

**NOAA Fisheries Office of Science and Technology**  
**Fiscal Year 2014**  
**Stock Assessment Science Program Review**

September 9-12, 2014  
Silver Spring, Maryland

CHAIR'S SUMMARY REPORT

**I. Summary Report Structure**

This Summary Report will begin with an overview of the meetings held by the Review Panel in connection with the NOAA Fisheries Office of Science and Technology Fiscal Year 2014 Stock Assessment Science Program Review. It will summarize recurrent observations and recommendations among the Review Panel members during the meeting and in their written reports. However, Review Panel members operated independent of each other, and did not attempt to develop any consensus views. Most of the Review Panel member reports analyzed major issues as laid out in the agenda; and this Summary Report will use that organizational format as well. The Summary Report will also note briefly the engagement by the public during the meetings, and include some concluding comments.

**II. Overview of Review Meeting Proceedings**

The members of the Review Panel were: John H. Dunnigan, Chair; Mark Dickey-Collas; Mary Erickson, Patricia Livingston, Robert O'Boyle and Bonnie Ponwith.

An introductory and organizational conference call was held on September 4, 2014. Review Panel members met in person from September 9-12, 2014, in the Fenton Room of the Silver Spring Civic Center in Silver Spring, Maryland. The agenda was prepared by the NOAA Fisheries Office of Science and Technology, and presentations were made by that office as well as the NOAA Fisheries offices of the Chief Scientist and Communications. The format for the meeting was somewhat relaxed, with open (and sometimes lively!) discussions throughout the presentations.

Review Panel members met privately each day to discuss logistical issues and to determine whether issues needed clarification. In a few instances supplemental information was asked for during the open proceedings, and ST staff met these requests expeditiously. Other supplemental information requirements were anticipated by ST, and the response was very helpful.

Review Panel members completed drafts of their reports by the last morning of the meeting. An oral summary debrief was held on September 12, 2014. The NOAA Fisheries Chief Scientist was able to attend along with many of the participants during the week's meetings. The reports of the Review Panel members have been completed, and final versions are being submitted to the Director of the Office of Science and Technology along with this Summary Report. The Chair elected not to submit an

individual report. This Chair's Summary Report is derived from the views expressed in the various Panel Member reports.

### **III. Recurrent Observations and Recommendations**

#### **A. PROGRAM OVERVIEW**

Panel Members were all complimentary about the quality of the ST stock assessment staff and what they are able to accomplish under difficult circumstances. They effectively manage the challenges of a national program, have a responsive and listening culture, and generally pursue and achieve appropriate objectives. Review Panel members noted that the role of ST in stock assessments is largely related to process, and questioned whether there ought to be more national direction in establishing common priorities and goals.

Some Review Panel members noted the absence of issues related to ecosystem processes, relationships to protected species, and climate variability in the agenda for the review. While noting that these would be subject to reviews later in the NOAA Fisheries science review cycle, the view was expressed that stock assessment activities could not be fully appreciated without some consideration of them.

#### **B. PROGRAM DEVELOPMENT**

Stock Assessment Improvement Plan: Review Panel members expressed the view that the Stock Assessment Improvement Plan was a critical activity that needed to be pursued assertively. This is an important opportunity for the NOAA Fisheries stock assessment enterprise to develop strategic direction. Some Review Panel members believed that it was important to expand the engagement of interests outside of NOAA (Regional Fishery Management Councils, stakeholders, international scientific interests) in the development of the new SAIP.

Education, Training and Workforce Capacity: Review Panel members believed that these were important and largely effective efforts. Some of them noted the need to focus on continuing training for existing staff members, and encouraged greater use of intra-agency transfers and details.

RFP's and Working Groups to Support R&D; AST: Review Panel members expressed the view that the RFP process was a useful way to address cross-cutting requirements. However, the process has become very complex, and spread across a wide swath of issues. Although the diversity in the program is a strength, it could be more efficient if it were more strategic. Some concern was expressed whether there is sufficient follow-through and evaluation over time after projects were completed, and whether enough attention is paid to moving from research to operations. The need to think systematically about future directions for Strategic Initiatives was noted.

National Methods Workshops: Review Panel members noted the importance of the national methods workshops for facilitating dialogue on priority stock assessment issues. They expressed support for reinvigorating the National Stock Assessment Workshop process.

## C. PROGRAM IMPLEMENTATION

Vessel and Survey Planning: Review Panel members believed that this is an important role that is very well-executed. They appreciated the strong analytical tools that have been developed.

Maintaining and Enhancing Science Quality: Review Panel members recognized the value of the Center for Independent Experts, but noted that the process has become cumbersome and expensive to operate. Some of them recommended investigating opportunities to develop efficiencies in the process.

Supporting Analytical Tools: The comments of the Review Panel members supported the concept of maintaining the NOAA Fisheries Toolbox. However it was noted that the process has some maturity and needs to be reevaluated to ensure that the NOAA Fisheries science enterprise is using it sufficiently and effectively.

Stock Assessment Planning and Tracking: Review Panel members noted the efforts at developing the new prioritization tool for stock assessment planning and believed that this would be invaluable. Members noted that the Species Information System appeared to have uneven support among the respective Regional Fisheries Science Centers, and would be stronger if it could be developed to produce value-added products (e.g., SAFE reports).

## D. PERFORMANCE TRACKING, COMMUNICATION AND OUTREACH

Review Panel members noted the importance of effectively communicating stock assessment issues and results to the external community. They also noted the importance of ensuring that internal offices are recognized as important audiences for these communications, and for information about ST and the important roles that it plays in facilitating stock assessments in NOAA Fisheries. Feedback loops should be developed to improve the effectiveness of these external and internal communications efforts. These efforts within ST would benefit from strategic planning, and should be coordinated with related programs within the Regional Fisheries Science Centers.

Review Panel members also recognized the importance of stock assessment performance metrics. These need to be thoughtfully constructed. Performance evaluations under the metrics need to be communicated effectively to both external and internal audiences.

## IV. Issues Raised by Members of the Public

Three members of the public attended parts of the sessions of the Review Panel: Ellen Bolen (Ocean Conservancy); David Newman (Natural Resources Defense Council); and Ken Stump (The Ocean Foundation). Because of the dynamics of the meeting, the size of the group, and the consideration of the individuals involved, it was possible to take comments and questions from the members of the public during the individual agenda discussions. No written comments were received from members of the public .

Members of the public agreed about the importance of stock assessment processes and the role that ST

plays in facilitating stock assessments. Concern was expressed about problems with approaches to assessments for data-limited stocks; and that methods, software and tools for data-limited stocks needed more work. Concern was expressed that stock assessment priorities are often driven more by political considerations than scientific evaluations.

## **V. Concluding Comments**

Review Panel members felt very strongly that the ST staff had done a really fine job bringing together all of the information necessary for the review. Review Panel members were particularly appreciative of the responsiveness by the ST staff to requests for supplemental information during the meeting. By and large, the ST stock assessment staff does a great job with a tough role. Their activities would be strengthened by developing a more strategic approach where possible, creating a clearer vision for their overall role and expectations and a shared vision for stock assessment outcomes nationally.

This was a very strong panel. It included persons from diverse backgrounds. Each panel member had detailed experience with the NOAA Fisheries stock assessment process that was invaluable in developing and analyzing the issues that were brought forward. All of the members would look forward to assisting ST and other NOAA Fisheries science offices in the future.

## **Reviewer 1**

### **Background and General Comments**

NMFS ST Office is responsible for coordinating and framing the direction of science programs at the national level and across NMFS Science Centers. These programs are prioritized through the NMFS Science Board, comprised of the NMFS Chief Scientist, six Science Center Directors, three Senior Scientists and ST leadership. ST manages and supports many stock assessment-related activities at a national level. Activities include strategic planning, quality assurance, data collection, research and development, education and training, and assessment tracking, reporting, communication, and outreach. The objective of this national review is to evaluate the quality, relevance, and performance of ST's stock assessment program with a focus on the ways in which ST supports, coordinates, and communicates stock assessments throughout NMFS.

The terms of reference for the review were to consider whether ST is conducting the right set of activities to support NMFS stock assessments nationally, recommend new directions, expansion or reduction in current activities that ST should pursue in national support of stock assessments, and comment on the effectiveness of the organization and management of STs stock assessment program activities with respect to supporting and advancing stock assessment nationally. There were difficulties encountered in reviewing the ST stock assessment program partly because ST organization does not have a discrete stock assessment program like the Science Centers but rather has a suite of activities across different ST divisions. Many are contained in one primary division (ST4) but that division also implements broad suite of activities besides those in support of stock assessment.

Comments will be organized by general observations and recommendations by the general suite of activities presented to the reviewers in the agenda: program development, program implementation, and performance tracking, communication and outreach. Some of the organizational structure and management issues will be dealt with last.

