SEDAR 85 – Gulf of Mexico Yellowedge Grouper (*Hyporthodus flavolimbatus*)

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SEFSC
Gulf Fisheries Branch

Operational Assessment

Gulf Reef Fish AP

April 23, 2024

East vs West separation

- Larger and older Yellowedge in the West (Cook 2007)
- Captures differences in habitat types across the Gulf
- Supported by grouping of fishing areas

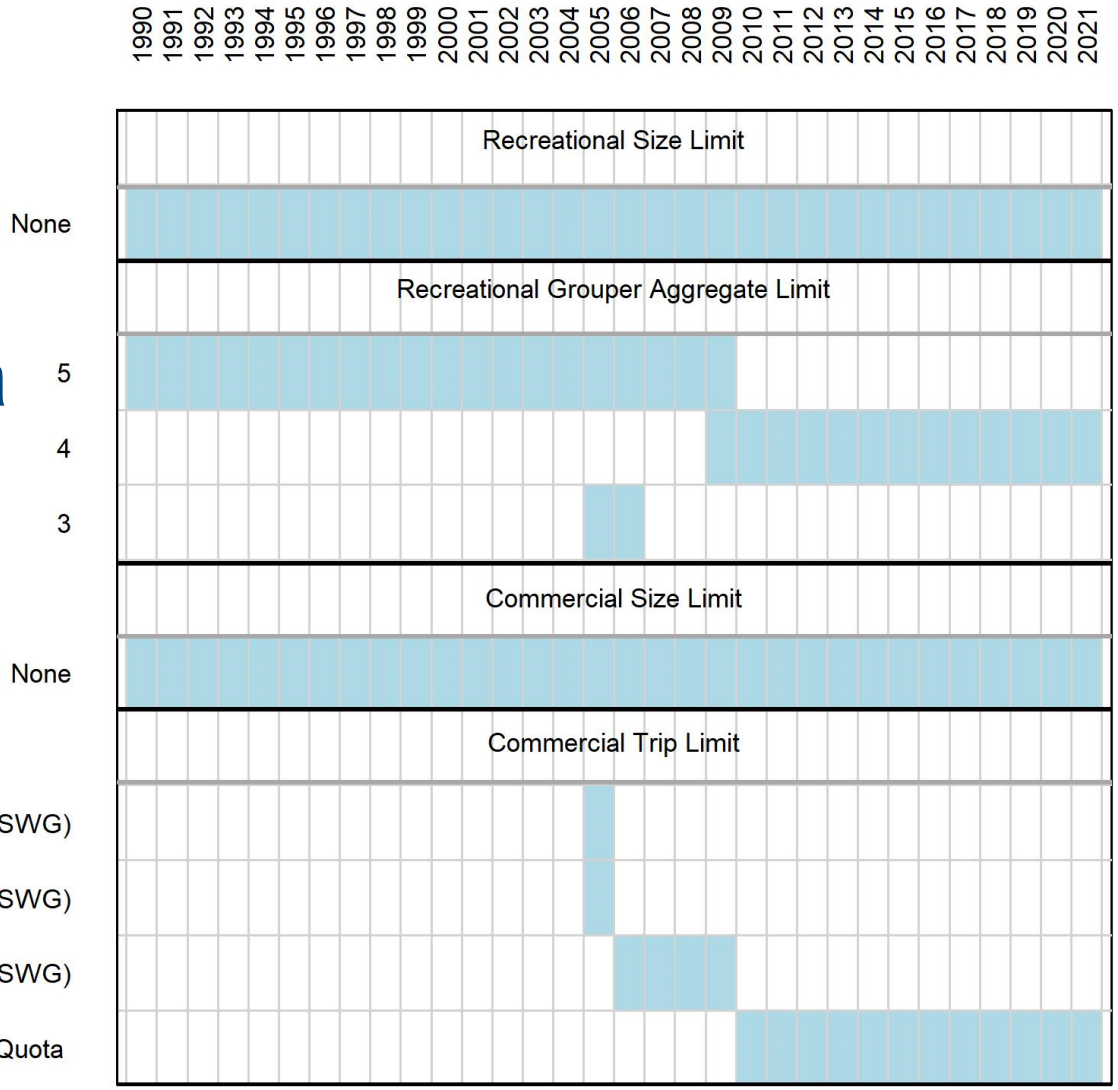
Figure 2.2. Spatial representation of fishing locations for the early (1982-1983) deepwater longline fleet (Prytherch 1983). A key point is the lack of separation between the "Northern" and "Eastern" grounds.

Gulf Yellowedge Grouper regulations

Commercial quota closures before implementation of Individual Fishing Quota (IFQ)

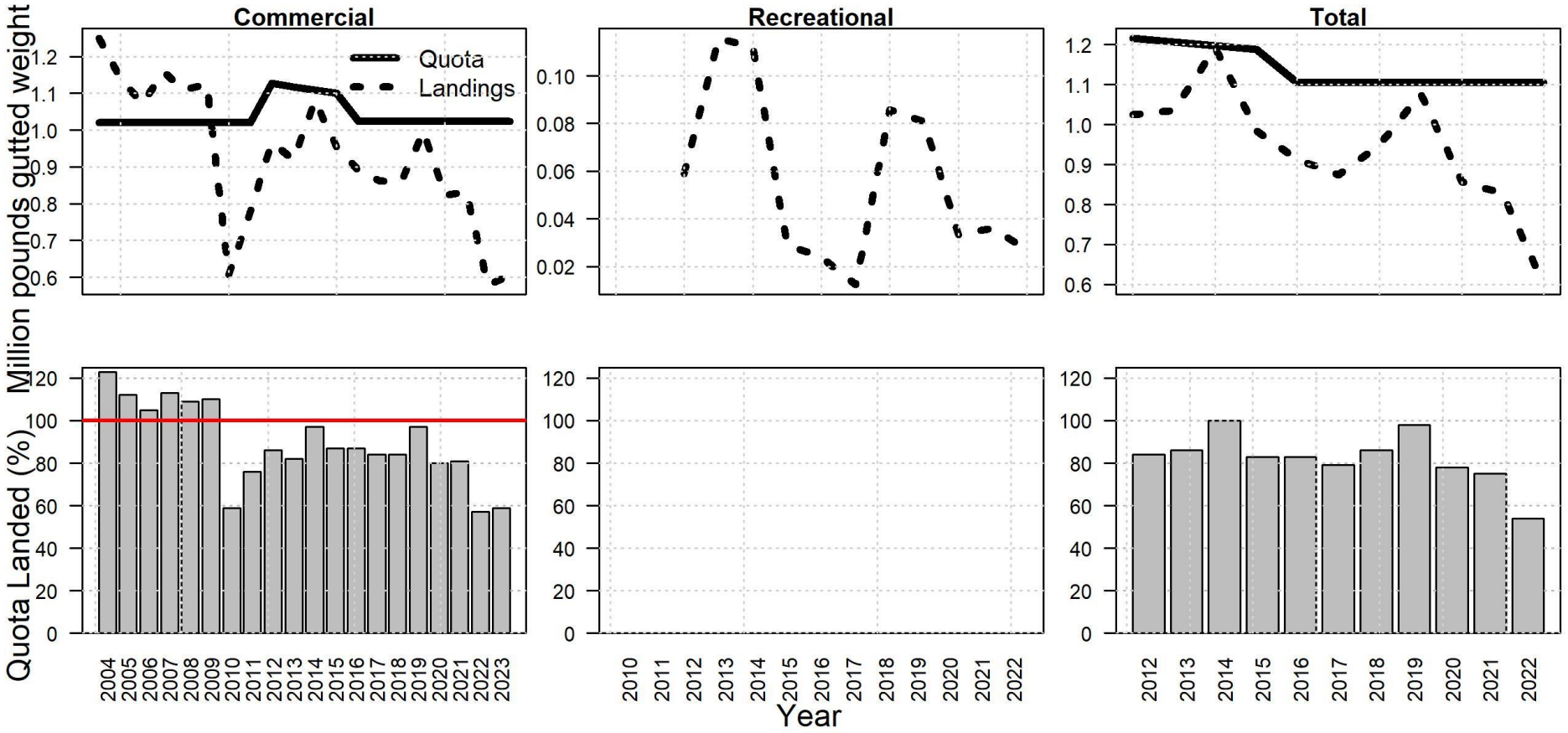
Rec seasonal closures:

- 11/1-12/31/2005



Deep Water Grouper*

*Includes Yellowedge Grouper, Speckled Hind, Warsaw Grouper, and Snowy Grouper

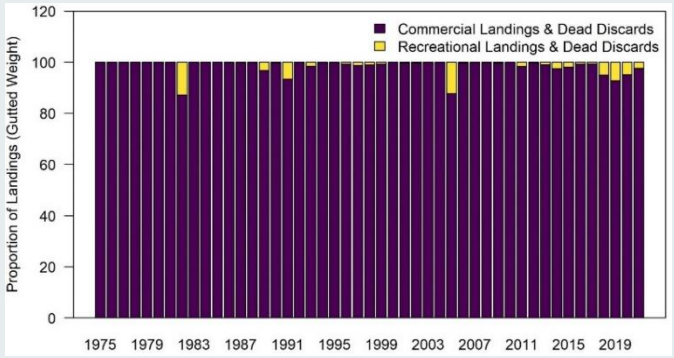


SEDAR 85 Overview

Notable changes compared with the SEDAR 22 Benchmark assessment model (end year 2009):

- Improved **commercial landings estimates**
- Improved **commercial discards**
- Recreational landings and discards use **MRIP-FES**
- Re-evaluated **sex-specific composition data, exclude small sample sizes & non-representative data**
- Used **weighted length compositions** for fisheries data where possible
- Switched to **nominal age compositions** instead of conditional age-at-length compositions
- **Corrected** the *a* parameter of the **length-weight relationship**
- Updated the **first age mature, first age male**, and fixed the **hermaphroditism transition rate**
- Fixed **steepness** and recruitment variability (**SigmaR**) at a more realistic value

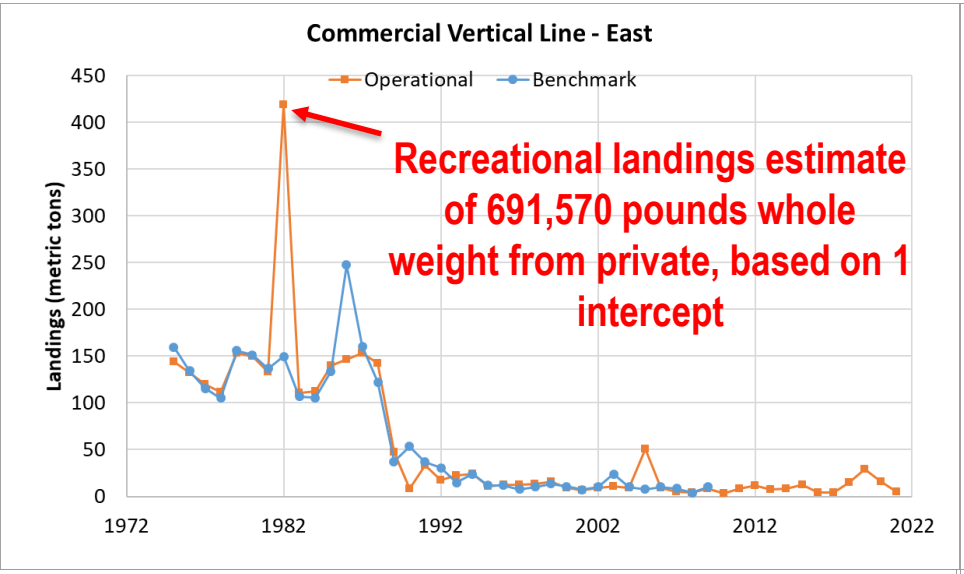
Data issue: Landings

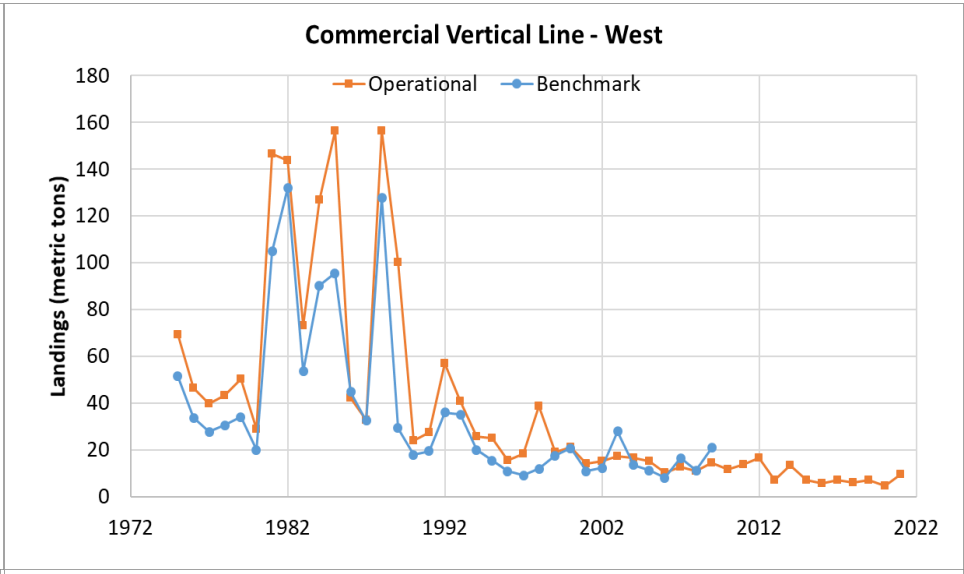
Issue	TWG Recommendations
Commercial landings diverge considerably from SEDAR 22 estimates	- Use as provided given improved methodologies
Recreational landings revised using MRIP-FES 	- Use as provided, except for 1982 value which is questionable; replace with mean of 1981-1985 • Consistent with decisions made for Gag during SEDAR 72
Landings uncertainty not considered in SEDAR 22 base model (SE of 0.01)	- Increase error for landings inputs to better capture uncertainty, particularly in early years

