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Management advice derived using alternative F_{MSY} proxies for Gulf Gray Snapper: Associated stock status, OFL and ABC



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GMFMC SSC Meeting
March 13-14, 2019
Tampa, Florida

Introduction

- In August 2018, the SSC recommended OFL and ABC yield streams be derived using:
 - F_{MSY} proxy of $F_{30\%SPR}$ or greater
 - $MSST = (1-M)*B_{30\%SPR}$
 - $P^* = 0.40$
- The Council reviewed the SSC recommendations (Jan 2019) and expressed concern that there was no biological basis to set the gray snapper F_{MSY} proxy (i.e. $F_{30\%SPR}$) at a higher level than similar species (e.g. red snapper: $F_{26\%SPR}$).
- Also, following changes to the MSST definitions for other assessed species (i.e. Reef Fish Amendment 44), the Council elected to set the MSST for gray snapper at $0.50*B_{MSY}$ (or proxy).

Introduction

- The Council requested the SSC evaluate an alternative which would set the MSY proxy at $F_{26\%SPR}$
- To support this evaluation, the Science Center was asked to develop OFL and ABC yield streams for 2019 - 2021 using the proposed MSY proxy of $F_{26\%SPR}$. $F_{30\%SPR}$ and $F_{40\%SPR}$ were also projected for comparison.

Methods

- Projections (using SS V3.24) were run from 2016 to equilibrium using the SEDAR 51 base model configuration, ***with the addition of assumed landings during 2016-2018.***
- Assumed landings (SERO):
 - 2016 - Rec: 2,364,614 lbs; Com: 156,337 lbs
 - 2017 - Rec: 1,848,895 lbs; Com: 136,927 lbs
 - 2018 - Aggregate ACL 2,242,000 lbs
 - After 2018, constant F was projected at three alternative F_{MSY} proxies, F_{SPR26} , F_{SPR30} and F_{SPR40} .
- Projections were run assuming that selectivity, discarding, and retention would continue as they had in the three most recent years (2013-2015). Steepness was fixed at 0.99.



Methods

- OFL was calculated as the median (50th percentile) of the probability density function (PDF) of retained yield using the projection of F_{MSY} (or proxy).
- MSST was set at $0.5 \cdot B_{MSY}$ (or proxy), the Council's preferred alternative.
- ***Using this MSST definition, none of the proxies considered led to an overfished stock status in 2015.***
- Therefore, the ABC was calculated at the 40th percentile ($P^* = 0.4$) of the PDF of retained yield using the projection of F_{MSY} (or proxy).

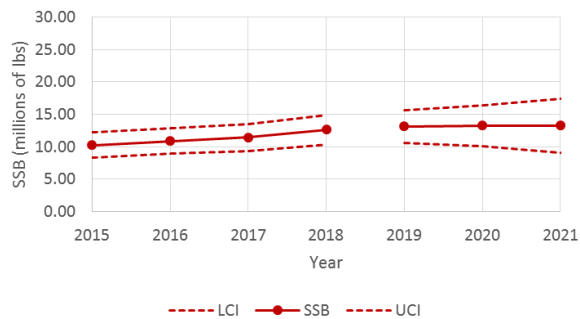
Methods

- The corresponding document submitted to this meeting includes details on how the assumed landings in lbs were broken out into the required fleet structure, and converted to numbers of fish for the recreational fleets.

