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Technical Guidance for Estimating Status Determination Reference Points and their Proxies in Accordance with the National Standard 1 Guidelines

Presentation to FMCs and SSCs

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2023

Status Update

**Draft is ready for
Council
comments**

Technical Guidance for Estimating Status Determination Reference Points and their Proxies in Accordance with the National Standard 1 Guidelines

Prepared for the
National Marine Fisheries Service

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U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

NOAA Technical Memorandum NMFS-F/SPO-###



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Overview of Document

- Approaches to calculating MSY-related quantities and SDCs
 - Tier 1: Age- or Length structured Assessment Models
 - Direct Estimation of FMSY, MSY, and BMSY
 - Proxies
 - Tier 2: Biomass Dynamics/Surplus Production Models
 - Tier 3: Data-limited Approaches
 - Biological Composition Method
 - Abundance-based Method
 - Catch-only Methods
 - Additional Special Considerations
- Multi-year approach to determine overfishing status
- Overfished and approaching an overfished condition
- Overfished Determination from %SPR approach
- Updating reference points and SDCs for changing conditions
- Multispecies Considerations

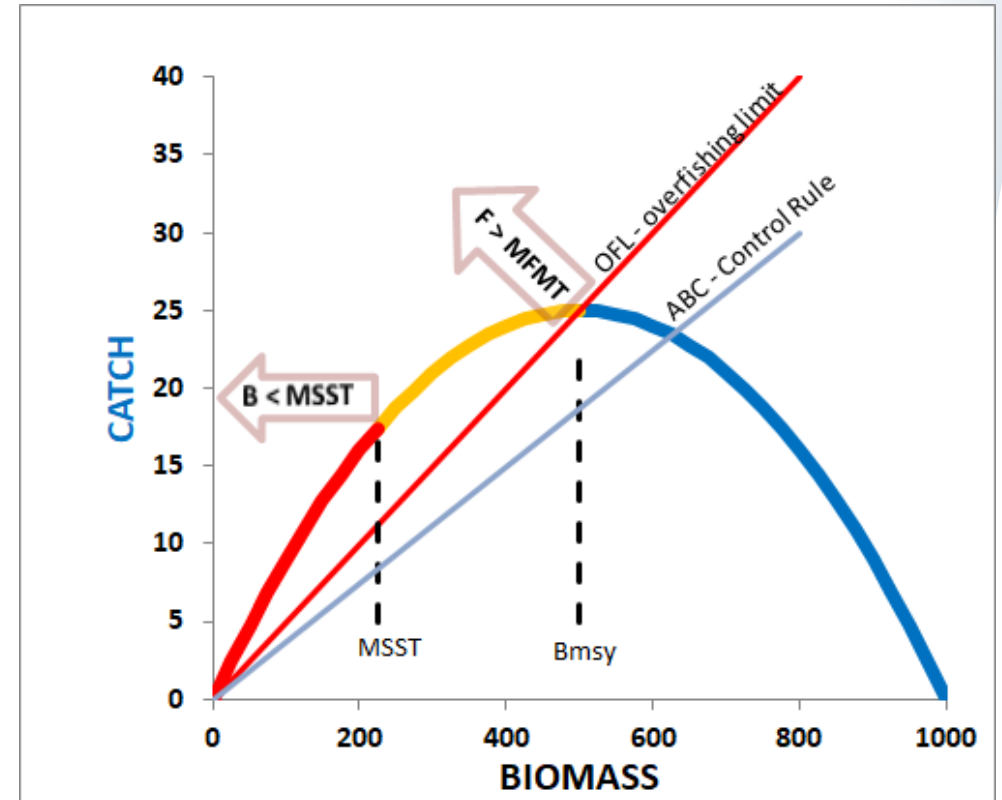


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SDC Concepts

SDC Reference Points for overfishing and overfished conditions work together with Control Rules to provide science-based fishery management