### **Overall impressions on ST organization and management with respect to its implementation of its stock assessment enterprise**

Even though ST does not have an organizational structure that is strictly devoted to stock assessment, it implements and oversees a very effective national stock assessment science program. It has a very lean, hardworking staff who are strictly devoted to this portion of the program, amounting to about 6.7 FTE. Management of the EASA funding administered and distributed by ST is directed by the Science Board and there are ongoing challenges to the prioritization of the use of those funds due to year-to-year budget uncertainties not only in EASA funding amounts but also in the funding of other lines that support stock assessment such as Survey and Monitoring. Furthermore, there are challenges in making sure there are resources available to maintain field survey efforts in the face of uncertain funding for DAS and unanticipated vessel availability, which may require large reserves to ensure the maintenance of important data streams for stock assessments. These are challenges that ST effectively deals with. Other ongoing challenges that will require ongoing communication and strategic thinking of ST with the Science Board is how to resource activities that were once developmental but have now transitioned to operational yet still maintain a sufficient source of funding for research activities.

### **Program Development**

Program development presentations encompassed the activities revolving around development of the next version of the Stock Assessment Improvement Plan: Education, Training, and Workforce Capacity; Requests for Proposals and Working Groups to support research and development activities; Strategic Initiatives; and National Methods Workshops.

SAIP - The Stock Assessment Improvement Plan is a key strategic document for ST to develop, update, and implement with Science Center involvement. The update that is currently under development is very important to making future decisions about strategic investments for improving the NMFS stock assessment enterprise. ST has taken an appropriate role in leading this development and involving not stock assessment and ecosystems. This is forward looking and should hopefully result in a new and improved vision for moving forward.

It is clear that the current metrics for measuring and assessing progress in improving stock assessments need updating and this new version appears to be moving towards a different and improved approach. Progress in completing the new version has been slow and the large, distributed group involved in writing has been a challenge to manage.

This highlights the challenge that ST continually faces in using regional science center expertise for developing national products that will be implemented through regional inputs. These experts are critical to the development and implementation. However, these scientists have many other duties and the priority placed on completing the tasks for national goals may not always take precedence over pressing regional issues that need attention. In addition to involving regional science center expertise, the development of this plan will also require communication with multiple partners and stakeholders, particularly the fishery management councils, states, and regional fishery management organizations. This latter involvement appears to have been designed to occur at the end of the plan development process.

ST has rightfully expended a large amount of effort in getting this plan developed as it is a central piece to the national stock assessment enterprise. Obtaining science center involvement in timely completion of the initial draft is crucial as is communicating the draft plan with partners and stakeholders. ST recommendations to ensure meeting deadlines on completion of this document are appropriate and should definitely be employed. Communicating this to Science Board and science center supervisors may help with meeting deadlines on completion of this key national stock assessment product.

Metrics used to measure performance may need additional testing to determine which are sensitive and informative to demonstrating how we are appropriately meeting stock assessment improvement goals and the plan should incorporate and communicate that requirement.

Education, Training and Workforce Capacity – It is clear from the various reports on anticipated changes in the national workforce due to retirements and future need for more stock assessment scientists that this is another important issue for ST national leadership. A number of efforts that accomplish this goal were presented, although not all of them were ST sponsored. Many of the efforts appear to be focused on bringing new, sufficiently-qualified stock assessment scientists into NMFS. There appeared to be a lesser emphasis on training efforts for existing staff. In addition, there was uneven ST resourcing of some of the programs.

The NMFS/Sea Grant Fellowship program appears to be somewhat effective at getting new population dynamics expertise into science centers. Other non-ST programs may also be equally effective. There

did seem to be some impression among science directors that the ST support was unevenly applied for programs such as QUEST.

Suggested improvements would be for ST to evaluate the appropriate mix of NMFS involvement and support for all the activities with the goal for a regional balance and training opportunities for both new stock assessment scientists and providing resources to train existing staff. The QUEST virtual institute course portal might be better advertised and support for providing regional training for various stock assessment tools such as R, etc. should be considered. ST should engage Science Board in discussions about how much permanent resourcing ST should provide to support QUEST-type faculty around the nation. ST has done a good job at filling various regional gaps but this does not lead to a coherent national program. There should also be discussions about ways to improve NMFS/Sea Grant fellows transitioning into NMFS positions, as currently about 40% go on to work for NMFS. Similarly, Science Board should be engaged in discussions about how to best meet the training needs for NMFS scientists. Although ST could play a role in providing some focused training on stock assessment tools, science centers should also be setting goals and setting aside fixed resources for staff training and improvement, including participation in regional, national, and international conferences and working groups. ST may also need to be involved in advocating for travel ceilings needed to accomplish this effectively.

RFPs and Working Groups to support R&D: The Request for Proposal process coordinated by ST is comprised of multiple but separate RFPs developed and reviewed by different work groups. Work groups are comprised of an ST representative and science center experts in the particular RFP topic. The format, timing and review processes of each RFP are different but are becoming slightly more coordinated in recent years. Science Board reviewed the RFP mix and provided feedback to ST that this was the appropriate mix of activities. In addition to these 1-2 year projects funded through the RFP process, there is now an added element of funding strategic initiatives to accomplish technological advancement of some key stock assessment areas of interest across regions through a longer term (3-5 year) focused funding instrument. Both of these are important tools for ST to employ.

ST involvement and leadership in organizing these efforts is important and necessary. RFP funding appears to have resulted in good regional advancement of stock assessments. The new strategic initiative process is just starting and learning how to manage these longer-term projects to get timely completion and operational products will be important.

Challenges of the RFP process from a science center perspective are the varied deadlines and formats. One recommendation would be to create an integrated RFP with a more common format and timing for submission. Components of the RFP should still be developed and implemented by the working groups as WG involvement and knowledge is key. It is also clear that successes and improvements to the stock assessment enterprise made as a result of funding are not well tracked and quantified. This should be a point of discussion within working groups and with the Science Board about how to synthesize research outcomes and communicate successes of this program from a national perspective. Are there some integrated products and measures of success that can be derived? Challenges for ST are how to get sufficient attention and discussion among WG members to this process and its outcomes given the fact that WG members may only be able to dedicate small amounts of their time to these duties. More consideration may need to be given to having more formal discussions about time allotments required for WG involvement with science center supervisors of WG members and making sure that time is adequately represented in the annual workplan of the member. Sometimes there is a trade-off between having the most experienced member of a science center on a work group, who may have little extra time to devote to the task versus less experienced scientist who may have more time.

Deciding when and how to fund strategic initiatives should be made with the Science Board. It wasn't clear how much the budget process allows for timely submission of ideas to obtain new funding for SIs versus how much the agency makes decisions about how best to utilize increased funding after the funding increase is actually realized. Budget uncertainty definitely plays into the difficulties ST has in making strategic, longer term commitments of funds. But regardless of the funding environment, ST should still continue to be forward-thinking and working with the Science Board and working groups to identify the next areas for strategic investment so that they can actively communicate those needs to others inside and outside of NMFS and be poised to act if increased funding should be realized.

National Methods Workshops: ST has supported workshops focused on specific topics to understand and advance the state-of-the-science in that area and has also funded national stock assessment workshops (NSAW) to facilitate communication across regions and create networking and professional development activities. ST also provides targeted resources to support participation of regional scientists in various regional and international workshops and also support of various conferences.

These are definitely appropriate for ST involvement. Despite the challenges of having an NSAW due to the group travel and funding commitments required, it should remain a regular commitment by ST to organize these. The goals of each particular NSAW might vary but should include the opportunity for young scientists to learn from others and for communicating across regions on best practices.

## **Program Implementation**

Vessel and survey planning: The vessel and survey planning effort is key to the stock assessment enterprise as data derived from fishery-independent surveys are the foundation of most stock assessments. There have been challenges in this enterprise due to fleet aging and replacement and changes in OMAO base funding of days at sea. However, there have been improvements to the process through an improved NOAA ship request, prioritization, and allocation process that is still evolving. The new process is more transparent and consistent than was the case previously. However, the challenges in funding and advancing this effort continue due to delayed annual appropriations, maintaining adequate vessel staffing, and streamlining the data acquisitions from the vessels. ST retains resources to respond to unexpected changes in vessel availability so that the critical time series for stock assessments can be maintained.

Maintaining and Enhancing Science Quality: ST plays an important role in implementing National Standard 2 and running the process for employing the Center for Independent Experts that is mainly used for the review of stock assessments. ST played an important role in coordinating a workgroup to develop the latest guidelines for National Standard 2 of the Magnuson Stevens Act, which requires that conservation and management measures be based on the best scientific information available. National leadership for developing and implementing the standards is essential while allowing for regional differences in the stock assessment review process. It is important that ST maintain this oversight to ensure that CIE terms of reference are appropriately developed across regions and continues to evaluate the outcomes of the review process to ensure that quality advice is produced. ST adequately funds this effort. ST should continue to review the CIE reviews and TORs to ensure they are used appropriately. Discussion and consideration to other less time intensive review procedures and more involvement of local or national experts should be considered when appropriate.

