

**Improving the SEDAR Process:
Better efficiency, greater throughput, and more timely management advice**
Southeast Fisheries Science Center¹
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Executive Summary

A recent NOAA report calls on all regions to establish a timely and efficient stock assessment process. The Southeast Data, Assessment and Review (SEDAR) process is thorough and transparent, but challenged to achieve high timeliness and throughput. We estimate that, with several specific changes, SEDAR throughput could be improved by 50% or more. The frequency of ABC advice could be increased another 50-100% by the use of interim monitoring analyses based on updates of key fishery indicators rather than full assessments.

The recommended changes are:

1. *Implement a regular cycle of Operational Assessments supported by as-needed Research Assessments to increase quality and increase throughput by 10-20%.* Research Assessments would produce a peer-reviewed stock assessment model that would be updated in subsequent Operational Assessments for management advice. This cycle will increase quality because Research Assessment are not rushed to completion under the gun of needing to provide management advice (as current Benchmark Assessments are). It will increase throughput because data providers can plan ahead and will not have to recalculate data inputs multiple times as they do now for the benchmark process.
2. *Conduct Interim (monitoring) Analyses that provide updated ABC advice based on regularly-updated indices of abundance and/or mortality to increase throughput 50-100% (depending on how often they are implemented).* Throughput is increased because the Interim Analyses allow ABC advice to be updated annually, rather than relying on analyses that are 2-3 years old by the time they are used (as with current projection approach). By regularly tuning the ABC advice to key data series, the interval between full Operational Assessments can also be increased, allowing more species to be assessed with the same number of personnel.
3. *Schedule assessments well in advance to increase throughput by 10-20%, and decrease the time to conduct each assessment by 10-20%.* Certain key stocks (e.g., red snapper) should be scheduled on a regular basis, while others should be scheduled at least 2 years in advance. Late planning and eleventh-hour changes by the SEDAR Steering Committee

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contributes to a number of failure points in the data provision process and creates inefficiencies as data providers leave one project unfinished in order to move to another.

4. *Consistently employ the Interdisciplinary Plan Team (IPT) style of decision-making for assessments to decrease the duration of assessments 10-20% and reduce postponements in the assessment schedule.* This feature is already included in the SEDAR SOPs², but not consistently adhered to.
5. *Group multiple Research Assessment data-limited species for analysis and review.* Methods are reviewed and vetted through previous processes, then ~15 species addressed simultaneously with one workshop. This approach has been used successfully in the Northeast, West Coast, and Pacific Island regions.

Background

A soon-to-be-released NOAA report, Implementing a Next Generation Stock Assessment Enterprise³ (eds. Lynch, Methot & Link), hereafter SAIP, calls on all regions to establish a timely and efficient stock assessment process. The report outlines two primary features of such a process:

- “Implement a streamlined operational stock assessment process for the provision of management advice, and in parallel, conduct the highest priority research assessments to improve operational approaches.”
- “Revise assessment peer reviews where appropriate to be tailored to the degree to which the assessment explores new/novel approaches, and use streamlined regional bodies for operational assessments and fully independent review for research assessments; focus terms of reference for peer reviews of research assessments on new approaches.”

The SEDAR process (<http://sedarweb.org/>) began in 2002 to improve the quality and reliability of fishery stock assessments in the U.S. South Atlantic, Gulf of Mexico, and Caribbean. SEDAR has emphasized thoroughness and transparency in the process, and rigorous and independent scientific review of completed stock assessments. It has been successful in that the quality of the assessments for many stocks has improved tremendously since 2002, but at the expense of throughput.

Several issues pertinent to the Southeast assessment enterprise, including SEDAR, are the following:

- High cost, both in terms of human resources and money
- Insufficient number of stock assessments per year
- Time between assessments is too long (5-10 years for many stocks)
- Assessments take too long to complete

² http://sedarweb.org/docs/page/SEDARPoliciesandProcedures_Oct15_FINAL_update.pdf

³ A draft version is available from https://www.st.nmfs.noaa.gov/Assets/stock/documents/SAIPCompleteDraft_2-16-17_ExSumm.pdf

The combination of these factors often results in assessments that are several years out of date by the time regulations based on them are implemented. Moreover, the ABCs must be based on uncertain projections several years into the future and do not incorporate trends in the latest data (e.g., an index of abundance) into the management advice.

