Assessment process improvements - How can we simplify?

SEFSC

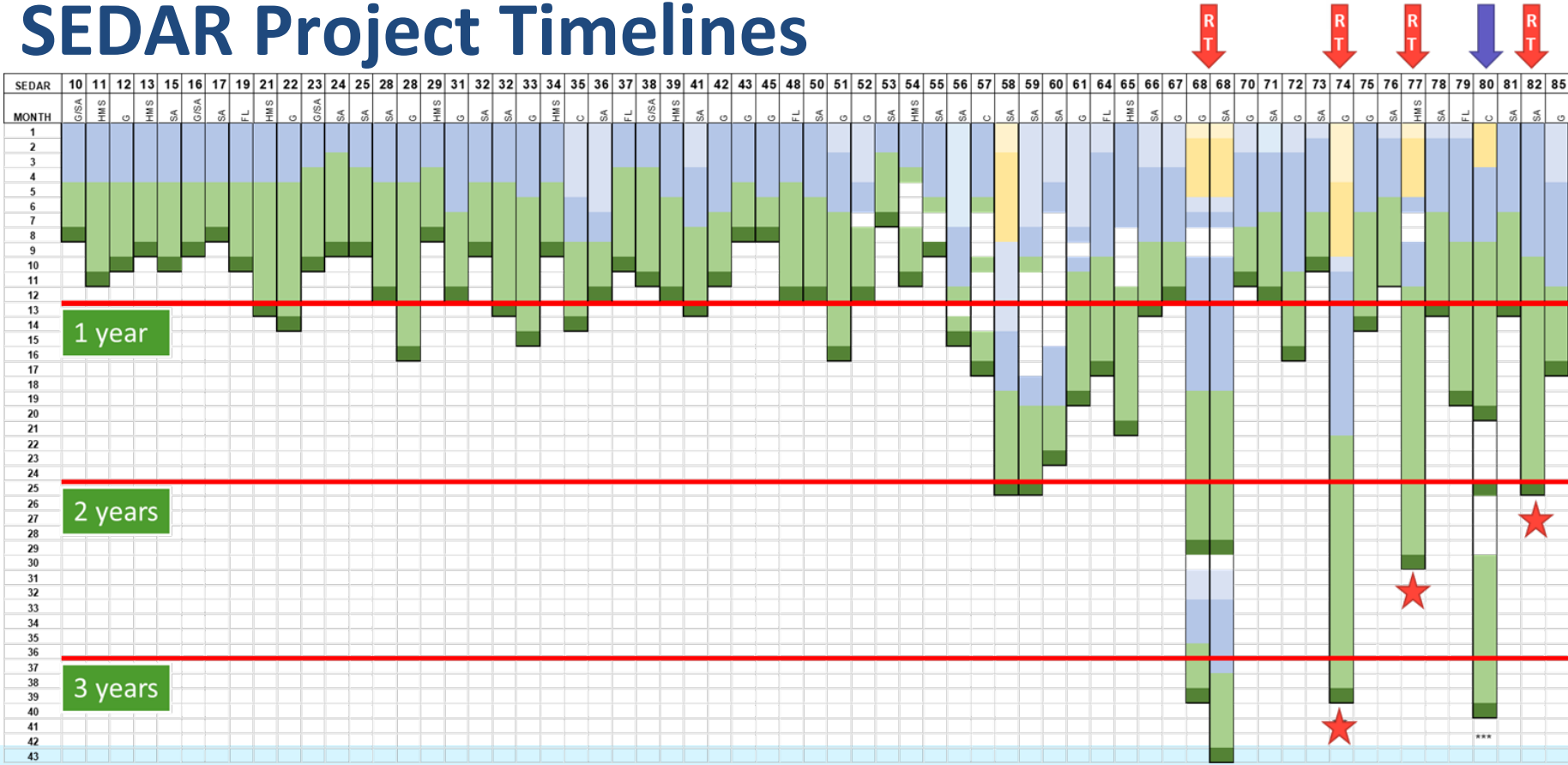
GMFMC SSC Meeting

May 7-8, 2024

Outline

- Background - why are we evaluating the assessment process?
- What steps have been taken so far?
  - What previous work has been done?
- What can be simplified?
  - Models?
    - Which species?
  - Methods?
  - Processes?
- Next steps