Supporting Analytical Tools: ST provides support for a number of analytical tools such as the NOAA Fisheries Toolbox, the ADMB project, and Stock Synthesis. The NOAA Fisheries Toolbox is a set of software applications used in stock assessments combined with a graphic user interface (GUI) that serves as a consistent way to provide inputs and obtain outputs from the diverse individual tools in the toolbox. Stock synthesis is also a package contained in the toolbox and can be used with or without the GUI. However, changes in any package in the toolbox often necessitate changes in the GUI, which hinders changing versions and advancing individual tools in the toolbox. It is not clear how much the GUI interface is used across regions and that type of interface may be outdated. ADMB is the basis for over one-half of NMFS assessments, including many Toolbox programs. ST rightly supports this enterprise to ensure that tools are maintained and accessible.

However, there are challenges to maintaining such a diverse set of tools and interfaces as computing needs and practices are constantly evolving. Packages or interfaces may be overly reliant on one individual's expertise and documentation may not be complete enough for use outside of a particular region. Maintaining and evolving software packages to be as efficient as possible for updating and certifying that they are reliable for operational use may require a different vision and model. We heard about some new evolving methods coming out of Denmark, ideas for transitioning Stock Synthesis to a more adaptable up-to-date-coding and the development of a generalized stock assessment model that may employ a community approach to updating and quality assurance. These are important to advance in a way that may result in a more streamlined system that does not rely on specific individuals for maintenance and does not rely on an outdated interface for access while still providing assurance that the tools available are adequately tested and operationally ready. ST resourcing of these efforts should not be decreased but some way of providing a vision for developing best practices for these toolboxes should occur. This could be a focused review study of best practices across a variety of disciplines that employ such tools, holding international workshops or symposia that discuss these practices, or some other method for getting a broad, forward-looking view of how to advance and fund these efforts in the longer term would be useful. In the short term, the CIE review of the ADMB and a planned review of the generalized model system currently under development may provide some insights.

Stock Assessment Planning and Tracking: Stock assessment planning efforts run by ST include the development of a stock assessment prioritization tool and the species information system, which tracks metrics of particular stock assessments. These efforts clearly have the potential for national benefit to allow for right-sizing stock assessment funding, streamlining communication about stock assessment accomplishments, making stock assessment results and information more widely available, reducing the amount of individual requests for information from individual science centers, and more quickly responding to information requests from those outside the agency. The new data requirements of SIS are certainly burdensome to individuals in centers tasked with that responsibility and there needs to be thought on how to streamline the SIS and the input process to minimize errors and reduce the manual entry of data into the system. It has the potential to provide benefits to centers (through archiving annual stock assessment information in a more reliable and transparent way, for example). Since maintaining this system is a joint responsibility of both ST and science centers, there may be a need to sufficiently resource this on both ends as the requirements increase and this should be communicated to Science Directors. ST is already increasing the time commitment for the SIS coordinator to full-time and centers may also need to increase staffing on their side to accommodate this enterprise and ST funding may be necessary to enhance staffing on the science center side and to streamline the system of data inputs.

The stock prioritization tool is still undergoing testing and its usefulness for providing sensitive, informative metrics is uncertain. It will also depend on the new SAIP assessment categorization that is awaiting finalization. This tool, which was intended to be employed for regional prioritization is now being conceptualized for a national system. There will definitely be a necessary evaluation and dialogue about this as the testing and roll-out proceeds.

## **Performance Tracking, Communication, and Outreach**

NMFS-level Outreach and Communication: NMFS is involved in the development of a number of outreach and communication tools from developing stories, producing videos and animations, providing plain language and finding ways to more regularize communications with the Hill. These seem effective strategies and are evolving to ensure better internal coordination with the development of communications that go outside the agency and more proactive planning to regularize communications with the Hill, get involvement of on the ground Sea Grant agents, etc. Web page interface and information update, particularly for stock assessment is planned and seems necessary. Particularly SIS connection and the toolbox are not well-designed. These could definitely use more resourcing to improve and update the web pages.

ST Communications: ST engages in a number of communication methods for internal and external communication. Internal communications include those with Science Board and working group representatives but also NMFS budget administrators and leadership. Congress, stakeholders, Councils and the public are also audiences for communications. Center Directors provided mixed feedback on ST communications and this may reflect some need for improvement in methods for internal communication. There is now a stock assessment communication forum and a google site for the information so that national information can be more readily shared. ST coordinators also have regular meetings with working groups. ST regularly produces products for communicating priorities and science directions to the Science Board. The senior scientists also have regular communications with individuals across centers to advance and discuss science advancement.

However, the communications with these individual groups often do not get distributed broadly enough within each center so that there is adequate knowledge of what is going on in each of these activities that ST is coordinating, what ST is doing and how the science center is linked to national priorities. Suggested improvements could be a NMFS ST intranet to make available the products and progress of working group efforts, more outreach of ST staff to field offices on specific efforts such as SIS/stock prioritization tool through discussion fora in face-to face and online formats. More transparent budget information on how ST uses and delivers EASA funding to the field for research activities, such as that provided to the panel on the third day might be helpful. Some regular (quarterly or so) higher level communications from the NMFS Chief Scientist and senior scientists to the broader science center audiences might also be helpful.

## Reviewer 2

### **General Observations**

The NMFS Office of Science and Technology (ST) is charged with coordinating and helping to frame the direction of science programs at the national level and across NMFS' science centers. NMFS and ST are to be commended for creating a national support network of programs which ensure that the quality and rigor with which NMFS executes science to support stock assessments – through RFP's, science quality, methods development and working groups, and capacity building – continually demonstrate and execute against high standards. The processes have allowed NMFS and ST to demonstrate many best practices for the “business” of science management across NOAA, even though they are building and carrying out these processes within the highly scrutinized and contentious environment of Stock Assessments, the Councils, and other stakeholders.

With a relatively small team, and within a challenging budget structure, ST clearly places a priority on not only refining the approach for advancing stock assessments, but on articulating these approaches and their return on value to the nation with NOAA, DOC, OMB and Congress. The success of the Expand Annual Stock Assessments funding is a demonstration of this. A growing recognition and attention to strengthening communication efforts with other stakeholders including the general public, and the approach of partnering and leveraging the expertise and resources of the NMFS HQ communications staff should demonstrate more future benefits.

ST appears to be doing a good job of supporting stock assessments while balancing the natural tensions between regional execution of assessments and the ST focus on national priorities, strategic direction, and performance tracking.

### **Review Approach:**

The Office of Science and Technology (ST) and Dr. Rick Methot presented a thorough set of briefing and background materials to the review panel which were easy to access electronically before and during the review (the data stick was my preference). The agenda provided plenty of time to discuss issues, all presenters were well prepared, and the ST leadership team and presenters were very open and responsive to questions and modifications during the process.

The topical layout of the review agenda seemed to jump into a series of activities at a detailed level without quite enough time to walk through and absorb foundational concepts such as: the overarching goals and vision for the NMFS-wide stock assessments program, how NMFS structure and budget is used to advance those goals, and the functions, roles and responsibilities of the different members of the Science Board. By the end of the review, we were able to pull much of this together, particularly with the additional budget slides, but the puzzle pieces took a bit of maneuvering. The SAIP appears the new strategic vision for stock assessments.

The consistent inclusion of both the results of the Science Center survey, and the “Strengths, Challenges, and Solutions” analysis for each major agenda item *was very helpful*, and provided useful insight into ST's perceived internal relevance, and awareness of key challenges and possible solutions.

### **Key Findings & Recommendations:**

#### **Organization and Management**

**Finding: ST scientific leadership** - Over the last few years, NMFS has selected three Executive Level Senior Scientists for economics, ecosystem science, and stock assessments (my shorthand). Overall, this move seems to be providing very good benefits across the NMFS science enterprise. It is less clear whether the transition of Dr. Methot's roles he held while in the Office of Science & Technology is complete, or what the functional impacts of this are to ST. The modeling and tool development support work, for example, might benefit from being handed off more substantially to ST folks for execution, with oversight by the Senior Scientist.

**Recommendation:** Consider filling the billet in ST that Dr. Methot vacated, or a similar type position. This would demonstrate a commitment to keep a career track from ZP4 to ZP5 to Senior Scientist open to employees, and would ensure ST could provide the proper attention to the oversight and support of key technical advancements.

**Recommendation:** Increase scientific credibility and field experience through recruiting ST employees from the Science Centers, and allowing ST employees to continue to develop and refine their skills by actively participating in key research projects involving fieldwork, or such as the strategic initiatives.

**Recommendation:** Consider creating more routine staff rotations between ST and field offices (and vice-versa).

**Recommendation:** ST needs an increased level of annual interaction with each of the Science Centers, providing exposure to the ST role, work products, successes, and how they "protect" the Science Centers from programmatic and budgetary fire drills. Interaction could include training sessions in national priorities, the assessment tools supported at ST, the SAIP, etc.

**Finding:** Clearly the **Science Board** plays an important role in setting the strategic direction for stock assessments, and in arbitrating the balance across Science Centers and ST. It is less clear whether or not the quarterly meeting notes and action items provide enough documentation and communication of these decisions.

