal than turtle program, but given the geographic dispersion, communication could clearly be more frequent and targeted.

Overarching Recommendations

1) There is a clear need for unified leadership in these two programs. The existing reporting and budget structure, and geographic dispersion works against this and existing Division/Lab Directors are charged with overseeing diverse portfolios. I recommend a re-organization that brings all marine mammal and turtle science into a single entity, and I believe the demand for mammal and turtle science justifies that this entity be at the Division level. The reporting and budget structure should be programmatic (all mammal and turtle scientists report to the same individual and all budget oversight and made by this same individual). A new leadership position (ideally a Division Director) should be created and an extensive search should be conducted for a person with experience with the MMPA, ESA, especially as it pertains to mammals and turtles. This person must bring leadership experience, vision, a desire to engage with and mentor scientists, strategically plan and prioritize, communicate and collaborate with diverse entities and individuals, represent mammal and turtle science at higher levels both within and external to the agency, strengthen existing partnerships and create new ones, and seek new funds.

2) The geographic dispersion of scientists works against collaboration and unification. Based on discussions with staff, I understand there are distinct benefits to this dispersion, but there are also clearly costs in terms of scientific isolation. I recommend the SEFSC set aside dedicated time to consider the benefits and costs of this geographic dispersion with a view toward consideration of some geographic consolidation of mammal and turtle scientists. This time should take the form of a strategic planning meeting/workshop, participants should include leadership of the center as well as staff from each of the labs where these scientists now reside, and discussion should dovetail with the existing SEFSC strategic facilities plan (which I understand is currently in preparation).

3) Staff levels (i.e., number of staff) are low, in some cases critically so. An associated concern pertaining to existing staff is maintaining critical scientific expertise in the face of emerging/changing issues, rapidly advancing technology, and development of new field, laboratory, and analytical methods. I recommend the SEFSC consider mechanisms to augment the staff of the mammal and turtle programs, and support training opportunities for existing staff. There are many ways to do this. Clearly the ideal situation would be to create a number of new and permanent positions (critical needs are apparent in the mammal molecular genetics lab, the turtle age and growth lab, as well as PI-level analysts in both programs, but there are additional needs), but the flat budget climate of the agency may preclude this. There are

alternative mechanisms to address these needs. They include: a) support for a series of two-to-three-year post-doctorate positions which would be allocated strategically to these programs as critical needs dictate; b) ongoing agency-funded detail positions in the SEFSC's mammal and turtle programs whereby scientists from other centers with relevant expertise in mammal and turtle science could spend weeks/months at the SEFSC in order to exchange ideas, field and analytical methods, and begin new or continue/grow existing collaborations; c) use of existing training funds to support external travel and training for SEFSC scientists, and to bring external expertise into the center. Related to this recommendation is a proposal currently under consideration by the scientific component of the Protected Resources Board to convene regular (annual or biennial) meetings focused on Protected Species science. These meetings could be thematically focused with a goal of sharing methods, establishing best practices, and unifying approaches across centers. While this is not an explicit recommendation for the SEFSC, if implemented, it would benefit the SEFSC's mammal and turtle programs significantly. This reviewer will push for its adoption.

4) Within NOAA Fisheries, at both the regional and national level, communication between science and management is a constant challenge. This communication is critical (both are partners addressing the same mandates; each has complementary responsibilities and strengths), and represents an opportunity. Managers require mammal and turtle science. In many cases, the science centers have the most relevant expertise to meet these science needs. I recommend that the mammal and turtle scientists of the SEFSC conduct regular and formalized meetings with relevant staff of SERO and OPR. These meetings should include at least one annual, in-person meeting, but I strongly suggest quarterly calls with as broad a participation (on both science and management sides) as possible. Management priorities of SERO and OPR should be clearly outlined and tracked, and where and when SEFSC scientific expertise is matching, science plans should be developed and implemented to meet these needs, depending on available funding and infrastructure. In many cases I suspect, (based on experience in my own region), SERO and/or OPR may be able to provide funding for this science. There is already a formalized process in place for this dialogue (the Protected Species Science Investment and Planning Process, PRSIPP). PRSIPP has been ongoing for several years and will be formalized in 2016 as an oversight responsibility of the Office of Science & Technology (ST) with annual engagement from all regions with science center-regional office partnership. This process could form the basis for regular meetings which could evolve over time to better address SERO/SWFSC mammal and turtle issues and build stronger partnerships between them.

