NEFMC SSC Workshop on Dynamic Reference Points

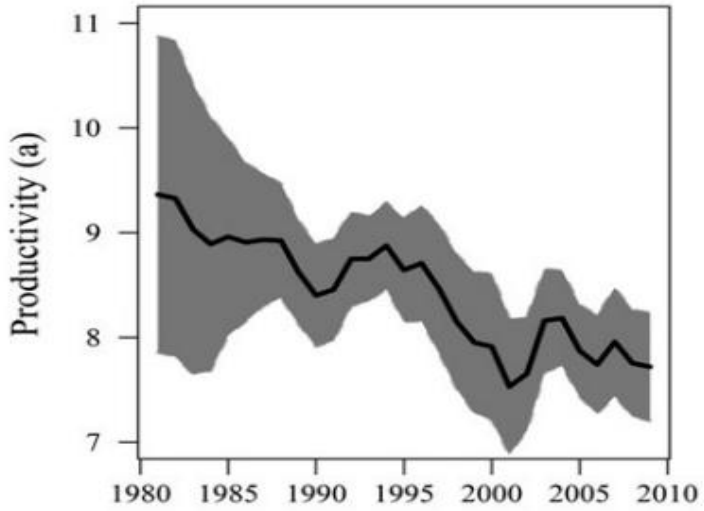
June 1-2, 2026, Hampton Inn, Boston Seaport District

Willy Goldsmith, Pelagic Strategies, Workshop Co-Facilitator

The Challenge

- Ocean conditions are changing
- For some stocks, changes in productivity have resulted
- Stationarity assumptions → unrealistic reference points and rebuilding timelines
- ***How can management adapt?***

On The Water



Bell, R. J., et al. (2014). Externally driven changes in the abundance of summer and winter flounder. *ICES Journal of Marine Science*. https://doi.org/10.1093/icesjms/fsu069

What are Biological Reference Points?

Biological Reference Points (BRPs) are the benchmarks used to:

- Determine stock status
- Inform management action (e.g., ABCs)
- Define rebuilding targets (SSB_{MSY} or proxies)