**Recommendation:** Consider creating a way to annually document the decisions on the science direction for stock assessments. In addition, create an internal communication on NMFS science decisions and directions to go out across all internal NOAA employees.

**Finding:** The complicated nature of the NMFS **Budget** seems to lead to spending a lot of time annually negotiating how all the budget lines and programs which support stock assessments are executed between the Science Centers and ST. While the programmatic vs organizational unit structure allows flexibility to ensure funds are focused on the highest priorities as well as emerging, and urgent requirements; a more streamlined approach could save time and increase efficiency.

**Finding:** The **connections** between the portfolio of stock assessment science **to ecosystem modeling, habitat, and protected resources research and science development** taking place across NMFS (and NOAA) were not clear. The Species Information System improvements and Stock Assessment Improvement Plan both acknowledge that building out tools to advance and include a better understanding of how the stressors/ecosystem factors affecting fish stocks, but the budget and organizational structures don't seem to support this. The Senior Scientist for Ecosystems was mentioned in conjunction with a few projects, and it is a significant sign that he is helping to oversee the SAIP. In addition, references to protecting marine ecosystems in MS were acknowledged, but it is not clear how

ST or NMFS is strategically pursuing this, although we did hear a few references about some early success in taking this approach more specifically for climate impacts.

**Recommendation:** Clarify how a matrix approach across NMFS can improve the linkages and ensure stock assessment science is informed by investments in ecosystem modeling, habitat, and protected resources science. Consider creating special components on the Science Board agenda where senior leaders from these offices can participate.

**Finding: Taking on the Objective Oversight role on Stock Assessment Science:** ST exists to be the “hub” of a science wheel (e.g. stock assessment science). Although ST does a very good job of keeping this wheel turning, it is very difficult to see whether or not they are doing the steering of this wheel, and if they are able to apply brakes or accelerators strategically. While the NMFS Chief Scientist and the Science Board are likely the correct venues to make decisions on the direction and speed of changes, ST needs to strengthen its ability to identify, propose, and help oversee the execution of these strategic course settings for the NMFS stock assessment enterprise.

**Recommendation:** Improve the collective strategic direction setting power of the organization by documenting through a portfolio approach the key priorities for stock assessment science, and mapping ST activities directly to these priorities.

**Recommendation:** Consider explicitly requesting and documenting annual science needs and requirements to support stock assessments from the Science Centers (it seemed possible that this is happening informally, but is not documented or available transparently to all).

## **Program Development**

### **SAIP:**

The effort to develop the new SA improvement plan seems to be a very strategic and broad effort to take on the complex challenges of ensuring stock assessment resources are applied to activities that can have the most impact, and being able to measure the effectiveness of these investments. The working group appropriately is led by two Senior Scientists, coordinated by ST, and includes expertise from across the organization. It did not appear, however, that significant engagement had been done with key external stakeholders on the SAIP; this may be an area to strengthen.

**Recommendation:** Consider determining interim milestones in the SAIP development process to pause and get external feedback and input to promote buy-in by stakeholders. A few suggestions include: virtual engagement sessions, presentations at key meetings and conferences, and drafts posted on the website and perhaps sent as a link in the NMFS newsletter.

### **Education and Workforce Capacity:**

The education programs being managed across ST seem to be effective and well run.

Placing a little more emphasis and tracking on the training of internal staff as well, will provide a strong balance. Tools may include promoting rotations or perhaps even sabbaticals for cross-training.

### **RFP/SI's:**

**Finding:** This system seems to appropriately serve the purpose of engaging scientists across NMFS in addressing key science issues together and with partners. The strategic initiatives seem particularly well focused on critical emerging issues. A challenge is that there seems to be a growing “laundry list” of RFP's.

**Recommendation:** Continue reviewing the list of RFP's and SI's annually or every other year with the Science Board to ensure the portfolio is sustainable and focused.

**Recommendation:** Transition of Research – Consider creating improved requirements for including plans for operational transition of the outputs of RFP projects or strategic initiatives within the proposals, or even having operations or application managers on the project teams, to help clarify requirements and get buy in for implementing the outputs.

#### **National Methods Workshops:**

**Recommendation:** Support putting the National Methods Workshop back in place as a shared learning experience.

#### **Program Implementation**

**Vessel and Survey Planning:** This activity seems to be well organized, demonstrates steps to strategically align days at sea with stock assessment goals, and maintains the ability to flexibly support field work, even when faced with vessel breakdowns or unexpected gaps. Well done!

**Supporting Analytical Tools (Toolbox, ADMB, SS):** While not this reviewer's area of expertise, these programs, particularly ADMB and SS seem to be providing a good service to the stock assessment community. Steps being taken by ST to improve and ensure the appropriate level of development and support for the development and usage these tools are critical.

**Recommendation:** Continue to pursue best practices of using testbeds, community modeling principles and R&D High Performance Computing resources and lessons learned from across NOAA to advance these stock assessment tools and ensure they have the appropriate infrastructure to continually improve and provide reliable services.

**Species Information System:** This system allows NMFS to smartly and quickly address inquiries from Congress, OMB, NGO's, etc. Plans to connect the prioritization process to the SIS, improve connections to modeling outputs, and developing tools to create the SAFE reports would increase the value. This reviewer is not fully up to speed on the complexities, but resonated with suggestions to ensure tools to evaluate the effectiveness of policy decisions and outcomes (e.g. closeness to optimal yield).

**Recommendation:** If ST is not already doing so; consider keeping track of the number and type of inquiries responded to, as one measure of ST's support to the SA enterprise.

#### **Communication and Outreach**

**Finding: Internal Communication:** Outside of the Science Board members and perhaps working group members, it appears many Science Center personnel have very little exposure or awareness to ST, and their roles in advancing the strategic stock assessment science directions.

**Recommendation:** Consider creating an internal communication on NMFS science decisions and directions to go out across all internal NOAA employees. This could go out quarterly after Science Board meetings, and could include other key workshop outputs or outcomes as well (e.g. Science Reviews!). It could also be a venue for highlighting ST contributions to national stock assessment. Consider documenting and conveying the number of inquiries handled, etc.

#### **Finding: External Communications -**

ST seems to have a good recognition of the need to improve external communications tools and methods, and I would encourage them to think beyond the solutions of the web and the SIS portal. Partnering with the NMFS HQ communications office is underway, and this continued leveraging of the expertise and resources of the NMFS HQ communications staff should demonstrate more future benefits. Media training of the Senior Scientists and other key science staff have been productive. Their does not seem to be adequate methods for having a “feedback loop” on communication efforts with Congress & OMB, or with the broader set of stakeholders. This reviewer is very supportive of the new direction of engaging Sea Grant staff in the development and execution of outreach.

***Recommendation:*** Consider creating opportunities for a broader range of appropriate science personnel to receive media training.

***Recommendation:*** Consider having at least one professional trained communications specialist in ST, or shared with another office. This expertise could streamline communication improvement efforts rather than having a number of staff do this as an “extra duties” role.

***Recommendation:*** Consider creating an annual ST communication plan, or at least documenting ST’s contributions and participation in the HQ communication plan.

***Recommendation:*** Consider the role of engaging in sociological research as a possible way to both improve messages and terminology, as well as engage stakeholders and the public in defining the best ways to measure and communicate the “health” of the stocks, in more simple ways. (Note: we did not discuss in the review, so this may be underway already.)

#### **Performance measurement:**

**Finding:** ST clearly understands the importance and challenges of good performance measurement. This reviewer is supportive of continued and increased efforts to evaluate the adequacy of existing measures and developing and modeling the performance of proposed measures to articulate the effectiveness of assessments to supporting economic fisheries and maintaining health of ecosystem.

***Recommendation:*** Consider creating indicators and pie chart type documents as a product of the newly developed database.

#### **Conclusions**

ST is a lean and well run organization supporting stock assessments at the national level. Placing a renewed focus on developing, documenting, and advocating for the national strategic direction, priorities, and key milestones to achieving stock assessment goals will strengthen the value ST provides to NMFS. Instituting processes with the Science Centers to routinely step back from the numerous programs they oversee to assess the combined effectiveness for advancing stock assessment goals will create a cycle of continual learning, refinement and renewal which will ensure the NMFS stock assessment will remain vital.

## **Reviewer 3**

### **General Observations**

The Office of Science and Technology (ST) is responsible for the strategic direction of stock assessment (SA) programs at the national level and across the regional science centers of the NMFS. It fulfills this mandate through the management and support of activities at the national level designed to support the program's development and implementation. It further undertakes communication and outreach to foster broader awareness of the program within and outside of the service.

In this report, the SA program is considered the range of activities that were presented to the review panel and not as a specific group under one line manager. Observations of the components of the SA program are provided in the next section with key findings and recommendations summarized in the following section.