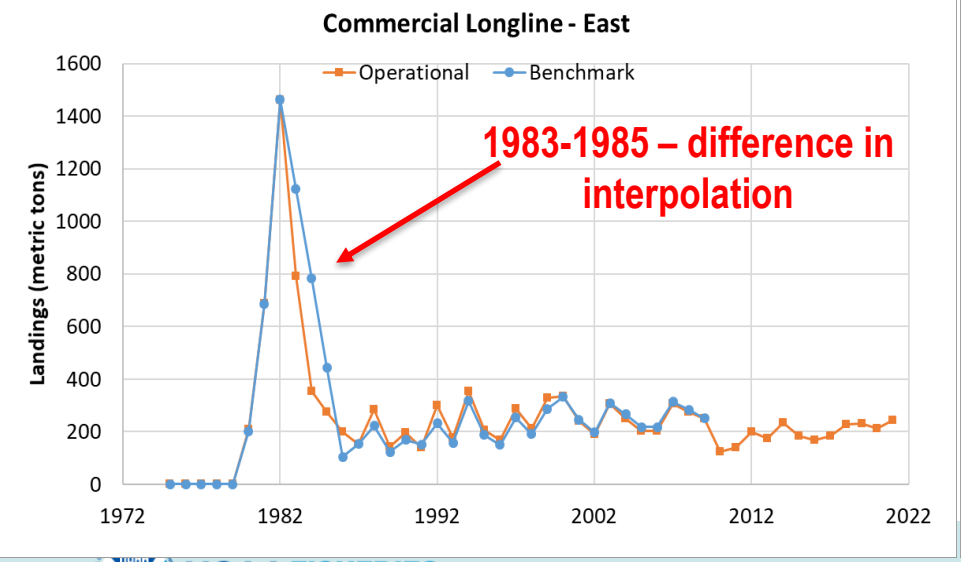
Landings

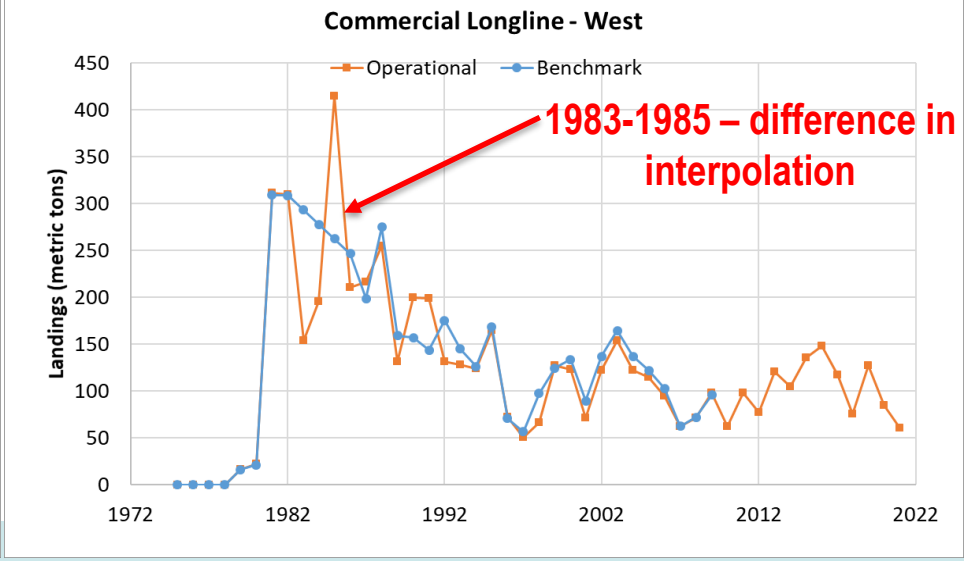
Vertical line - includes Commercial Other Gears and Recreational landings and dead discards

Longline - includes Commercial Longline dead discards



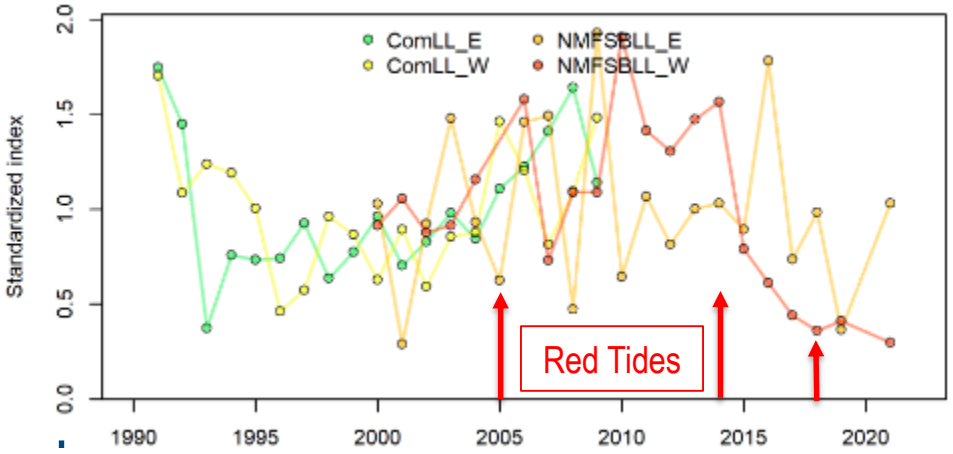






Ecosystem considerations: red tide

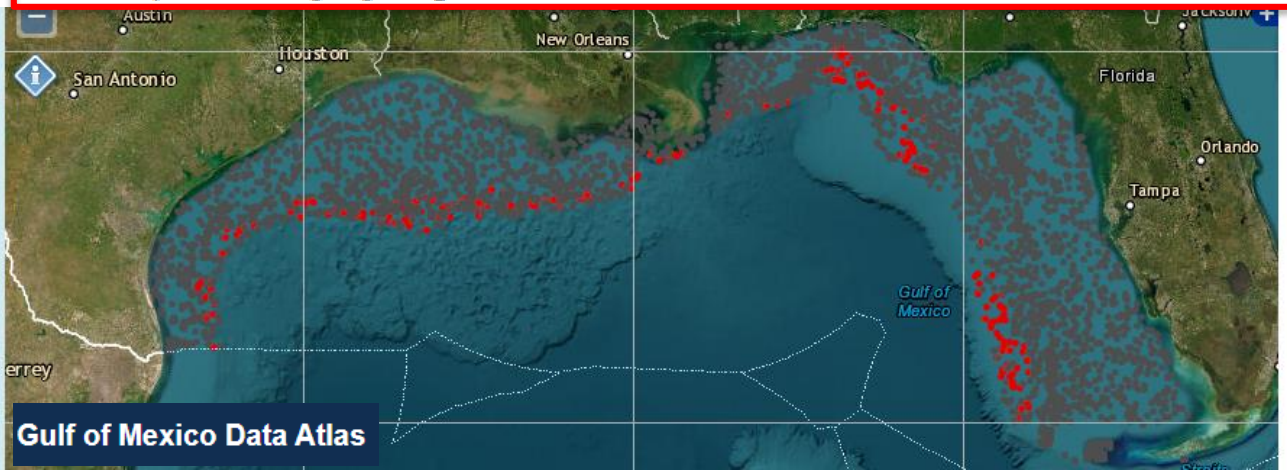
3. To the extent possible, the following should be considered for inclusion in the model:
   - Consider potential effects of red tide on yellowedge grouper, with consideration of past red tide events in 2005, 2014, 2018, and 2021.

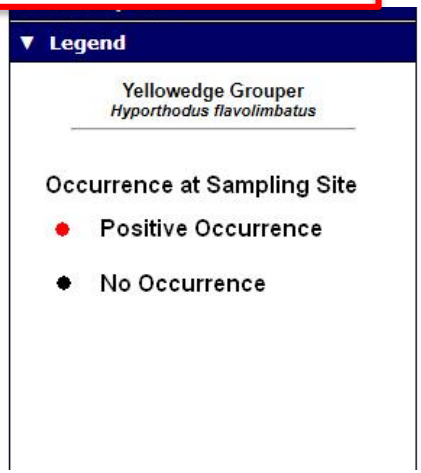


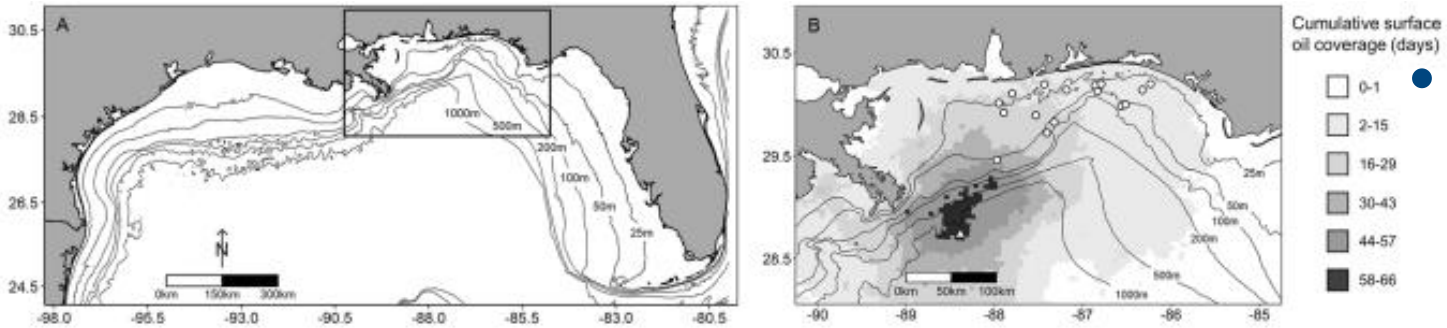
- Not identified in literature:
  - 1971 (Smith 1975)
  - 2014 (Driggers et al. 2015)
  - Blake et al. (2023) oral histories
- West Florida Shelf Ecospace results available but need review of inputs/outputs for Yellowedge
  - Minor red tide mortality estimates (Vilas et al. 2023 Shiny App)

Ecosystem considerations: DWH

3. To the extent possible, the following should be considered for inclusion in the model:
   - Consider the effects of the *Deepwater Horizon* MC252 oil spill from April 2010 on the yellowedge grouper stock.





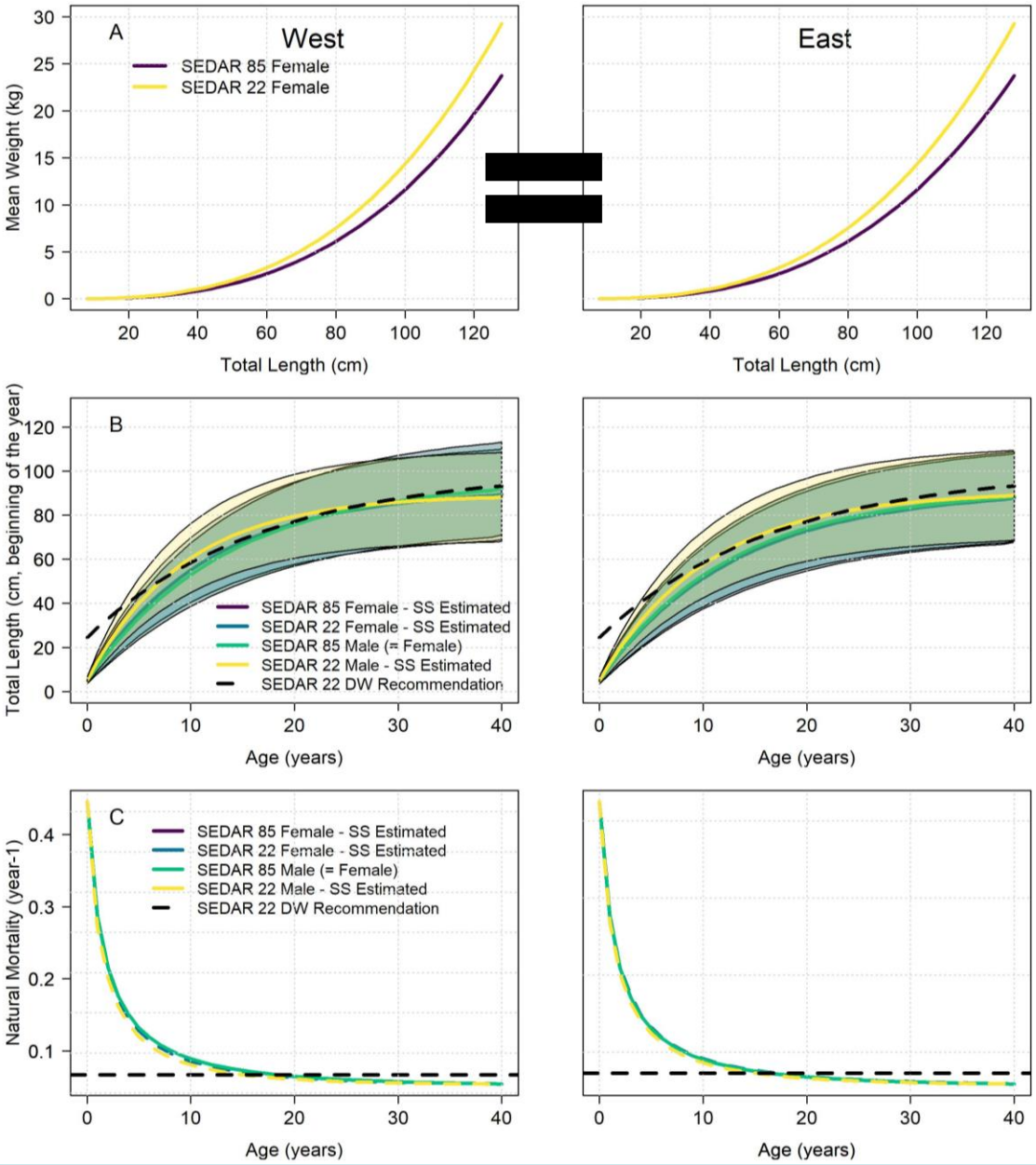


Lewis et al. 2020 (SEDAR68-RD44)