BRPs can be derived either analytically (model-based) or empirically

Traditional ("static") BRPs ***assume stationarity in stock productivity***

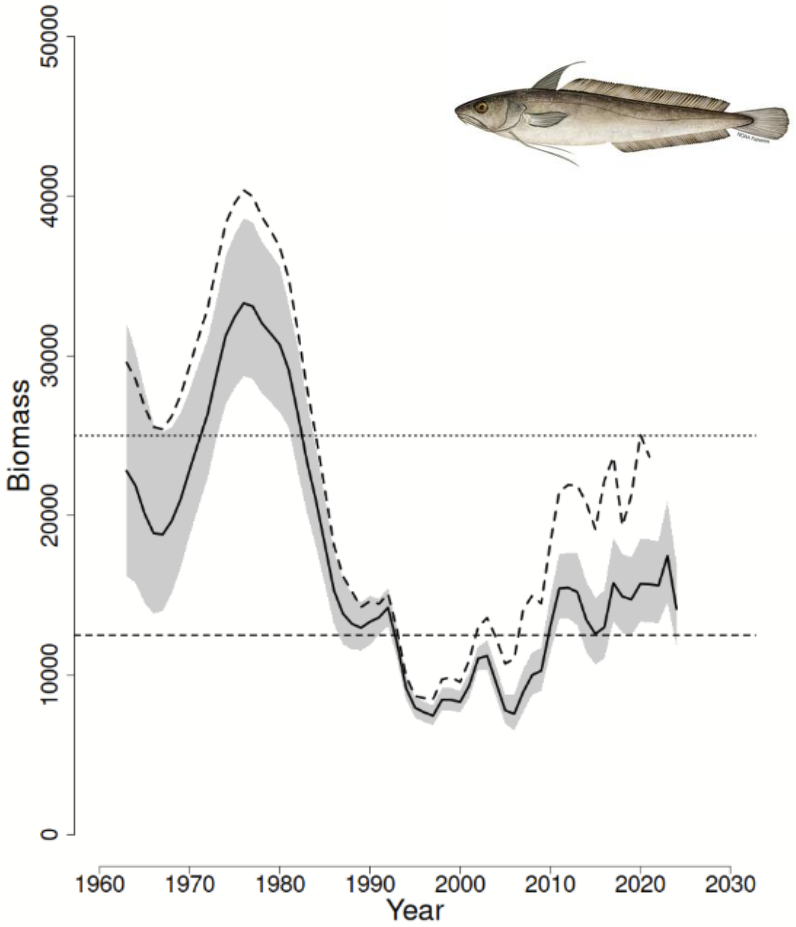


Figure 1: Trends in spawning stock biomass (SSB) of White Hake between 1963 and 2024 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{Threshold}$ ($\frac{1}{2}$ SSB_{MSY} *proxy*; horizontal dashed line) as well as SSB_{Target} (SSB_{MSY} *proxy*; horizontal dotted line) based on the 2025 assessment. The approximate 90% lognormal confidence intervals are shown.

What are *Dynamic* Reference Points?*

Maximum Sustainable Yield (per MSA NS1 guidelines):

The largest long-term average catch/yield that can be taken *"under prevailing ecological, environmental conditions and fishery technological characteristics (e.g., gear selectivity), and the distribution of catch among fleets."*

But what if those conditions change?

Dynamic Reference Points (DRPs) are time-varying BRPs that adjust for changes in stock productivity

- Account for the impacts of broad and persistent ecosystem change or regime shifts → enable more responsive management

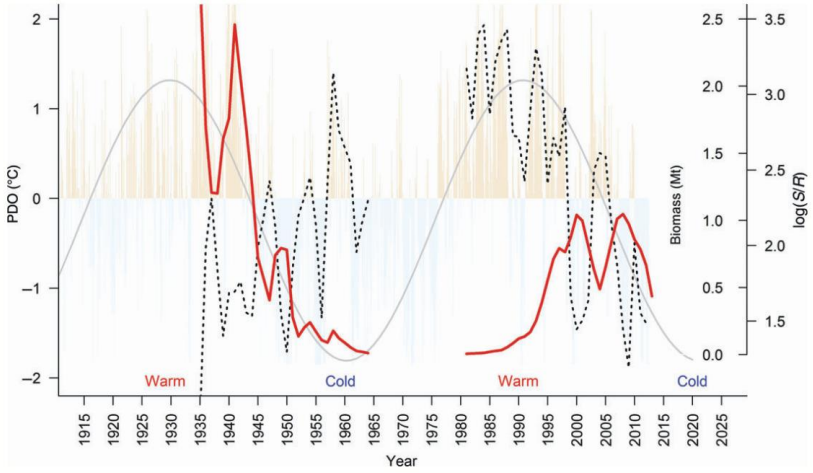


Figure 4. The PDO index indicating positive (pink) and negative (light blue) monthly values; the 60-year periodic component of the PDO projected to 2020 (grey line; Zwolinski and Demer, 2012); the assessment estimated sardine biomass (red); and the predicted logarithmic stock – recruitment ratio (dashed line).

Zwolinski, J. P., et al. (2014). *Environmental and parental control of Pacific sardine recruitment in the California Current ecosystem*. *ICES Journal of Marine Science*, 71(8), 2198–2207. https://doi.org/10.1093/icesjms/fst173

**Definition refined during workshop planning and the workshop itself*

Workshop Goals

1. Establish a **shared understanding** of current approaches and recommendations from regional and national workshops on defining dynamic biological reference points, including the challenges of implementation and human dimensions.
2. Recommend ways to evaluate the effectiveness of existing reference points for NEFMC stocks to **determine when it may be more appropriate** to use dynamic reference points.
3. **Evaluate alternative approaches to defining reference points** that can account for non-stationarity, appropriateness of methods for NEFMC stocks (given data), and potential challenges in application.
4. **Identify tradeoffs, pathways and potential stocks** for implementing dynamic reference points within the current scientific process to inform management.