5) The DWH event and subsequent Natural Resource Damage Assessment (NRDA) activities and responsibilities provide an opportunity through the required post-spill monitoring. I suggest that the mammal and turtle scientists of the SEFSC and relevant staff of SERO conduct a strategic planning meeting as soon as possible to ensure that this monitoring is conducted in a comprehensive and scientifically rigorous manner. This should be an in-person meeting and should result in an action plan with clear timelines and roles and responsibilities. Subsequent and regular meetings will be critical to ensure clear communication and maintenance of roles and responsibilities.

Specific Observations and Recommendations

Marine Mammals

6) The marine mammal leadership (division and branch chiefs) of NOAA Fisheries' science centers, in strong partnership with ST, have developed a proposal to carve out sea days aboard NOAA research vessels for multispecies cetacean and ecosystem assessment surveys. These sea days would be used on a 6-year cycle to ensure that the regions of responsibility for which NOAA Fisheries has jurisdiction would be regularly surveyed, forming the basis for time series on cetacean abundance and trends, stock structure, and ecosystem characteristics. The proposal will soon be published as a NOAA Technical Memorandum. I recommend that the SEFSC support the agency-level proposal to provide sea days for multispecies cetacean and ecosystem assessment surveys.

7) The Gulf of Mexico is a distinct ecosystem that includes the EEZs of more than one nation. This makes a comprehensive survey challenging due to required research permits and additional political requirements. Yet the transboundary nature of the species within it makes interpretation of data collected from less than a comprehensive survey challenging (ecosystems and the organisms they support do not recognize geopolitical boundaries). I recommend that the SEFSC strive to comprehensively survey the Gulf of Mexico ecosystem into the future. The international partnerships that such a survey would create and the insight gained with respect to understanding of ecosystem structure and function would be invaluable.

8) The challenges faced by the marine mammal molecular genetics lab in Lafayette are unique. In particular, the high cost of equipment, rapidly changing technology, and ever-changing laboratory and analytical methods make it difficult for the lab and staff to stay current. I recommend a dedicated strategic planning meeting to discuss if and how greater collaboration with NOAA Fisheries' Southwest Fisheries Science Center's molecular genetics lab and staff (also struggling with similar challenges) could be of benefit in this respect.

9) The stock prioritization tool for marine mammals presented at this review is remarkable. Per a suggestion made by the scientists themselves, I recommend that this marine mammal stock prioritization tool be applied to all stocks for which the SEFSC is responsible.

Marine Turtles

10) The number of entities and individuals involved in marine turtle science and management in the southeast United States is mind boggling. In order to be effective, SEFSC turtle biologists must have a strong understanding of and relationships with these partners. I recommend the SEFSC turtle biologists engage in a strategic exercise to clarify roles and responsibilities with respect to turtle science. This should be done collectively (with SERO and OPR) and explicitly with a goal to identify who/which entities have the lead for data collection, analysis, products, and integration with respect to the core components of sea turtle assessment: abundance, trends, population structure, mortality. Clear roles

and responsibilities for the SEFSC should be developed, and in a spirit of collaboration and integration. The magnitude of this activity will require active and ongoing engagement by SEFSC leadership

11) I further recommend that the SEFSC turtle biologists actively engage in strengthening existing partnerships and building new ones with the myriad of entities involved in conducting turtle science in the southeastern United States. These include but are not limited to SERO, OPR, USFWS, and the states.

12) The importance of conducting more in-water work on turtles was stressed throughout the review. Great insight can be gained through use of technology applied to specimens. In particular, skeletochronology and stable isotopes obtained from dead turtles are of huge value to understanding the at-sea lives of turtles. Additionally, this research is cheaper, less invasive, and provides greater sample sizes. I recommend that the SEFSC support the existing age and growth lab and place a strong emphasis on using these tools to gain insights into the at-sea lives of marine turtles.

Deep Water Horizon

13) The SEFSC leadership and staff are in a unique position to inform the agency about the DWH event and in particular, to learn from it so that the agency will not repeat past mistakes. I recommend that the SEFSC write a comprehensive overview of their involvement in DWH. This overview should include the state of knowledge/information pertaining to marine mammals and turtles prior to DWH, and the science conducted, methods, and results post-DWH. Most importantly, this overview should include lessons learned, and this last should be focused at NOAA Fisheries' leadership level and above to specifically highlight the critical importance of maintaining baseline data, time series, and core science capabilities.

Personal comments and recommendations on the SEFSC review on Protected Species Science
Reviewer #5; August 28, 2015

I am grateful and honored that I was invited to be part of the review panel and I hope that my comments and recommendations will serve to provide guidance towards continuing the SEFSC work towards achieving NOAA's goals. During these days I had the opportunity to learn some of the very exciting and important work done at NOAA for the nation. I had interactions with scientists, leadership, and management, which helped me understand and value even more the critical work done by the Center.