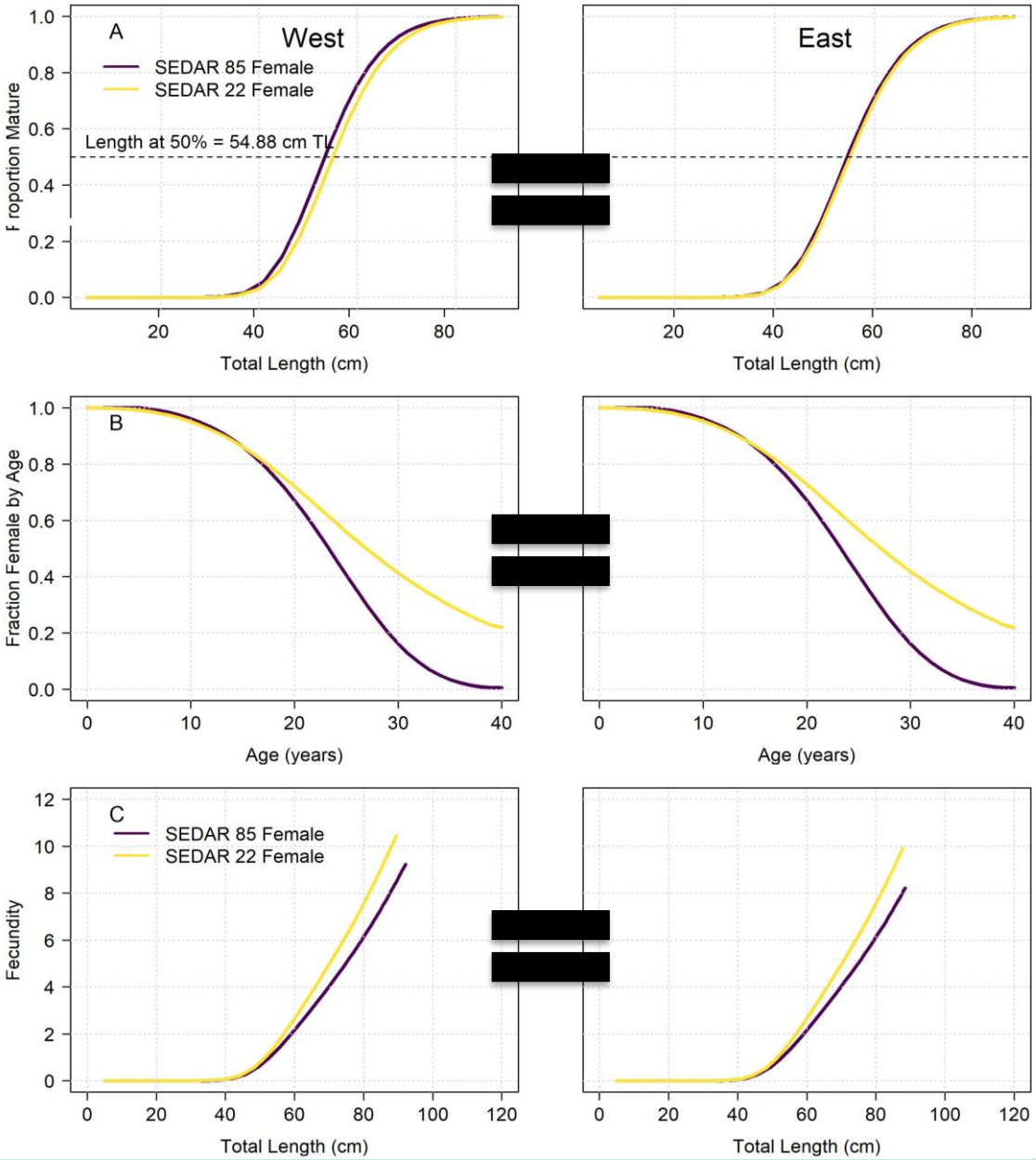
Figure 1. Map of the northern Gulf of Mexico (**A**) and sampling region (**B**). Panel B shows the location of the Deepwater Horizon blowout at the Mississippi Canyon-252 wellhead (triangle), and the natural reefs surveyed from 2009 to 2010 (circles). The shaded area represents the cumulative surface oil coverage in days. Maps were produced in R version 3.5.1[77].

- Mechanism unclear for inclusion in assessment

Life history

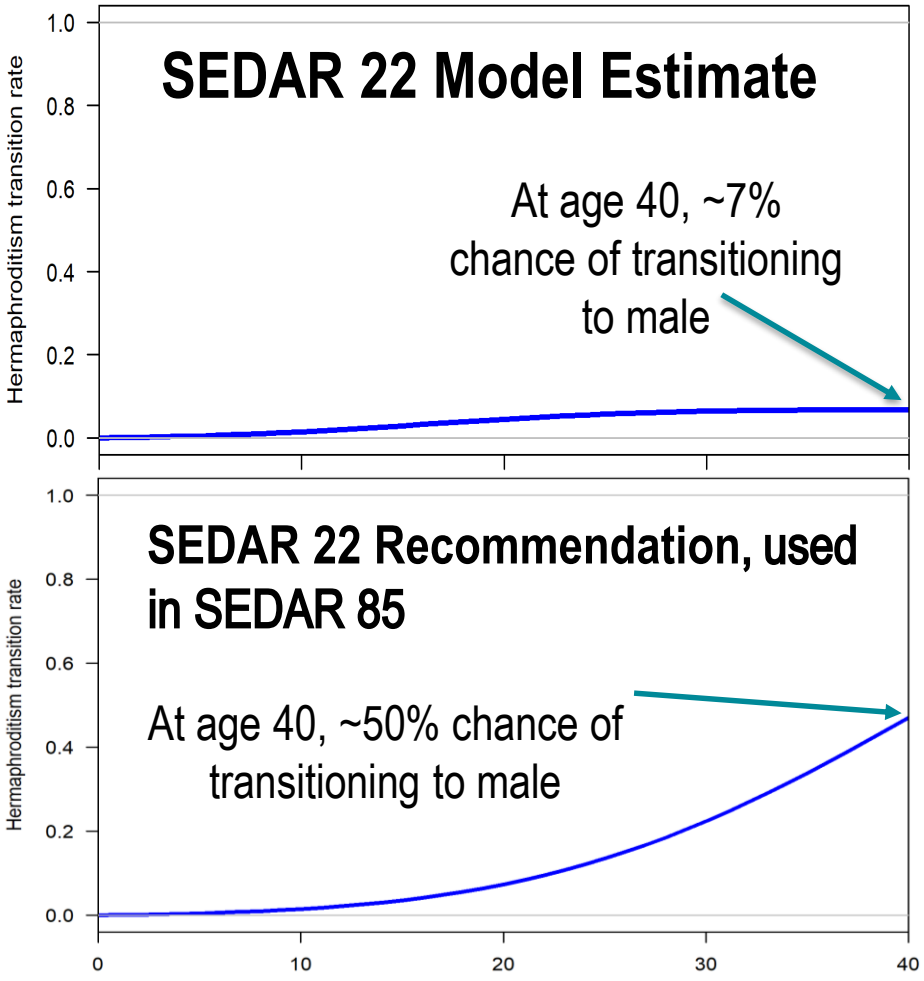


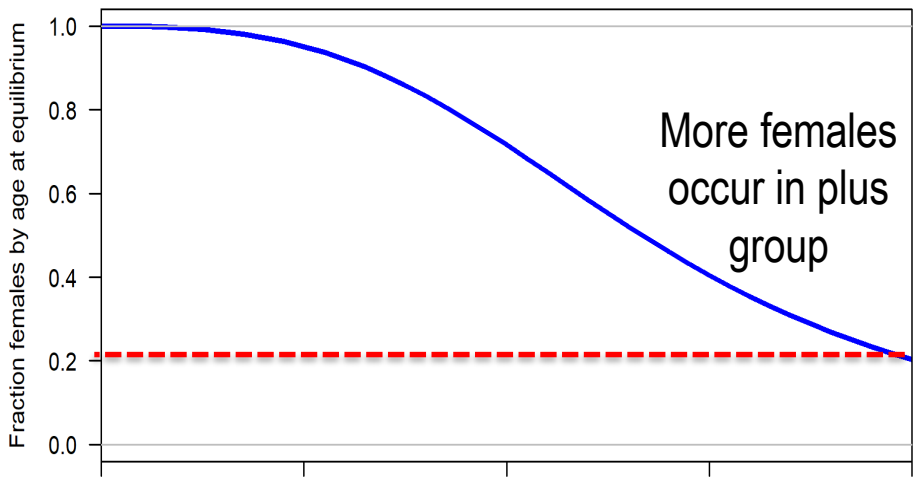
Life history

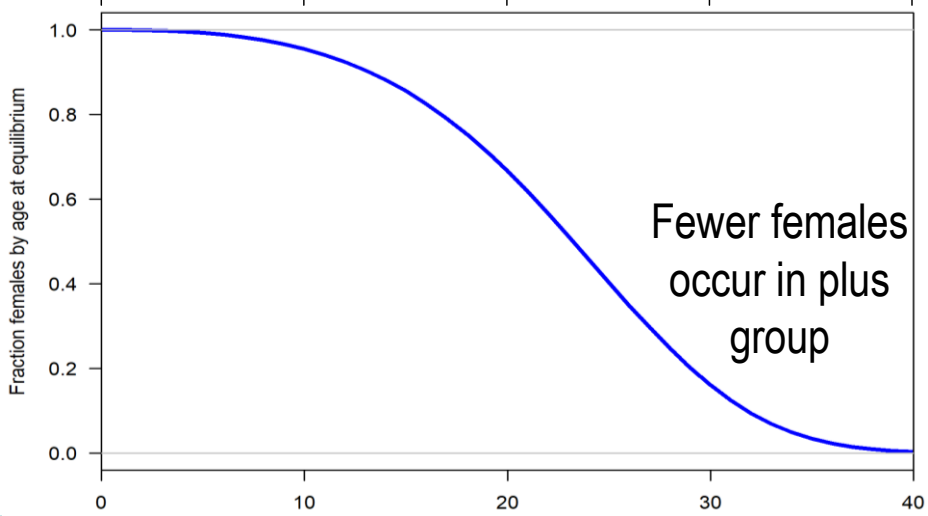


Hermaphroditism transition rate

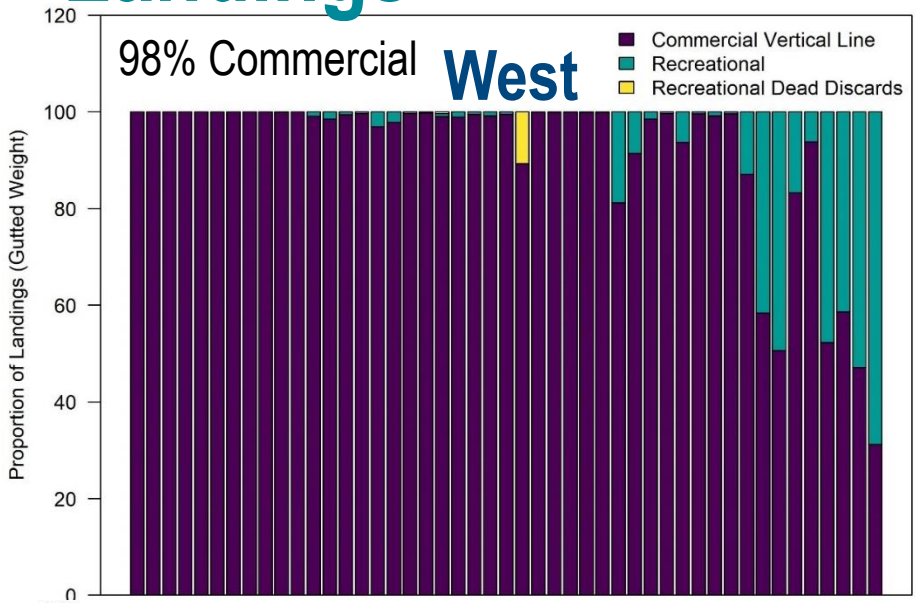
- Modeled as the % of individuals transitioning at age

