

**NOAA
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SEDAR 61: US Gulf of Mexico Red Grouper

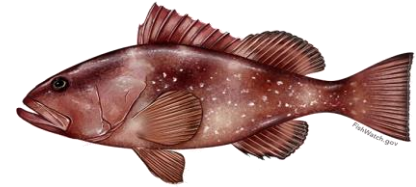
Updated Interim Analysis

Gulf of Mexico Fishery Management Council
Scientific and Statistical Committee



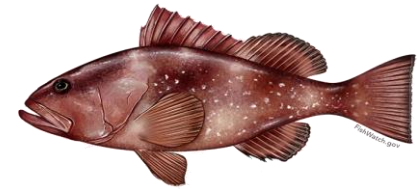
August 9, 2021

Outline

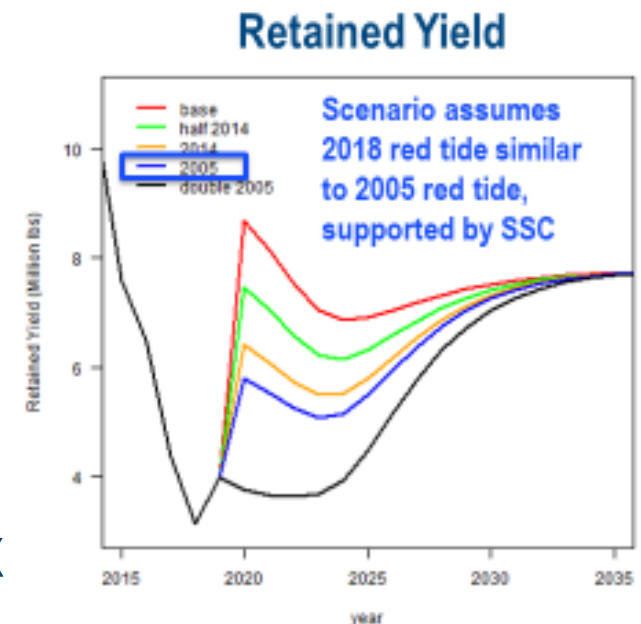


- Interim Analysis History for Red Grouper
- Motivation for Updating Methodology
- Updated Interim Analysis Methods and Results
- Recommendations

Interim Assessment (IA)

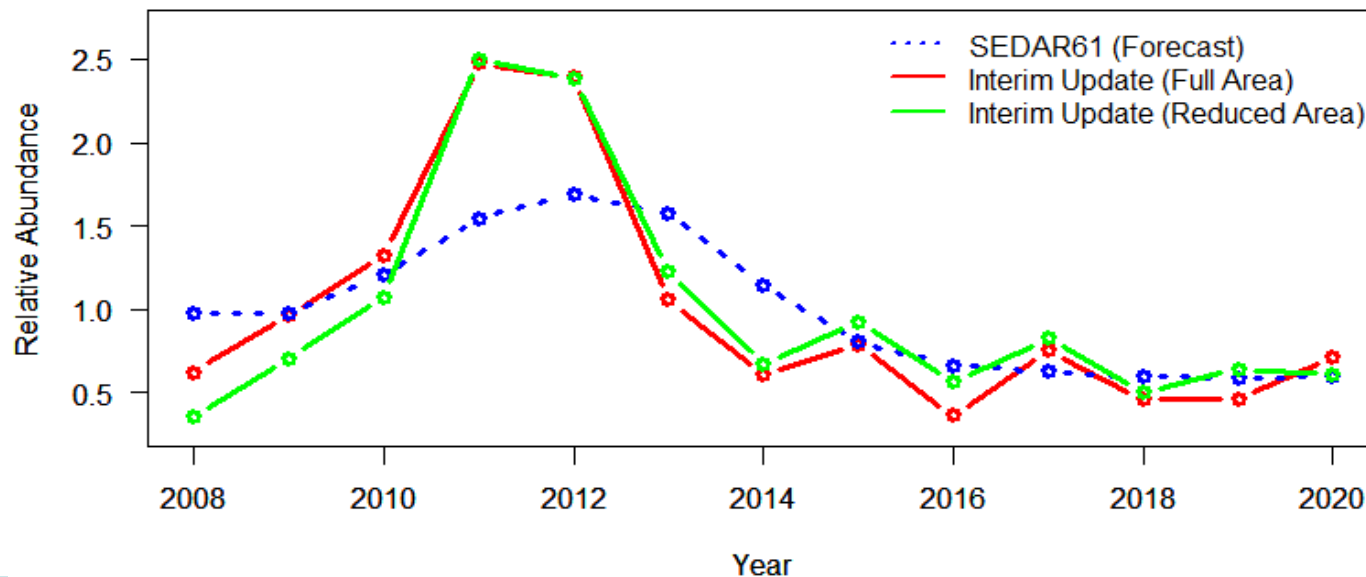


- First red grouper IA conducted in October 2018 was **projection-based**
- Updated red grouper IA in 2019 to adjust harvest recommendations based on stock conditions
 - SEDAR61 terminal year: 2017
 - Made assumptions in projections regarding the impact of 2018 red tide
- Two IAs developed for 2021
 - Full index and reduced area index