I am not an expert in protected species and, therefore, I am not fully qualified to evaluate some of the specifics related to assessments of protected species. I will provide my comments from the point of view of a NOAA employee, a physical oceanographer who has done work with fisheries scientists and who values ocean research in support of applications, operations, and services. My comments will be focused on what I learned about the work that is done in connection with ocean environmental conditions, which is critical for assessments.

Format of the review: I liked the format of the review, divided by themes. It was extremely beneficial to understand the work carried out by the SEFSC leadership, scientists, and support personnel, since it helped to focus on specific areas and to present detailed information on the work performed at the Center. Through the two and a half days of the review, I saw personnel that showed excitement and love for their work, which is certainly key to success. This, by itself, also indicates that there are many aspects that are working very well at the different levels at the Center and Organization. Having one or two presenters per theme and a panel to hold discussions maintained the review on focus and always flowing smoothly. The scientists also kept continuous focus while showing a wide range of knowledge, interests, and approaches. Personnel were also eager to answer questions and they were always very respectful towards the panel members, their questions, recommendations, and sometimes criticism. Overall, I noticed a very high morale among the personnel.

There was additional information that I would have liked to see in the slides, but I am aware of time constraints to include all materials. I am aware that I probably saw only one small, although very important, component of all the work done at the Center. There is nothing that was done that I would stop doing in the review, but there are a few things that I would add:
1) Have a formal interaction between reviewers and science support staff, maybe during a 30-minute time slot in which support personnel meet with in groups with the reviewers.

2) Similarly, conduct a formal interaction between reviewers and post-docs and early career scientists, maybe a 30-minute time slot in which the meet in a relaxed atmosphere with the reviewers.
3) Hold a short poster session with a few science and service topics that are not covered in the talks and presented by those who did not have a chance to be in the panels or give an oral presentation.
4) Have the interaction time in a place that it is not a crowded bar, but somewhere with a limited space, such as the RSMAS Commons, SEFSC picnic area, AOML picnic area, UM, etc. On the Tuesday interaction at the bar I was not sure who belonged to the review group or not, there was just too many people.
5) Hold a 30 minute-long meeting between stakeholders and reviewers only.
6) At the beginning of the review it was shown the names of the various institutions that collaborate and partner with the SEFSC. It was hard for me to sometimes understand what part of the work was done by SEFSC scientists and what part was done in collaboration with partners.
7) I would have liked to see one or more post-docs making oral presentations or being in the panels.

Quality of work: I do not have the expertise to comment on the detail of the quality of the work, specifically on stock assessments. Several methodologies were shown during the presentations, with work that has been published in refereed journals. SEFSC showed that they are uniquely positioned to carried out these assessments, because of their expertise, ability to interact with a suite of different agencies, located next to a University and other NOAA lab, etc.

With respect to assessments of changes in ocean environmental conditions, I believe that scientists recognize its value and that they have personnel and budget limitations to carry out in depth studies. It was recognized by the scientists, managers, leadership, and panel members that creating baselines of stocks and of ocean environmental conditions is challenging, but it is critical have in order to accomplish their goals of understanding stock variability. I recommend that more ocean environmental observations, carried out in a continuous, sustained fashion, and incorporated into all studies, along with their corresponding analysis. This may be done in a cost-effective fashion by enhancing current partnerships with those laboratories that carry out ocean observations and data analysis. These baselines are critical to assess time and spatial variabilities, and even more critical when evaluating the effects of extreme natural and made-made events (oil spills, hurricanes, red tides, etc).

Main Recommendation: It is imperative that NMFS partners with other Line Offices (OAR, NESDIS, NOS), where the expertise already resides, to design, implement and maintain, ocean observing systems that will provide baselines on key ocean parameters (temperature, salinity, oxygen, pH, pCO2, currents, sea level, etc) to better understand the link between ocean variability (seasonal, annual, year-to-year, and trends), extreme events, and stock assessments.

My impression is that scientists from these centers will be more than willing and able to help SEFSC scientists enhance their observing systems and ocean data analysis. To accomplish the above, new funding needs to be sought after and secure.

With respect to the science elements that were presented in the talks, I really appreciate that the scientists took time to make presentations that exhibited a good flow, homogenous formatting with figures and text that could be read and understood. I had the opportunity to also read the presentations before hand, which facilitated my understanding during the presentations and helped with the discussions.

