



**NOAA  
FISHERIES**

# SEDAR 74 Gulf of Mexico Red Snapper Stock Assessment: Assessment Webinar 7



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# Assessment Webinar 6 Review

- GRSC
  - Variation in estimates
  - CV concern
- Sample sizes
  - Number of fish measured where available when using Dirichlet multinomial data weighting
- Discard Fraction
  - Of little concern for final model due to magnitude
- Stock recruitment formulation
  - Deviations (simple), no R0 block

# Topics for Current Assessment Webinar 7

- GRSC Update
- Time Varying Maturity Update
- Total Egg Production to Spawning Stock Biomass
- Natural Mortality Sensitivities
- Removal of Fishery-Dependent Surveys

# GRSC



# GRSC review

- Incorporated into assessment model as a region-specific (west, central, east) survey of age 2+ abundance occurring in 2018.
- Catchability coefficient fixed at 1 (i.e., treated as absolute abundance index).
- Given equal model weight relative to other sources of data.
- AW6 - assessment region-specific abundances and CV's yet to be finalized

# GRSC Estimates By Stock ID Region

## West (Texas & Louisiana)

- Original Texas abundance estimate (22,025,035)
- LGL Louisiana abundance estimate (8,377,591)
- ~83% of the pipeline estimate split by region (421,359)
- Total West: **30,823,985**

## Central

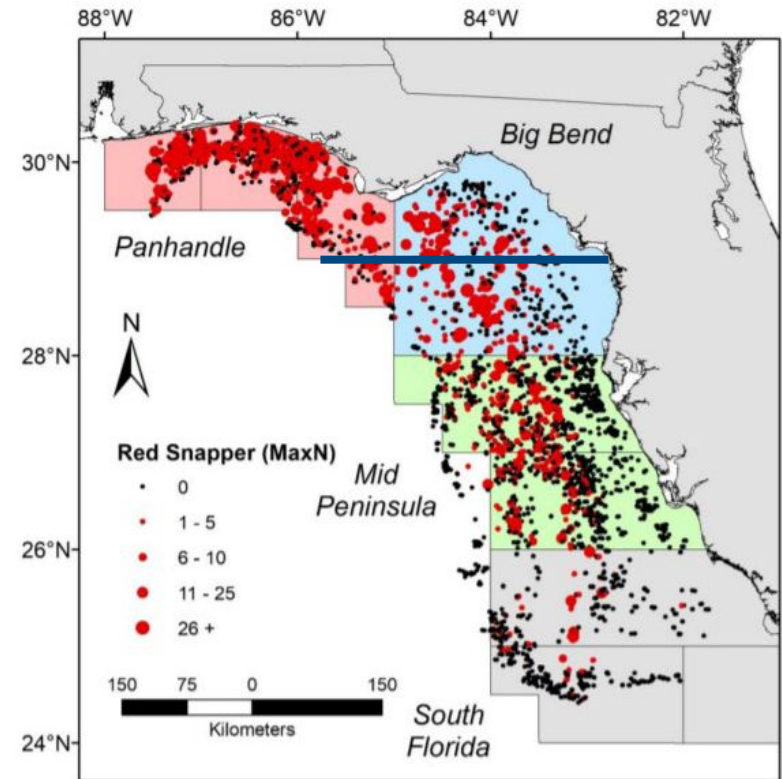
- Original AL/MS abundance estimate (8,461,085)
- ~16% of pipeline estimate (83,634)
- A portion of the FL estimate derived from post-stratified methodology

## East

- ~1% of pipeline estimate (2,669)
- A portion of the FL estimate derived from post-stratified methodology

# Steps Leading to New Estimates for Florida

- Re-analysis split FL abundance by adding an stock ID strata and re-estimating (32,512,132)
  - 15,420,666 central & 17,091,466 east, or 47.4% central & 52.6% east
- Reviewed post-stratified GRSC estimate (46,965,780) substantially greater than new estimate.