### **Planning**

The activities of the five divisions of the ST, of which the SA program is a component, are guided by the 2013 strategic plan which is composed of four themes: data collection and assessment, science advancement, information management and dissemination, and support services. This plan, which is the first of its kind, responds to national legislation and policy (i.e. MSA, National Ocean Policy) and has as its primary focus support for fisheries management and as its primary clients the six regional science centers. The directors of the latter and the ST as well as the NMFS chief scientist form the Science Board which oversees the implementation of this strategic plan.

During the review, relatively limited reference was made to ecosystem and climate processes. While ecosystem and climate science is the focus of the 2016 ST program review, there is a concern that linkages across themes is not occurring to the extent that they should. The ST Office should in its strategic plan make greater effort to ensure that ecosystem processes are considered in the stock assessment program and vice versa.

The overarching goal of the SA program, which is the focus of this review, is the enhancement of the ability of the science centers to provide fishery managers with high quality, reliable, transparent and timely stock assessments. In FY 2014, the SA program comprised the majority of the ST budget (\$74.8 mil of the \$85.4 mil), 41.5% of which is kept within the SA and the rest allocated to the science centers to support specific initiatives. The overall approach of the SA maintaining a core of funding within the ST and allocating the remainder to the science centers is prudent as it allows the SA to partner with the regional offices on activities which have a national focus. It is not possible to state what the national/center split should be although the current arrangement appears to be suitable.

In 2001, the first Stock Assessment Improvement Plan (SAIP) of the SA was developed to provide strategic direction to the program. The plan using a 5-level system to characterize assessments and three tiers of assessment excellence identified SA program gaps and resource needs and has guided budget implementation since then. Overall, it has led to national assessment program improvements. However, the ST recognized that it had deficiencies (e.g. need for assessment prioritization protocol) and thus a new plan is being developed which is to be released in fall 2014. This protocol is discussed below.

The SA program, as noted above, is a collection of activities across a number of line organizations. These activities can at first impression seem like a group of unrelated initiatives but on

inspection have common goals. Also, while many activities might be considered ‘reactive’ to external forces, many were proactive. Having said this, it is not evident how strategic directions in the ST plan are responded to in the SAIP either old or new. This needs to be addressed in the new SAIP to be released in fall 2014.

## **Development**

The overall approach of the SA in encouraging the development of the SA program nationally involves three broad activities:

- Capacity Building
- RFP initiative
- National Methods Workshops

Overall, these activities offer an effective means in the long term to promote the development of stock assessment in the NMFS.

Two major initiatives are undertaken as part of capacity building – the Quantitative Ecology and Socioeconomic Training Program (QUEST) and NMFS Sea Grant Fellowships. QUEST provides faculty support for seven quantitative ecologists at universities around the country who are currently providing training and supervising graduate students in quantitative ecology. These faculty and their students are engaged in stock assessment and management in various capacities. The Fellowship program in contrast provides support for post-doctorates to undertake assessment and research on quantitative methods under mentors at the science centers. It was reported that about 75% of the Fellows go on to work in marine resource management with over 40% working for the NMFS.

The combination of the QUEST and Fellowship initiatives should provide an effective means to increase the overall pool of expertise in quantitative ecology. There is however currently a lack of positions for finishing students. It would be useful to explore the possibility of having graduate students working on assessments at the centers as has been the case at the U. Washington. An issue raised by one of the science center directors in the questionnaire response is the decline in quantitative training opportunities for current NMFS staff. The Science Board should discuss if this view is generally shared and whether or not a NMFS training program should be instituted.

An issue with the capacity building initiative is the apparent lack of an overall sense of whether or not it is achieving its goals. While it is evident that it is providing positive training benefits and improving capacity in quantitative ecology expertise, it is not clear to what degree this is the case. The SA program should undertake an examination of its expectations of this initiative.

The main vehicle by which the SA program facilitates methodology development is the Request for Proposal (RFP) initiative. Sixteen funding envelopes, eight of which are core to the SA program, are used to solicit proposals from the science centers on projects identified by the Science Board. Each of these funding envelopes is coordinated by a working group which oversees and reports on project deliverables. In FY 14, the majority of the funds appeared to be allocated to data collection and science advancement projects (Table 1).

Table 1. Distribution of ST FY 14 funds across themes of ST Strategic Plan; based upon project descriptions presented to review panel

	RFP Project	Data Collection	Advance Science	Data Mgt	Support Services	Total
Core SA	SA Methods		\$532.00			\$532.00
	SA Improvements		\$526.00			\$526.00
	Fish & Environment		\$1,359.00			\$1,359.00
	Habitat Assessment		\$707.00			\$707.00
	Coop Res	\$750.00		\$750.00		\$1,500.00
	Intern. Science	\$62.50	\$62.50	\$62.50	\$62.50	\$250.00
	Advanced Tech	\$841.00				\$841.00
	AST SI	\$1,310.00				\$1,310.00
Non-Core SA	NOP	\$900.00				\$900.00
	FINS	\$2,000.00				\$2,000.00
	MRIP	\$2,600.00				\$2,600.00
	Turtle Assess		\$500.00			\$500.00
	NS8			\$390.00		\$390.00
	Rec Economics	\$250.00	\$250.00			\$500.00
	Economics	\$550.00	\$550.00			\$1,100.00
	Ocean Acoustics	\$300.00				\$300.00
	<b>Total</b>	<b>\$9,563.50</b>	<b>\$4,486.50</b>	<b>\$1,202.50</b>	<b>\$62.50</b>	<b>\$15,315.00</b>

Overall, the administration of the initiative appears to be effective. The concept of partnering with the science centers to facilitate national projects is sensible but needs enhancement. As noted by some science center directors in the response to the questionnaire, the number of project envelopes appears to be excessive. Some of the projects are closely related and might reasonably be combined. Also, the funding envelopes appear to be primarily based on historical allocation.

While the proposed solutions to challenges identified are appropriate, there is a broader need to be more strategic in the allocation of RFP funds. The SA program should define what strategic areas it wishes to pursue and organize the RFP fund according to these areas. These areas can be linked back to the ST strategic plan. Then it should preferentially fund these areas over a given time horizon (3 – 5 years).

The National Methods Workshops, conducted since 1991, have been an effective means to facilitate national understanding on stock assessment issues, identify knowledge gaps and research needs and develop national practices and guidance. The current review is timely as the use of these workshops has fallen into disuse, the last one being in 2010. Perhaps this is a symptom of there being multiple competing opportunities for the presentation and discussion of the science of quantitative stock assessment. Also, the RFP working groups provide a forum for dialogue of specific issues. Notwithstanding this, there is a valuable role to play for the national workshops in facilitating strategic thinking in specific ST areas. They should be used to facilitate national dialogue on priority stock assessment issues, leading to the development of national best practices. They also provide an opportunity for scientists from different regions to learn from each other and provide a forum for the development and networking of new NMFS scientists.

## Implementation

The overall approach of the SA to implement stock assessment programs nationally involves four broad activities:

- Coordination of survey vessel resource allocation

- Oversight of peer review
- Provision of supporting analytical tools
- Stock assessment planning and tracking

Compared to the SA development activities, the SA implementation portfolio is more of a collage than a group of linked programs, although all are intended to meet the goals of the strategic plan.

The ST has a good and strong working relationship with the Office of Marine and Aviation Operations (OMAO) in the management of time usage of the 16 NOAA research vessels. In 2012, while only 34% of the requested ship time was met, it was evident that the ship allocation process is thorough and effective. Notwithstanding this, the new initiative the use a multi-criteria decision analysis tool to guide the allocation process is worthwhile although it should not be relied upon as the sole basis of ship time allocation decisions.

The SA's mandate in peer review is to strengthen the integrity, reliability and credibility of the science enterprise, an important component being the coordination of the stock assessment peer review process with the Center of Independent Experts (CIE) and the science centers. The annual process managed by the SA is well organized and thorough. It is acknowledged that the stock assessment schedule is not entirely driven by science requirements and is sometimes a response to management demands. Notwithstanding this, there was a general sense of a highly demanding system which may outstrip resources in the longer term. While the peer review processes in each region are similar, it would be useful for the ST to coordinate dialogue amongst the regions to develop national best practice guidelines of peer review. Each region can learn from the other on how best to manage and implement effective peer review. Consideration should be given to clearly separating assessment to service harvest control rules in management from the investigation of the models and assessments to be used in the assessments. The latter should be conducted as part of an MSE and would attract the majority of CIE resourcing; on-going assessments should be the subject of desk reviews with more limited, if any, CIE involvement.

The Support of Analytical Tools activity consists of a number of initiatives which can be considered elements of a chain of software products, from source code through packages of various degrees of user friendliness to online library to facilitate distribution and use of the tools. The ADMB project is the first step in this chain. NMFS showed international leadership when it offered significant support for the project in 2007. The package is now one of the most widely used in stock assessments both in the US and elsewhere. NOAA groups outside of NMFS (e.g. physical oceanographers) might find ADMB useful for their analytical purposes and should be encouraged to try it. While alternates will no doubt arise (e.g. TMB), continued ST support for this project is strongly supported. It is noted that the administrative arrangements of the project are to be CIE reviewed in 2015 which will be very worthwhile.