Relevance of work: The importance of the areas being researched and covered at the Center are critical and address NOAAs mission, there should not be absolutely any doubt about this. All presentations were very clear to show the relevance of their work. Protected species is an area that, from my perspective, is better understood and appreciated by different sectors, and in particular the general public. Although not mentioned during the presentations, I know of outreach work done by the SEFSC, and my only recommendation at this time is to have a more updated, user friendly, and visually attractive web pages to inform a general audience about the work on protected species done at the Center. I was really impressed with the work being done in support of Deepwater Horizon recovery efforts. The expertise gained by SEFSC, together with the expertise gained by other institutions, should be used to determine strategies to follow during similar extreme events.

Performance of science: This is usually assessed by the number and quality of scientific publications and their impact, and by the use of scientific results for developing applications, operations, and services. Much of the work done at the Center ranges from designing and planning research to conducting regular observations, and carrying out research with the direct objective of providing a service and recommendations. This work is done at the Center and in partnership with other institutions. At times, however, it was difficult for me to understand what work was done by scientists from the Center alone, and what was done in partnerships with others. In future reviews this could be partly addressed by including the reference below figures showing key results. I recommend that SEFSC maintains a table with some metrics on scientific performance, including H-Index of scientists, and number of R2O and R2A products.

There is a long-standing partnership between the SEFSC and AOML, probably a product of their close location but mostly because scientists are willing to work together to take advantage of their complementary backgrounds and knowledge. This interaction makes research both highly efficient and cost-effective. Key examples are the research cruises that carried out jointly by both Laboratories in support of fisheries and larval transport studies, and one oceanographic research cruise that was done by SEFSC and AOML scientist in July 2010 in support of Deep

Water Horizon monitoring efforts. These cruises and studies could be taken as appropriate motivation to carry out similar efforts in support of research geared towards stock assessments of protected species.

I recommend the continuous support of SEFSC and AOML science annual or biannual workshops, which has already shown to have very positive impact in fisheries stock assessments.

General Comments and Recommendations:

Interdisciplinary, multiplatform research is encouraged by NOAA, and the leadership and scientists of the SEFSC understand and value this.

A few things that I would have liked to be presented during the review are the following:
1) A distribution of the Center employees by Federal, CIMAS, contractors, etc; and an analysis if that distribution is satisfactory or if it needs to be change in any fashion.
2) A distribution of the budget by type of expense (scientist salaries, administration, building maintenance, etc)
3) Infrastructure needs, such as maintenance, addition of extra space for labs/office/etc, health facilities for employees, meeting room, etc.
4) Efforts being made and plans to mentor early career scientists and science support personnel, to mentor high school students, etc.
5) Efforts to improve web pages to, for example, include news, recent and key accomplishments, videos with personnel interviews, publications, etc
6) Efforts presenting paths for growth of early career employees
10) A more clear picture on how, sometimes, priorities are set.

Additionally, I have the following recommendations:

1) I heard the word trend being repeatedly stated over the review, even when the time record was short and the number of observations very small. Given that the other reviewers used the same terminology, I believe that this might be acceptable within the community. I recognize that working with small samples is extremely challenging as statistics may not be robust enough to use standard methods. Therefore, I recommend that an interaction be initiated with one or more mathematically/statistically-oriented groups that are dedicated to work with small samples in order to help to better understand
2) Initiate modeling efforts to design optimal observing strategies. Models at this time may not be adequate to carry out this effort, however, it is recommended that an initial effort is initiated.
3) I understood that the resources diverted towards Deepwater Horizon restoration studies may have hurt some of the research carried out at the Center. It is obvious that these resources are needed for DWH studies, however, at the expense of a

negative impact on regular SEFSC projects and objectives. This negative impact should be assessed.
4) Ship time (days at sea) appears to be a problem, common to other NOAA laboratories and Line Offices. The negative impact of reduced ship time was highlighted and it is recommended that NMFSC assess these impacts. I understood that the existence of a travel ceiling did not have a negative effect on their research and operations.
5) Some of the key work is being carried out by contractors. I understand that this is a quick alternative to CIMAS or federal government employees. Some of the presenters indicated that it is difficult to carry out sustained work when too much effort is concentrated in contractors, whose time of work may be too limited for what they are really needed.
6) I am not familiar with requirements on recruitment of women and/or minorities. I saw a very good representation of women in each of the themes, and in the Center as a whole, but I did not see the wider diversity with respect to race or ethnic backgrounds.
7) I would have liked to see a time diagram of FTE age distribution, that could have provided some justification on the need of increasing recruiting of early career personnel.
8) The partnerships with local, state, and federal government agencies were clearly indicated in many presentations. The partnerships with universities were not as obvious, in particular for a Center that has a strong emphasis on research. Although not indicated in the talks, they may be in existence, however, not mentioned (with a few exceptions as UM, Duke, SIO).