Results: Spawning Stock Biomass

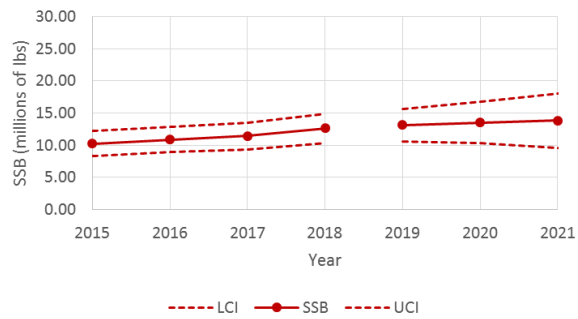
$F_{26\%SPR}$

Spawning Stock Biomass



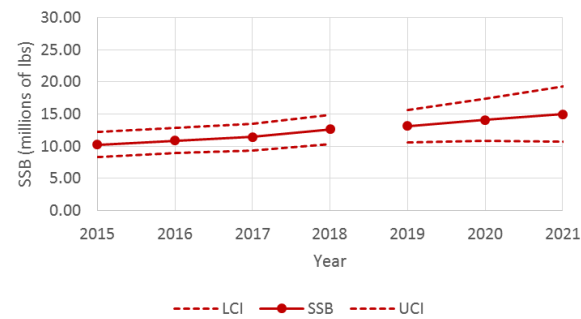
$F_{30\%SPR}$

Spawning Stock Biomass

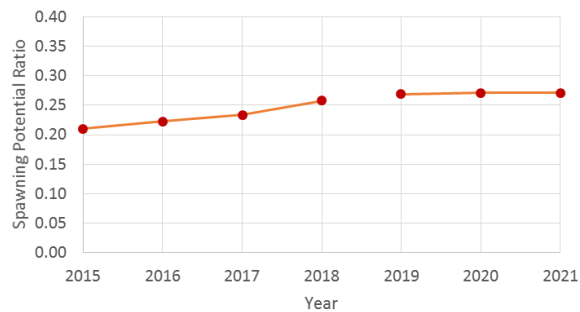


$F_{40\%SPR}$

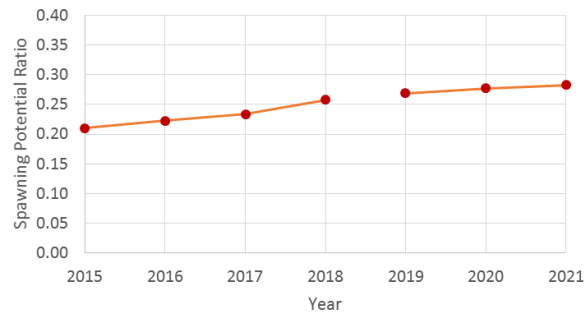
Spawning Stock Biomass



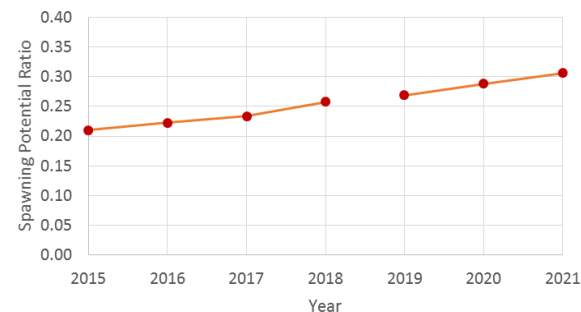
Depletion (SSB/SSB_0)



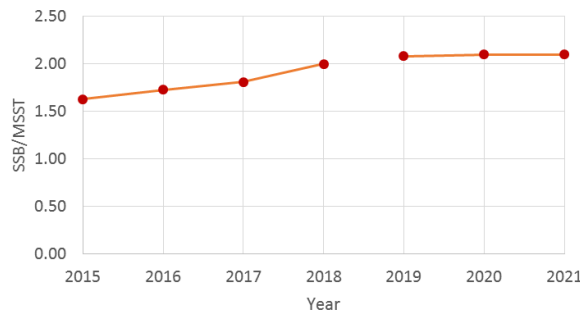
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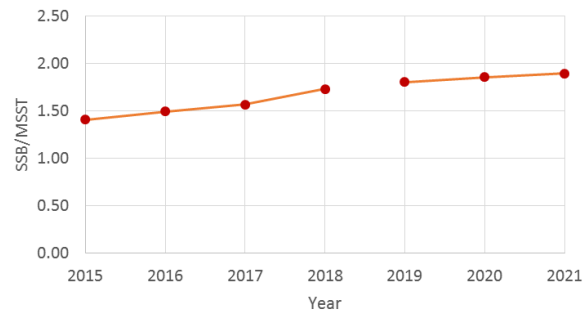
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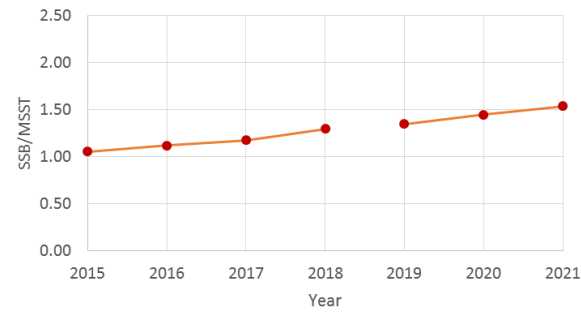
SSB/MSST