What is the problem:
SEDAR Project Timelines



RT/OA has not achieved its potential

- RT/OA process has ***reduced throughput and timeliness***, and has ***increased the burden on data providers.*** Complete RT/OA cycle takes 3-4+ years!
- Panelists express concerns about the limitations imposed on data explorations
- Does not significantly increase integration of new science compared to benchmark assessment
- CIE Reviewers have expressed strong concerns about the lack of final datasets and model diagnostics
- Reserve capacity and flexibility not realized due to heavy burden on data providers, and difficulty scheduling the OA assessments that follow RT
- Emphasis on transparency and thoroughness is the primary bottleneck because it is extremely time-consuming for data providers

Clear need to improve process

In January and February 2024, SEFSC staff met with SAFMC and GMFMC staff to discuss Council objectives, and improvements to "SEDAR" to better meet them. Topics included:

- Identification of primary objectives
- Evaluation of trade-offs
- What has/hasn't worked
- Make changes to the stock assessment process

Important Caveat: Assuming no increase in resources or staffing

Primary Council Objectives

- Accuracy/Reproducibility
- Timeliness (i.e. recency of TY)
- Throughput
- Transparency as needed
- Automation/Access to data, including FI Indices
- “Long-lasting” catch advice
  - Interim assessment
  - Routine updates, etc
- Thoroughness
- **Accuracy > Timeliness**
- **Throughput > Complexity**

Primary Council Concerns

- Insufficient frequency and timeliness of management advice
- Lack of access to key data streams leads to extra council requests
- Current process is insufficiently transparent (e.g. to allow external reviewers to reproduce results)
- TORs may not be met (the intentions)
- Documentation fragmented (e.g. final projections not in SEDAR report)

Recommended Changes

1) ***Eliminate RT/OA process - agreed at the SEDAR SC Meeting***

2) ***Eliminate nomenclature and the slot concept -***

- An age structured assessment conducted without a DW, TWGs or CIE review takes about 6-9 months
- Choose the project “add-ons” and develop appropriate calendar
  - Stock ID Workshop adds ~6 months
  - Data Workshop adds ~3 months
  - Each Assessment Webinar adds ~1 month
  - Incorporation of new information/Each TWGs adds ~1-3 months
  - CIE review adds ~1-3 months
  - Rework for SSC adds at least 3-4 months (due to frequency of SSC meetings)

Recommended Changes

3) Identify Key Stocks and prioritize them

- Declare priorities two-years in advance, but no need to lock in detailed calendars
- This would allow more flexibility to address changing priorities/emerging needs

"As part of evolving and improving the stock assessment process, the SEFSC requested that the Council identify "key stocks" to begin operationalizing these efficiency gains in 2026. Below is a list of five key stocks that that Gulf Council has identified the need for catch advice at least every 3-years:

Red snapper, Red grouper, Gag grouper, Gray snapper, Greater amberjack"

Recommended Changes

4) Remaining stocks could be assessed using less time-consuming approaches

- Stock assessments with limited webinars/workshops
- Update assessments or updated projections
- Less complex assessment approaches, data limited methods and interim assessment/MPs

What could this look like?

- We cannot provide full flexibility and full participation and also create a long-term calendar that maximizes throughput
- We envision establishing a process where the Center communicates frequently with Council Staff to develop project schedules and insert them into the planning calendar at first opportunity

Data Provision Highlights

- Standardization and automation efforts have streamlined the provision of commercial finfish landings, recreational removals, length data, and observer data
- Improved coordination efforts and data scoping for SEFSC led operational assessments
- Increased communication with data providers, analysts, and stock assessment leads, both within SEFSC and with partners
- Working papers documenting data analyses routinely provided, and many are automated
- Additional work needed to improve a few data provision processes (e.g. age composition and Gulf shrimp)

Gap analysis

Stock	Current Classifications					
	Catch	Abun	Life Hist	Size/Age	Eco Link	SUM
Red grouper	4	4	3	4	4	19
Gag	4	3	3	4	4	18
Red snapper	4	4	3	4	3	18
Gray triggerfish	4	3	4	4	1	16
Gray snapper	4	4	3	3	1	15
Vermilion snapper	4	3	3	4	1	15
King mackerel	4	3	3	4	1	15
Scamp/Yellowmouth	4	3	3	3	1	14
Spanish mackerel	4	3	3	4	0	14
Tilefish	4	3	3	3	0	13
Brown shrimp	4	3	2	2	2	13
Pink shrimp	4	3	2	2	2	13
White shrimp	4	3	2	2	2	13
Greater amberjack	5	1	1	4	1	12
Cobia	3	2	3	3	1	12