Workshop Outcomes

1. A preliminary **suite of indicators and guidelines** for evaluating whether to use dynamic BRPs and potentially candidate stocks.
2. Consensus on recommendations for developing, reviewing, and maintaining DRPs, building on existing CINAR, SSC8, and NS1 guidance (e.g., **evaluation standards, evidence thresholds**).
3. A stepwise **implementation roadmap** that aligns scientific advances with management, legal, and capacity constraints and identifies potential risks.
4. A prioritized **list of research recommendations** that could advance our understanding of DRPs and future development of best practices for implementation.

Agenda Overview

Monday, June 1
Morning: Setting the Stage – Where we are in 2026
Afternoon: Evaluating Reference Points and Considering Potential Guidelines

Tuesday, June 2
Morning: Management Applications, Challenges, and Opportunities of Implementation
Afternoon: Toward Operational Guidance and Next Steps

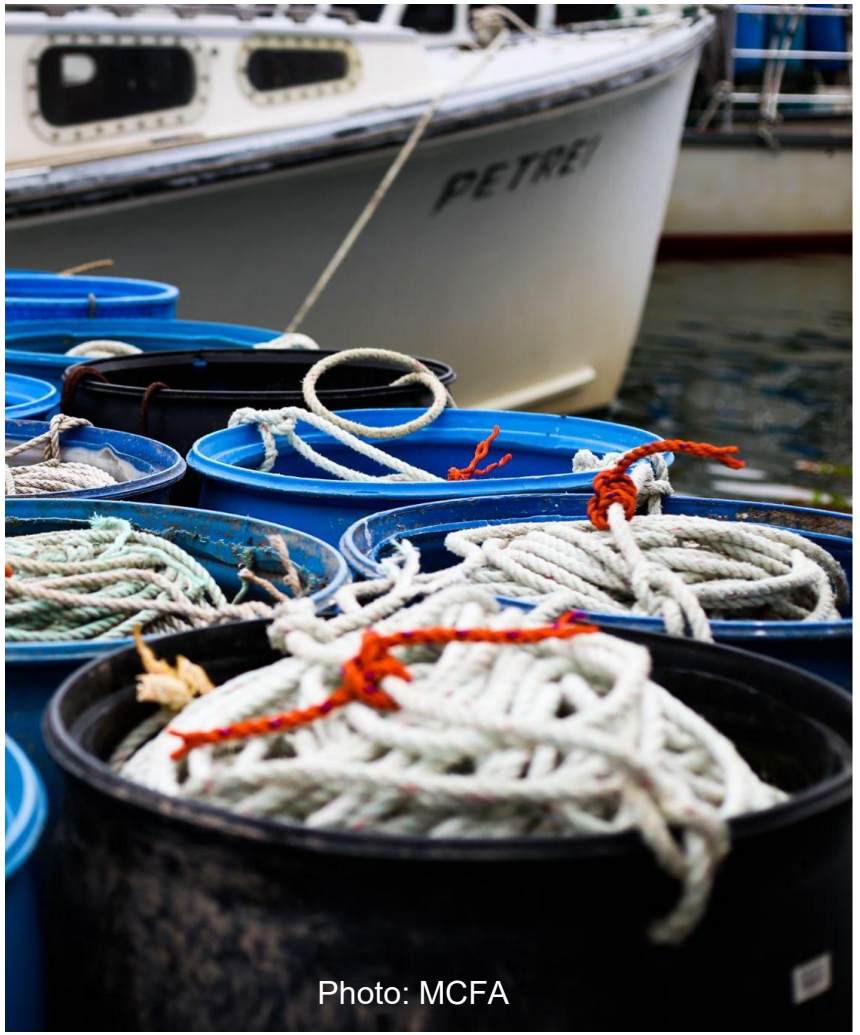
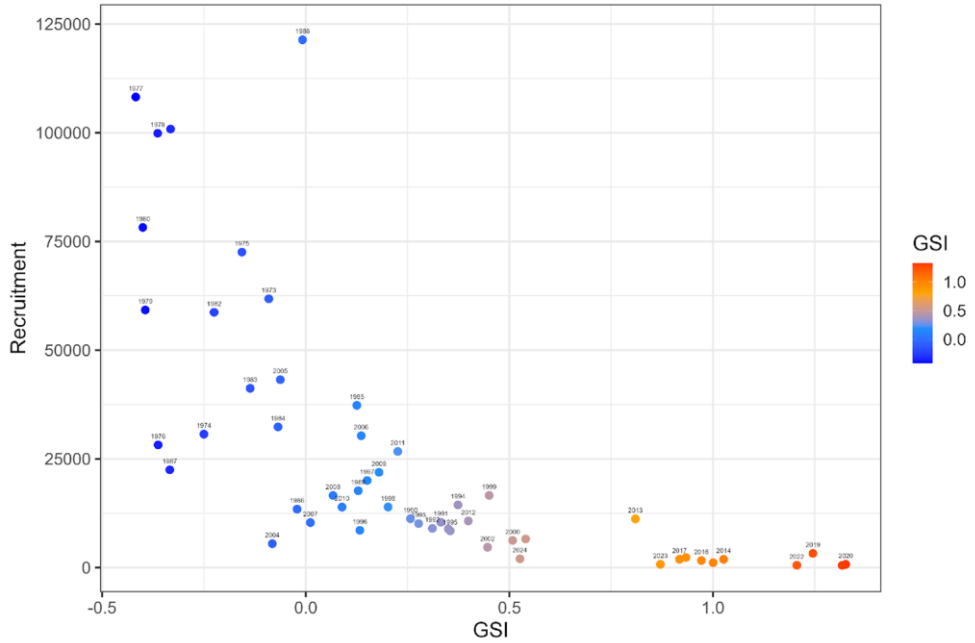