This document proposes several ways in which the SEDAR process might evolve based on experiences gained in all regions and documented in the SAIP. After 16 years, the SEDAR process has matured to the point where assessment methods and data inputs have become fairly consistent from stock to stock within each region (South Atlantic, Gulf of Mexico, Caribbean). This creates an opportunity to streamline the process, without sacrificing quality or thoroughness.

Characteristics of an Ideal Assessment

Stock assessments can be slowed down for many different reasons. It is helpful, therefore, to consider some of the characteristics identified at the national level that contribute to timely, and efficient assessments, while retaining high quality. The key idea is to build, review, and document a good assessment approach in the research stage before using it operationally to provide management advice. Chapter 10 of the new SAIP describes the operational and research assessment processes from data preparation through conduct, documentation, and review. Key excerpts from the SAIP are summarized next, which we follow with a potential approach for SEDAR:

1. Preparation of Data for Operational Assessments
 - a. Keep key data streams (e.g., fishery independent abundance surveys and fishery CPUE indexes) updated and readily available so everyone can see trends for relevant stocks consistent with NOAA's Public Access to Research Results (PARR) Plan⁴.
 - b. Pre-processed data is put in the hands of analysts quickly and with little need for additional processing. Improved regional databases are key to this and 1a (above).
2. Conduct of Operational Assessment
 - a. Use the method investigated and approved in the research process. Similar stocks with similar data sources may be able to use the same approaches.
 - b. Don't modify the assessment method unless there is a clearly documented and compelling reason for the change and it fits within the scope of the approach developed in the research stage.
 - c. Don't redo and re-document all the sensitivities that were done during the development of the assessment model during the research phase. Just do what is needed to update estimates of assessment uncertainty.
3. Conduct of Research Assessment
 - a. Evaluate suitability of a broad range of data, but only accept what is necessary to get a good operational assessment approach.

⁴ <https://repository.library.noaa.gov/view/noaa/10169>

- b. Consider alternative models or model configurations and be open to advancing an ensemble.
 - c. Look at ecosystem and environmental drivers, especially where contrary trends in indexes are detected.
 - d. If building from a previous assessment, focus on what is new and don't re-investigate old issues for which nothing has significantly changed.
4. Review and Documentation
- a. Review of Operational Assessments should focus on QA/QC for implementation of the accepted assessment model and can be done by a knowledgeable regional team (e.g., the SSC). Flag discrepancies for future investigation.
 - b. External, fully independent reviewers are best reserved for review of: new or substantially modified modeling methods, new data sources, hindsight look at performance of past assessments to advise on research to improve future assessments.
 - c. Don't re-document all the data sources in the Operational Assessment. Rather, refer to the previous documents and provide appropriate Tables with the latest information.
 - d. Post-mortem: Gather input from the assessment process, closely related disciplines (e.g., ecosystem, socioeconomic sciences), data providers, and fishermen, about what people are seeing versus what the assessment is showing. Use discrepancies to guide research investigations; not simply a quick redo using the same assessment method.

The first ideal (PARR) is primarily the responsibility of the data providers and should occur independent of the SEDAR process. The remaining ideals are encumbered to varying degrees by the current SEDAR process. For example, in the current process, it is not uncommon for the SEDAR Steering Committee to renegotiate the schedules when various stocks are assessed, e.g., swapping one stock for another with less than a year before the proposed start date. This practice makes it difficult for data providers to prepare, leading to missed deadlines and squandered efforts (failure points at ideal 3), which can considerably slow the progress of an assessment. In the next section, we propose several changes intended to make the SEDAR process more effective and increase assessment throughput.