SSB/MSST



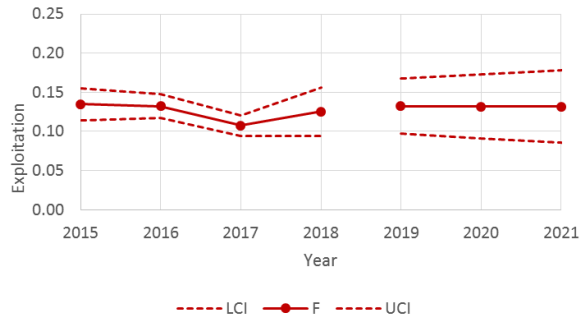
SSB/MSST



Results: Fishing Mortality

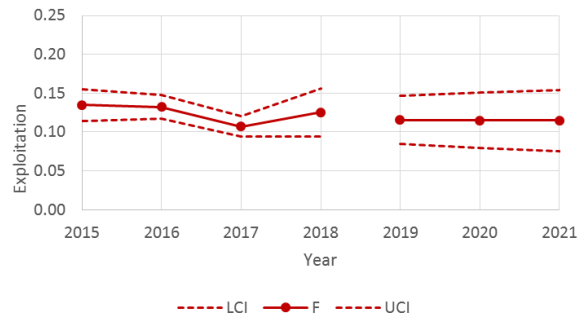
$F_{26\%SPR}$

Fishing Mortality



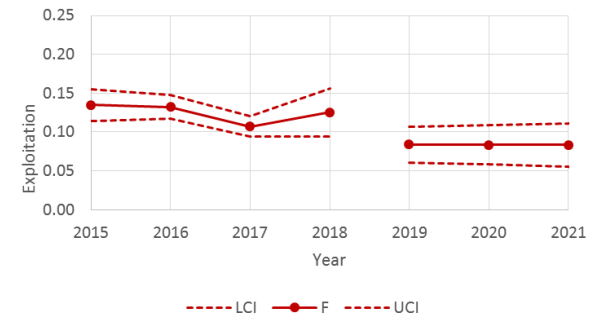
$F_{30\%SPR}$

Fishing Mortality

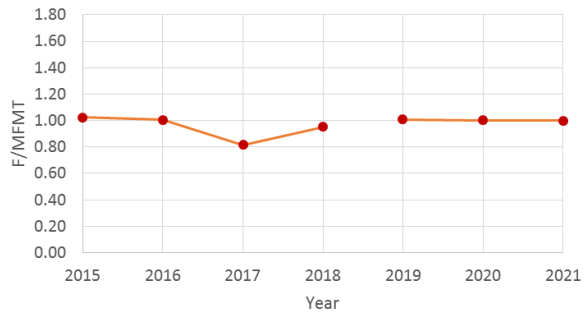


$F_{40\%SPR}$

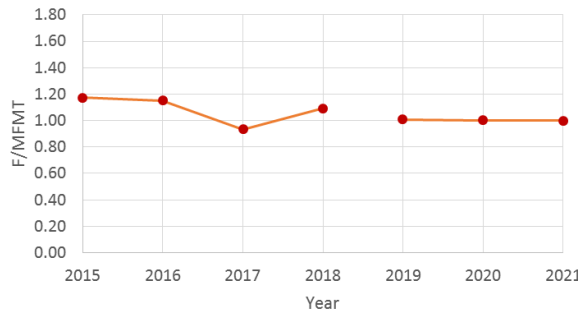
Fishing Mortality