Photo: MCFA

Where We Are in 2026

- It has historically been challenging to account for changes in productivity in the assessment and management processes
- There have been efforts to revise reference points to reflect changing productivity for some stocks
- No consistent framework for revising reference points as conditions shift

2024 Research Track Assessment:
SNE/MA Yellowtail Flounder



Where We Are: Considering productivity shifts

Species/Stock	What Changed?	Approach
Atlantic Herring 	Low recruitment despite low fishing pressure	WHAM with recruitment process random effects
GB and SNE/MA Yellowtail Flounder 	Low recruitment linked to environmental conditions	Inclusion of environmental covariates in WHAM to identify recruitment stanzas
SNE/MA Winter Flounder 	Warm conditions negatively impacting stock-recruitment relationship	Moving 20-year window of recent recruitment to reflect contemporary conditions
White Hake 	Low recruitment despite historically low harvest	Autocorrelated recruitment for short-term projections (reference points unchanged for now)

Concept mapping: From screening to implementation

1. Scoping/ Screening

- Lead: NEFSC/SSC/ NRCC working group
- Prioritize stocks to evaluate (adjust TOR?)
- Low burden of proof– reasonable to consider DRPs?

2. Evaluation of Shift

- Lead: NEFSC
- Formalized strength-of-evidence approach (indicators)
- Higher burden of proof-sufficient evidence?

3. Integrate into Science

- Lead: NEFSC
- Approach varies by stock (data availability, empirical v. analytical, etc.)
- From NEFSC to peer review

4. Integrate into Policy

- Peer review → SSC catch advice → Council
- Levers: Risk policy, flexible SDCs, ECS designation?