A Potential Solution

This document proposes a cycle of regularly scheduled Research and Operational Assessments similar to that used effectively to support the North Pacific Fishery Management Council, and more recently the NE and Mid-Atlantic Councils. For SEDAR, we keep the following guiding principles in mind:

- Consistency with national guidance from NOAA, as outlined in Lynch et al.'s SAIP report described above.
- High quality stock assessments with the scope of the peer-review tailored to the degree to which new data and methods are being considered.

- Timely assessments, providing regular and more frequent ABC advice using updated data.
- Transparency, with well-organized public access to documentation of data, model, results and reviews.
- Innovation. Maintain an orderly approach to implementing new stock assessment methods or new ideas, to incorporate advances in population dynamic modeling, statistical applications, or multispecies approaches.
- Regular, predictable assessment cycle. This will help managers in knowing when to expect new ABC advice, and will help data providers in planning their efforts.

The proposed improvements are

1. Designate two types of assessments: Research and Operational. This is expected to increase quality, and increase throughput by 10-20%.

Research Assessments allow for innovation and new ideas to be built into the assessment models. Such assessments would occur as needed to provide a first assessment of a stock or to improve existing Operational assessments, or to establish a data source or procedure that can be implemented in many assessments (e.g., SEDAR Procedural Workshops). Research Assessments are vetted through fully independent review (e.g., CIE), and if the innovations are found to be acceptable, the new methodology would be used subsequently in Operational Assessments. Research Assessments have much in common with the current Benchmark approach, however it is more efficient because data providers will not be asked to provide the most recent data in multiple formats as they are now in Benchmarks. More importantly, we can expect that quality will be improved because analysts will have the time for more rigorous, expansive analyses without the constraints of producing immediate results for management. Without the pressure to meet hard deadlines for management advice, Research Assessments would encourage increased stakeholder involvement during the development process and through cooperative research projects.

Operational Assessments provide management advice. They are designed to be timely and efficient, and address the deficiencies of the current SEDAR process. The Operational Assessment schedule puts key stocks into a regular assessment cycle. These key stocks include those that have already been through a Benchmark or Research Assessment, and for which the Councils desire regular and timely ABC advice. The frequency of that advice will depend on the number of stock assessment analysts and the number of key stocks, and could also reflect expected annual rates of changes in abundance (e.g., a short-lived species like black sea bass could be assessed more frequently than a long-lived species like tilefish). Operational Assessments are similar in scope to the current SEDAR Update Assessments, taking a previous Benchmark or Research Assessment and updating all relevant data, but making no or minimal change to methodology.

2. Use **Interim Analyses** to adjust ABCs between Operational Assessments. This innovation is expected to as much as double throughput by allowing annual or biennial updates of ABC advice using the most recent data available instead of relying on

assumptions about fishing practices and recruitment for several years into the future (as with current projection approaches). More frequent Interim analyses would also permit a wider interval between Research and Operational Assessments. Interim Analyses are not full assessments in the sense of revising model structure or re-estimating all model parameters, but instead provide updated ABCs based on current trends in critical data sources, such as landings or fishery independent indices of abundance. We predict that the use of Interim Analyses will increase throughput by 50-100%, depending on how often they are implemented. Interim Analyses offer the biggest “bang-for-the-buck” in terms of providing timely management advice with the largest savings in cost.

3. Regular, predictable assessment cycle. This will help managers in knowing when to expect new ABC advice, and will help data providers in planning their efforts. This could increase throughput another 10–20% and also increase quality. Advanced planning could be facilitated by the Prioritizing Fish Stock Assessments⁵ initiative, which is designed to inform the frequency of Operational Assessments and the choice of stocks for Research Assessments. In addition, the SEFSC will provide a spreadsheet to help with planning that includes explicitly the limits of the data providers and assessment leads. Figures 1 and 2 below show possible assessment cycles, with differences primarily in availability of abundance indicators. Figure 1 shows an example assessment cycle where three analysts could provide ABC advice every other year for eight species; Interim Analyses could be based on partial updates of the operational model, which would not occur as frequently. Figure 2 shows an alternative cycle where Interim Analyses adjust ABC based on recent trends in abundance indicators where possible, resulting in more frequent Interim Analyses.
4. More consistent use of Interdisciplinary Plan Team (IPT) style decision-making during Research Assessments. The IPT format is expected to decrease time for each assessment 10-20%, because analysts do not need to wait from one webinar to the next to implement decisions, nor restrict decision-making only to webinar times announced far in advance in the Federal Register.
5. Research Assessments for data-limited species are most efficient when methods are reviewed and vetted through previous processes, and then many (e.g., 15) species are addressed simultaneously at one workshop.