Previous IA approach

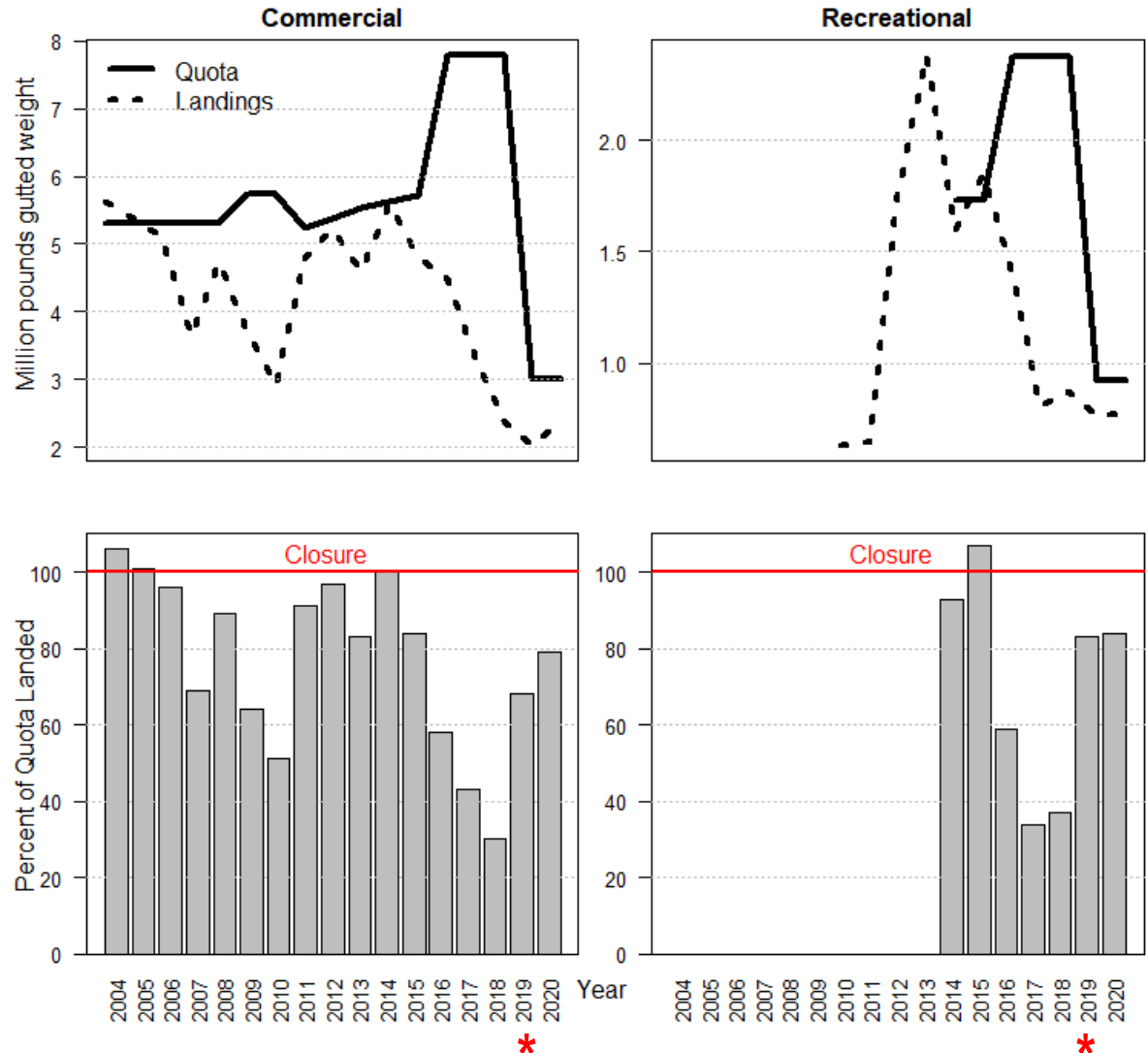
- Prior IAs for Red Grouper relied on forecasted (projected) index of abundance from the SEDAR61 assessment model
 - Assumed 2018 red tide mortality similar to 2005
 - 2019 catch levels (commercial lower, recreational higher)



***ACL reduced in 2019**

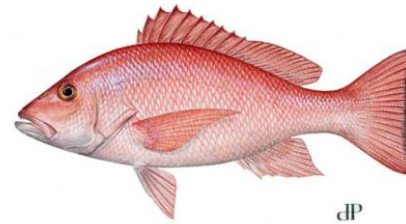
Recent red grouper catch history

Commercial data from 2010 through 2020 were obtained from the Quotas and Catch Allowances, accessed June 30, 2021 (<https://secatchshares.fisheries.noaa.gov/additionalInformation> [select Commercial Quotas/Catch Allowances (all years)]), remaining years were obtained from the Gulf of Mexico Historical Commercial Landings and Annual Catch Limits (ACLs), updated October 23, 2020 (<https://www.fisheries.noaa.gov/southeast/gulf-mexico-historical-commercial-landings-and-annual-catch-limit-monitoring>). Recreational data from 2010 through 2019 were obtained from recreational historical landings, accessed June 23, 2021 <https://www.fisheries.noaa.gov/southeast/recreational-fishing-data/gulf-mexico-historical-recreational-landings-and-annual-catch>), **preliminary** data from 2020 were obtained June 23, 2021 from <https://www.fisheries.noaa.gov/southeast/2020-and-2021-gulf-mexico-recreational-landings-and-annual-catch-limits-acls-and-annual>.