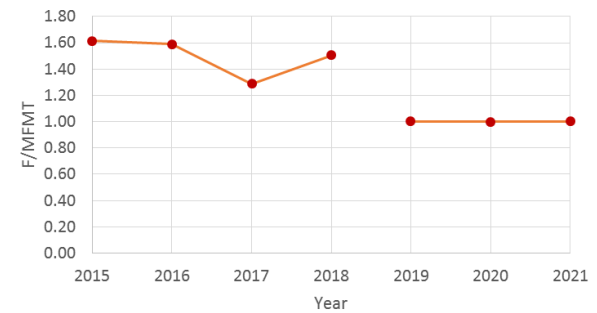
F/F_{SPR26}



F/F_{SPR30}

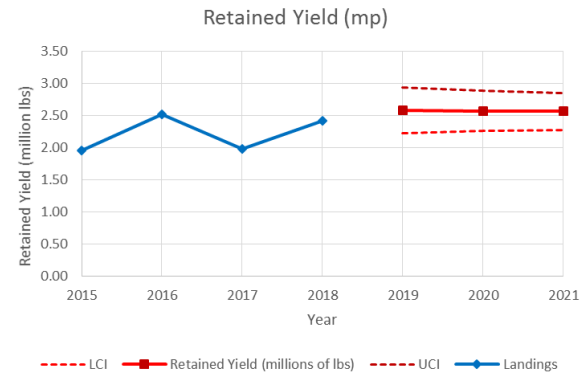


F/F_{SPR40}

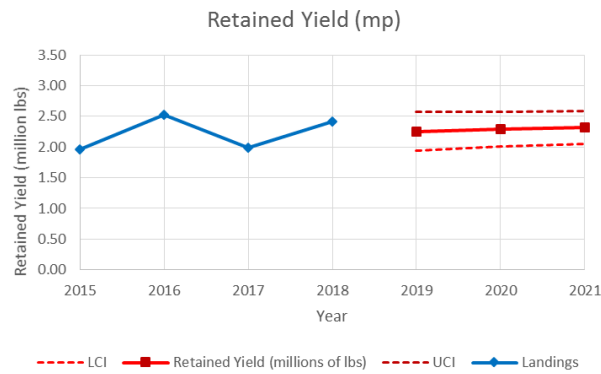


Results: Retained Yield, OFL, ABC (P* = 0.4)

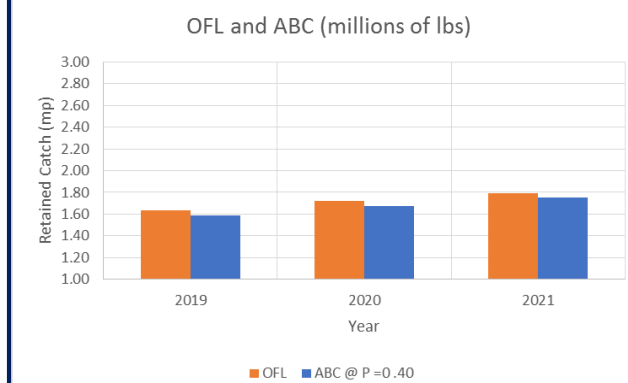
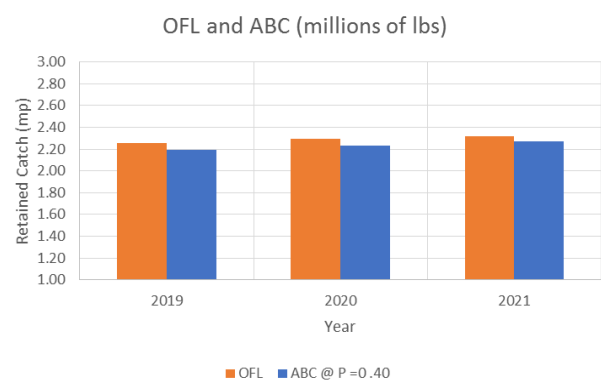
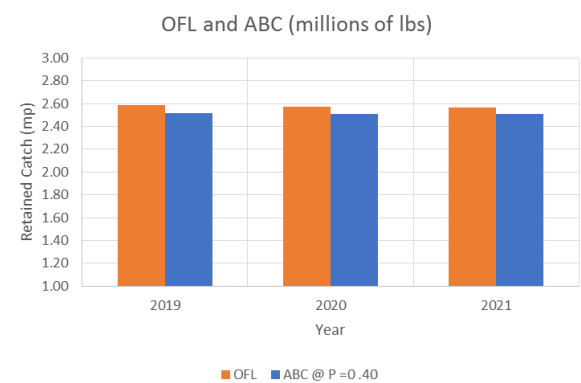
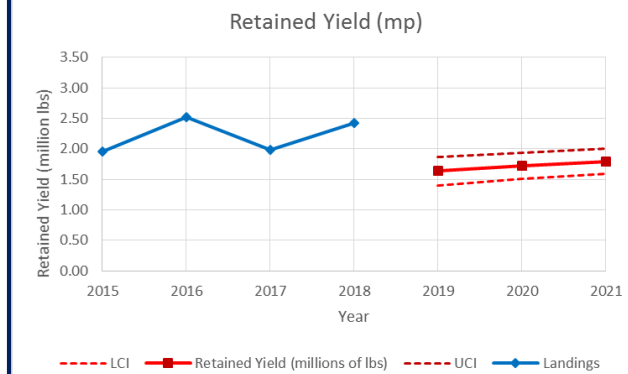
F_{26%SPR}