Summary

The proposed process can improve SEDAR and the Southeast assessment enterprise, and in doing so, maintain all of the guiding principles listed above. Most stock assessments would be conducted through a schedule of Operational Assessments and Interim Analyses, such that timely management advice would be provided for the maximum number of stocks possible. The regular and predictable Operational and Interim schedule will benefit data providers and managers alike. Additional efficiencies can be gained by streamlining the Operational Assessment reports. These assessments would be reviewed by the Council’s SSC. Research

⁵ https://www.st.nmfs.noaa.gov/Assets/stock/documents/PrioritizingFishStockAssessments_FinalWeb.pdf

Assessments would be conducted when stocks are assessed for the first time, or when high priority issues are identified for previously assessed stocks. Research Assessments allow for innovation in methodology, and for new ideas to be vetted through external review, as well as by the SSCs, prior to implementation for management advice. The combination of Research and Operational Assessments, along with Interim Analyses, allows for both innovation and for timely, efficient, high quality assessments to meet the needs of NMFS, the Councils, and stakeholders in the fisheries.

Figure 1. Illustrative example of Research Track, Operational Assessments and Interim Analyses. In this example using three assessment analysts, management advice (ABCs) is updated every year for one species (Red Snapper), every other year for seven other stocks, and Research Track Assessments are completed for two new stocks. Note that once the Research Track is completed for the unassessed species, then they enter into the Operational-Interim cycle.

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Analyst 1	Operate	Interim	Interim	Interim	Operate	Interim
Analyst 2		Operate		Interim		Operate
Analyst 3	Interim		Operate		Interim	
Red Snapper	Operate	Interim	Interim	Interim	Operate	Interim
Black Sea Bass		Operate		Interim		Operate
Red Porgy	Interim		Operate		Interim	
Gag Grouper		Interim		Operate		Interim
Vermilion Snapper	Operate		Interim		Operate	
Snowy Grouper		Operate		Interim		Operate
Tilefish	Interim		Operate		Interim	
Red Grouper		Interim		Operate		Interim
Scamp	Research	Operate		Interim		Operate
Gray Triggerfish			Research	Operate		Interim
Greater Amberjack			Interim		Operate	

Figure 2. Hypothetical schedule of Research (RT) and Operational (O) Assessments, and Interim (I) Analyses. Stocks ranked by SEFSC and Gulf Council staff using the stock assessment prioritization tool. Proposed Interim Analyses adjust ABC based on recent trends in abundance indicators where possible. Alternatively, Interim Analyses could be based on partial updates of the operational model, which could not be done as frequently (see Fig. 1). Year 1 is the first year the new process is fully implemented (assuming a year or two to transition from the existing process). DLM refers to Data Limited Methods.

Stock	Prioritization Score	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Red Snapper	6.6	RT + I	O	I	O	I	O
Greater Amberjack	6.4	I	RT + I	O	I	I	O
Gray Triggerfish	6.1	O	I	I	RT + I	O	I
Gray Snapper	3.7	O	I	I	I	O	I
Scamp	2.8	I	I	O	I	I	I
Red Grouper	2.5	O	I	RT + I	O	I	I
Gag Grouper	2.5	I	O	I	RT + I	O	I
King Mackerel	2.4	I	O	I	I	RT + I	O
Cobia	2.3	I	I	O	I	I	RT + I
Vermilion Snapper	2.2	I	O	I	I	RT + I	O
Spanish Mackerel	2.1	I	I	O	I	I	I
Yellowedge Grouper	1.5	RT + I	O	I	I	I	O
GULF DLM		DLM	I	I	I	I	I
Caribbean		I	I	I	DLM	I	I