



SPR Proxies for the South Atlantic

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Request from SAFMC:

Council requests a presentation on SPR proxies. The presentation should include analyses for which proxy is most appropriate for the species with a focus on currently assessed species in the South Atlantic region.



Outline

- Background
- Brief history and science of SPR proxies
- Use of SPR proxies in the U.S.
- NS1 recommendations for SPR proxies



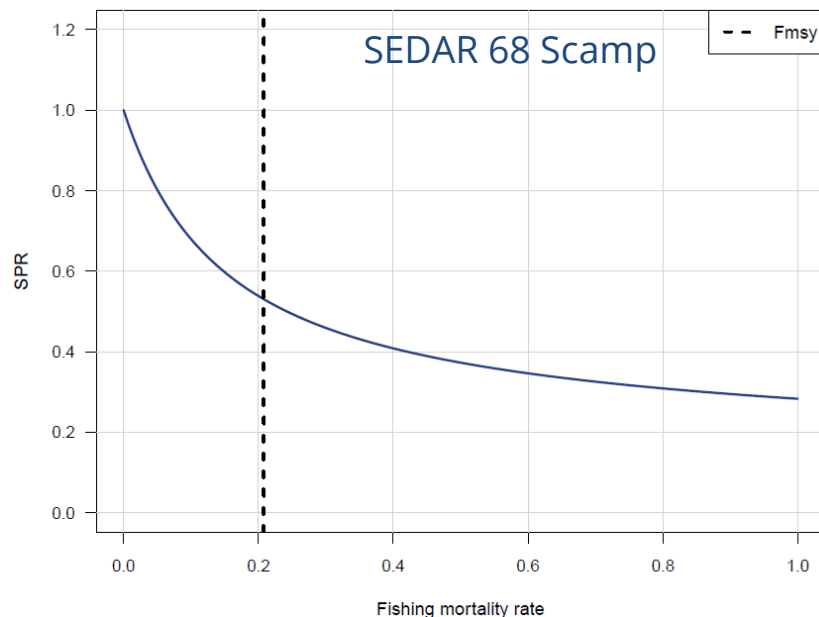
Our Mandate:

National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires preventing overfishing while achieving, on a continuing basis, optimum yield (OY), from managed U.S. fisheries. OY is limited by the biologically feasible maximum sustainable yield (MSY) which in turn serves as the basis for status determination criteria (SDC) by which NOAA determines when a stock is experiencing overfishing or is overfished.



Spawners-Per-Recruit (SPR) Proxy

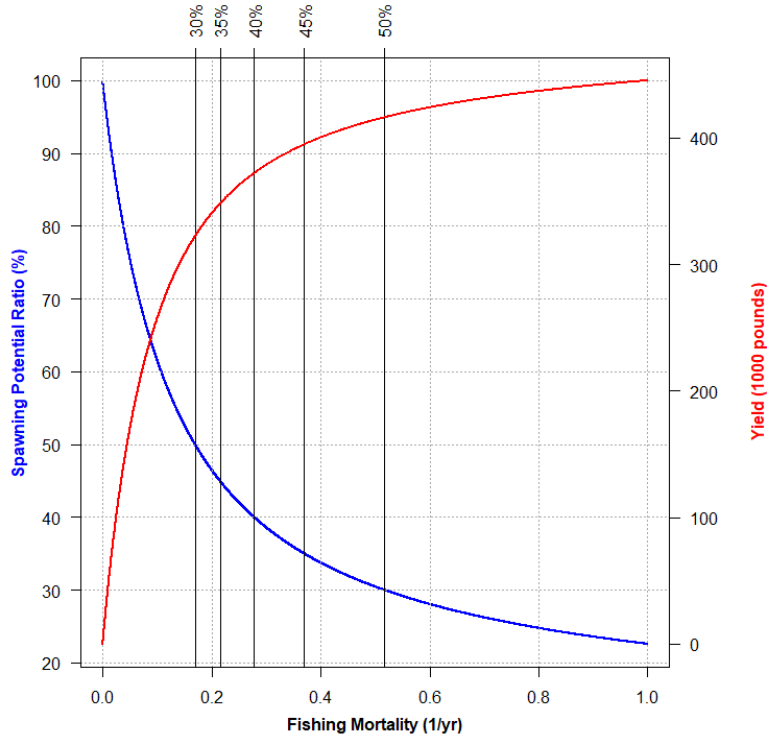
- $\%SPR = SPR_F / SPR_{F=0}$
- $\%SPR$ is a proxy for F_{MSY}
- MSY is based on a production function [e.g. Stock-Recruit Relationship (SRR)]



Factors that affect SPR curve

- Fishery selectivity
- Life history parameters (e.g. M , growth, maturity)

Effects of different values of SPR (Ex: Scamp)



	30%	35%	40%	45%	50%
<i>Fishing Mortality (F)</i>	0.52	0.37	0.28	0.22	0.17
<i>Mean Age of Catch</i>	2.9	3.1	3.4	3.6	3.8
<i>Mean Length of Catch (mm)</i>	415	423	430	437	444
<i>B / B₀</i>	0.39	0.44	0.48	0.52	0.57