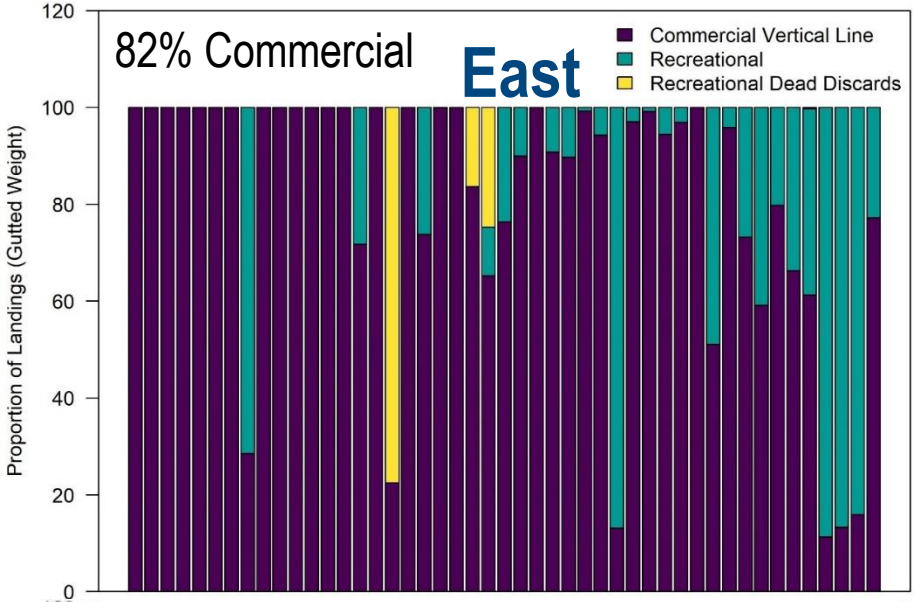


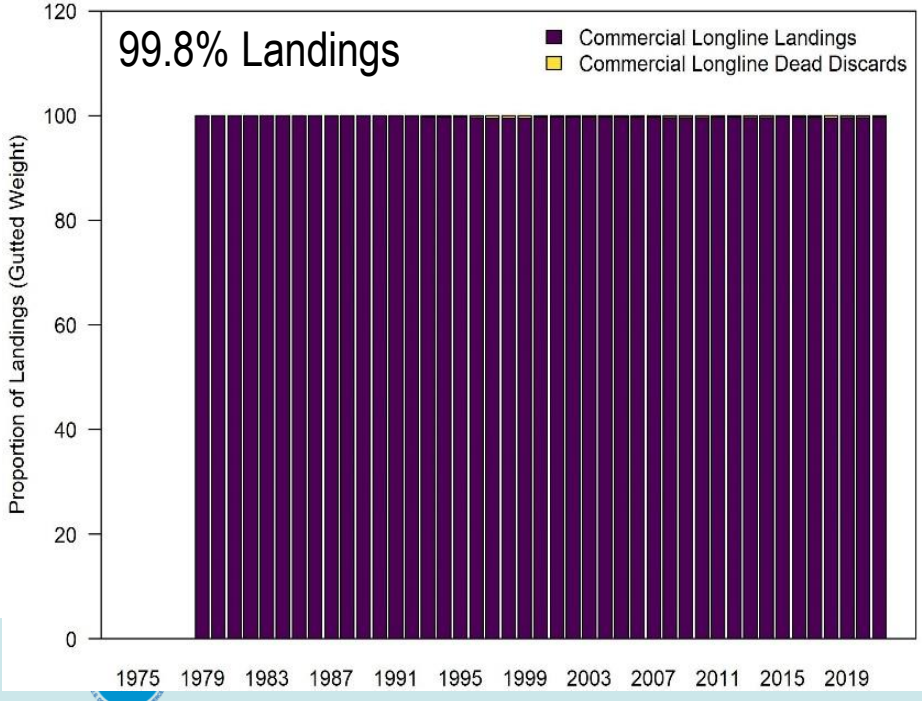




Landings


98% Commercial
West
Commercial Vertical Line
Recreational
Recreational Dead Discards
Proportion of Landings (Gutted Weight)
0
20
40
60
80
100
120


82% Commercial
East
Commercial Vertical Line
Recreational
Recreational Dead Discards
Proportion of Landings (Gutted Weight)
0
20
40
60
80
100
120


99.8% Landings
Commercial Longline Landings
Commercial Longline Dead Discards
Proportion of Landings (Gutted Weight)
0
20
40
60
80
100
120
1975
1979
1983
1987
1991
1995
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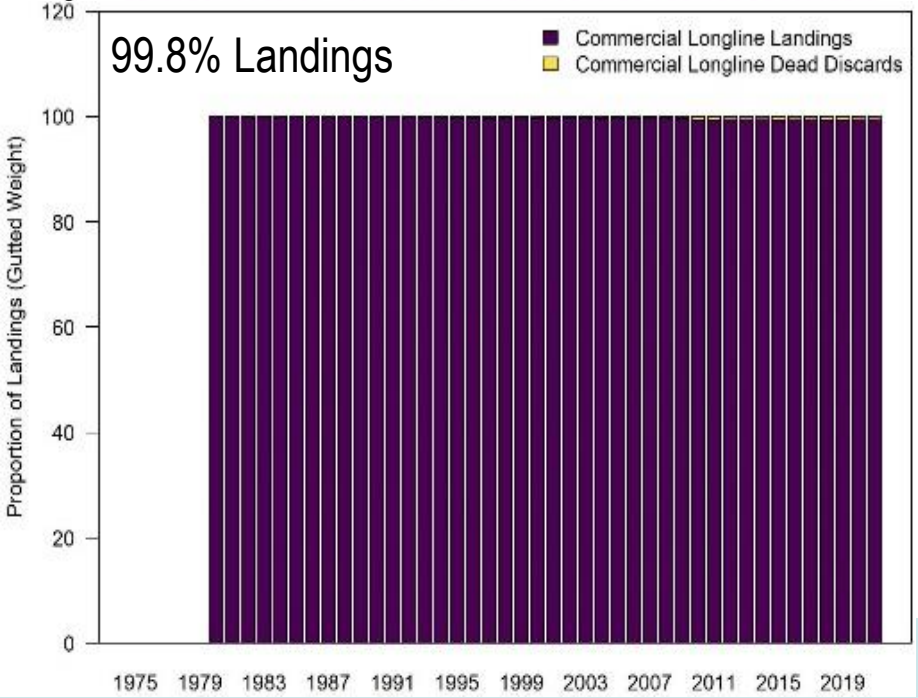
2003
2007
2011
2015
2019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120
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1987
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1995
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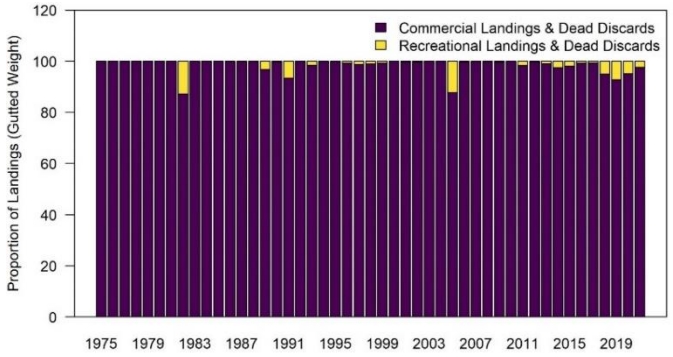
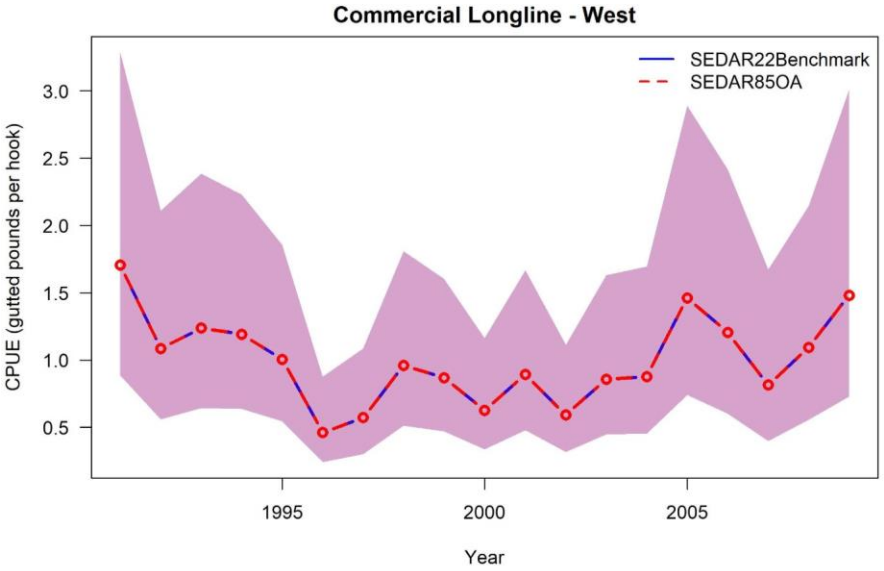
2003
2007
2011
2015
2019

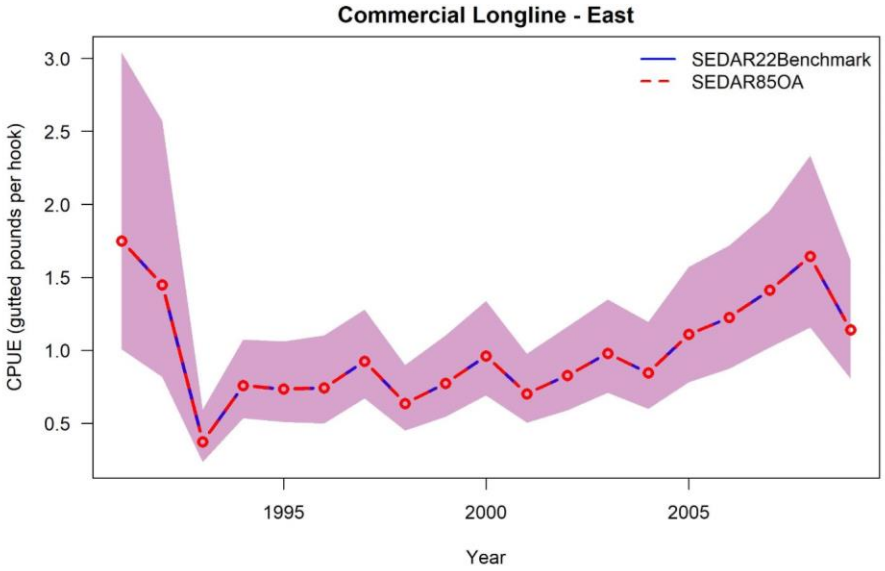
MRIP data

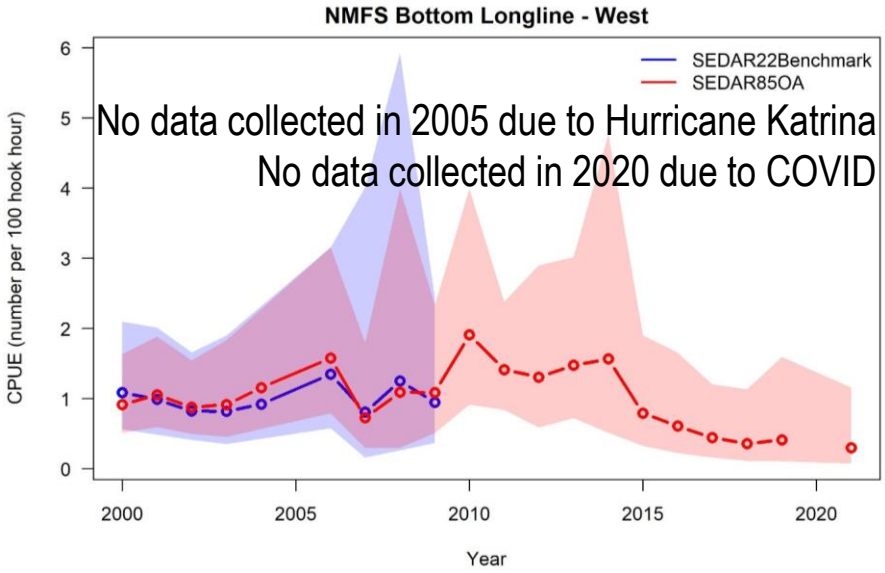
- SEDAR 22 used MRFSS data
- Large differences in a few years, but still minor overall