Stock	Current Classifications					
	Catch	Abun	Life Hist	Size/Age	Eco Link	SUM
Snowy grouper	2	2	3	2	0	9
Speckled hind	2	2	3	2	0	9
Warsaw grouper	2	2	3	2	0	9
Wenchman	2	3	2	2	0	9
Blueline tilefish	2	2	3	2	0	9
Lane snapper	3	2	2	2	0	9
Silk snapper	2	1	3	2	0	8
Red drum	2	1	3	1	0	7
Blackfin snapper	2	0	3	2	0	7
Queen snapper	2	0	3	2	0	7
Yellowfin grouper	2	0	2	2	0	6
Cubera snapper	1	0	2	2	0	5
Almaco jack	2	1	1	1	0	5
Lesser amberjack	2	1	1	1	0	5
Banded rudderfish	2	0	1	1	0	4
Royal red shrimp	4	0	0	0	0	4
Nassau grouper	0	0	2	1	0	3

	LEVEL					
	0	**1**	**2**	**3**	**4**	**5**
Catch	None	Some catch data, but major gaps for some fishery sectors or for historical periods such that their use in assessments is not supported	Enough catch data establish magnitude of catch and trends in catch for a major fishery sector in order to apply a data-limited assessment meth-od. This includes fisheries that are closed and it is known that negligible catch is occurring	Catch data is generally available for all fishery sectors to support quantitative stock assessment, but some gaps exist such as low observer coverage, high levels of self-reported catch, weak information on discard mortality	No data gaps substantially impede assessment, but catch is not without uncertainty (e.g., recreational catches estimated from surveys)	Very complete knowledge of total catch
Size/Age Comp	None	Some size or age composition data has been collected, but major gaps in coverage, and not used in stock assessment	Enough size or age composition data has been collected to enable data-limited assessment approaches	Enough size or age composition data is collected over a sufficient time series to be informative in age/size structured assessment models	Enough age composition data has been collected over a sufficient time series to enable assessment methods that need age composition data from the fishery	Very complete age and size composition data, including, as needed on stock-specific basis, knowledge of ageing precision, spatial patterns or other issues

	LEVEL					
	0	1	2	3	4	5
Abundance/CPUE	None	Fishery-dependent catch rates (CPUE) are available, but high uncertainty about their standardization over time; or expert opinion on degree of stock depletion over time	Fishery-dependent catch rates (CPUE) are sufficiently standardized to enable their use in full assessments; data from fishery-independent sources are not available or sufficient to estimate abundance trends	Limited fishery-independent survey(s) provide estimates of relative abundance; however, the temporal or spatial coverage of the stock is limited or the sampling variability is high	Complete fishery-independent survey(s) provide estimates of relative abundance, and the survey(s) cover a large proportion of the spatial extent of the stock with several years of tracking at a level of precision that supports assessments	Calibrated fishery-independent survey(s) or tag-recapture provide estimates of absolute abundance

	LEVEL					
	0	**1**	**2**	**3**	**4**	**5**
Life History	None	Most life history factors not based on empirical data; derived using proxies, meta-analyses, borrowed from other species, or without scientific basis	Some life history factors based on stock-specific empirical data, but at least one derived using life history proxies, meta-analyses, borrowed from other species, or without scientific basis. Generally supports data-limited assessments	Estimates of most life history factors based on stock-specific empirical data	Data are sufficient to track changes over time in at least growth	No major gaps in life history knowledge, including detailed stock structure, spatial and temporal patterns in natural mortality, growth, and reproductive biology
Ecosystem Linkages	None	Ecosystem-based hypotheses inform the assessment model structure and/or are used for processing assessment inputs (e.g., abundance index), but no explicit link-age to any ecosystem drivers (environment, climate, habitat, predator-prey, etc.)	The assessment includes some form of variability or effect to explicitly account for unidentified ecosystem dynamic(s) (e.g., time/space "regimes", random variation, or other approaches to changing features without direct inclusion of ecosystem data)	One or more assessment features is linked to a dynamic from at least one of the following categories: environment, climate, habitat, predator-prey data.	The assessment model is linked to at least one eco-system dynamic, and one or more process studies directly support the manner in which environmental, climate, habitat, and/or predator-prey dynamics are incorporated.	The assessment approach is configured to be coupled or linked with an ecosystem process (e.g., multispecies, coupled biophysical, climate-linked models)

Species captured by GFISHER

Key Species:

- Red Snapper
- Greater Amberjack
- Gag
- Red Grouper
- Gray Snapper

Identify other indices where we have gaps.