- Fishing mortality (F) \sim slope of line relating catch to biomass
- Higher F causes lower average stock BIOMASS
- Intermediate F gives MSY
- Overfishing occurs when $F >$ Maximum Fishing Mortality Threshold (MFMT)
- or when catch $>$ Overfishing Limit (OFL)
- Stock is overfished when $B <$ Minimum Stock Size Threshold (MSST)
- There is a F corresponding to MSST



Approaches to calculating MSY-related quantities and SDCs: Age-structured methods

Direct Estimation

- Choosing the SRR functional form and parameterization
- Estimating parameters of the SRR curve
- Using priors for one or more of the SRR parameters
- Regional differences have evolved - tailored to local data and situation

Data-moderate MSY-based Proxies

- Proxies for F_{msy} : recommended %SPR in range of 30-60%, with default of 40-45% for most stocks
- Proxies for B_{msy} : Mean Recruitment \times SSB/R @ F_{proxy} ; %B0



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Approaches to calculating MSY-related quantities and SDCs: Biomass Dynamics

Can be employed when there is:

- (1) time series of total catch
- (2) at least one time series of relative abundance data

Pros

- minimal data requirements
- simple to implement and to communicate
- straightforward connection to MSY quantities

Cons

- cannot account for age-specific fisheries
- Ignores lag effect of recruitment contributing to the spawning biomass
- Cannot project recent recruitments into OFL and ABC



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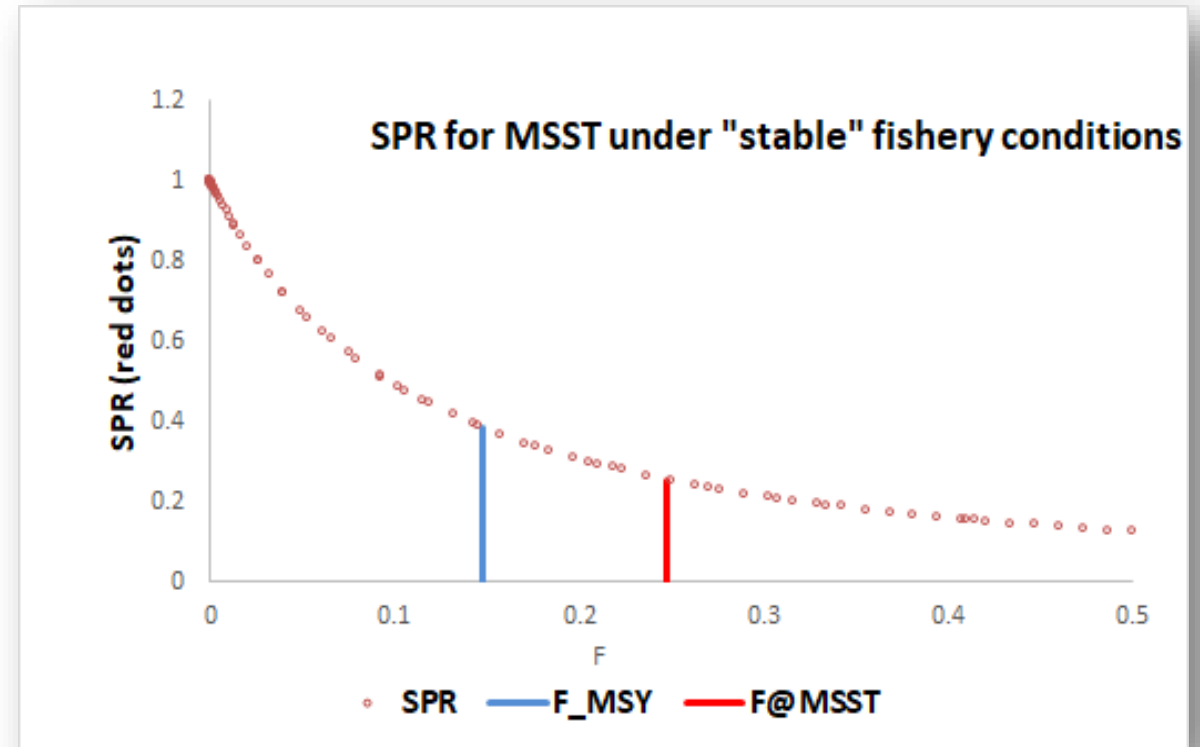
Approaches to calculating MSY-related quantities and SDCs: Data-limited Methods