Proposed change to IA approach

- Use index-based harvest control rule (HCR) that relies solely on the observed index of abundance (which tracks more “real-time” changes in abundance)
 1. **Removes the reliance on the forecasted index** and assumptions inherent in SEDAR61 projections
 2. **Simulation tested** by Huynh et al. (2020) for Vermilion Snapper and performed well, including when episodic natural mortality was not accounted for in projections
- Implemented in 2020 IAs for:



SEFSC 2020a



SEFSC 2020b

Index of abundance: NMFS Bottom Longline

- Huynh et al. (2020) approach modified to include buffer for tolerance in observed and reference index values using 3- or 5-year moving average:

$$C_{y+1} = C_{ref} * \left(\frac{1}{3 \text{ (or 5)}} \sum_{k=y-2 \text{ (or -4)}}^y I_k \right) / \left(\frac{1}{3 \text{ (or 5)}} \sum_{Y_{ref}-1 \text{ (or -3)}}^{Y_{ref}+1} I_{ref} \right)$$

The equation is presented with two boxes highlighting the moving average components:

- Recent Mean Index (I_k)**: $\frac{1}{3 \text{ (or 5)}} \sum_{k=y-2 \text{ (or -4)}}^y I_k$
- Reference Mean Index (I_{ref})**: $\frac{1}{3 \text{ (or 5)}} \sum_{Y_{ref}-1 \text{ (or -3)}}^{Y_{ref}+1} I_{ref}$

- Reference Year* (Y_{ref}) = 2018; the first year following the terminal year of the assessment (2017)

Catch levels

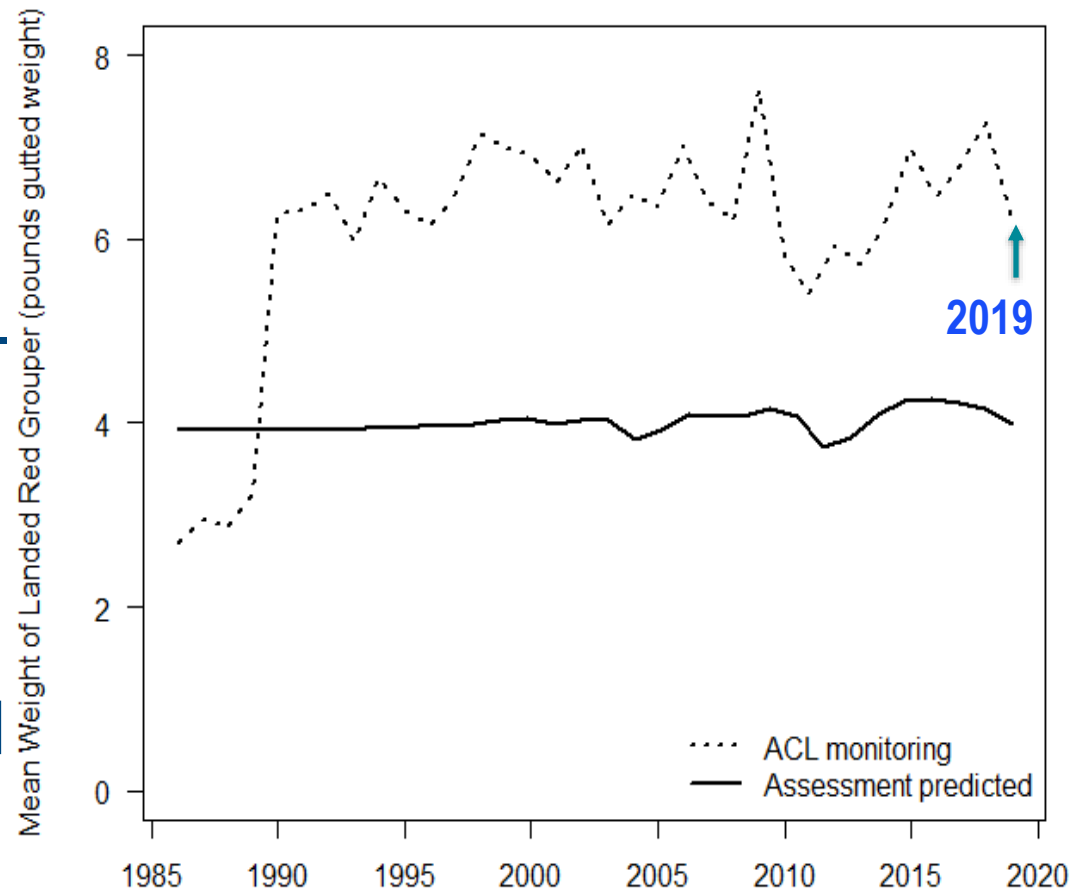
- C_{y+1} = adjusted catch recommendation for 2021
 - For implementation starting in 2022
- C_{ref} = reference catch level to be adjusted