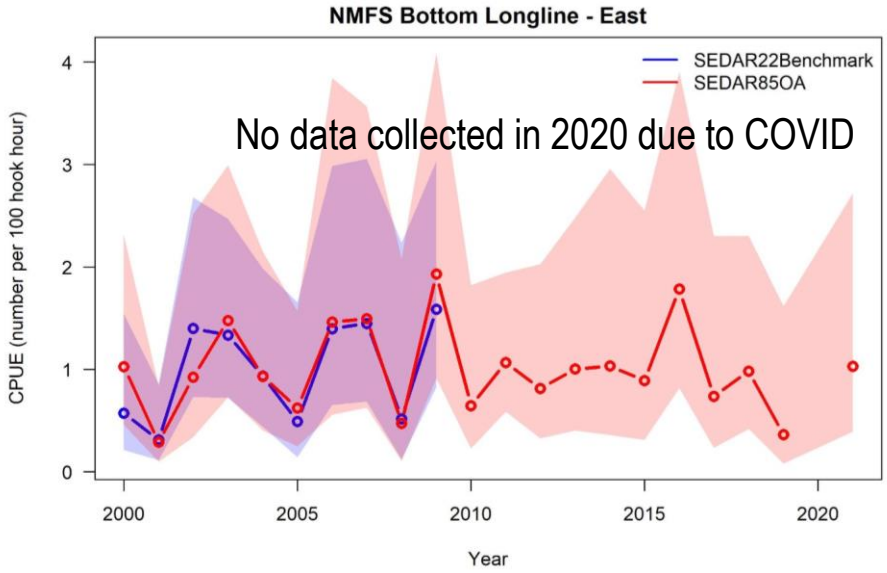


Indices of relative abundance

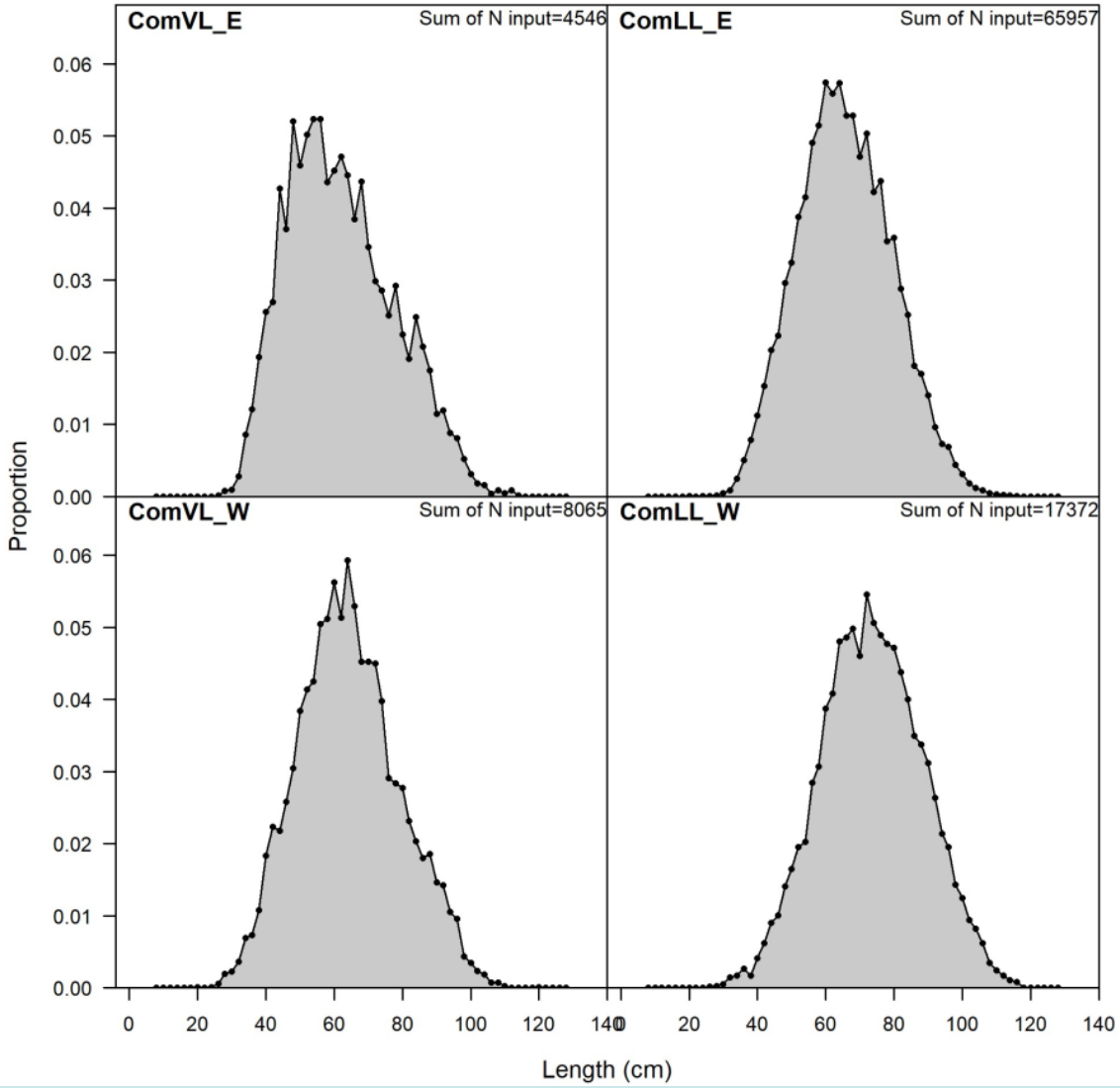




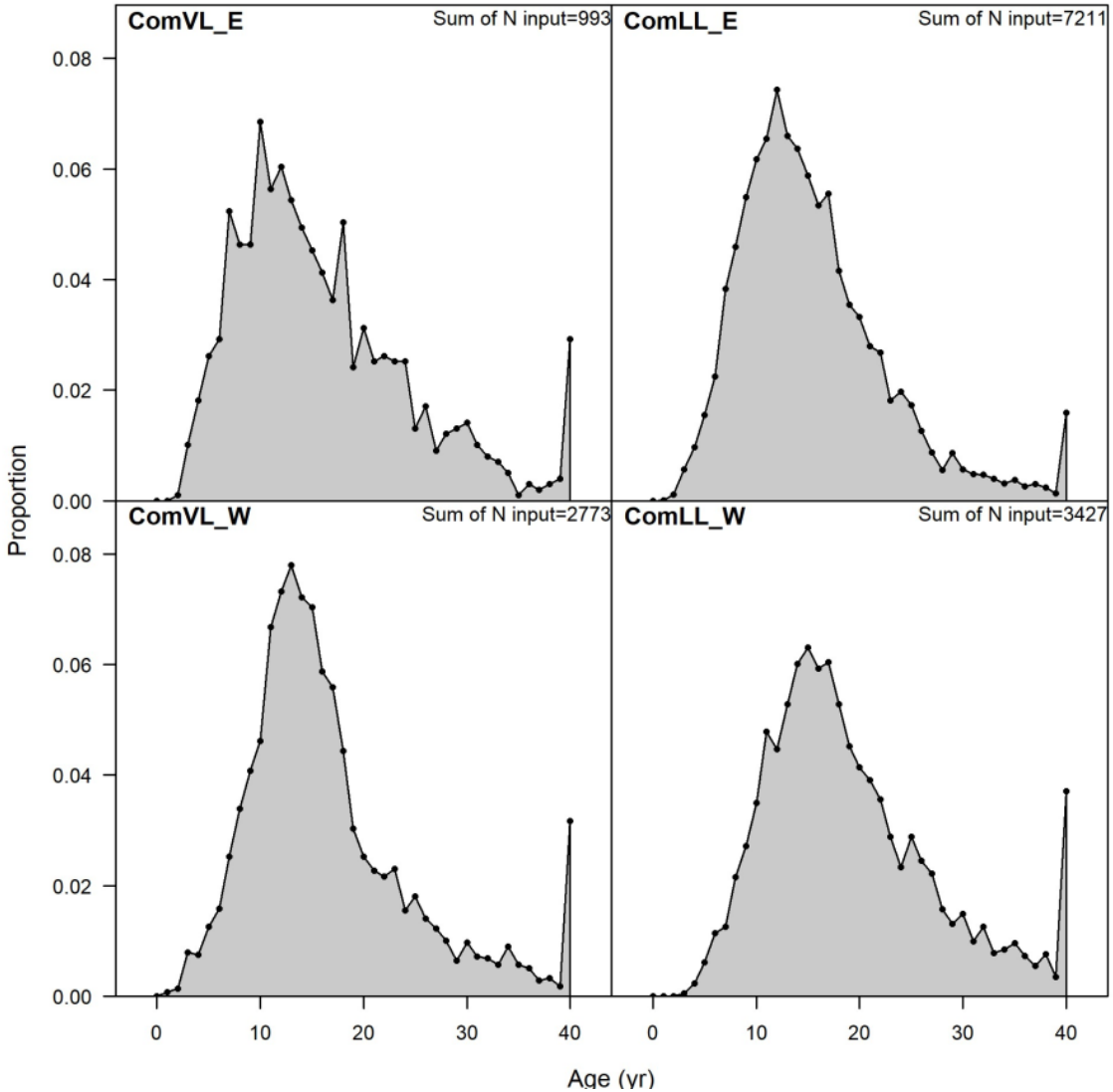




Landings – length composition data

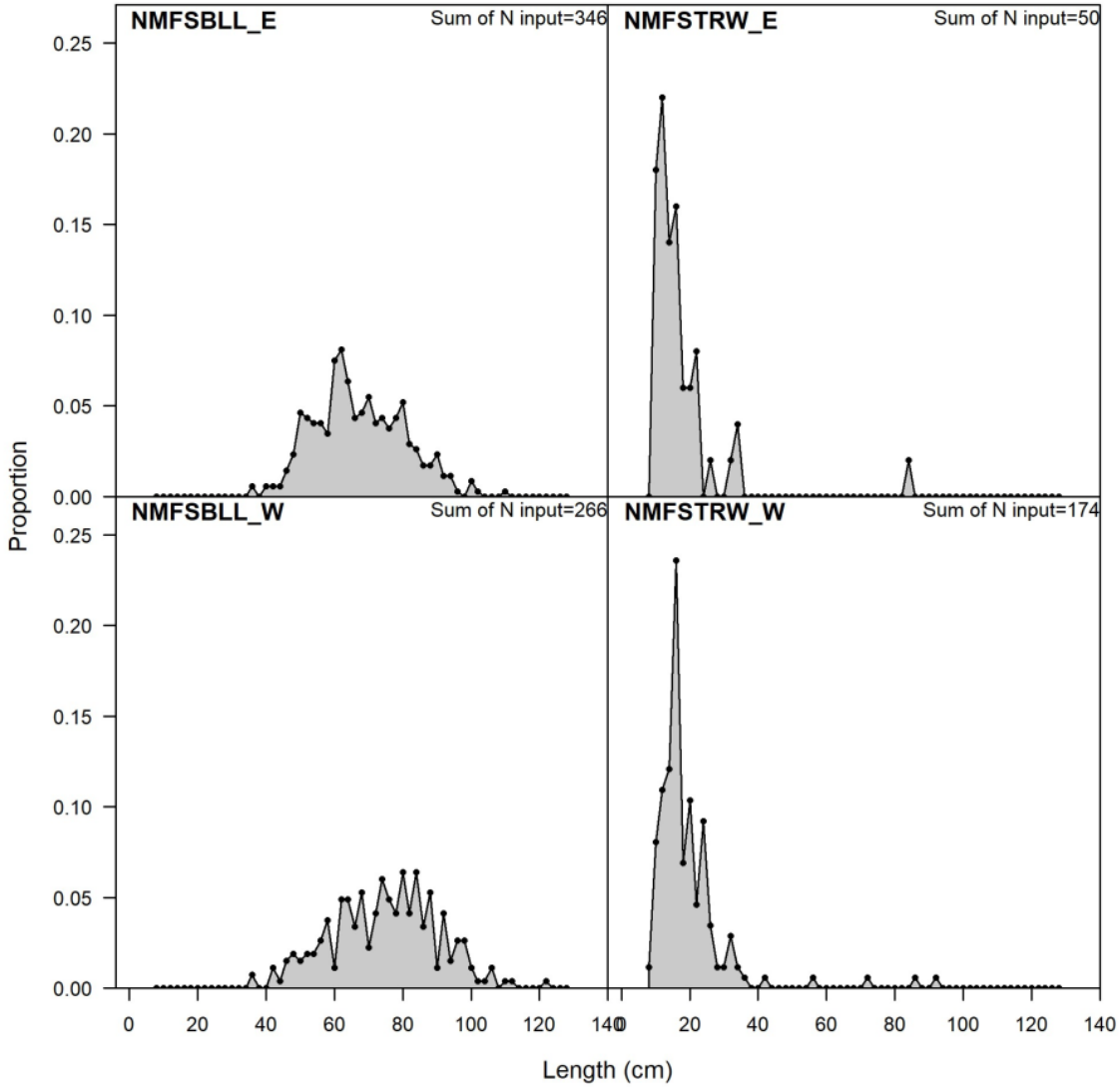


Landings – age composition data



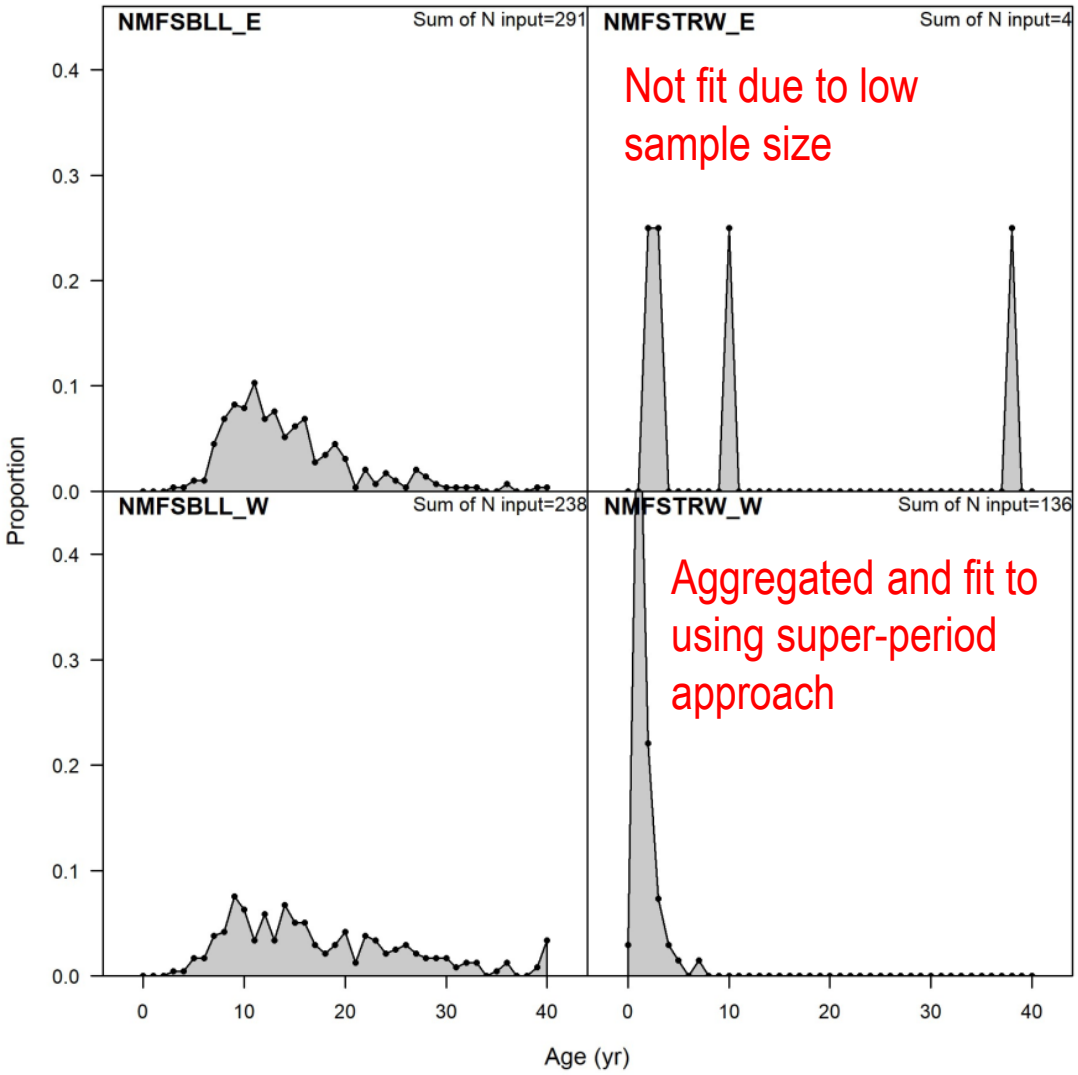
Surveys – length composition data

NMFS Bottom Longline



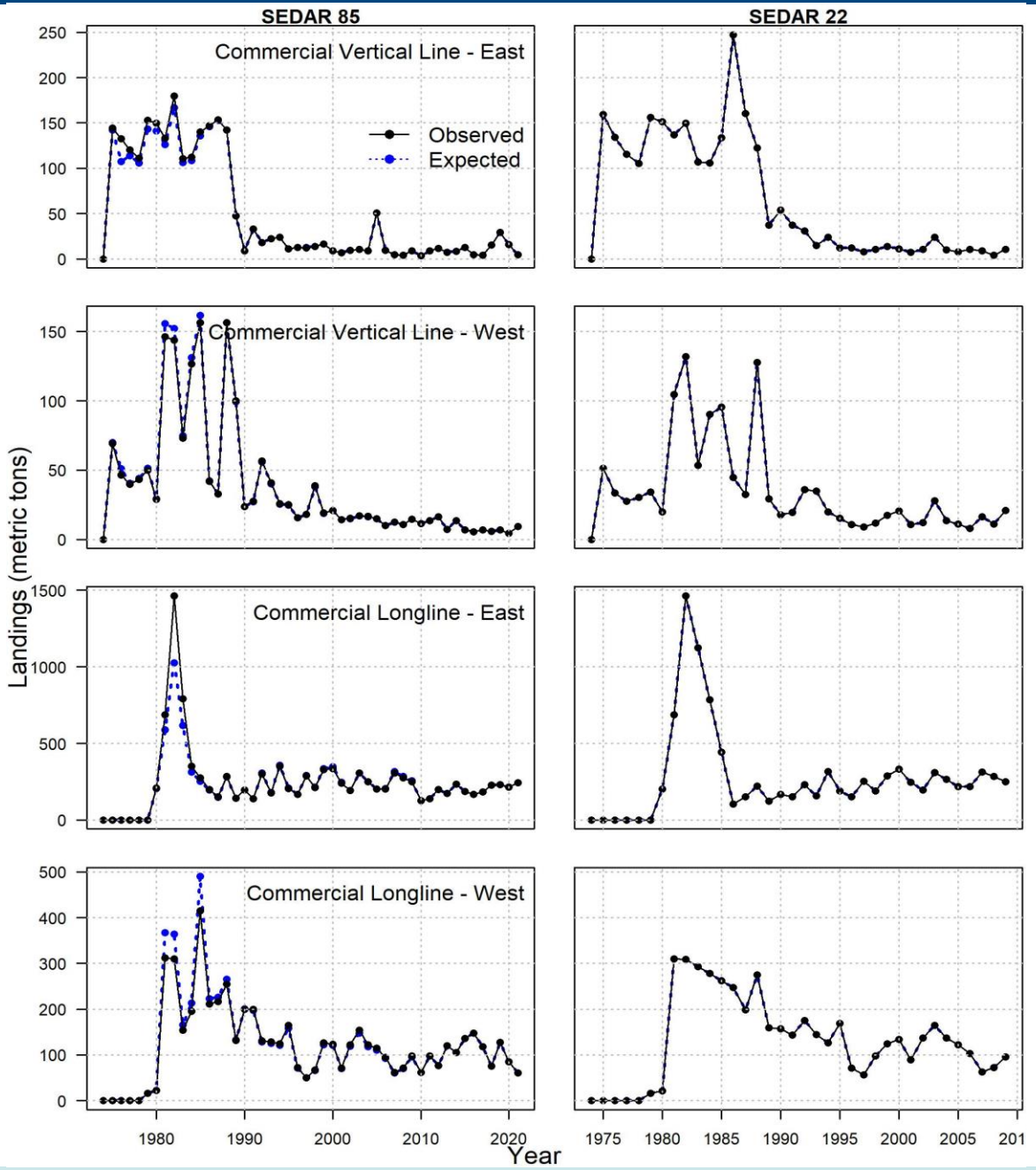
SEAMAP Groundfish Trawl