Brief history of SPR proxies

- Clark (1991) recommended maintaining SPR between 20-60%, with a target of 35%
 - Clark (1993) revised recommendation to SPR 40% as a default
 - Mace (1994) recommended SPR 40% when stock-recruit relationship is unknown
 - Clark (2002) suggested SPR 40% may be too aggressive for some stocks, recommended considering SPR 50% and 60%
 - Dorn (2002) SPR 40% is too high for West Coast rockfishes, recommended SPR 50-60%
 - Harford et al (2019) 40% to 50% SPR had the highest probabilities of achieving long-term MSY.
 - Zhou et al (2020) - next slide
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- Legault and Brooks (2013) and Williams and Shertzer (2003) confirmed direct linkage between SPR value and stock recruit relationship (steepness)

Recent: Zhou et al. (2020) Results



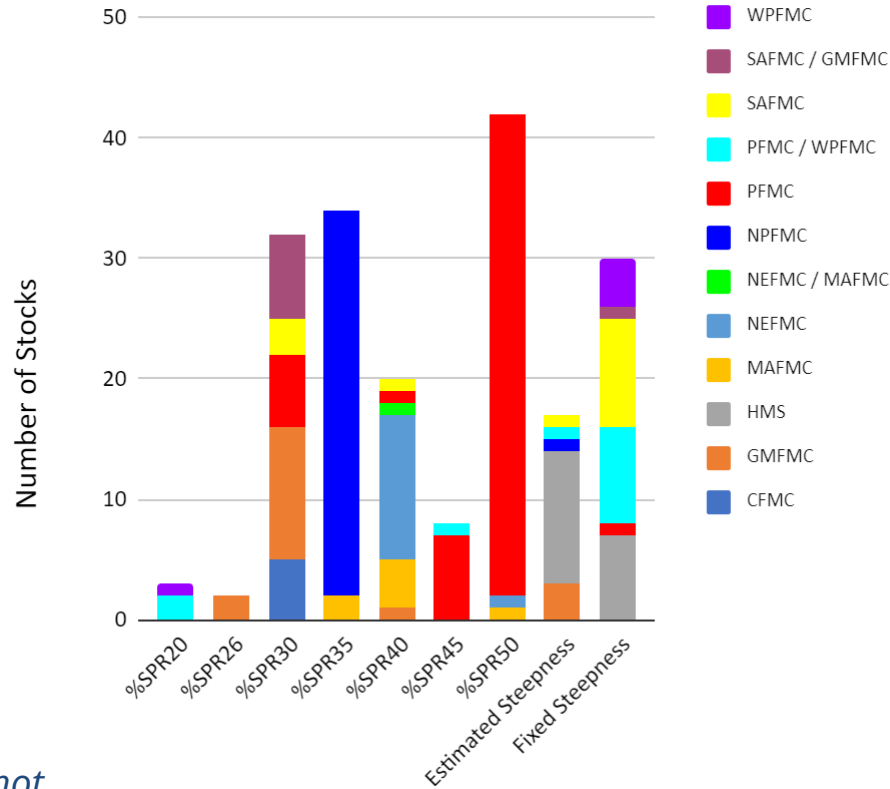
- Used records from the RAM Legacy Database (RAMLD)
- SPR_{MSY} predicted from life-history parameters and gear selectivity.
- The calculated SPR_{MSY} ranges from about 13% to 95% with a mean of 47%.
- About 64% of the stocks in the RAMLD require $SPR_{MSY} > 40\%$.

Predicting SPR from LH parameters



- Predicting the best value of %SPR = F_{MSY} has proven difficult
- Past studies have tried to relate life history (L-H) parameters to the %SPR.
- However, L-H parameters are just one piece of the dynamics that govern populations. In fish, recruitment can often be the most important factor.
- The apparent shift over time to slightly higher %SPR values (e.g. 40%-50%) is the result of decades of population analysis across many fish stocks (e.g. years of stock assessment work) showing that higher values are closer to the true underlying MSY. *Takes decades of data to figure out!*

Use of SPR proxies in the U.S.