For Red Grouper, based on:

 - Allocation of 59.3% commercial and 40.7% recreational from Amendment 53 (GMFMC 2021)
 - An ABC adjustment that scales up assessment predicted recreational landings in weights using mean weight from ACL monitoring dataset (SEFSC 2021)

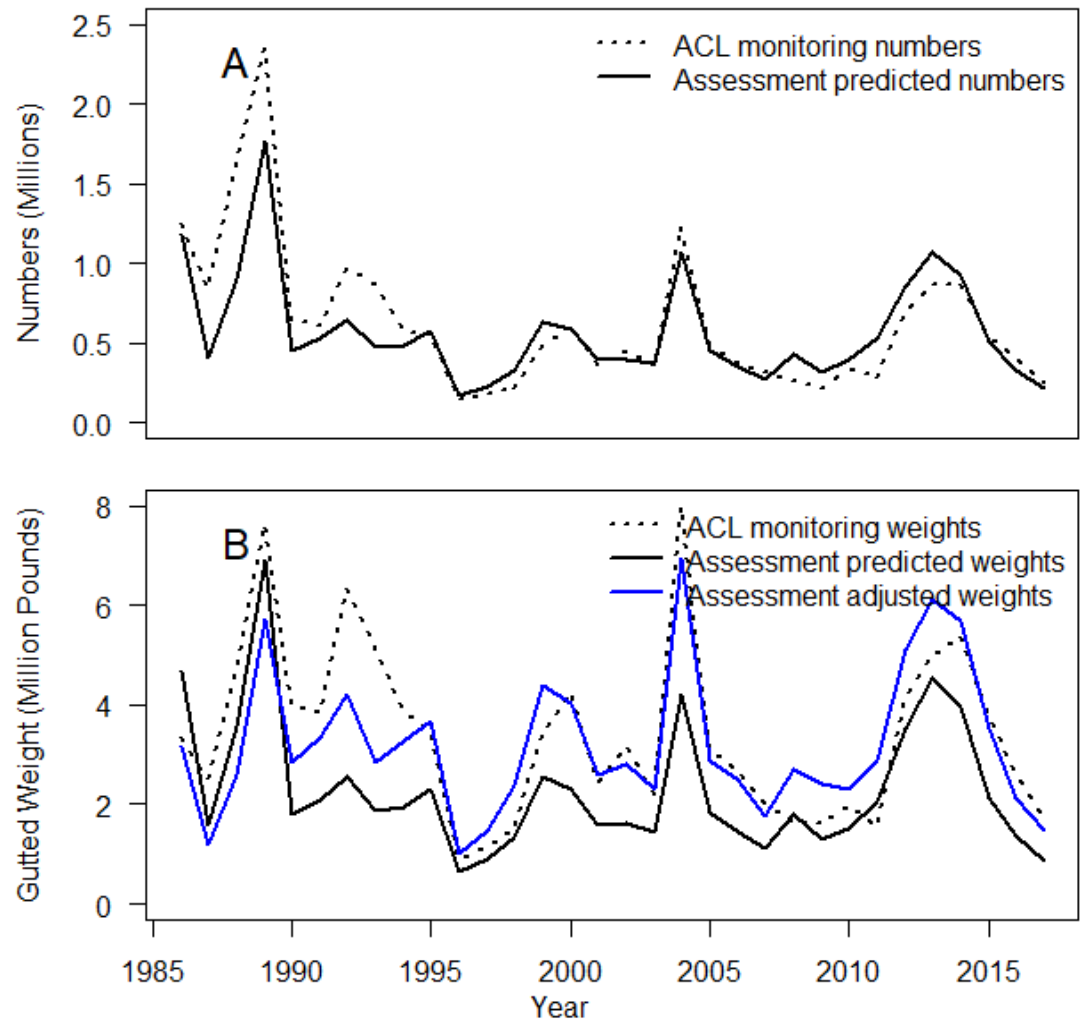
SEDAR61 mean weight of Red Grouper

- Assessment model underestimated mean weight landed by the recreational fishery
- External growth curve (i.e., assumed distribution of variability-at-length [CV])
- Length-weight conversion
- No weight data included in assessment model



Weight adjustment to predicted recreational landings

- Assessment predicted recreational landings in weights were multiplied by a mean weight (MW) scalar



