

**Pacific Islands Fisheries Science Center (PIFSC)
Program Review of Fishery Stock Assessments
Dates: 19-22 May 2014
Report submitted by: Reviewer 3**

Background

The PIFSC's mission is to provide timely, high-quality applied scientific information to support the conservation and management of fisheries, protected species, and marine habitats in the central and western Pacific Ocean. PIFSC provides data, information, analysis and technical advice to the NOAA Fisheries Pacific Islands Regional Office (PIRO), Western Pacific Fishery Management Council (WPFMC) and other conservation and management responsibilities within NOAA as well as international scientific bodies such as the Western and Central Pacific Fisheries Commission's Scientific Committee (WCPFC), the International Scientific Committee on Tuna and Tuna-like Species (ISC). It also collaborates on broader oceanographic science issues with PICES (the North Pacific Marine Science Organization).

The geographic area of responsibility of PIFSC's activities is vast and includes partners with the State of Hawaii, the Territories of American Samoa and Guam, and the Commonwealth of the Northern Mariana Islands. Culturally distinct communities also characterize these geographically different sites. Fisheries species include pelagic highly migratory species (HMS) such as tunas, billfish and sharks; bottomfish complexes, e.g. the "Deep 7"; and the Coral Reef Fish complex. As such, PIFSC faces significant and perhaps unique challenges logistically, geographically, scientifically and societally.

General Overview

The review of PIFSC's "Fishery Stock Assessments" was presented over a 4-day period (19-22 May 2014). The objective for this review was to examine and evaluate the Center's fishery stock assessment program that is conducted pursuant to the Magnuson-Stevens Act (2006) and comparable international agreements. Stock assessments are demographic analyses designed to provide particular scientific advice to living resource managers. All presentations were uniformly of very high caliber and the information was delivered clearly. The presenters also made themselves available for follow-up clarifications after their presentations. Thanks are due to all involved at the PIFSC in preparing for the review.

The presentations and structure of the review focused on information related to three assessed species/complexes: (i) pelagic/highly migratory species (HMS), (ii) bottomfish (the Deep 7), and (iii) the Coral Reef Fish complex. The information for these assessments is collected via logbooks, creel and port surveys, and landing reports, and less so on fishery-independent survey data, e.g., information collected by NOAA fisheries research surveys, was reviewed in 2013¹. Following the section below offering General Comments, the seven themes the panel was asked to consider in their charge² will be addressed.

General Comments

- The approaches to the stock assessments of the HMS/pelagics, the Deep 7 (Main Hawaiian Island bottomfish), and the Coral Reef Fish are appropriate and are at different levels of advancement. The modeling approaches are also, by necessity, different due to the fishes' life histories and the availability and type of data supporting each. The HMS is the most developed, followed by the Deep 7 (Main Hawaiian Island bottomfish), and the Coral Reef Fish complex being the one in the earliest stages of development.
- Data for the three fisheries is mainly fishery-dependent data. For HMS the data comes from logbooks, observers, port sampling, etc. Data are compiled and products include CPUE indices, size (length and weight). For bottomfish challenges include documentation of data collection, integration of data sets without duplication, statistical analysis of historical data, among others. For the Coral Reef Fish complex, collecting is daunting with over 100 species, different fishing gear, etc., resulting in a data-poor species to assess and manage.
- Given the particular challenges with fishery-dependent data, the collection of fishery-independent data should be actively supported. The limitations of some of the fishery dependent data (e.g., the ability to collect it in remote areas, the consistency in the quality of the data, etc.), fishery-independent data can provide much needed additional information to shore up some of the assessments.
- The stock assessment group is young, very capable and energetic. While the *number* of assessments is not as high as at other Science Centers, the

¹ http://www.pifsc.noaa.gov/media/news/peer_review_of_data_management_2013_presentations.php

² http://www.st.nmfs.noaa.gov/Assets/science_program/TOR%20Fishery%20Stock%20Assessment%20Review%202014_6Mar2014.pdf

assessment group works as a team on various assessments and they are involved in preparatory work (e.g., on analysis of the incoming data) as well as on the implementation of the stock assessment models and subsequent analysis.

- The assessment team is in the initial stages of establishing itself. There is a need to allow for the individual members to develop. For example, training courses, exchanges or details at other Centers, among other opportunities may offer interaction with different groups and growth of the assessment scientists. It was mentioned during the presentations, that difficulties in attracting new stock assessment scientists further underscore this need.
- The assessments' prioritization is still evolving. For example, there is not a firm (or target) schedule for the coming 2-3 years. The demands on the assessment scientists are already substantial, and the workload appears to be increasing, e.g., the added consideration of the Coral Reef Fish complex. The relative youth of the staff can benefit from a more deliberate approach to the assessments they need to deliver. The establishment of a prioritization may result in shifting of present emphases. This discussion would benefit from participation of PIFSC, the WPFMC and PIRO.
- The Western Pacific Stock Assessment Review (WPSAR) is a formal collaboration between PIFSC, the WPFMC, and PIRO. WPSAR provides an independent peer review process to improve stock assessments and the data on which they are based. WPSAR's framework should also enable establishment of stock assessment priorities and schedules. This may be particularly important as mandates expand, and decisions for a structured process to allow for high quality assessments to be delivered on a realistic schedule and without undue stress on the assessment scientists.
- While the WPSAR framework is appropriate, the onus on improvements in the process improved is on its Steering Committee that includes representation from PIFSC, the WPFMC and PIRO. A close/closer working relationship between these three units is encouraged. For example, PIRO and WPFMC were largely absent from the present review of PIFSC's Fisheries Assessment (except for their presentations to the Panel).
- The collection of environmental data and its relation to fisheries/ecosystem dynamics should be enhanced. The effects of changing environments, e.g., under Global/Climate Change, will be relevant to spatial structure of the