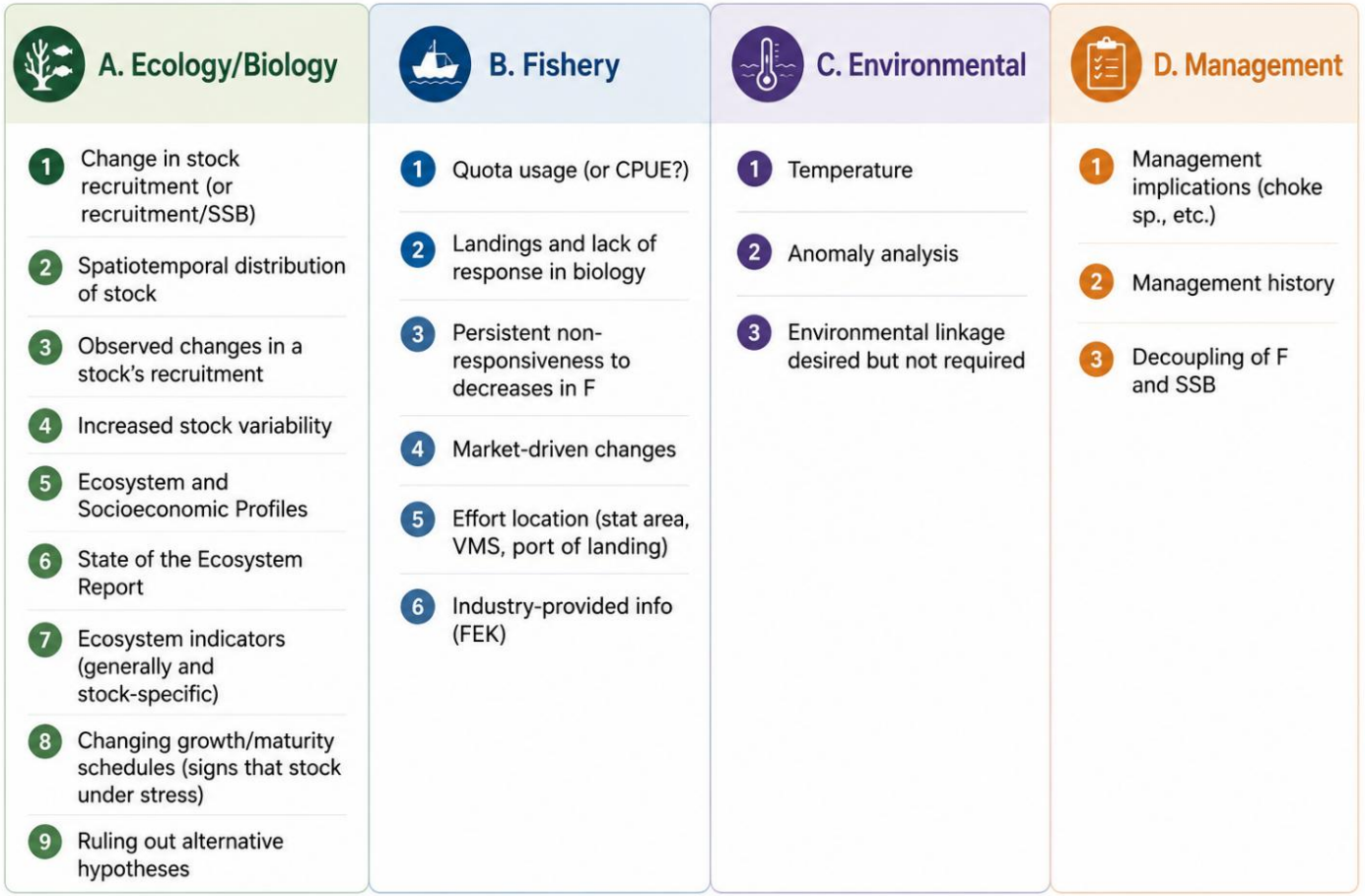
5. Review and Monitoring

- Lead: SSC and NEFSC
- Revisit steps 1-3
- Consider in conjunction with State of Ecosystem report

When to shift to DRPs: Preliminary indicators*

- Strength-of-evidence approach (e.g., Klaer et al. 2015) based on stock indicators (some weighted more heavily than others)