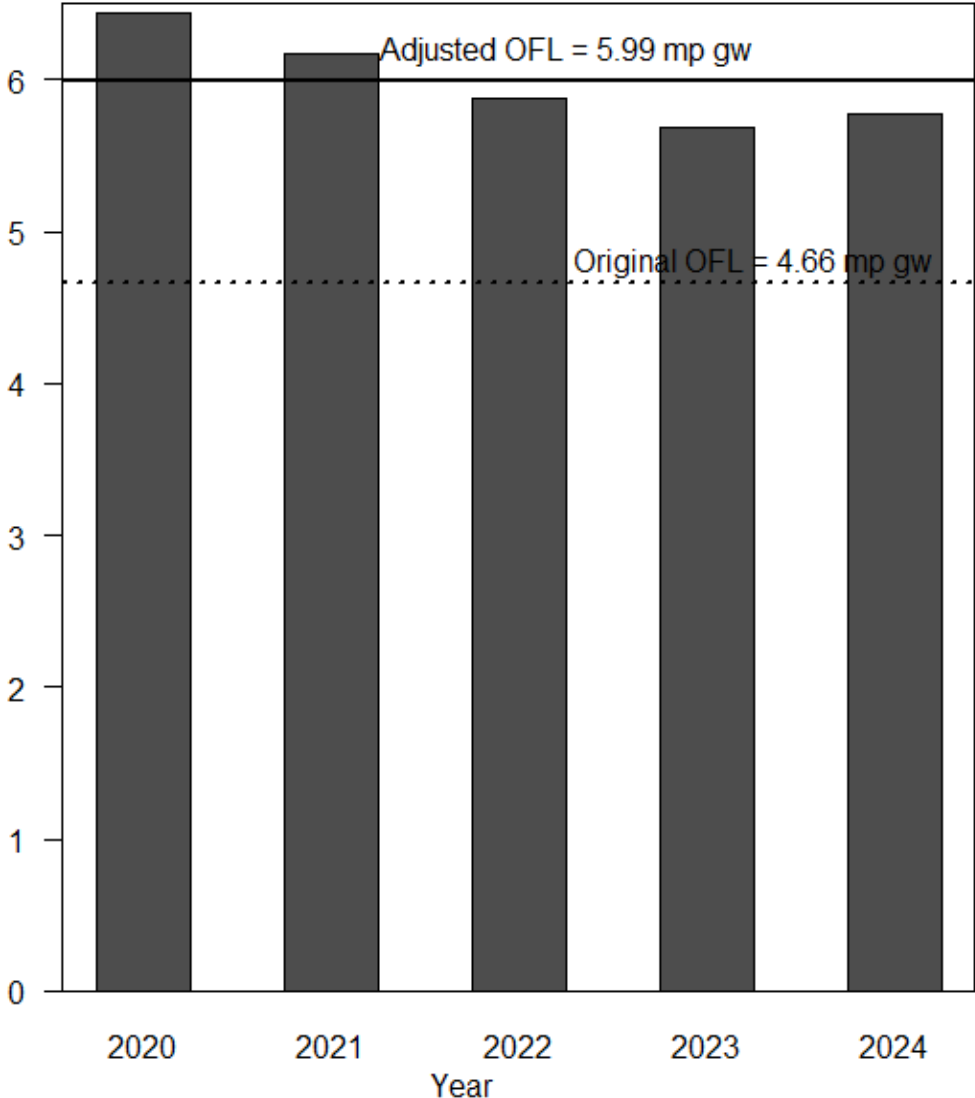
Original OFL refers to Amendment 53 following reallocation

Adjusted catch streams

- Projected (2020-2024) recreational landings scaled up by 1.597
 - 2019 MW scalar