populations as well as to aspects of the life-history/life-cycle and vital rates (e.g., growth) of the target species. Laboratory experiments in the new PIFSC facilities should provide some of this information.

- The Northwest Hawaiian Islands Monument offers an opportunity for comparative analyses of an undisturbed (recovering) system to those areas where resources are more highly exploited. Consideration of surveys and other field efforts in the monuments region can provide information on population recovery and population structure in a protected area.
- The continued commitment of PIFSC in the international highly migratory species (HMS) arena (data collection – largely fisheries-dependent – and associated population assessments) is essential. In part because the commercial value of these fisheries is the highest of the three species under PIFSC’s responsibility, but because the U.S.’s is a lead member nation in many of the tuna treaties. A large part of this work is shared with the SWFSC and the close collaboration and coordination between the two Centers should continue to be supported. Additional directed funding is needed to carry out this work. The required travel for presence at the assessment workshops and related Commission’s plenary/advisory meetings is costly to the responsible Centers. There is also an important opportunity that should be pursued to establish links with PICES (the North Pacific Marine Science Organization) in the study of changing environments and its effects on pelagic/HMS, including future scenarios, at a pan-Pacific basin scale.

Comments on the Seven Themes

1) Does the Center apply a suitable scientific/technical approach to fishery stock assessment modeling?

The approaches to the stock assessments of the three species pelagics/HMS, the Deep 7 (bottomfish), and the Coral Reef Fish are appropriate. They are different formulations and they are at differing levels of advancement – largely by necessity, because of the fishes’ life histories, and the availability and type of data supporting each. The HMS model is the most developed, it is by comparison to the others “data rich”, and by some measures it is a state-of-the-art size/age/stage-structured formulation used by the international community. It is followed in complexity by the “data poor” (or data-limited) model for the Deep 7, which may be close to transitioning from its current formulation (an aggregated production model) to one

that includes more age- or length-structure as more data becomes available. The Coral Reef Fish complex, which includes a large number of species (>100) and is also “data poorer”, is the one in the earliest stages of development and most challenged by the paucity of adequate data. Normalizing for differences in the diversity, complexity and challenges of the three species, the approaches taken by the stock assessment team are yielding strong and defensible results.

Additional biological/life-history data is needed including biosampling, age- and size-composition, and tagging (distributions). These data are necessary to help improve the assessments, but cannot be unilaterally provided or acquired by US activities alone. It will require a coordinated effort, which in turn will require in some instances international commitment to capacity building and training.

2) Is the assessment process efficient, effective and clearly described, including terms of reference for assessment reports?

The assessment process is being established. There is a need for a more formal structure of the final assessment reports, including the definition of Terms of Reference (ToR). An example from the Pacific Fisheries Management Council is http://www.pcouncil.org/wp-content/uploads/Stock_Assessment_ToR_2013-14_Final.pdf where guidelines and procedures are outlined for the various participants in the assessment and review process. ToRs serve to frame the expected process and contain the results and their evaluation in a pre-defined scope of activities avoiding thereby a possible expansion/drift of expectations. Establishment of ToRs as part of the assessment process should be discussed with the WPFMC and PIRO. The WPSAR offers a framework within which missing aspects the assessment process can be defined. It should be noted that participation in the present Fisheries Stock Assessment review by members of the WPFMC and PIRO was modest. Representatives of these organizations were present to deliver presentations but were unfortunately otherwise largely absent. Opportunities such as the ones offered by these public fora should not be overlooked as they offer valuable opportunities for exchange, input and learning.

3) Does the Center, in conjunction with other entities such as the Council's Scientific and Statistical Committee (SSC), have an adequate peer review process?

There is a framework for peer review through the Western Pacific Stock Assessment Review (WPSAR). The WPSAR is a relatively recent two-tiered review process (consistent with other similar processes such as the STAR, SAW and SEDAR), and is a collaborative initiative of PIFSC, the WPFMC, and PIRO. WPSAR is designed to be

an independent peer review process with the intent of improving the quality and reliability of stock assessments and the data on which they are based. WPSAR attempts to ensure that the best scientific information is available for management purposes. Reviewers are drawn from the Center for Independent Reviewers (CIE) the WPFMC's Scientific and Statistical Committee (SSC) and other organizations. To ensure independence, none of the reviewers can have any involvement in conducting the stock assessment being reviewed. Only one WPSAR Panel has been convened (for the Main Hawaiian Islands Bottomfish in 2010) and the result was mixed. While the WPSAR framework is appropriate, the onus on the process being improved appears to be on its Steering Committee that includes representation from PIFSC, the WPFMC and PIRO. Proper funding of the WPSAR process is important.