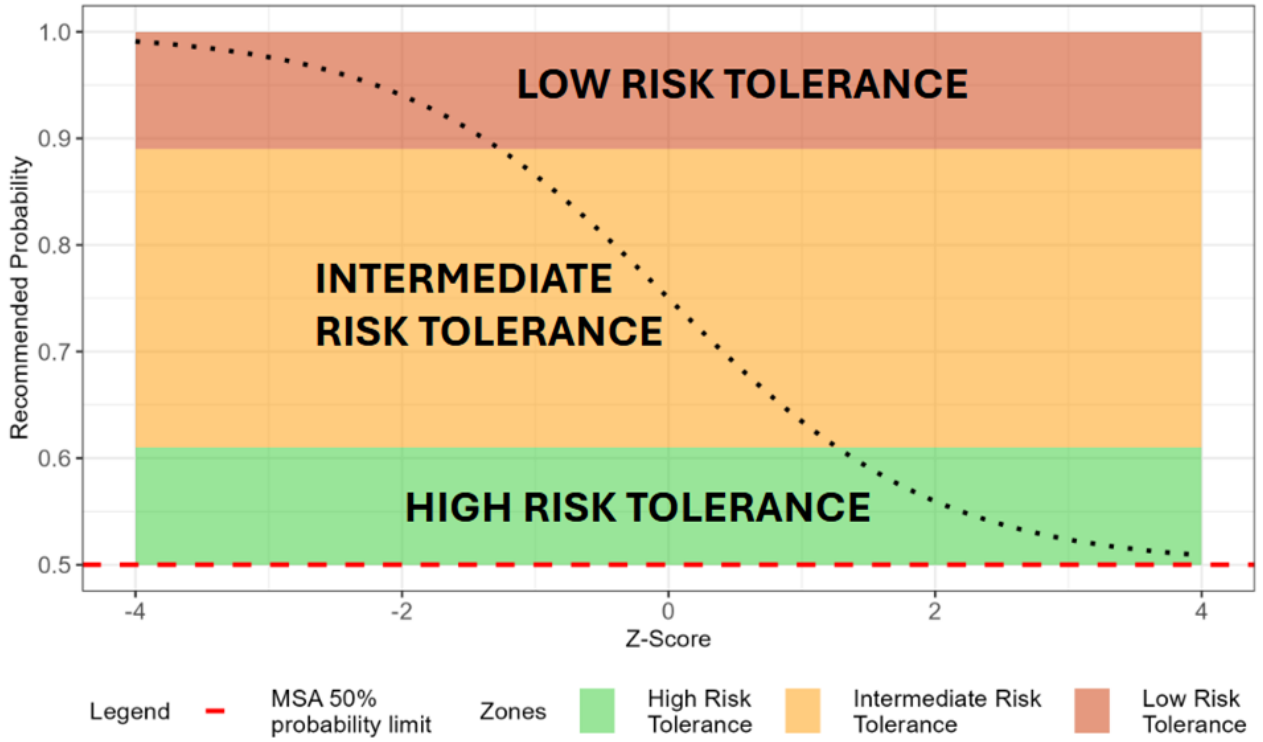
- NRCC's Assessment Working Group could provide key input



**To be reviewed at the August SSC meeting*

How to shift to DRPs/revise reference points?

- Omnibus amendment to implement flexible Status Determination Criteria
- Planned Council revisions to ABC control rules and Risk Policy may provide a systematic mechanism for incorporating changing productivity into catch advice



NEMFC 2026

Toward operationalization: Identification of priority stocks*

Tim Tower

White Hake

- Subject of previous analyses re. changing productivity
- Still assessed using ASAP model
- Best poised for adoption of DRPs

NOAA Fisheries

Georges Bank Atlantic Cod

- Data-rich
- Assessed using WHAM
- In low-recruitment stanza

NOAA Fisheries

Witch Flounder

- Empirically assessed (assumed to move to analytical age-structured model)
- Biomass reference point not used to determine stock status