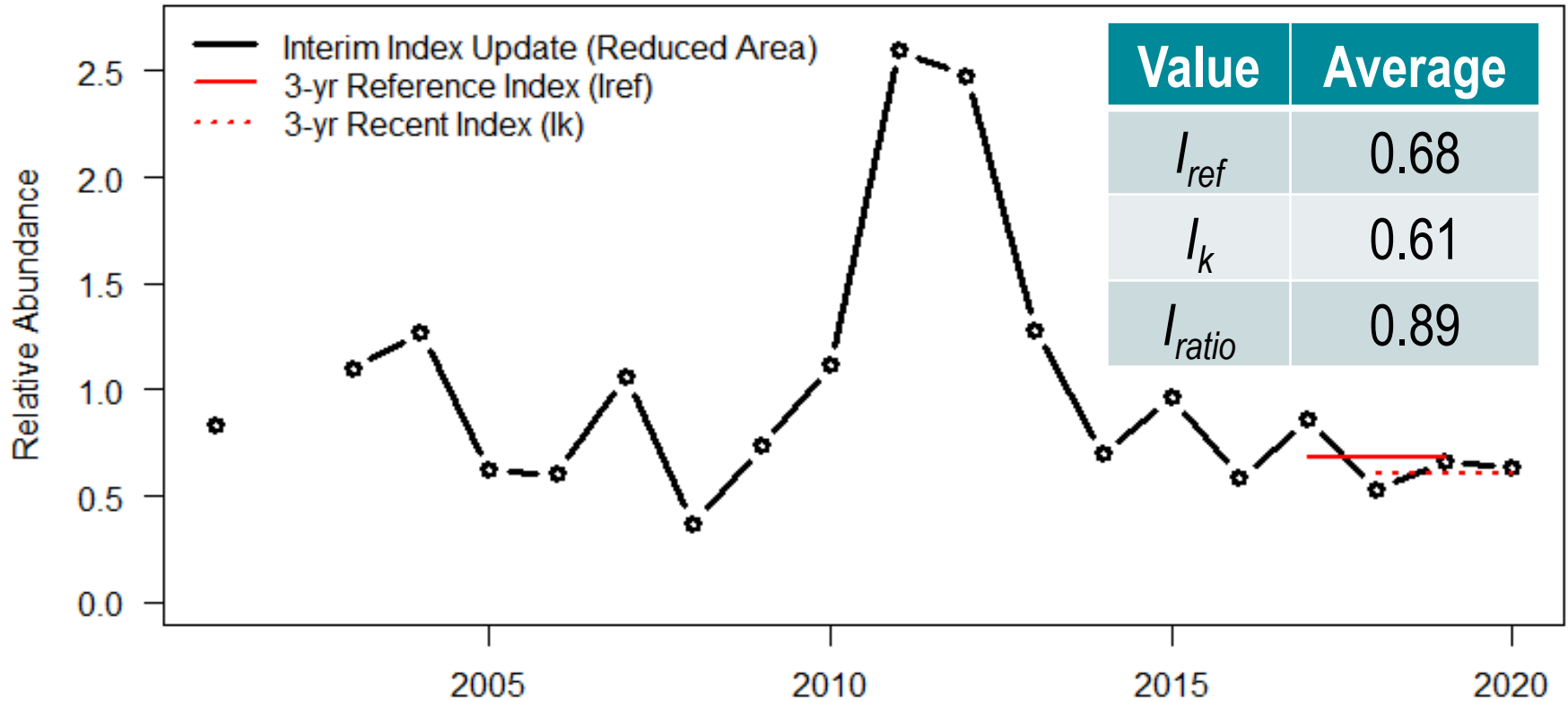
Yield (mp gw)	Probability of Overfishing
5.99 (OFL)	0.50
5.57 (ABC)	0.30

Projected Retained Catch (million pounds gutted weight)



$C_{ref} = 5.57$ million pounds gutted weight (mp gw)