Stock Synthesis is the next step in the software chain, being a sophisticated user interface to ADMB which allows development of a wide array of stock assessment models. This is important as the upcoming challenges of stock assessment (e.g. impacts of climate change and ecosystem processes) will likely have to rely, at least in the short term, on the datasets which currently exist. It is therefore important to have available modeling frameworks, such as Stock Synthesis, which allow examination of old data in new ways. Thus, the continued support of Stock Synthesis by the SA program is supported. However, it is timely to consider transitioning software management to a development team associated with the Assessment Methods WG.

The last step in the software chain is the NMFS fisheries toolbox which provides online access to tested basic and advanced assessment software packages and documentation. However, it is becoming dated and it is timely to consider its future. Ready online access to the array of tools available

in the toolbox is very useful. If resources could be found to encourage its broader use and create standardized testing protocols that would be appropriate.

It is useful to step back and consider the suite of analytical tools and their long-term usage and management. It is easy to ‘over-plan’ this portfolio. In the software industry, events happen quickly and can quickly make redundant well-planned initiatives. In the short-term, the current suite of tools is appropriate and its continued support recommended. However, thought needs to be given to both modularizing the components of the packages to allow greater flexibility in model development and adopting user interfaces which allow greater access to these packages. One possibility is engaging the gaming community in this endeavor. It is important to be flexible while at the same time addressing ongoing modeling demands. A team, composed of assessment modelers and computer scientists, should be commissioned to outline a future software development track which would integrate all three tools and allow future extensions.

The Stock Assessment Planning and Tracking activity consists of two initiatives – assessment prioritization protocol and the Species Information Systems (SIS). The first is a key part of the new SAIP which was discussed above. It is intended to inform decisions on the frequency and type (update vs benchmark) of assessment. The current assessment schedule represents a heavy workload, which could be lightened by application of the prioritization protocol. However, the assessment schedule is often driven by demands outside science. It would be useful to rethink what an assessment is. It can be the annual evaluation of a suite of indicators (e.g. commercial and survey catch rate, catch and / or survey age/size composition, model estimated SSB) informed by stock dynamics assessed during a benchmark review, the latter conducted outside of the management cycle. The performance of this assessment approach would be evaluated as part of the benchmark. The issue then becomes when to do a benchmark review. While the prioritization protocol is supported as it will lead to better understanding of the current situation, thought needs to be given to broader changes in the design of assessments in the longer term.

The SIS initiative is a meta-data tool on assessments primarily designed to meet communication and information requests from individuals both internal and external to NMFS (e.g. Congress). Its utility will be enhanced both by including SAFE reports and the results of the assessment prioritization protocol noted above. As such, its continued support is recommended. However, to get by-in on the use of the tool within NMFS, it would be useful to go to obtain feedback from the science centers on its future use and development.

## **Performance Tracking, Communication and Outreach**

The SA communications program undertakes two broad activities to achieve its goal of internal and external understanding and support of stock assessment activities:

- Communication and Outreach
- Performance Tracking and Reporting

While related, the first activity is primarily devoted to promoting the stock assessment program through internal and external communication which often is to address misconceptions that arise. The second activity is primarily an internal reporting function, a very important element of which is measuring and reporting on SA program performance in relation to the budget allocated.

Regarding communication and outreach, the science centers handle media and other public requests related to local issues. In their response to the questionnaire, some of the center directors indicated a need for the ST program to better communicate the assessment capabilities of the agency.

This highlights the need for the ST communications program to develop a strategic plan which clearly outlines what its role is and how this dovetails with communications and outreach activities in the science centers. During the development of this strategic plan, dialogue with the science centers would lead to a both better plan and a greater understanding within NMFS on the role and activities of the national ST communications program.

An essential feature of the performance tracking activity is the reporting, primarily internally, on how well the ST communications program is performing in relation to its long-term objectives. An impediment is the Performance Measure (PM) currently being used (% Adequate Assessments). This metric has only a weak link to the ST communications program budget, given that it is only a coarse measure of the species-specific effort being expended in assessments. As well, the budget being used in the performance analysis does not necessarily include all monetary sources going into an assessment. An additional dimension that the PM should consider is the benefits accrued by the assessments. The benefits of assessments as part of a rebuilding program are not realized until the stock has recovered. Thus, the cost/benefits of assessments will change over time dependent on the relative proportion of depleted and rebuilt stocks. It is essential for the ST communications program to define the right PM(s) in order to appropriately track the overall cost/benefit of assessments.

### **Key Findings and Recommendations**

This section provides a synopsis of the key findings and recommendations on the components of the Stock Assessment program which are described above. These respond to the two overarching questions raised in the panel's Term of Reference: 1) is ST conducting the right set of activities to support NMFS stock assessments nationally? And 2) is the organization and management of ST's assessment program activities effectively supporting and advancing assessments nationally, and are there recommendations for improvement?

1. The ST Office should in its strategic plan make greater effort to ensure that ecosystem processes are considered in the stock assessment program and vice versa.
2. The ST and SAIP strategic plans are good initiatives and their further development is strongly endorsed. It will be useful to link the strategic directions in the ST plan with SA program improvements to be identified in the new 2014 SAIP.
3. The maintenance of a core of funding within the ST with allocation of the remainder to the science centers is prudent and facilitates partnerships on activities which have a national focus.
4. The combination of the QUEST and Fellowship initiatives provides an effective means to increase the overall pool of expertise in quantitative ecology although modifications are needed to allow better transition to the science centers. Also, an examination of the expectations of this initiative is required.
5. The SA program should define what strategic areas it wishes to pursue and organize the RFP fund according to these areas. Then it should preferentially fund these areas over a given time horizon (3 – 5 years).
6. The National Methods Workshops have an important role in facilitating strategic thinking in specific ST areas within NMFS, particularly promoting national dialogue on priority stock assessment issues, leading to the development of national best practices.
7. The new initiative to use a multi-criteria decision analysis tool to guide the ship time allocation process is worthwhile although it should not be relied upon as the sole basis of budgeting decisions.

8. The SA program should coordinate dialogue amongst the regions to develop national best practice guidelines of peer review. Each region can learn from the others on how best to manage and implement effective peer review.
9. Consideration should be given to clearly separating assessment to service harvest control rules in management from the investigation of the models and assessments to be used in the assessments, the latter conducted as part of an MSE and which would attract the majority of CIE resourcing
10. The current suite of supporting analytical tools is appropriate and its continued support recommended. However, a team of assessment modelers and computer scientists should be commissioned to outline a future software development track which would potentially integrate all three tools and allow future extensions.
11. While the assessment prioritization protocol is supported as it will lead to better understanding of the current situation, thought needs to be given to broader changes in the design of assessments in the longer term (see Rec 8).
12. To get by-in on the use of the SIS communication tool within NMFS, it would be useful to obtain feedback from the science centers on its future use and development.
13. The ST communications program needs to develop a strategic plan which clearly outlines what its role is and how this dovetails with communications and outreach activities in the science centers
14. It is essential for the ST communications program to define the right PM(s) in order to appropriately track the overall cost/benefit of assessments. This should address not only the costs of assessments but also their long-term benefits as realized from rebuilding efforts

## **Reviewer 4**

### **Background**

The NOAA Fisheries Office of Science and Technology hosted a programmatic peer review of their activities supporting stock assessments across the nation. Review panelists were tasked with evaluating the quality, relevance, and performance of the stock assessment program conducted by the Office of Science and Technology (ST) in support of the stock assessment programs in NMFS' science centers. Specifically, panelists were asked if ST is conducting the right set of activities to support NMFS stock assessments nationally and if the organization and management of ST's assessment program activities are effective in supporting and advancing stock assessments nationally.

A great deal of thought and effort went into the preparation for this review and staff and the leadership within ST are to be commended for this work. Over the course of the review, it became abundantly clear that the persons responsible for carrying out these activities are dedicated, innovative, resilient to change and make a significant and unique contribution to the stock assessment enterprise.

### **General Observations**

The Office of Science and Technology (ST) plays a unique and valuable role in carrying out stock assessment programs across the country. By design, operational stock assessment programs are executed regionally. The Science Board, which includes ST in its membership, provides a national perspective across the regional programs to address programmatic prioritization, to set and maintain science quality standards, and to conduct strategic planning. ST, therefore, has a role in arriving at these decisions and in executing them from the national perspective.

The activities that ST carries out to support stock assessment programs across the nation make a significant contribution the success of those programs represent the correct focus. ST functions in a dynamic environment from the standpoint of the demand for their scientific support and the resources available to conduct that work. Because of this, striking the correct balance across the suite of activities is more of a process than an endpoint and will require regular and focused communications within the Science Board. Striking the proper balance between investments in research and operational science carried out in the field versus the coordinating roles carried out by ST also requires consistent attention because that balancing point can be dynamic. For example, concern was raised over the lack of redundancy across programmatic efforts. The decision on whether to mitigate this by adding staff versus by cross training existing staff must be carefully weighted in light in the context of this balance.