F_{30%SPR}



F_{40%SPR}



OFL and ABC ($P^* = 0.4$)

$F_{26\%SPR}$

YEAR	LCI	Retained Yield (mp)	UCI	OFL	ABC @ $P^* = 0.4$
2015		1.956			
2016		2.521			
2017		1.986			
2018		2.420			
2019	2.229	2.587	2.945	2.587	2.516
2020	2.257	2.575	2.893	2.575	2.512
2021	2.274	2.564	2.854	2.564	2.507

$F_{30\%SPR}$

YEAR	LCI	Retained Yield (mp)	UCI	OFL	ABC @ $P^* = 0.4$
2015		1.956			
2016		2.521			
2017		1.986			
2018		2.420			
2019	1.942	2.257	2.573	2.257	2.195
2020	2.007	2.291	2.575	2.291	2.235
2021	2.057	2.320	2.582	2.320	2.268

$F_{40\%SPR}$

YEAR	LCI	Retained Yield (mp)	UCI	OFL	ABC @ $P^* = 0.4$
2015		1.956			
2016		2.521			
2017		1.986			
2018		2.420			
2019	1.402	1.635	1.867	1.635	1.589
2020	1.504	1.720	1.937	1.720	1.677
2021	1.591	1.796	2.001	1.796	1.755



OFL and ABC ($F_{OY} \sim 75\%F_{MSY}$)

$F_{26\%SPR}$

YEAR	LCI	Retained Yield (mp)	UCI	OFL	ABC @ F_{OY}
2015		1.956			
2016		2.521			
2017		1.986			
2018		2.420			
2019	2.229	2.587	2.945	2.587	1.977
2020	2.257	2.575	2.893	2.575	2.040
2021	2.274	2.564	2.854	2.564	2.094

$F_{30\%SPR}$

YEAR	LCI	Retained Yield (mp)	UCI	OFL	ABC @ F_{OY}
2015		1.956			
2016		2.521			
2017		1.986			
2018		2.420			
2019	1.942	2.257	2.573	2.257	1.721
2020	2.007	2.291	2.575	2.291	1.802
2021	2.057	2.320	2.582	2.320	1.873

$F_{40\%SPR}$

YEAR	LCI	Retained Yield (mp)	UCI	OFL	ABC @ F_{OY}
2015		1.956			
2016		2.521			
2017		1.986			
2018		2.420			
2019	1.402	1.635	1.867	1.635	1.240
2020	1.504	1.720	1.937	1.720	1.335
2021	1.591	1.796	2.001	1.796	1.420