4) Is the Center's program organization effective at accomplishing needed assessments according to a set of assessment priorities? Include program structure, staffing, and funding; include prioritization of stocks for assessment.

This is a rather important aspect that with some attention can be improved upon quickly. The structure leading to the assessments' prioritization is not settled. For example, there appears not to be a target assessment schedule for the coming 2-3 years. The demands on the assessment scientists are already substantial, and the workload appears to be increasing, e.g., the added consideration of the Coral Reef Fish complex. The relative youth of the staff can benefit from a more deliberate (i.e., evenly paced) approach to the work they need to deliver.

Questions that were raised during the review included whether the assessments should be reprioritized. For example, with the emergence of the Coral Reef Fish complex, and the need to enhance/advance the Deep 7's assessment model's structure, should the/pelagics' priority be lowered? An obvious argument counter to lowering the HMS's priority is its economic value. These discussions are needed and should be the focus of attention for the WPSAR's Steering Committee.

5) Does the Center achieve adequate assessment accomplishments relative to mandates particularly with respect to the number of Fishery Management Plan (FMP) species assessed?

The number of assessments is *numerically* not as high as that of other Centers. The observation is not intended to be negative as there are probably several reasons for this. The size of the assessment team is relatively small and over the years there has been turnover in the assessment team, which leads to discontinuity (stop and

restart) in assessments. At the same time, some of the pelagics/HMS assessments are complex and are carried out in the international arena with yearly workshops requiring travel and coordination with partners along the North Pacific rim. As pointed out in the results of the Data Review of last year, there is also disparity in data availability and quality that makes the assessments challenging. Furthermore, the assessment scientists need to participate in the data's processing, quality control, etc. The Center's data processing is envisioned to improve in the coming years, which will result in a more efficient, or pipelined, process where the data will be provided to the assessment scientists for use in the assessment models. Building this "pipelining" into the Center's structure should greatly enhance the ability to generate not only more, but also better assessments.

6) Does the assessment program adequately communicate their results, needs, and research?

Presentation of results takes place in several fora, with the main ones being the WPFMC and the WCPFC. Reports are also provided to the WPFMC's SSC, as well as published in refereed professional journals, reports of Regional Fisheries Management Organizations (e.g., the ISC's website), and internal PIFSC reports (also publically available via the Center's website). As such, the results of the assessments are in the proper places to reach fishery managers, as well as the public and the scientific community.

7) Are there opportunities for improving stock assessments and the stock assessment process?

There are a number of opportunities that are being explored by the scientists at the Center. I focus here on three instances focusing on consideration of ecosystem-related opportunities:

- Development of new, promising and much needed methods for fishery-independent surveys using optical and acoustic methods. Some of the developments are taking place internally within PIFSC, but there is also a healthy relationship with universities in Hawaii as well as the mainland, and with other Science Centers such as the SEFSC and the SWFSC.
- Development and implementation of ecosystem models that complement stock assessment models. Such information provides possible impacts of future environmental states, such as those affected by the Pacific Decadal Oscillation, or longer period secular changes. There is no full-time ecosystem

modeler at PIFSC at this point, but continued collaboration with partner groups can provide a bridge. Possible partners (some of which are already active collaborators) and tools include:

- NOAA's Geophysical Fluid Dynamics Laboratory (GFDL) can provide opportunities to consider ecosystem changes under future climate scenarios. Given that the next IPCC Assessment Report is 5-6 years away, there is an opportunity for an effort to contribute a North Pacific fisheries component of the IPCC Report.
 - PICES, the North Pacific Marine Science Organization, is a natural partner that can result in additional research opportunities given the overlap of the geographic footprint of the PICES domain of interest, that of ISC (for which PIFSC scientists provide assessments of tuna, billfish and sharks). Note that PICES' interests include future states of the North Pacific, which would complement – via the development of regional climate models – the collaborations of PIFSC with GFDL.
 - And, at a more targeted scales in space and time, models such as SEAPODYM³ and others, provide a framework to integrate detailed spatial and ecosystem information and its effects on higher trophic levels (e.g., tuna, billfish and turtles) with consideration of basin-scale effects and/or indicators on ecosystems and impacts on target fisheries, as well as possible top-down (e.g., fishing fleet) effects.
- The Northwestern Hawaiian Islands Marine National Monument offers an opportunity for comparative analyses of recovering versus exploited systems. Access to the monument is understandably restricted, but consideration of surveys and other field efforts in the monuments region can provide valuable and unique information on fish population recovery and population structure in a protected area. Over time this region's return toward “undisturbed” conditions adds great scientific value to the understanding of the state of harvested/managed fisheries.

³ Lehodey, P., Senina, I., Murtugudde, R. (2008) A spatial ecosystem and population dynamics model (SEAPODYM) - Modeling of tuna and tuna-like populations. *Progress in Oceanography*, v.78, 304-318.