## **Key Findings and Recommendations**

### **Stock Assessment Improvement Plan**

*Finding:* The first edition of Stock Assessment Improvement Plan was an excellent communication tool for internal and external audiences to explain what goes into conducting a successful stock assessment. Refreshing the document should be equally valuable in capturing the contemporary thinking on scientific best practices and serving as a strategic plan for stock assessment programs across the country. A large team of representatives from across the science centers and ST has been involved in this process, which helps balance the views across the regions and disciplines, but can make for an unwieldy process. It also appears that competing demands may also be slowing progress toward a final product.

*Recommendation:* To the fullest extent possible, push to complete the updated plan as it should provide the overarching goals and objectives to guide progress in stock assessment programs nationally.

### **Fishery Independent Survey Support**

*Finding:* Given the importance of data from fishery independent surveys as inputs in stock assessments, the role served by ST in executing decisions by the Science Board to arrive at a national package for days at sea and then advocating for that package at the NOAA level is crucial. The process is complex and given that days at sea are a limited resource, is competitive by nature. The analytical tools in development to assist decision making should be valuable in this process.

### **RFPs**

*Finding:* The Request for Proposal (RFP) process has evolved over time. A great deal of effort has been put into organizing the call and selection process and synching it so the coordinators can look for possible synergies and also cases of duplication and double dipping across the calls. It is unclear if this is happening. It was pointed out that for the strategic initiatives the principal investigators for the research are often the end users of the results. This means the handoff from research to operations is often as simple as passing a project from the left to the right hands of the same individual or group. It appears that less time is spent on post-completion follow up than on the front end of the process for the smaller, one-off projects. There may be an opportunity to improve the frequency at which results from the one-off projects are used to generate products or advice.

*Recommendation:* Making some follow up investments on the post-completion side of the RFP-driven research projects may ensure the maximum use of the research completed under these calls is made. This might come in the form of ensuring the results of those projects are readily accessible via an indexed or key worded database would help put the results into the hands of the broader science community. This would also help develop a meta-analysis of work already completed to facilitate decisions on now- or future-year research foci. This could be facilitated by including dynamic fields in the proposal templates to automate ingestion of information directly into a centralized database.

*Finding:* Efficient execution of funded projects can be compromised by late awards. It is recognized that timing of awards is driven by the timing of the appropriation. Announcing the projects that are at the top of the list and remaining silent on those on the bubble may be a compromise that would help the staging of the top projects.

*Recommendation:* Consider letting principal investigators of the top-rated projects know their ranking to help them prepare to execute their projects more efficiently. Draw the line on notifications based on the degree of uncertainty in the appropriation.

*Finding:* It is laudable to hold back a percentage of the discretionary funds to conduct research that advances the stock assessment discipline. Stronger coordination across the RFPs to leverage research could improve the scientific bang for the buck.

### **Working Group Approach**

*Finding:* Linking regional science activities at the national scale via the national working groups has been a productive, resulting in identification of best practices and providing a forum for innovation. It is likely that mid- to high-level staff are selectively approached to represent their respective science

centers to provide longitudinal awareness on the issues that are studied and to ensure representatives have the skills and stature to make what are often influential representations. This can result in placing additional demands on individuals who are already stretched.

*Recommendation:* It could be valuable to compare the amount of time needed for proper representation on the collection of current working groups, given their current charges, and compare it to the amount of time available from the pool of individuals who meet the criteria for service as representatives. This could be done by selecting a percentage of a scientist's time that, on the average, would be appropriate for service of this type and multiplying that by the number of scientists who fit the criteria and that would represent the total resources available. Comparing that figure to the total time estimated to be needed helps to evaluate the investments needed against the resources available. If the requirements outstrip the resources available, other models or modifications of the current one could be considered, e.g., fortifying the teams with dedicated staff; broadening the pool of representatives by intentionally including more junior scientists; cutting down the number of working groups and only adding more when an equivalent number could be sunsetted.

### **NOAA Fisheries Toolbox**

*Finding:* The concept behind the NFT is a good one. Having a set of models that are thoroughly documented and peer reviewed can generate higher returns on the investment relative to creating one-off tools across the country. The programmer vacancy represents an opportunity to step back and evaluate the returns on investment for this project to help inform decisions going forward. Understanding the usage of the packages posted to the NFT would help determine if the considerable effort to maintain those tools is the best use of time and resources.

*Recommendation:* ST could consider accumulating web statistics or conducting an informal poll to determine usage of the toolbox elements and weigh that against what it would take to keep it up to date. If the cost/benefit doesn't play out, doing a carefully planned and communicated phase out of this work could be considered.

### **Species Information System**

*Finding:* Given the volume of queries that ST fields from internal and external sources, they are best suited to judge of the cost/benefit ratio of this program, but it seems like this is a very valuable tool with a high return. From the discussions, it sounds like cooperation from the science centers to help keep the database up to date waxes and wanes. Building and communicating the business case for how the system directly and indirectly benefits the science centers could help bolster support and improve timely acquisition of the data. Tracking the number of data and information calls that are fielded at HQ using the NFT rather than being tasked out to the science centers would be a helpful metric for this.

*Recommendation:* Evaluate the use of the SIS to automate generation of portions of the Stock Assessment and Fishery Evaluation reports. This would be an invaluable contribution to the reporting requirements within each of the fishery management regions, and could represent a considerable time savings within each of the science centers. A strong endorsement from the Science Board members to their respective staff could go a long way to emphasizing the importance of the program within the science centers. A presentation that is tailored to the primary points of contact and potential users of SIS within each center would also bolster support. This could be done via webinar for the sake of

efficiency. A positive outcome of this would be more timely submissions and the use of SIS for addressing Q&As handled by the science centers in addition to the current use by ST.

### **Stock Assessment Prioritization Process**

*Finding:* This project can provide an invaluable tool for improving the efficiency and throughput of stock assessment programs in the regions and promoted the wise use of fiscal resources. It provides objective criteria for making decisions on the appropriate stock assessment level and frequency across the managed species within the region. A significant component of this project will be the communications and support offered to the regions to assist them in adapting it for their needs and implementing the process.

### **Center for Independent Experts (CIE)**

*Findings:* Peer reviews are a hallmark of strong science programs and are required to meet federal quality requirements for science that informs policy and regulatory decision making. The CIE provides timely and high quality peer reviews for stock assessments and other products.

*Recommendation:* Care should be taken to use this resource appropriately, given the expense associated with these reviews. It could be valuable to revisit the criteria that trigger the need for a CIE review, refresh them as necessary and ensure they are applied when setting the annual schedule.

### **Communications and Performance Metrics**

*Finding:* It is good that the FSSI is being revisited as the primary performance metric for stock assessments. It was a giant step forward from its predecessor and has served the agency well, but sounds like it is falling short on some of the criteria that mark a good metric over time. Enhancing the list of stocks included in the pool and benchmarking against that list is a reasonable step to improve the metric, but that may not help the poor correlation with changes in the budget. Concerns over equating a dollar amount to a number of stock assessments that funding could provide seem well justified. Careful evaluations of proposed performance metrics will be a good investments. This improves the odds of getting it right on the first try, which provides stability in the time series against which to track progress.

*Recommendation:* Using simulations to fully evaluate the effectiveness of a new performance metric against the set of criteria and over a broad range of scenarios should continue.

*Finding:* Progress is being made in making data and information publically available.

*Recommendation:* Use of Digital Object Identifiers to stabilize accessibility of information and data as web sites evolve would be prudent.

*Finding:* ST provides a tremendous service to the science enterprise by fielding a high volume of questions from congress, within the full chain of the executive branch and from constituents.

*Recommendation:* It may be worthwhile to establish a queriable database to store these Q&As for future use. This helps ensure responses are consistent and could represent a significant time savings.

*Finding:* The considerable contribution that ST makes to stock assessment efforts across the nation may not be understood by many of those who benefit from it.

*Recommendation:* Science Board members could do a better job of building awareness within the science centers of this unique role. Where funding and travel ceiling allow, details established in ST and in the science centers could provide a useful exchange to strengthen collaborations, catalyze innovation and build trust across the field and HQ components of the program.

### **Conclusions**

The Office of Science and Technology conducts programs and projects that make substantial contributions to the success of NOAA Fisheries' stock assessments. The programs are appropriate and are generally achieving their stated objectives. ST is committed to maintaining the communication and planning necessary to be resilient to a demanding and dynamic environment in terms of the science requirements and the funding available to address them.