G-FISHER - site specific red snapper abundance. Presented at January 2022 SSC Meeting

Approx.  
Stock ID  
boundary



# GRSC region-specific abundance options

## Scenario 1 - Base case:

- Central abundance **(30,820,822)**
  - GRSC estimate of MS/AL abundance (8,461,085)
  - 47.4% of the post-stratified GRSC FL abundance estimate (24,689,677)
  - 16% of the pipeline abundance estimate (83,634).
- East abundance **(24,692,346)**
  - 52.6% of the post-stratified GRSC FL estimate (24,692,346)
  - 1% of the pipeline estimate (2,669)

## Scenario 2 - Sensitivity:

- Central abundance **(23,965,385)**
  - GRSC estimate of MS/AL abundance (8,461,085)
  - Central FL abundance estimate from the re-analysis (15,420,666)
  - 16% of the pipeline estimate (83,634).
- East abundance **(17,094,135)**
  - East region FL abundance estimate (17,091,466)
  - 1% of the pipeline estimate (2,669)



# GRSC region-specific abundance options

	Base Scenario	Sensitivity Scenario	Low CV	Weighted CV (Base)	Weighted CV (Sens.)
West	30,823,985	30,823,985	0.149	27.3	27.3
Central	30,820,822	23,965,385	0.149	21.8	25.6
East	24,692,346	17,094,135	0.149	22.0	68.0
Total	86,337,153	71,883,505			

- For the RT model configuration decisions are more pressing than final numbers.
- For the OA, a topical working group to evaluate FL re-analysis and make CV recommendations would be useful.

# GRSC CV Development



State/Region	Habitat Type	CV(%)
TX	Natural	36
	Artificial	21
	Uncharacterized Bottom	46
	Total	32
LA	Natural	
	Artificial	
	Uncharacterized Bottom	
	Total	14
AL/MS	Natural	20
	Artificial	11
	Uncharacterized Bottom	51
	Total	21
FL	Natural & Uncharacterized Bottom	22
	Artificial	17
	Total	22
ALL	Pipeline	43
Gulf of Mexico		14

- CV's will influence degree of model fit to GRSC data.
- Region-specific estimates less precise than overall estimate and this should be reflected in assessment model

# Analytical Team Recommendation

- Model configuration will be
  - Incorporated as a region-specific survey of age 2+ abundance occurring in 2018.
  - Catchability coefficient fixed at 1.
  - Given equal model weight.
- “Base” GRSC region specific abundances will be used as will the “weighted CV (base)”