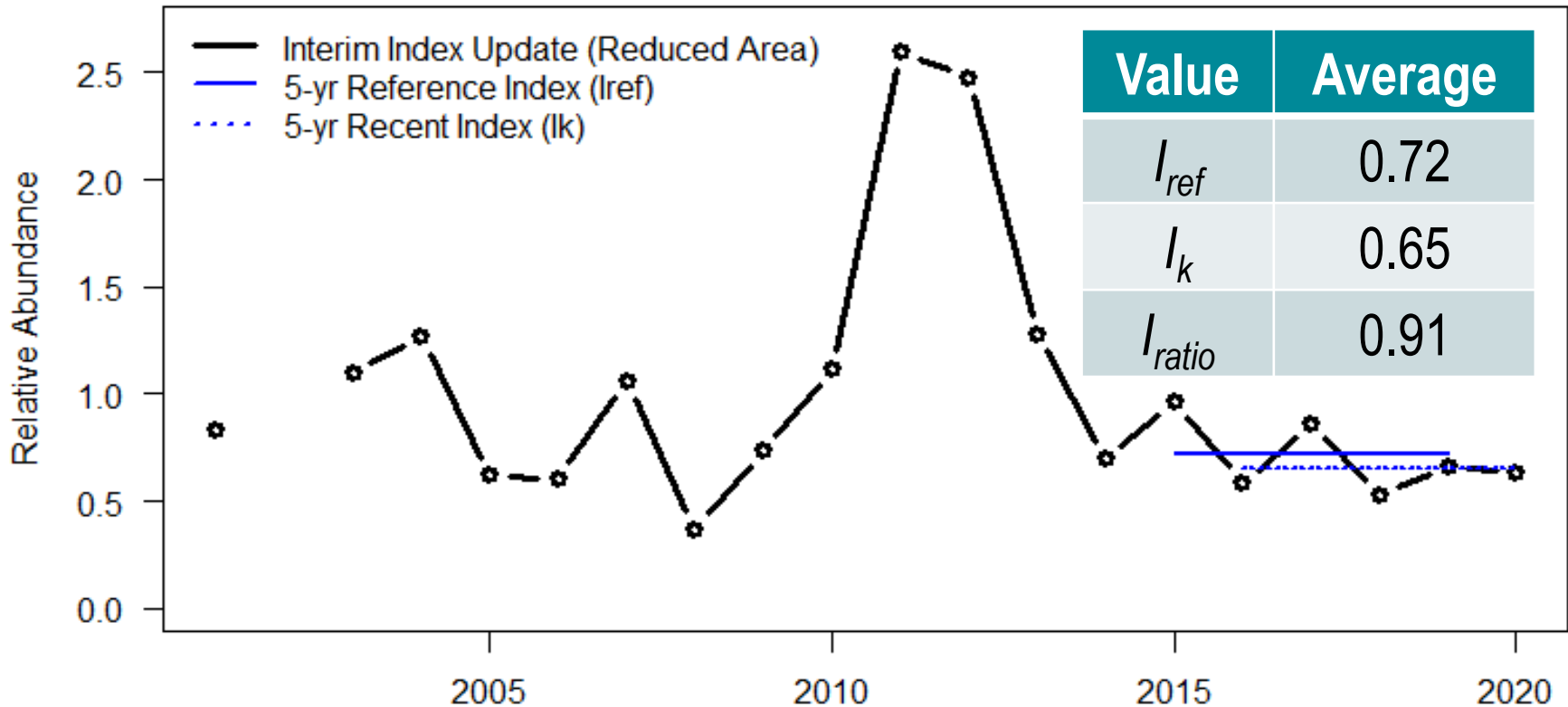
Adjust ABC* using 3-year average



* C_{ref} = 5.57 million pounds gutted weight

C_{ref} 3-yr adjust = 4.96 million pounds gutted weight

Adjust ABC* using 5-year average



* C_{ref} = 5.57 million pounds gutted weight

C_{ref} 5-yr adjust = 5.07 million pounds gutted weight

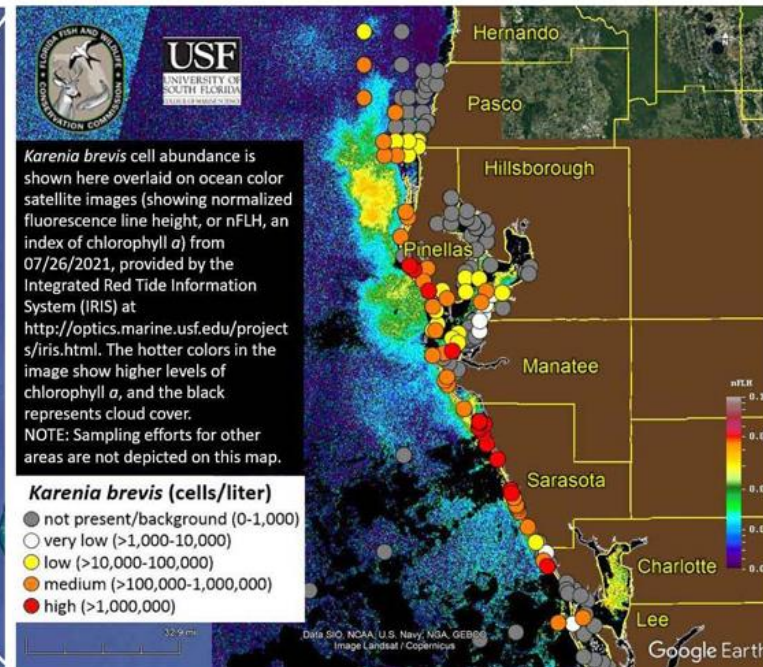
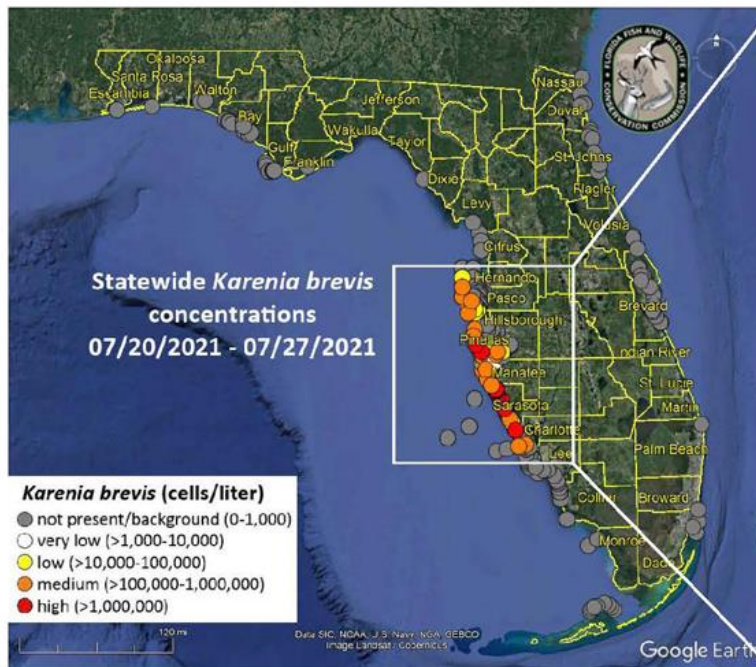
Catch advice summary

- Recommend updated approach which uses the observed index for both reference and recent periods
 1. Removes reliance on forecasted abundance
 2. Simulation tested for Vermilion Snapper and works well where episodic natural mortality is not accounted for in projections
- **Option 1:** accept results as applied for either 3-year or 5-year moving average
 - 3-yr moving average IA = 4.96 mp gw
 - 5-yr moving average IA = 5.07 mp gw

Catch advice summary

- **Option 2:** wait for the 2022 IA delivered at the end of 2021 (index update through 2021)
 - Unknown impact of the ongoing 2021 red tide event