Surveys – age composition data



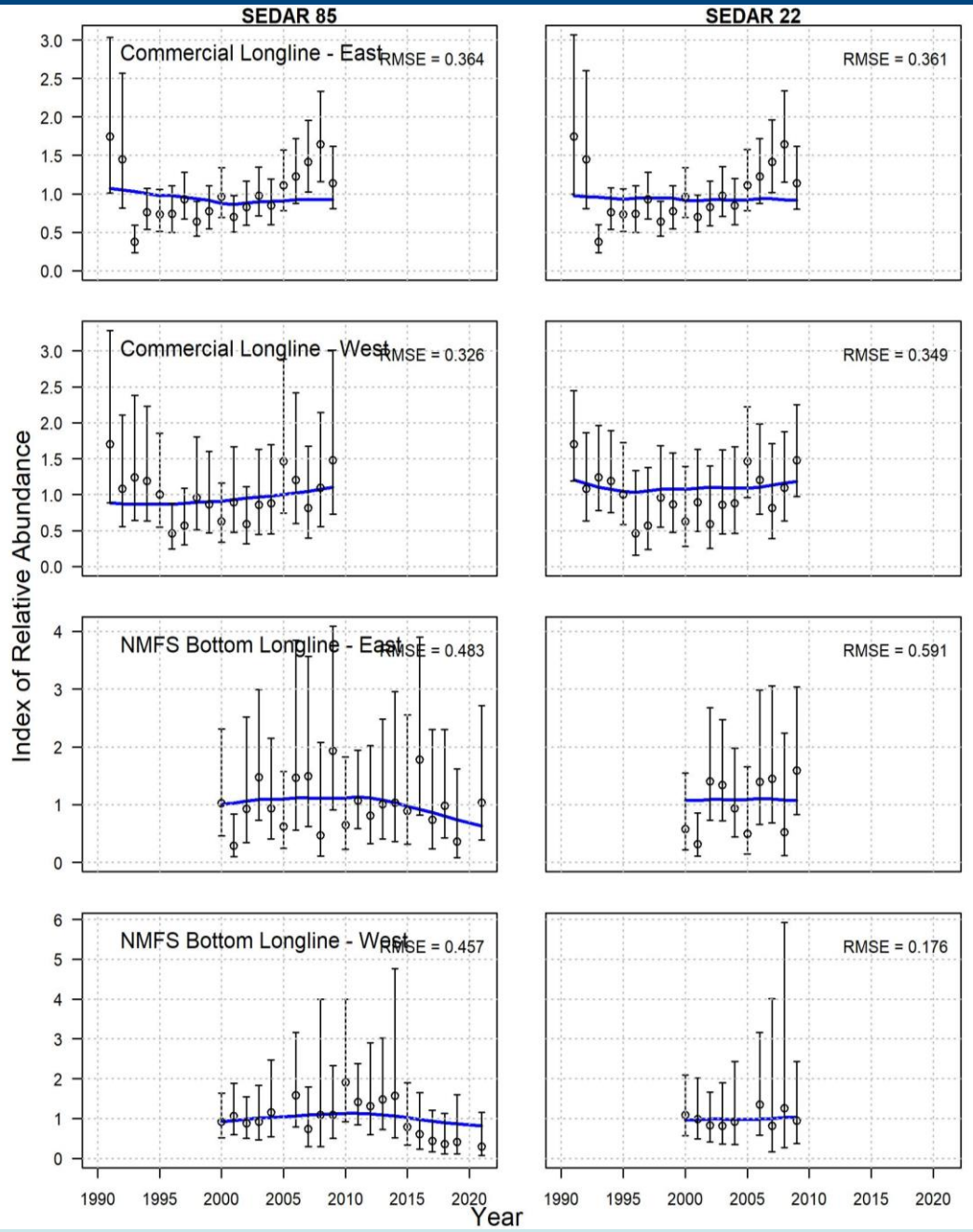
Landings

- More uncertainty in earlier years (pre-1986) leads to poorer fits
- Tight fits from 2010+ (IFQ years log-scale SE = 0.01)

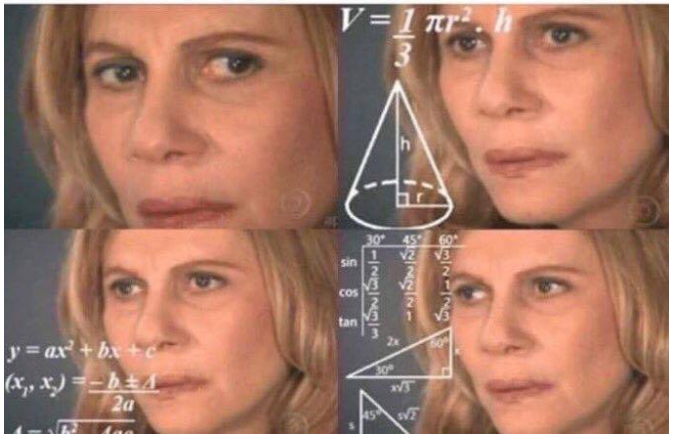


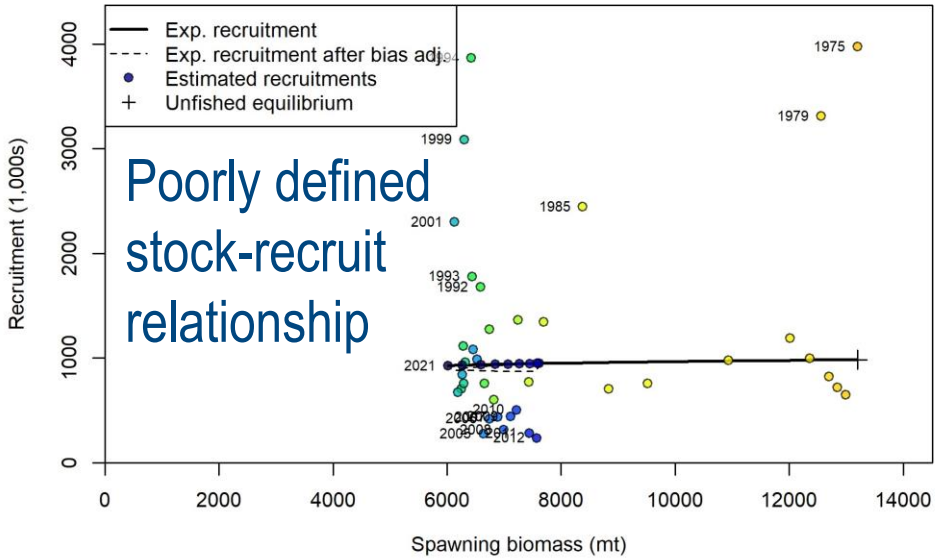
Indices

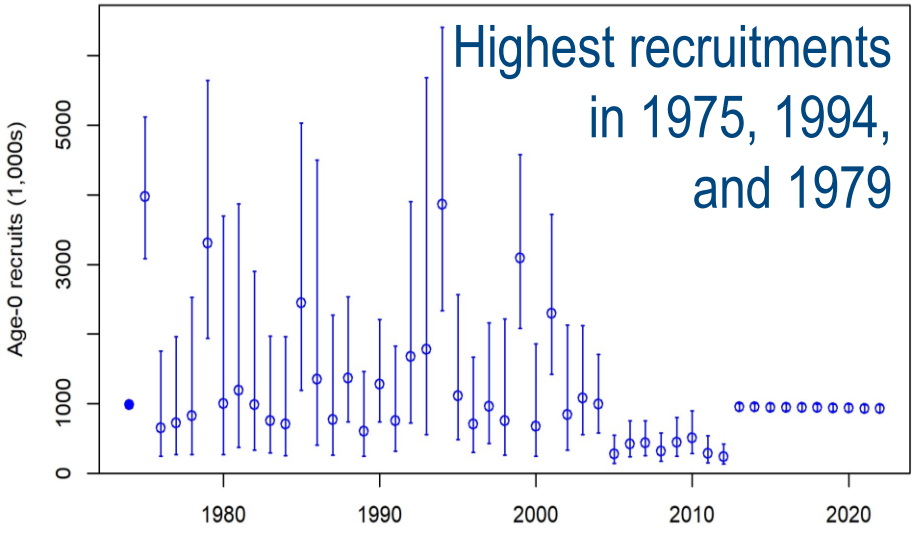
- Fits remain poor for all indices
- Model predicts relatively flat indices, as observed in SEDAR 22 model