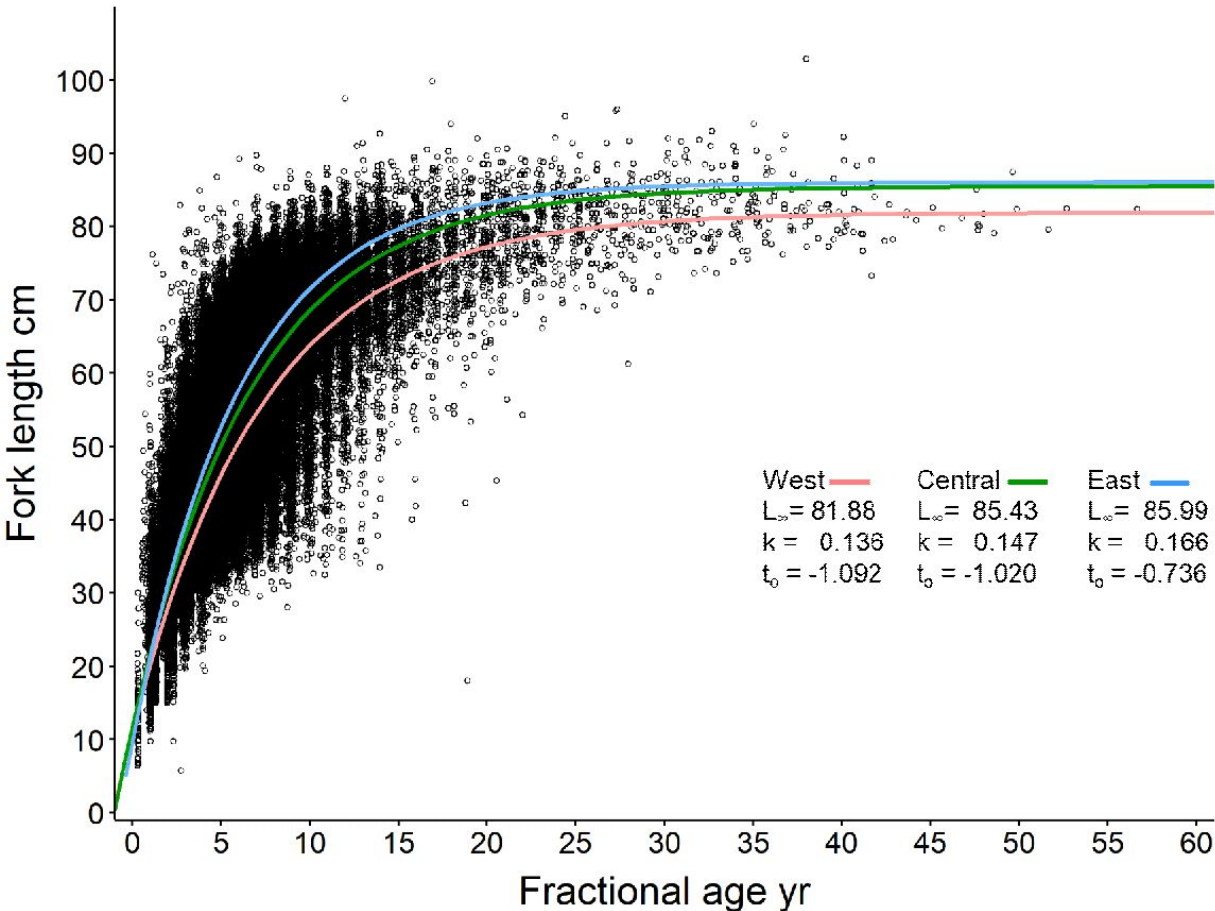
# Switching to SSB & Time Varying Maturity