**All three stocks are currently on the assessment schedule for 2027*

Priorities moving forward

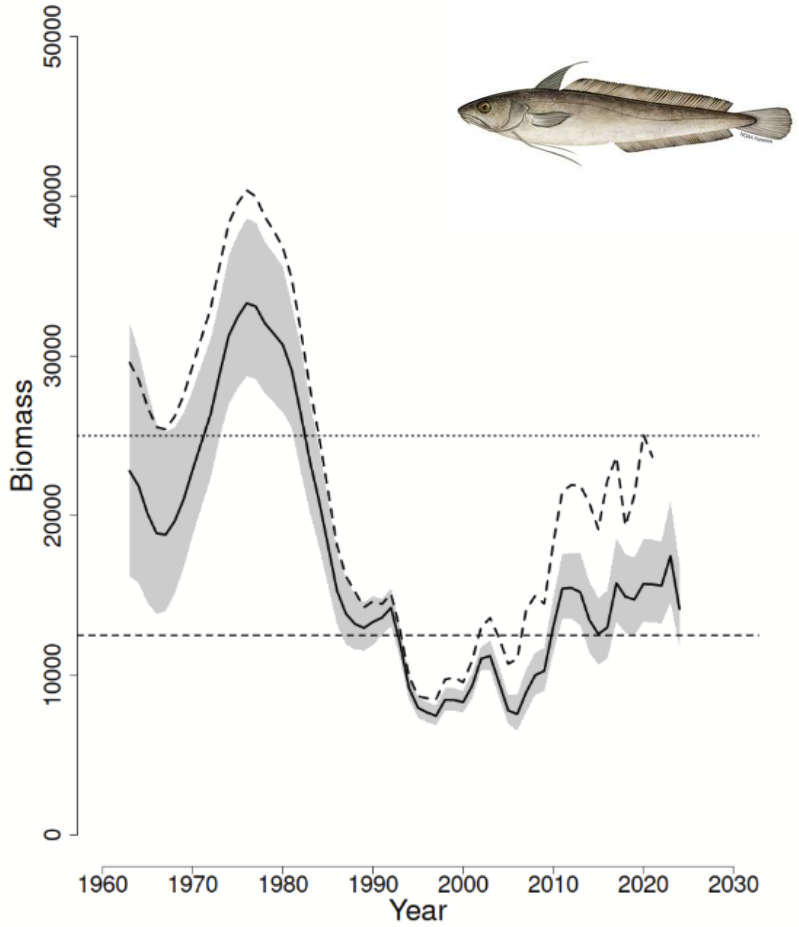
Detecting Productivity Shifts	Specific DRP Approaches	Management Implementation
● Develop **guidance for which metrics to use to assess productivity** ● Identify **indicators of an imminent regime shift** → proactive approach ● Investigate analytical approaches for using **fishery and socioeconomic indicators** to infer productivity shifts ● Explore/analyze potential **synchrony in stock dynamics**) → enable proxies for data-poor stocks ● Examine strategies to **quantify whether fishing is a driver of stock health/decline**	● Explore appropriate **DRP approaches for empirical stocks** ● For data-limited stocks, consider applying **economic reference points** ● Evaluate **assumptions in models that are used for projections** (e.g., numbers at age random effects) ● Examine **strategies for adjusting fishing mortality proxies** (e.g. $F_{40\%}$) to ensure that they align with changes to biomass proxies ● Conduct a **retrospective on how reference point have changed** over time for certain stocks to lend context to current efforts ● Investigate how to appropriately **account for age composition** in developing DRPs	● Seek clarity from NOAA Fisheries to better understand **whether transitioning to DRPs differs markedly from "routine" reference point changes** for the purpose of setting SDCs ● Examine the **management implications of revising BRPs** for the ABC control rule process to foresee and address potential SSC/NEFMC implementation challenges ● Investigate the effect of different DRP methods on **stability of catch** (e.g., through simulation testing), and explore strategies to coordinate DRPs with ABC control rules to avoid large interannual shifts in catch advice and resulting industry impacts

Next Steps

- August SSC meeting
  - Review indicators and apply them to the three DRP candidate stocks to determine whether pursuit of DRPs is warranted.
  - Social Sciences Subcommittee to continue discussion of socioeconomic indicators
- Consider development of omnibus FMP amendment to implement flexible SDCs
- Add evaluating applicability of DRPs as a Term of Reference for the SSC across stocks
- Joint meeting between NEFSC and SSC to discuss coordination on indicator development and screening

Discussion questions

- Feedback on workshop outcomes, including the SSC-identified process (concept map) for DRP implementation?
- Do CESC members have thoughts on the next steps and key priorities identified during the workshop?
- How does the CESC envision its role/involvement in the process of considering the application of DRPs to NEFMC-managed stocks?