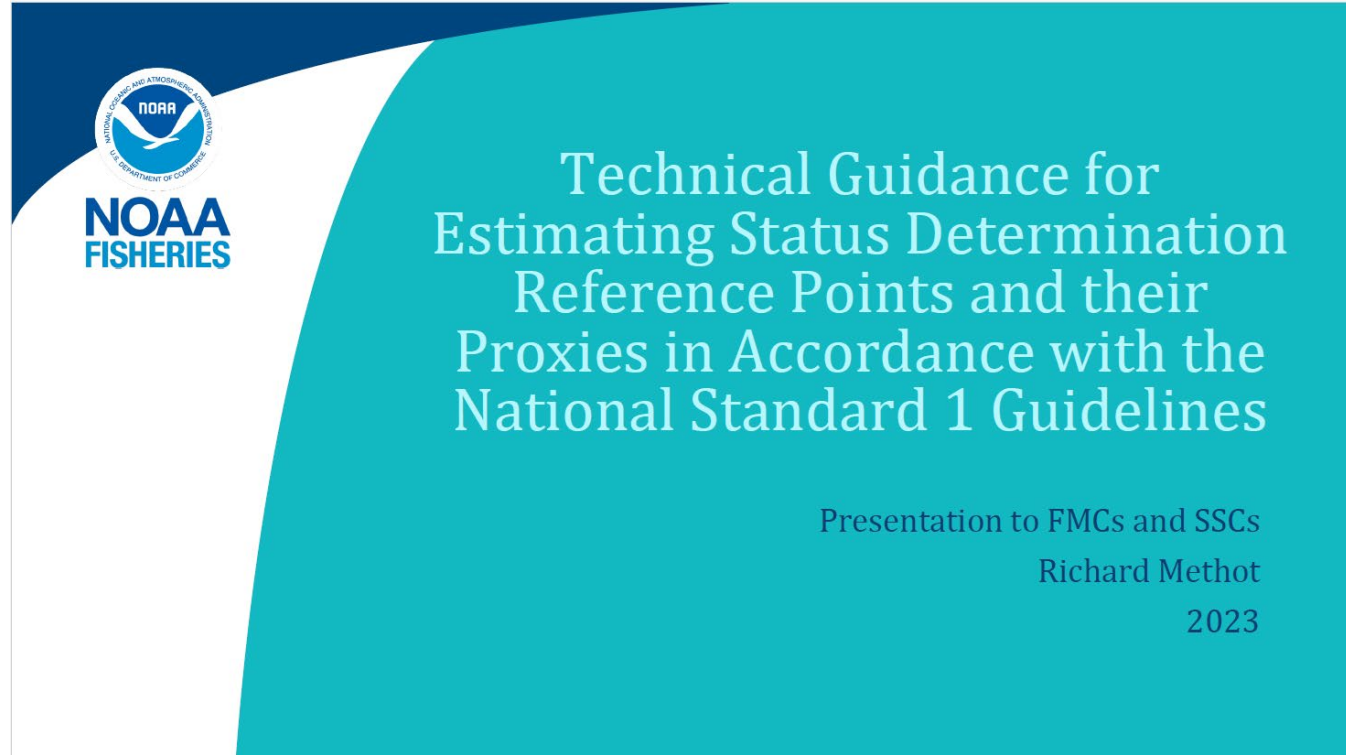


Data provided by Rick Methot

NS1 recommendations for SPR proxies



SSC received presentation at the July 27, 2023 webinar meeting.



The slide features a teal background with a white curved shape on the left side. In the top left corner of this white shape is the NOAA Fisheries logo, which includes the NOAA circular emblem and the text "NOAA FISHERIES" in bold blue letters. The main title of the slide is "Technical Guidance for Estimating Status Determination Reference Points and their Proxies in Accordance with the National Standard 1 Guidelines", written in white text. Below the title, it says "Presentation to FMCs and SSCs" and "Richard Methot" in white text, with "2023" at the bottom right.

NS1 recommendations for SPR proxies



Direct Estimation (preferred)

- Stock-Recruit Relationship (SRR)
- Choosing the SRR functional form and parameterization
- Estimating parameters of the SRR curve
- Using priors for one or more of the SRR parameters; fixed parameters are ill-advised

Should be re-evaluated with each new stock assessment

MSY-based Proxy (alternative)

From Methot's July 2023 presentation

NS1 recommendations for SPR proxies



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 SSB_{MSY} : Mean Recruitment x SSB/R @ F_{proxy} ; %SSB0

From Methot's July 2023 presentation

NS1 recommendations for SPR proxies



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*

SDC within FMPs are specified to be adaptable to accommodate changes to the BSIA. This approach can expedite stock status determinations if the BSIA process recommends a different MSY proxy (reference level), or endorses switching from an MSY proxy to a direct estimate, or vice versa[#]

**From Methot's July 2023 presentation
[#NMFS Flexible Status Determination White paper](#)*

**Should be re-evaluated
with each new stock
assessment**



Conclusions:

- Estimate MSY directly if possible (e.g. stock-recruit relationship is well estimated).
- If a proxy for MSY is necessary, consider an appropriate level based on stock biology, fishery characteristics and long term population trends.
- A default level would be in the range of 40%-45% SPR.
- SSC at their October, 2024 meeting stated: *"Recommendation: minimum of 40%SPR as an appropriate proxy..."*

Conclusions:



- While currently the Council's set the SPR in FMPs, fundamentally, decisions regarding the selected value of %SPR should be based on scientific determinations of the closest approximation to Fmsy.
- In situations where a council chooses to deviate from SSC advice, it would need a strong scientific justification to do so.
- Choosing an SPR level less than the SSC's determination to set the ABC, would allow for a greater than 50% probability of overfishing.



Questions?