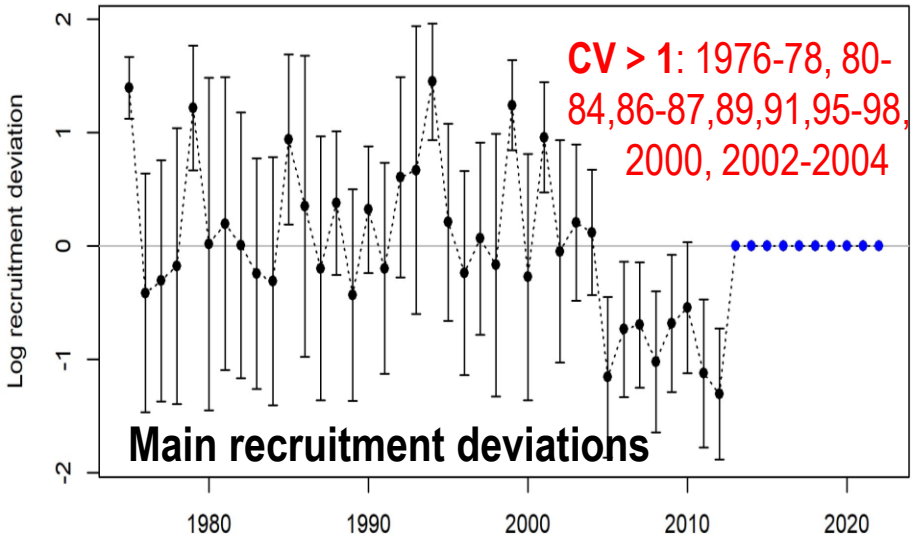


Recruitment



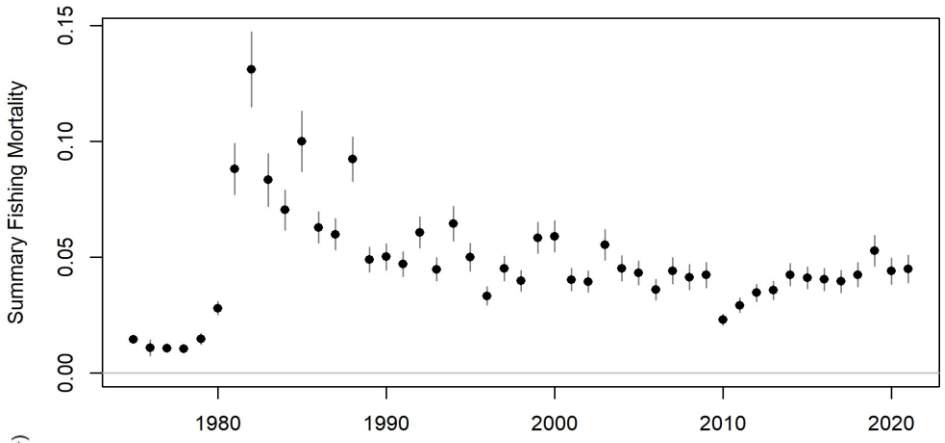


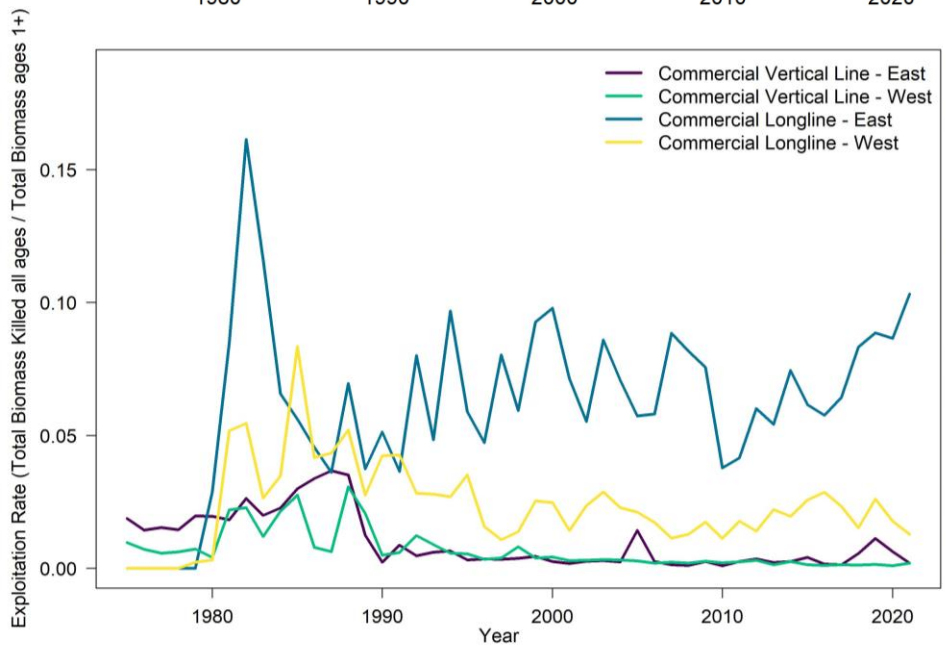




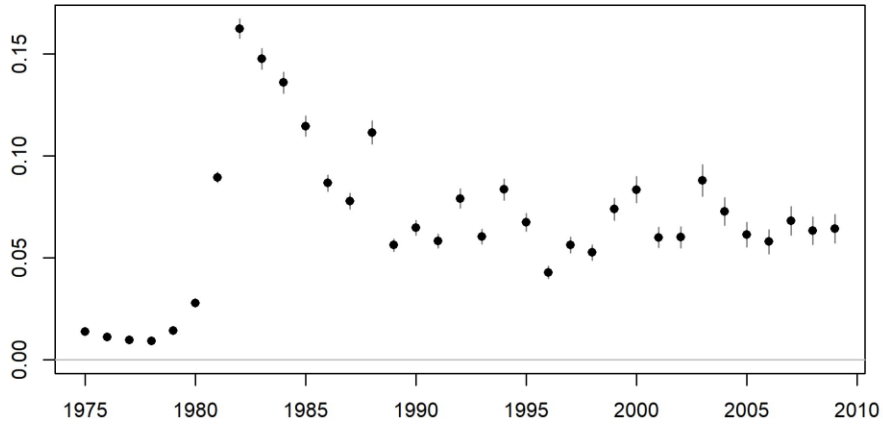
Exploitation Rate

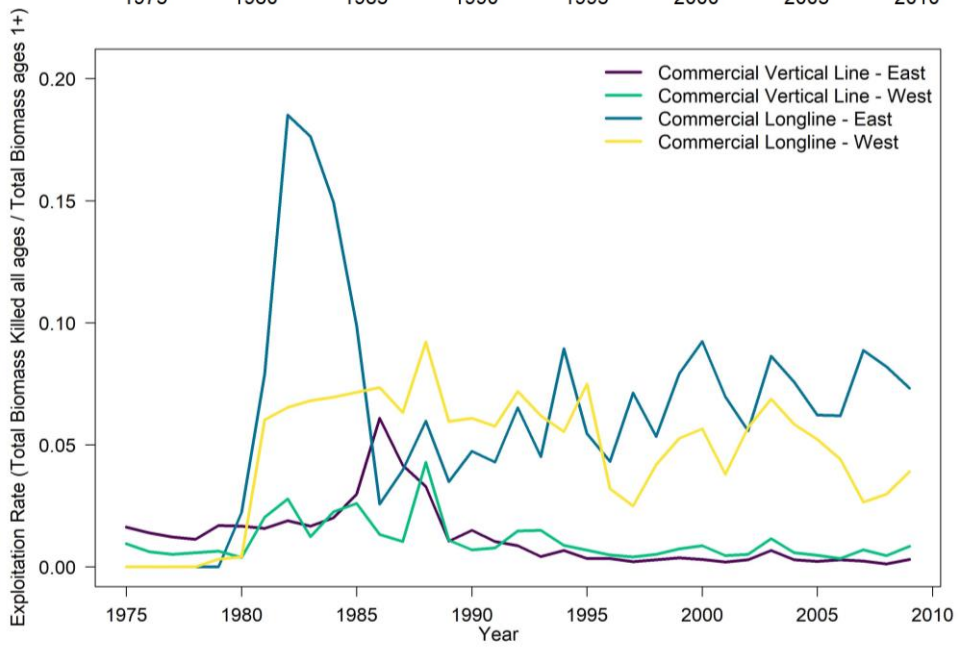
SEDAR 85



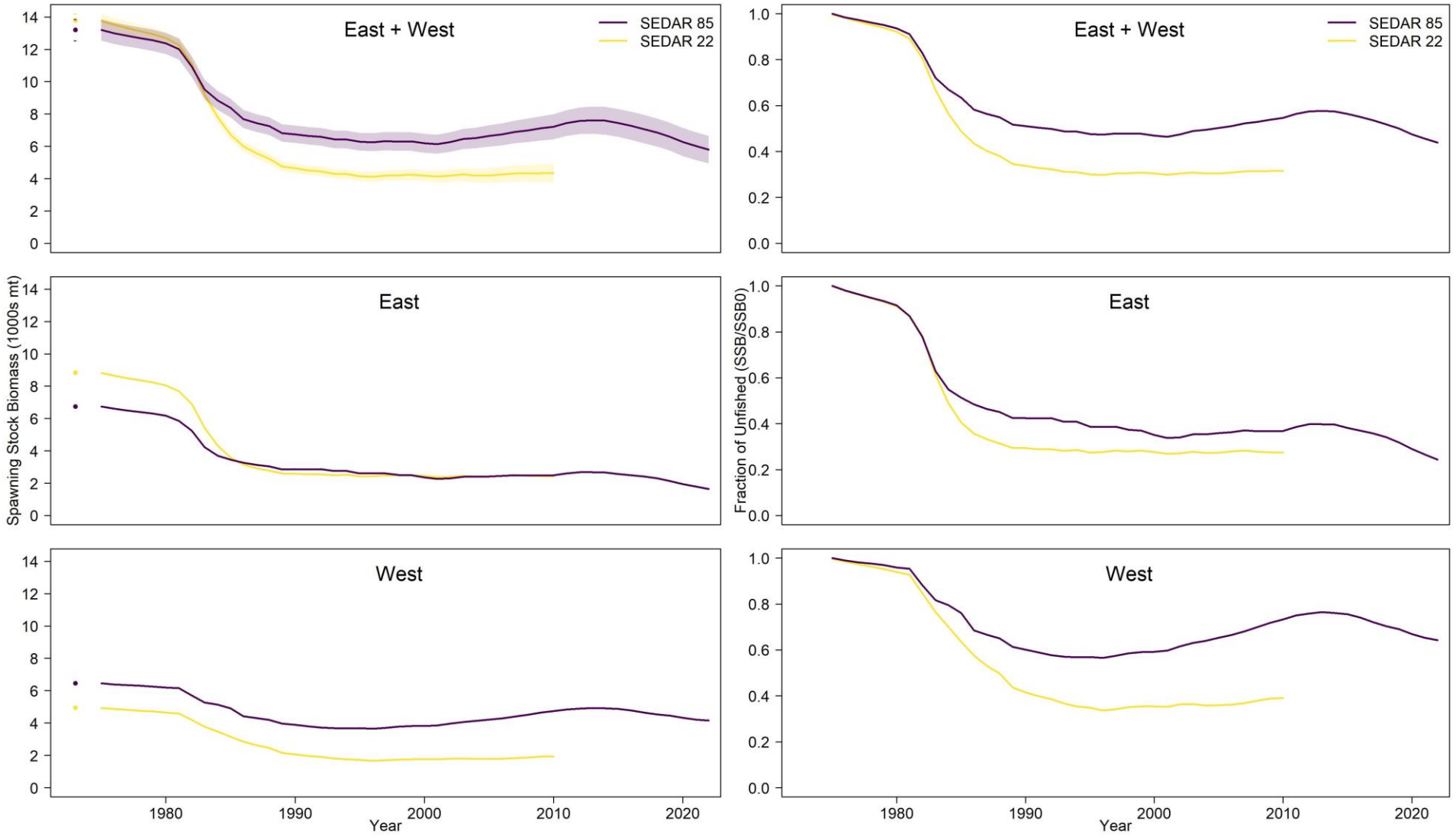


SEDAR 22



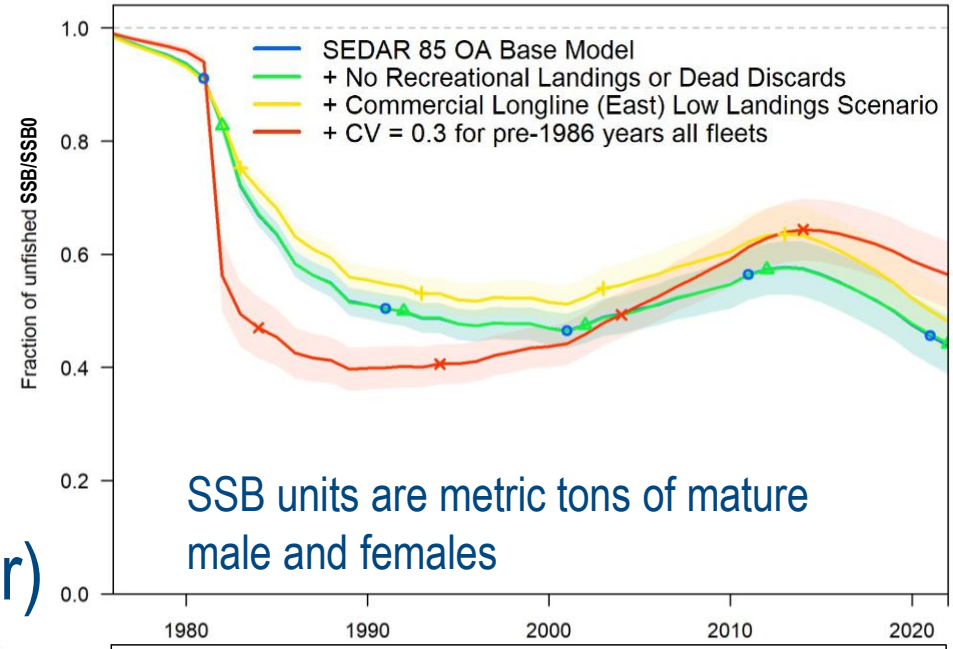


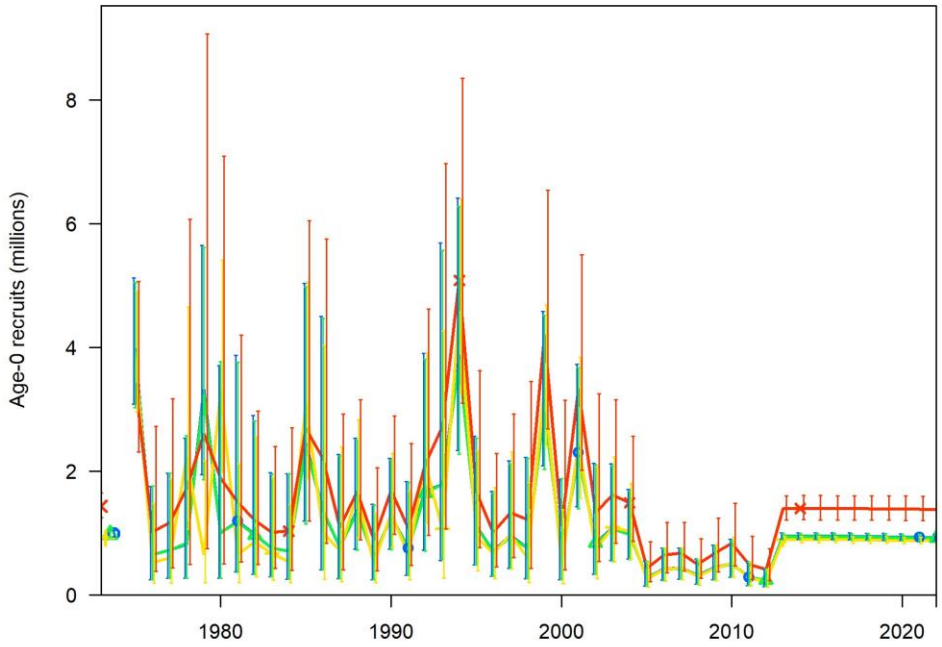
SSB and SSB/SSB0 trajectories

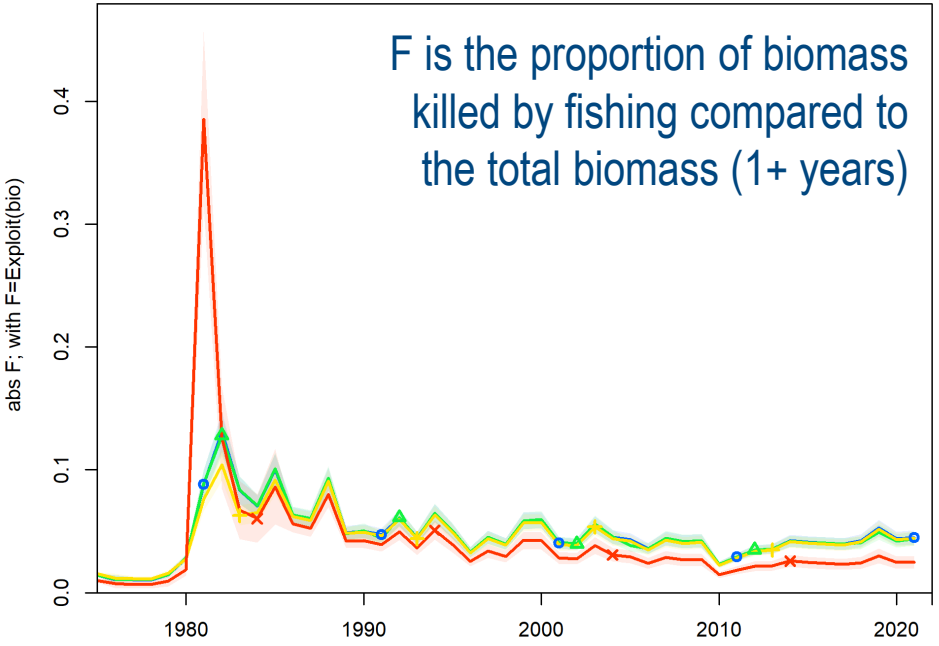


Sensitivity:: Landings

- Large impact of early uncertainty
- No noticeable impact from recreational data (very minor)







Conclusions

- SEDAR 85 OA Base Model incorporated the best available data, addressed the TORs, and showed an improved model with better fits and diagnostics

Improvements

- Data inputs from best practices methods
- Captures more uncertainty in landings
- Reduced stratification (sex-specific data)

Outstanding Issues

- Historical landings
- Poor fits to indices
- Limited survey data
- Recruitment uncertainty
- Compositions (representativeness)

Catch Equivalency Table

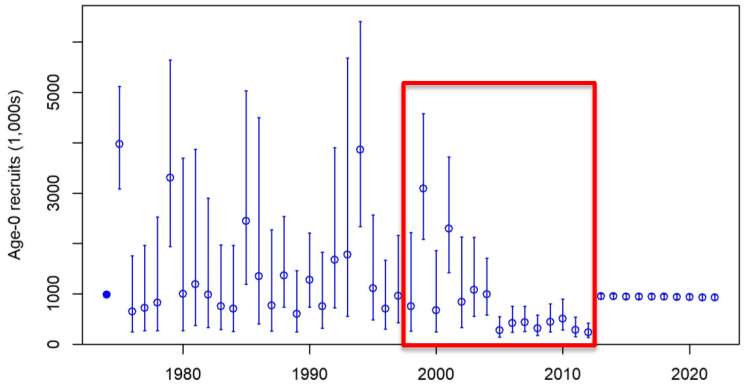
- Describe changes in catch advice as they relate to the use of FES-adjusted MRIP recreational catch and effort data, versus changes related to stock abundance.

Year	SEDAR 22 MRFSS OFL	SEDAR 22 FES/Comm OFL	%Difference OFL
2012	0.913	0.940	3
2013	0.903	0.926	3
2014	0.893	0.912	2
2015	0.883	0.899	2

- An MRIP-FES only projection was not feasible because the SEDAR 22 landings vector could not be recreated.

Projection settings: SSC Recommendations

1. 40% SPR proxy for calculating benchmarks
   - YEG mature at 9 years old, can live into their 80s
     - Late maturing, longer lived
     - E.g., gag: mature at 3-4y, can live to 31
       - Gag also uses 40% SPR
2. Recruitment assumption
   - Use recent average recruitment from 1998-2012
     - Last 15 years estimated



Projection settings for catch advice

Parameter	Value	Comment
Relative F	Average from 2019-2021	Average relative fishing mortality (apical F) over terminal three years
Selectivity	Average from 2019-2021	Fleet specific selectivity estimated over terminal three years
~~Recruitment (Benchmarks)~~	~~Beverton-Holt stock-recruitment relationship~~	~~Derived from the model estimated Beverton-Holt stock-recruitment relationship~~
Recruitment (catch advice)	1998-2012 average	Average recruitment over the last 15 years where estimated
Interim Landings (2022-2024)	9.04/6.85 metric tons (Commercial Vertical Line - East) 12.53/11.01 metric tons (Commercial Vertical Line - West) 161.73/202.74 metric tons (Commercial Longline - East) 34.38/47.48 metric tons (Commercial Longline - West)	Landings provided for 2022 For 2023 and 2024, used 2-year average (2021-2022)
Allocation Ratio	None	

MSRA Benchmarks & Reference Points: 40%SPR

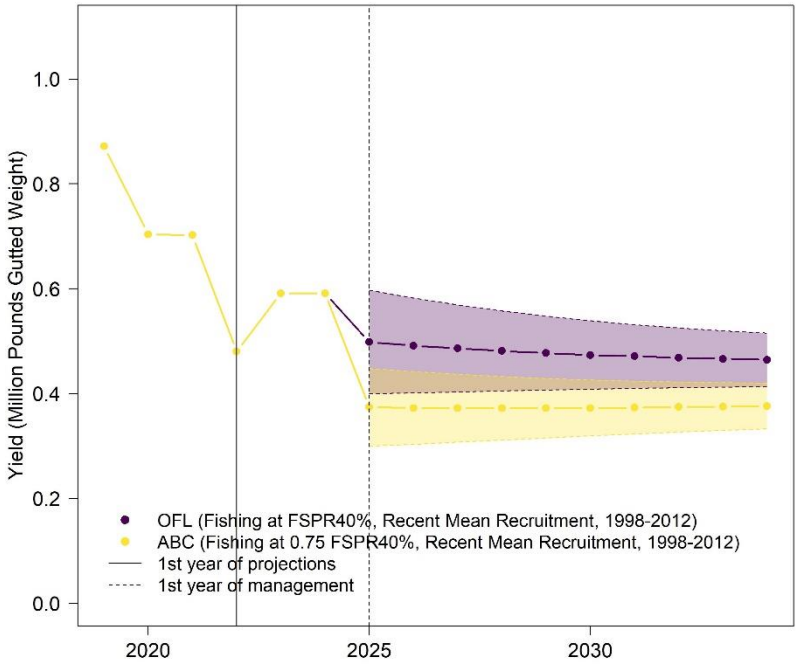
Criteria	Definition	Value