## Reviewer 5

### **General Observations by Suite of Activities**

This review is of the stock assessment science component of ST activities. These activities form 87% of NMFS budget lines kept in ST. I had presumed that being based at NOAA HQ and by working closely with the Chief Science Advisor and the NMFS science board that ST would facilitate and guide the regional centres towards national priorities (National Ocean Policy 2010). ST acts as a type of service organisation<sup>1</sup> to the regional science centres that does indeed facilitate the science on stock assessments through a complex set of funding lines and projects. I see this as operational support rather than strategic support. ST does not exist to provide leadership, but in my mind it should communicate the national needs and priorities to the regional centres. I found this role lacking. The overall ST mission is to “**sustain and enhance** NMFS’ science programmes to enable sound conservation and management of living marine resources and their ecosystems”. NOAA is mandated by Congress under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), Endangered Species Act (ESA), and Marine Mammal Protection Act (MMPA). The NMFS regional centres are crucially driven by the very strong need for science to inform local fisheries management. In my mind, centres require guidance on national objectives and priorities from the NMFS science board and Chief Science Advisor, which should be communicated and facilitated by ST in a transparent and traceable manner. A document of national fisheries science priorities should be produced and updated as appropriate.

The terms “priority” and “mission” were used often during the week. My impression is that ST does an extremely good job of keeping the current system operational, but does it have enough guidance itself to enable facilitation towards national goals? The complexity of the budgeting process lends itself to short termism, and I heard one presenter say that a four year horizon was “long term”. This is one generation time of a cod in the Gulf of Maine.

### **Current activities**

ST certainly deals well with the complexity of the current federal system. We were provided evidence of a responsive and listening organisation. The RFP approach appears to provide opportunities for

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<sup>1</sup> See NMFS “Strategic Science Plans: An Overview” <http://www.st.nmfs.noaa.gov/Assets/Strategic-Plans/NOAA%20Fisheries%20Strategic%20Plan%20Overview%202013.pdf>

research-led innovation and local solutions being found to local problems. This diversity is a strength. The use of working groups to determine calls and select successful RFPs after submissions is also appropriate. Some working groups appear to be “legacy groups”, in that they have existed for quite a long time, especially if four years is considered long term. I would encourage an evaluation of the number of working groups but with a view of longer term goals. The take up of findings from RFPs should be the responsibility of the working groups and I would discourage any attempts to create synthesis projects (with the aim of informing others of RFP findings). You need to engage the users of ideas (the working groups) with a research project throughout its development to ensure effective technology transfer. I also understand the need for the SI approach which enables the science board to set higher priority on various issues. This appeared robust and research areas chosen were innovative and useful.

The efforts for capacity building and education of new researchers were well described and one of the strong roles for ST. This should be maintained. I would encourage increased placement of NMFS staff at various locations throughout the early years of a researcher’s career.

Building on the SAIP (2001) is a crucial activity for ST. The momentum of developing “New Stock Assessment Improvement Plan” must be maintained. I would encourage broader engagement in the development of the plan, especially with those outside NOAA. I see the creation of a new plan as vital. The rationale for the need for a new plan, with new metrics and new approaches, was well argued by the ST staff.

The national stock assessment working group (NSAW) should be maintained and should continue to meet approximately triennially to discuss topical issues and develop specific approaches.

Collaboration with international partners might be constructive. Physical meetings are always a challenge but I think that the need to create a national NMFS identity and the benefit of using the diversity of NMFS experience and expertise, justifies the likely problems caused by creating a large physical gathering.

### **New directions or expansion**

I would like to see ST translate national strategy into an implementation plan for NMFS science. This plan should inform RFPs, SI, educational initiatives, national data issues, the SIS and methods developments of national objectives and priorities. These objectives will probably differ from regional

objectives but if true subsidiarity<sup>2</sup> is followed than these national goals need national steering. The national strategy for NMFS should highlight the priorities and operational goals for the scientifically informed stewardship of living marine resources and the protection and restoration of healthy ecosystems.

I am concerned about any expansion of “stock assessment for stock assessment sake” approaches. A misinterpretation of SAIP 2001 could lead to a drive for a comprehensive programme of age based stock assessments for all stocks that are impacted by fishing. ST should work to create the appropriate framework for the delivery of science products for fisheries management decision making. This is partially already taking place through the New Stock Assessment Improvement Plan. However the use of additional approaches should also be considered. The MSA National standard 1 states *“Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.”* This mentions optimum yield from each fishery, not from each stock assessment. I think that an exploration of fleet based approaches to OY should be encouraged and explored, especially for groundfish fisheries and also fleet based approaches for reconciling OY with impact on protected species.

Presenters at the review mentioned the greater use of MSE in the exploration of the prioritising of the stock assessments. This is a positive development that should be encouraged. MSE can also be used to explore the utility of any potential metrics of the success of the stock assessment programme. MSE can also be used as a tool to explore local management objectives. Whilst this exploring of local management tradeoffs through MSE could be seen as an infringement of the objectivity and independence of NOAA scientists, I see these explorations as fundamental to the next generation of stock assessment advice.

I would have liked to have seen more evidence of dialogue and engagement at a national level with stakeholders. I am sure that regional centres carry out much dialogue, but how is this passed back to ST? The communication efforts of ST appeared to be focused on legislators, other administrators and educating the general public. If no mechanism exists, ST needs to develop an approach to engage with those impacted by their activities, or to listen to the experiences from the regional science centres.

### **Deletions or reduction**

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<sup>2</sup> subsidiary - performing only those tasks which cannot be performed effectively at a more immediate or local level.

The review process currently operated through CIE is drawn out, expensive and bureaucratic. Also the application of CIE reviews varies across regional science centres. A national framework should be drawn up to encourage similar approaches to update assessment and benchmarks across the USA. These standards should account for local needs but should aim to create a level playing field for review requirements. The review process should be “fit for purpose” rather than gold-plated. I would suggest a greater involvement of ST in the drawing up of terms of reference for the reviews. Reviewers should be cleanly guided by those terms of reference. IT solutions should be found for the burdensome reporting process for stock assessment, benchmarks and their reviews.

ST should think carefully about how it will further invest in the tool box of stock assessment methods. The dominance of methods from one science centre within the tool box is evident. If a new programmer/administrator is hired, where should they be based? ST should consider who the tool box is for; NOAA scientists, global researchers or stakeholders? Does the next version of the tool box need all the currently listed tools? Does it need the graphics interface and how should users enter the tool box (i.e. the landing pages). I was pleased to hear that the “methods for protected species” tool box was prepared to join the initiative. Keeping a portfolio of both tools and available frameworks for tool development is crucial but does it have to be in the current format? Further investment should be considered carefully.

### **Organization and management**

ST operates as an umbrella over the regional system, that leaks to allow funds to flow through to oil the regional machine. I see the ST as a form of secretariat for the science board and the chief science advisor. As such, a secretariat role of enabling policy of the leadership should be formally set up. Transparency of process and traceability of decisions is required. The national identity of NMFS scientists is apparently weaker than their regional affiliation. This is to be expected as the centres respond mostly to Council or State needs. As I mentioned above, I see much of the work as operational (tactical) rather than strategic. This appears to be recognised by ST leadership.

The operation of the science board appears appropriate and the engagement of the science advisors appears a strong move. These have a strong support team in the ST staff.

I would have liked to have seen more evaluation metrics and reporting on the progress to operational and strategic goals in the review. The lack of these prevented a better evaluation of the organisation of ST. It also highlighted that few national strategic goals for ST were presented to review panel (the

ST strategic science plan was more a service delivery plan covering the jobs done by ST in four themes). The ST stock assessment programme goal is stated to be accomplished by “identifying and addressing national and regional assessment-related priorities”. The review was not shown any national and/or regional assessment priorities. This led to the question, how are these priorities determined and what forms the basis for decisions over priorities?

### ST's Stock Assessment Program Goal

- To enhance the ability of the NMFS science centers to provide fishery managers with high quality, reliable, transparent, and timely stock assessments.
- This is accomplished by
  - Identifying and addressing national and regional assessment-related priorities through targeted projects and programs
  - Managing related budget lines
  - Facilitating reporting and communication

**Is the organisation and management of STs assessment programme activities effectively supporting and advancing assessments nationally, and are there recommendations for improvements?**

If the goal is to support regional centres to deal with the local day to day challenges of providing the evidence for fisheries management, then the answer is broadly yes. If those centres have longer term strategic needs then some of the existing ST activities advance those needs (education, RFP and SI etc). However, in my mind, part of ST's role is preparing the regional fisheries science centres to provide the science foundation for future policy objectives of the USA and here I feel that that ST needs to adapt. There should be a plan or framework that maps the likely national direction. In the areas of stock assessment quality, prioritisation, data standards, review, working with stakeholder information, the ST should develop with the science board, a plan for national action.

ST should facilitate the delivery of national priorities (National Fisheries Science Plan). They should work to, where possible, align regional and national priorities. Where this is not possible ST should endeavour to secure further funding to ensure that national priorities for science are met.

### Key Findings and Recommendations

- the number and remit of working groups that run RFP should be evaluated

- the review programme of benchmarks through CIE should be reformed
- the science board use ST to publish national science priorities
- with partners, create a strategic plan “National Fisheries Science Plan”
- continue development of the New Stock Assessment Improvement Plan
- encourage more use of MSE in both providing management advice and evaluating potential approaches
- re-establish NSAW, perhaps with international contributions
- consider the purpose of the stock assessment methods toolbox and invest accordingly