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Thank you!

Workshop Planning Team

Steering Committee

Conor McManus, NEFSC (SSC Chair)
Ed Camp, University of Florida (SSC Vice-Chair)
Lisa Kerr, University of Maine (SSC Member)
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Concept mapping: From screening to implementation

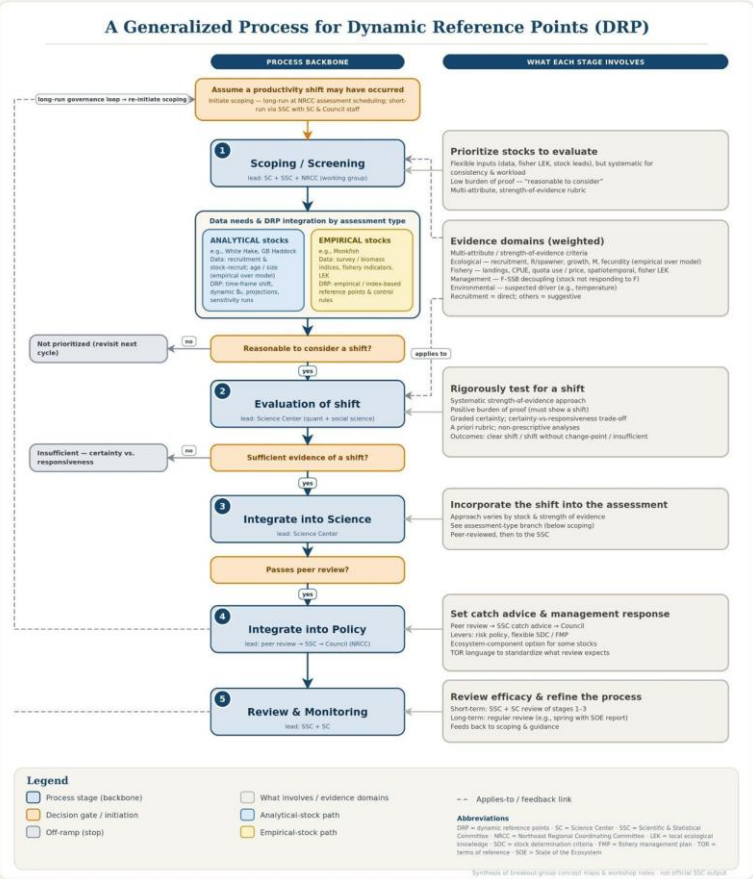

Table 1
Scoring guidelines.

Score	Observed change in a productivity indicator	Understanding of assessment model input data	Understanding of assessment model structural assumptions	Explanatory hypothesis
0	Short period less than one generation	Model input uncertainties are unknown	Key population parameters affected have not been identified	The mechanism is unknown
1	More than one generation	A number of model inputs are uncertain and the extent of uncertainty has not been characterised	Modeled changes in one or more key population parameters have fitted with observed biomass changes	A plausible mechanism for productivity shift has been developed from general knowledge of biophysical processes
2	Multiple generations and across several assessment/management cycles	Uncertain model inputs have been characterised and plausible ranges for those uncertainties have been investigated	Modeled changes in key production parameters have been somewhat validated by investigation of alternative model structures and/or improved model behaviour such as the removal of retrospective patterns	Output from a limited biophysical or multispecies model is consistent with observed patterns of change in productivity
3	Multiple generations and across many regular assessment/management cycles in the same timeframe	The character of model inputs is well understood and uncertainty has largely been eliminated or well estimated statistically	Validated modeled changes are consistent with output from a biophysical or multispecies model	Output from a comprehensive biophysical multispecies model is consistent with observed patterns of change in productivity

Strength-of-evidence approach (Klaer et al. 2015)