Assessed:

- Gray Triggerfish
- Vermilion Snapper
- Yellowtail Snapper
- Mutton Snapper
- Scamp/Yellowmouth Grouper

- Black Grouper
- Hogfish
- Almaco Jack
- Lane Snapper
- Lesser Amberjack
- Snowy Grouper
- Speckled Hind
- Wenchman Snapper
- Black Seabass

What requires additional discussion?

- Desired level of transparency, and how to achieve it while ensuring desired throughput?
- As defined in NOAA's Scientific Integrity Policy
  - Transparency ensures that all relevant data and information used to inform a decision made or action taken is visible, accessible, and consumable by affected or interested parties, to the extent allowable by law
  - Transparency, traceability, and integrity at all levels are required for NOAA to achieve its strategic vision of "healthy ecosystems, communities, and economies that are resilient in the face of change." They are core values of our organization.
- How is transparency different from participation?

Next Steps

- Receive feedback on initial recommendations (Council, SEDAR Steering Committee, **SSC**)
- Identify assessment priorities. Age and growth providers must begin work on 2026 assessments
- Continue conversations with Council Staff to establish and describe the process.
- The Center will continue work to identify the appropriate assessment complexity for species with more data gaps.
- Develop project schedules for stocks to be assessed beginning in 2026

Stock Assessment Model Complexity

Source: https://www.fisheries.noaa.gov/national/population-assessments/fish-stock-assessment-report

- NOAA Fisheries uses a variety of models to conduct stock assessments. When stock assessment scientists conduct an assessment they identify and develop appropriate models based upon the available data.
- Those models fit into one of six general categories based upon their data requirements and products:
  - Index-based
  - Data-limited
  - Aggregate biomass dynamics
  - Virtual population dynamics
  - Statistical catch-at-length
  - Statistical catch-at-age

Index Based Approaches (IB)

- **Typical Data Requirements:** One or more indices of stock size
- **Resources Required:** Minimal to execute, benefit from MSE evaluation to ensure management objectives are met with sufficient probability
- Most often used in-between comprehensive stock assessments (Interim Assessment). Uses index trends to update management advice (e.g. ABC)
- Some IB methods evaluate the current index value against a critical threshold. If the stock index falls below the threshold it triggers management actions such as a reduction in catch
- Cannot provide estimates of MSST or determine whether a stock is overfished
- Cannot evaluate the risk associated with many harvest options (e.g. size limits, allocations)

Examples include: AIM, I-target, I-slope, Interim Assessments…

Data Limited Models (DLMs)

- **Typical Data Requirements:** Total catch of a stock over time or a survey-based index of total stock abundance
- **Resources Required:** Minimal to execute, benefits from MSE evaluation to ensure management objectives are met with sufficient probability
- DLMs typically provide management advice in relative terms (e.g. whether harvest level should increase or decrease compared to previous years)
- Cannot provide estimates of MSST or determine whether a stock is overfished
- Cannot evaluate the risk associated with many harvest options (e.g. size limits, allocations)

Examples include: DBSRA, DCAC, MLE…

Aggregate Biomass Dynamics

- **Typical Data Requirements:** Total catch over time and an abundance index for the stock; perform best when the input data have high levels of contrast, with periods of high and low abundance and catch
- **Resources Required:** Minimal to execute
- These represent the simplest stock assessment method able to provide the full suite of management advice
- Can provide estimates of stock status relative to management references, current stock size, harvest rates, etc.
- Cannot evaluate the risk associated with some harvest options (e.g. size limits, allocations)

Examples include: ASPIC, BSP, JABBA

More complex models are the norm, but…

- It is likely that some assessments are currently conducted with more complexity than is supported by the available data, or that the resources needed to support their complexity is unwarranted given their priority/importance. In other cases increased complexity may be warranted, but trade-offs may be required.
- Complex models will not be replaced just to simplify. Rather, it will be a data-based decision how to proceed with stocks not identified as a key stock.