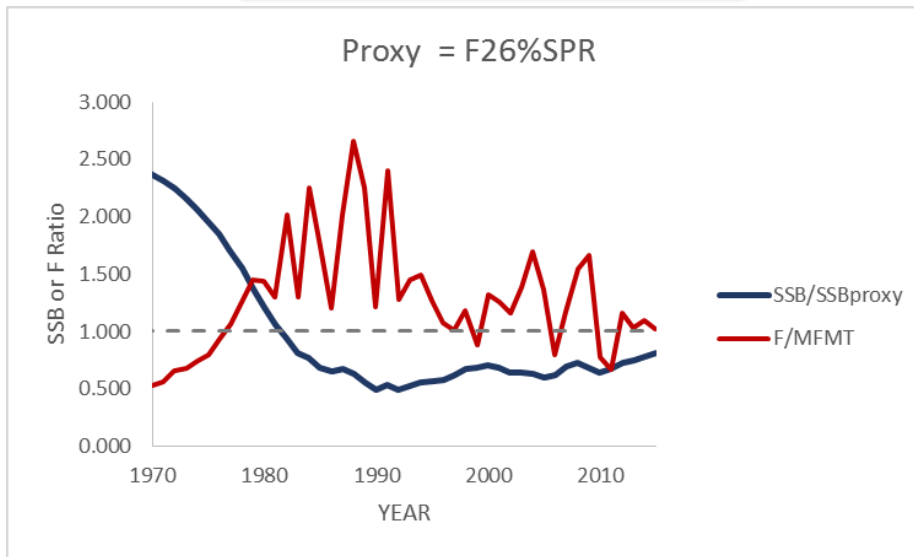
Discussion: Effect of inconsistent references

- Some have noted that it is unusual for a stock to experience overfishing for many years without becoming overfished.
- Under the Council's preferred MSST and MFMT definitions, a stock is not considered overfished until $SSB < 50\%$ of SSB_{MSY} (or proxy), while a stock is assumed to be undergoing overfishing when $F > F_{MSY}$ (or proxy).
- The Council's preferred MFMT and MSST definitions will often produce an outcome where a stock can be experiencing overfishing for a number of years, but will not yet have reached the level that triggers an overfished designation.

Discussion: Effect of inconsistent references

Consistent References

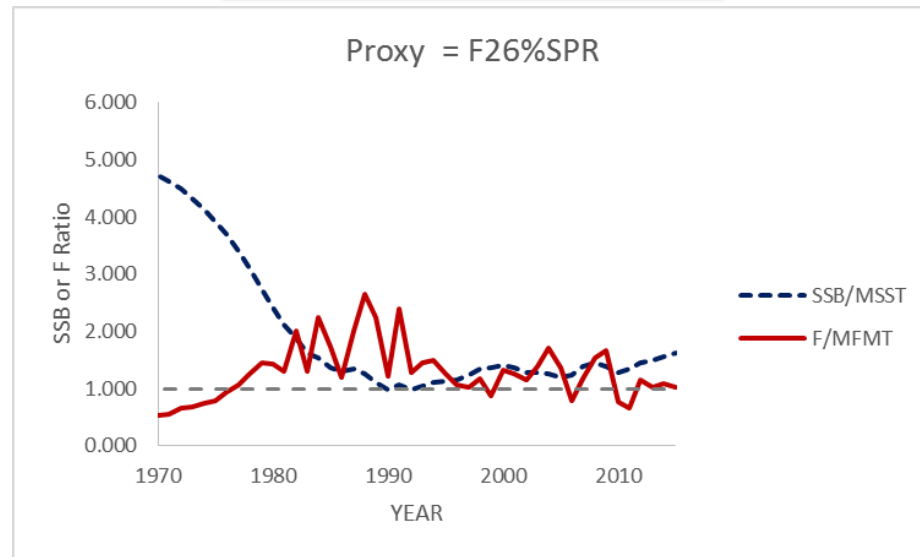
$$\text{MFMT} = F_{26\% \text{SPR}}$$
$$\text{MSST} = \text{SSB}_{F_{26\% \text{SPR}}}$$



This selection of management references results in a stock that has generally experienced overfishing since 1977, and has been overfished since 1982.

Inconsistent References

$$\text{MFMT} = F_{26\% \text{SPR}}$$
$$\text{MSST} = 0.5 * \text{SSB}_{F_{26\% \text{SPR}}}$$



This selection of management references results in a stock that has generally experienced overfishing since 1977, but has not yet declined to the level that triggers an overfished designation.

Caveats

- The results presented are dependent on a number of strong assumptions (slide 4). If any of these assumptions are violated (e.g. by a change in selectivity, retention/high-grading, environmentally driven recruitment fluctuations) the “true” OFL and ABC will be lower/higher than predicted.

Acknowledgements

- Stock assessment products depend on a large team of data providers and analysts. This assessment would not be possible without the substantial efforts of the SEDAR 51 data, assessment and review workshop participants and panelists.