- Data-limited approaches include: catch-only, absolute abundance, abundance trend, and biological composition (e.g. %SPR) as data categories
- All rely on structural assumptions in order to infer some aspect of status determination; none can do it all



Approaches to calculating MSY-related quantities and SDCs: Data-limited Methods

- Biological composition data allow calculation of recent average SSB/R, from which the SPR can be calculated
- Previously NMFS has disallowed MSST status determinations from only %SPR calcs because it did not explicitly refer to biomass



- Now: we demonstrate how assumption of quasi-stable stock and fishery provides logical basis by which %SPR, which is a measure of the impact of historical F on current stock's relative biomass, can be used to make MSST determinations

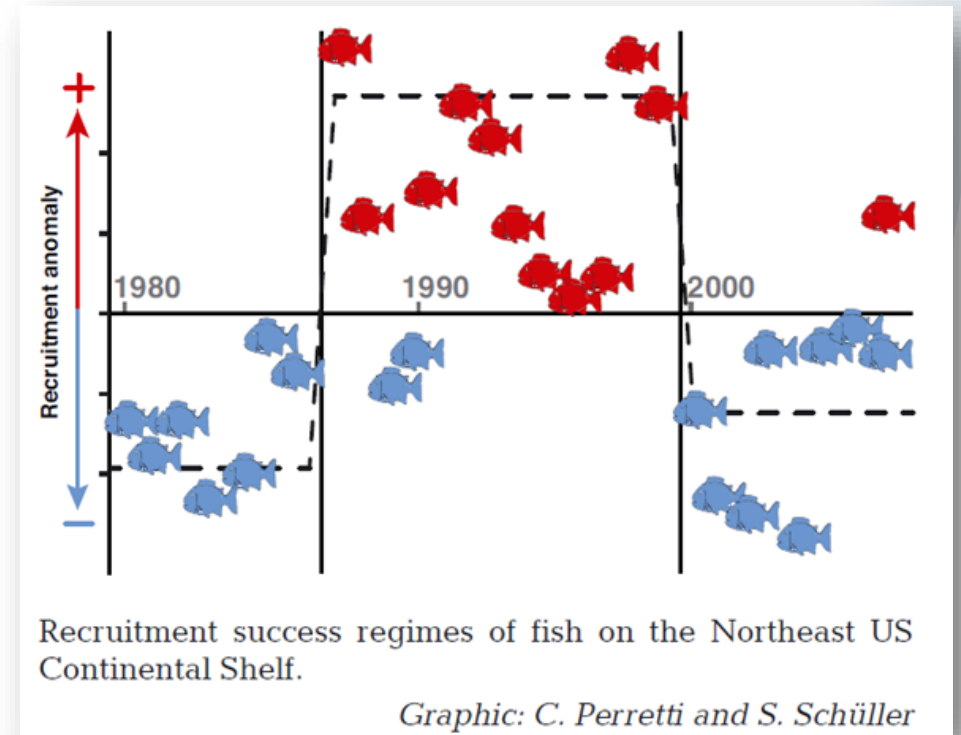
Additional Considerations for Reference Point Calculations

- Fleet dynamics
- Spatial complexity
- Size-selective fishing
- Density-dependence in other life-history factors beyond stock-recruitment
- Age-truncation
- Units of reproductive potential



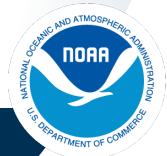
Updating Ref Pts for Prevailing Conditions

- Track changes with empirical trailing averages
 - already routinely done for fishery conditions and fish biology
 - recommend extending that logic to recruitment also
- If environmental drivers are identified, explore ways to directly incorporate them in the assessment model and resultant SDC ref point updates
- Invoke regime shifts, when demonstrably necessary, as exceptions to that trailing average approach; with high bar to avoid explaining away fishing effects on SSB