Steepness	Steepness of the Beverton-Holt stock-recruit relationship (fixed)	0.827
R0	Virgin recruitment (1,000s)	985
Generation Time	Fecundity-weighted mean age	18.17
SSB0	Virgin spawning stock biomass (mt)	13,197
	Mortality Rate Criteria	
$F_{MSYproxy}$	Equilibrium F that achieves 40%SPR	0.044
MFMT	$F_{MSYproxy}$	0.044
$F_{current}$	Geometric mean of the last 3 years of the assessment ($F_{2019-2021}$)	0.047
$F_{current}$/MFMT	Current stock status based on MFMT **OVERFISHING**	**1.08**
	Biomass Criteria	
$SSB_{MSYproxy}$	Equilibrium SSB at $F_{40\%SPR}$	4,842
MSST	0.75 * $SSB_{40\%SPR}$	3,632
$SSB_{current}$	SSB in 2021	6,017
$SSB_{current}/SSB_{FMSYproxy}$	Current stock status based on $SSB_{40\%SPR}$ (Equilibrium)	1.24
$SSB_{current}$/MSST	Current stock status based on MSST **NOT OVERFISHED**	**1.66**
$SSB_{current}$/SSB0	SSB ratio in 2021	0.46

OFL Projections: $F=F_{40\%SPR}$

Year	Recr (1000s)	F	$F/F_{40\%SPR}$	SSB (mt)	$SSB/SSB_{40\%SPR}$	SSB/ MSST	SSB ratio	OFL (mp gw)
2025	698.493	0.043	1	4,227	1.128	1.504	0.324	0.498
2026	698.493	0.043	1	4,142	1.105	1.474	0.318	0.491
2027	698.493	0.043	1	4,071	1.086	1.449	0.312	0.486
2028	698.493	0.043	1	4,014	1.071	1.428	0.308	0.481
2029	698.493	0.043	1	3,967	1.058	1.411	0.304	0.477

- Assuming mean recruitment from the last 15 years (1998-2012)

Years	Constant Catch
Three (2025-2027)	0.492 mp gw
Five (2025-2029)	0.487 mp gw

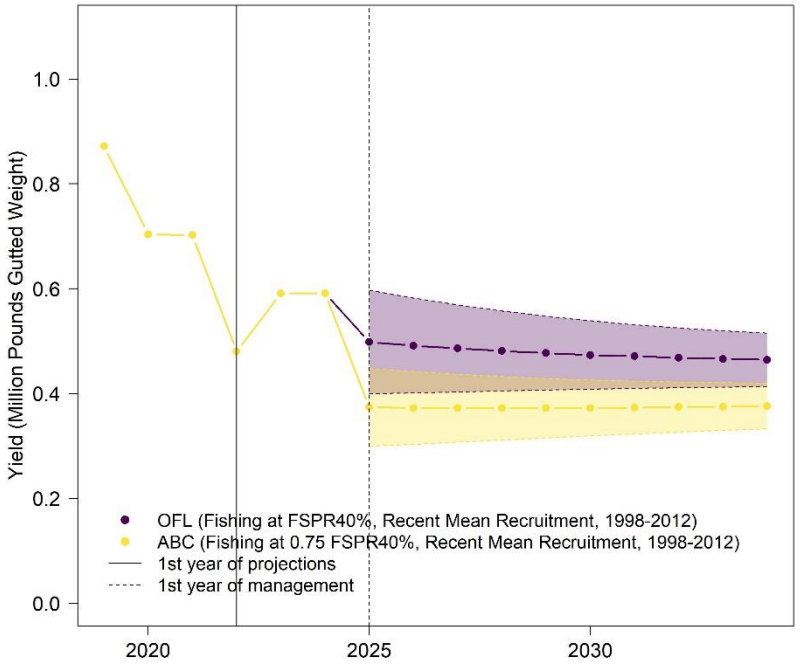


ABC Projections: $F=0.75*F_{40\%SPR}$

Year	Recr (1000s)	F	$F/F_{40\%SPR}$	SSB (mt)	$SSB/SSB_{40\%SPR}$	SSB/ MSST	SSB ratio	Yield (mp gw)
2025	698.493	0.033	0.75	4,227	1.128	1.504	0.324	0.374
2026	698.493	0.033	0.75	4,190	1.118	1.491	0.321	0.372
2027	698.493	0.033	0.75	4,166	1.112	1.482	0.32	0.372
2028	698.493	0.033	0.75	4,153	1.108	1.478	0.319	0.372
2029	698.493	0.033	0.75	4,149	1.107	1.476	0.318	0.372

- Assuming mean recruitment from the last 15 years (1998-2012)

Years	Constant Catch
Three (2025-2027)	0.373 mp gw
Five (2025-2029)	0.372 mp gw



Thank you for your attention!

Questions?

The SEDAR 85 Operational Assessment for Gulf of Mexico Yellowedge Grouper would not have been possible without the efforts of the numerous SEFSC, SERO, and GMFMC staff along with the many state, academic, and research partners involved throughout the Gulf of Mexico. The following agencies contributed to the assessment and deserve notable attention and thanks for efforts extended to developing data inputs: NOAA SEFSC Fisheries Statistics Division (FSD), NOAA SEFSC Panama City Laboratory, NOAA SEFSC Mississippi Laboratories, NOAA Southeast Regional Office (SERO), Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, NOAA SEFSC Beaufort Laboratory, and the Gulf States Marine Fisheries Commission. Special thanks are also extended to the Data Updates Topical Working Group members for their rapid and helpful guidance with model development.