# Switching to SSB

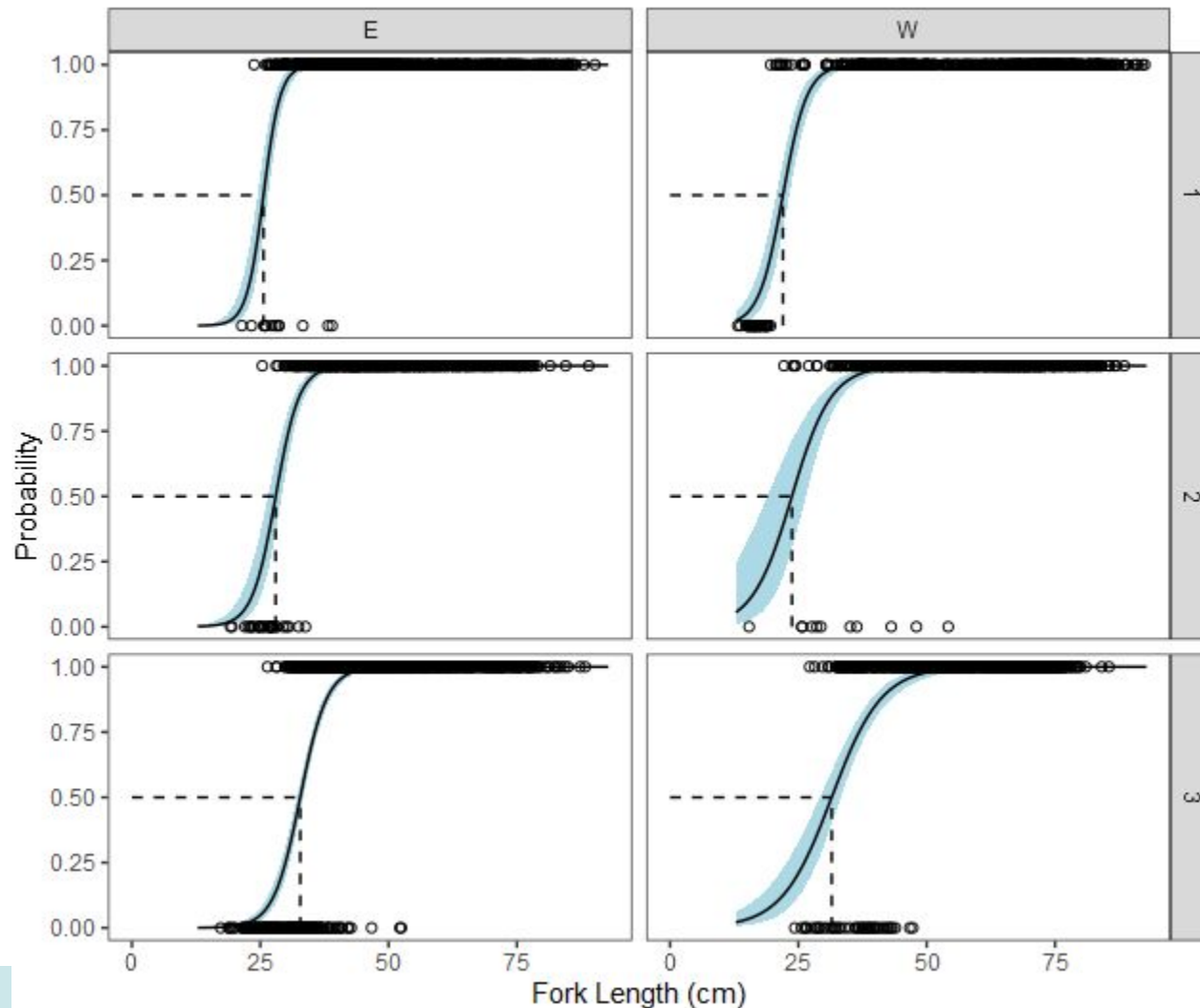
- Recommendation from the life history working group was to switch from total egg production to SSB for reference point and stock status determination.
- To facilitate the transition the LH working group provided
  - Spatially and temporally varying estimates of growth and maturity.

# Switching to SSB - Growth



- Estimates of growth vary little with time however differences observed between regions.
- Currently specified by region with fixed parameters.

# Switching to SSB - Maturity

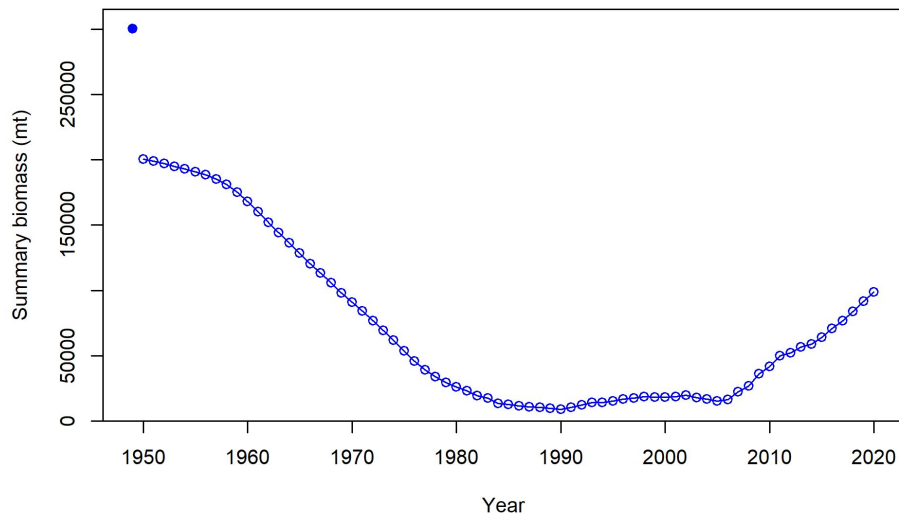


- Spatial and temporal differences in maturity.
- 1 - '91 - '08
- 2 - '09 - '16
- 3 - '17 - '19