Caution for Declining Stocks

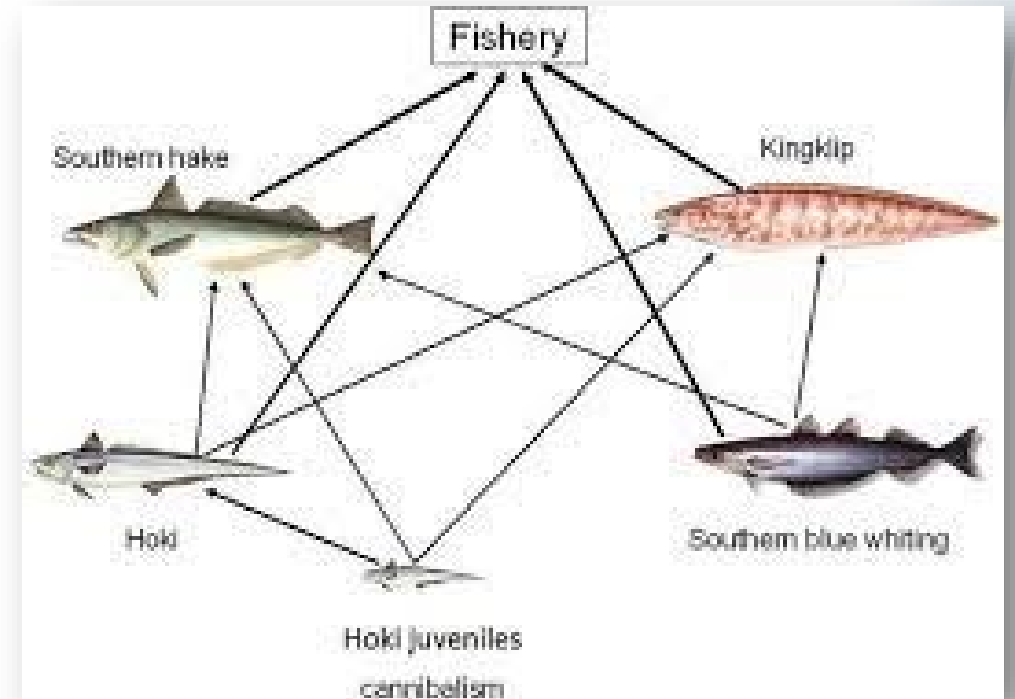
- Highlight and investigate changing conditions that would lead to maintaining high F on a declining stock.
- Example: Increase in M causes stock decline, but also causes $F_{40\%}$ to be a larger F
- Consider setting control rule inflection biomass based on long-term perspective, and setting F_{MSY} , B_{MSY} , MSY , and rebuilding target on the basis of more recently prevailing conditions. Such an approach needs simulation testing before being used.
- If using a $\%SPR$ for the proxy reference points, re-evaluate the choice of $\%SPR$ proxy used to ensure it is still consistent with the new perception of the stock's productivity



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Multispecies Considerations

- **Single Species approach not mandated, just convenient**
- **Should be doing best analysis possible to understand status of each species**
- **Technical interactions (e.g., mixed-stock fisheries)**
 - System wide multispecies MSY (MMSY)
 - Calculate F associated with F_{MSST} , to ensure no stock is fished at level that would result in dropping below MSST in long-term
- **Biological (ecological) interactions**
 - Estimating predation mortality ($M2$)
 - Simultaneously estimating targets for multiple species
- **Explore use of MSEs to evaluate tradeoffs**



Conclusions

- This document strives to update technical guidance for implementation of reference points and status determinations under NS1
- Based on deliberations among knowledgeable experts that spanned several years
- It addresses some old and some new issues
- Highlight that despite the challenges and differences, the NS1G system of reference points has been highly effective in providing a scientific approach to implementation of the Magnuson-Stevens Act's mandate to prevent overfishing and rebuild overfished fisheries



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Questions?



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