<https://myfwc.com/research/redtide/statewide/>



Future improvements

- Finish MSE development for Red Grouper
 - MSE will be used to compare HCRs that best achieves management goals
- Design multitude of HCR's with stakeholder input
- Test HCR/Index combinations to identify optimum HCR

References

- Gulf of Mexico Fishery Management Council (GMFMC). 2021. Revised Draft Reef Fish Amendment 53. Red Grouper Allocations and Annual Catch Levels and Targets. National Marine Fisheries Service, NA15NMF4410011, Tampa, Florida.
- Huynh, QC, Hordyk, AR, Forrest, RE, Porch, CE, Anderson, SC, Carruthers, TR. 2020. The interim management procedure approach for assessed stocks: Responsive management advice and lower assessment frequency. *Fish Fish* 21: 663–679.
- Southeast Fisheries Science Center (SEFSC). 2020a. A “Traditional” Interim Assessment for Gulf of Mexico Red Snapper. 14 pp.
- Southeast Fisheries Science Center (SEFSC). 2020b. An Interim Assessment for Gulf of Mexico Gray Triggerfish. 10 pp.
- Southeast Fisheries Science Center (SEFSC). 2021. Adjustment of SEDAR61 Gulf Red Grouper Projected Catch Streams Using Mean Weight of Recreationally Landed Fish from ACL Monitoring. 10 pp.

Questions?

**Thank you to all SEDAR61 data providers
and for your attention!**

Point of Contact:

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NMFS Bottom Longline Index – full area

Survey Year	Frequency	N	Delta-Lognormal Index	Scaled Index (mean = 1)	Coefficient of Variation	Lower Confidence Level	Upper Confidence Level
2001	0.215	93	0.74	0.818	0.291	0.462	1.448
2002							
2003	0.342	117	0.983	1.087	0.203	0.727	1.625
2004	0.418	98	1.606	1.775	0.193	1.21	2.604
2005	0.25	40	0.553	0.611	0.408	0.279	1.339
2006	0.282	39	0.52	0.575	0.393	0.269	1.228
2007	0.195	41	0.851	0.941	0.466	0.388	2.284
2008	0.267	60	0.573	0.634	0.324	0.337	1.192
2009	0.349	63	0.889	0.983	0.265	0.584	1.655
2010	0.343	67	1.217	1.346	0.259	0.809	2.24
2011	0.398	123	2.27	2.51	0.182	1.749	3.602
2012	0.469	49	2.196	2.428	0.255	1.468	4.014
2013	0.34	47	0.97	1.072	0.306	0.589	1.95
2014	0.262	42	0.561	0.62	0.384	0.295	1.302
2015	0.255	52	0.719	0.795	0.361	0.395	1.601
2016	0.18	50	0.335	0.37	0.436	0.161	0.854
2017	0.326	43	0.692	0.765	0.343	0.393	1.491
2018	0.191	47	0.422	0.466	0.428	0.205	1.059
2019	0.2	40	0.427	0.472	0.462	0.196	1.136
2020	0.314	35	0.661	0.731	0.384	0.348	1.535

NMFS Bottom Longline Index – reduced area

Survey Year	Frequency	N	Delta-Lognormal Index	Scaled Index (mean = 1)	Coefficient of Variation	Lower Confidence Level	Upper Confidence Level
2001	0.22222	54	1.12113	0.83603	0.36061	0.41545	1.68238
2002							
2003	0.39189	74	1.47565	1.10039	0.22531	0.70512	1.71725
2004	0.42647	68	1.70252	1.26958	0.22227	0.81831	1.96971
2005	0.27273	33	0.83131	0.61991	0.40836	0.28263	1.35969
2006	0.31429	35	0.81096	0.60474	0.37568	0.29239	1.25074
2007	0.26923	26	1.42127	1.05985	0.48346	0.42380	2.65046
2008	0.24242	33	0.49831	0.37159	0.44741	0.15814	0.87316
2009	0.35000	40	0.98529	0.73473	0.31744	0.39536	1.36541
2010	0.31707	41	1.49276	1.11316	0.33651	0.57819	2.14311
2011	0.44444	72	3.48325	2.59747	0.21226	1.70693	3.95263
2012	0.52941	34	3.32402	2.47873	0.26427	1.47417	4.16785
2013	0.42857	28	1.71615	1.27973	0.32803	0.67522	2.42545
2014	0.37037	27	0.93856	0.69989	0.37742	0.33733	1.45210
2015	0.35484	31	1.28871	0.96099	0.37050	0.46903	1.96899
2016	0.30769	26	0.78804	0.58764	0.43497	0.25559	1.35109
2017	0.43333	30	1.15140	0.85860	0.32492	0.45564	1.61796
2018	0.29630	27	0.70685	0.52710	0.42932	0.23155	1.19989
2019	0.29630	27	0.89194	0.66512	0.43571	0.28892	1.53119
2020	0.32353	34	0.85120	0.63474	0.36666	0.31196	1.29148