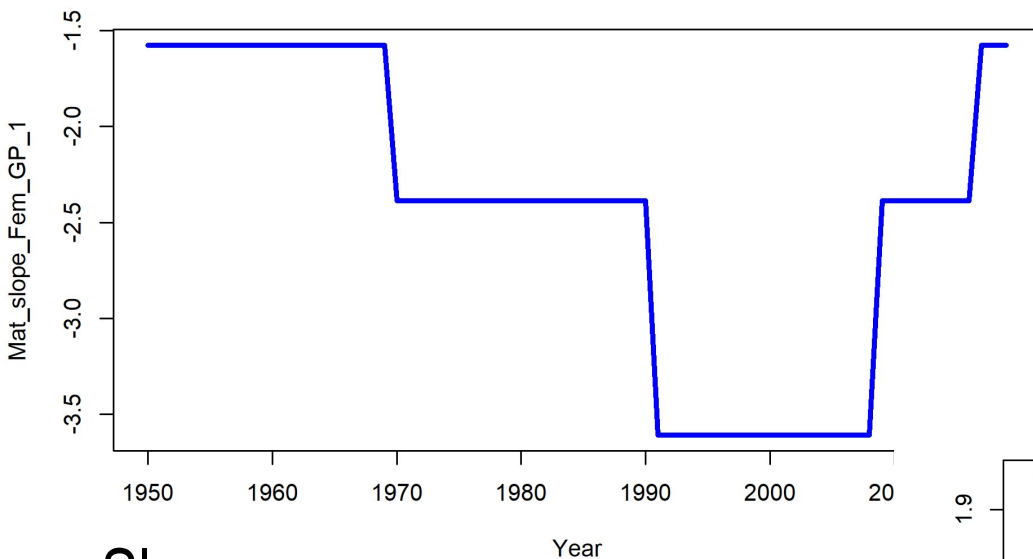
# Switching to SSB - Maturity

- To use time-varying maturity we must specify maturity values for data-free periods '50 - '90.
- LH working group labeled the periods as 1 - overfished, 2 - rapidly recovering, 3- stabilizing.



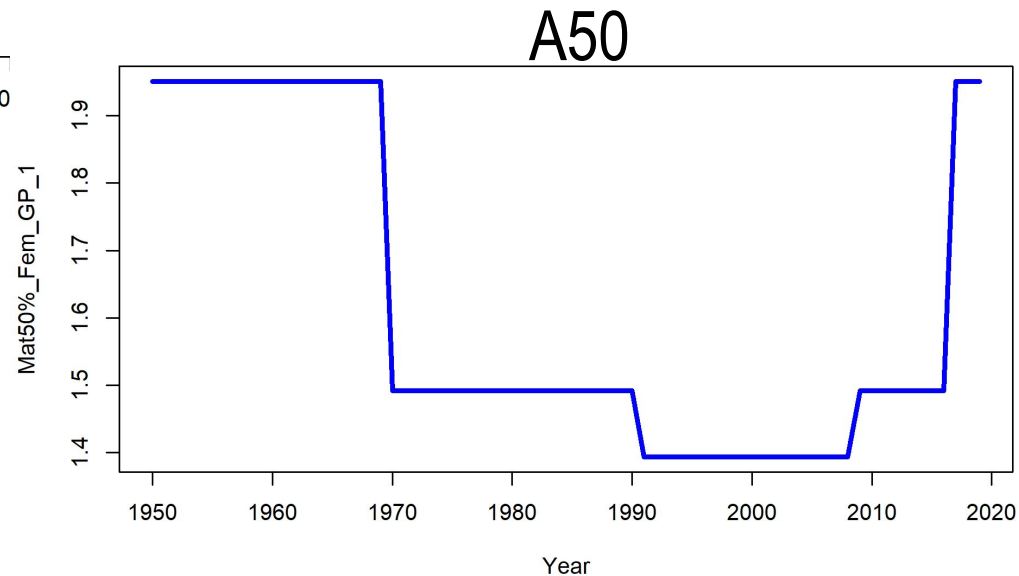
Use model estimate  
biomass to define pre-data  
periods.

# Time Varying Maturity & SSB Switch



East region  
example

Slope



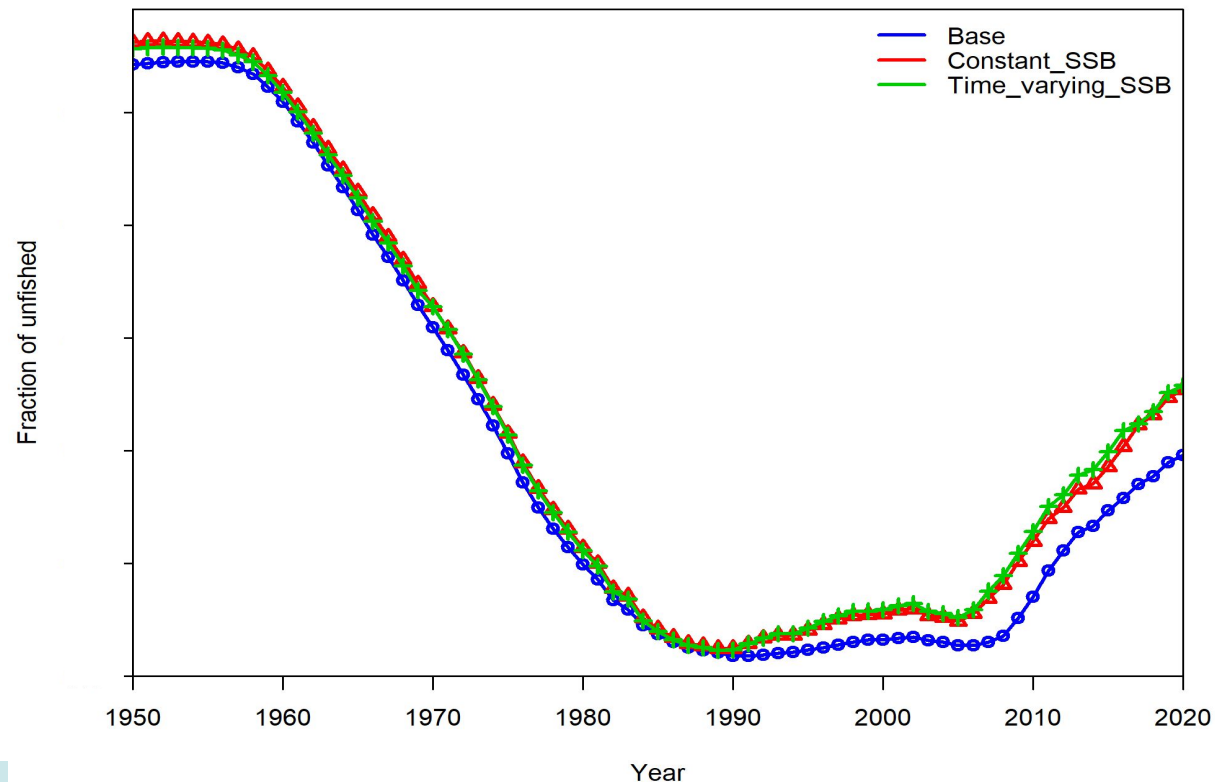
A50

# Time Varying Maturity & SSB Switch

Switching to SSB impacts stock status as it ignores possible allometry (i.e., BOFFF's).

Little impact of  
Time varying vs.  
Constant

Larval index (SSB)  
Fit changes



# Analytical Team Recommendation

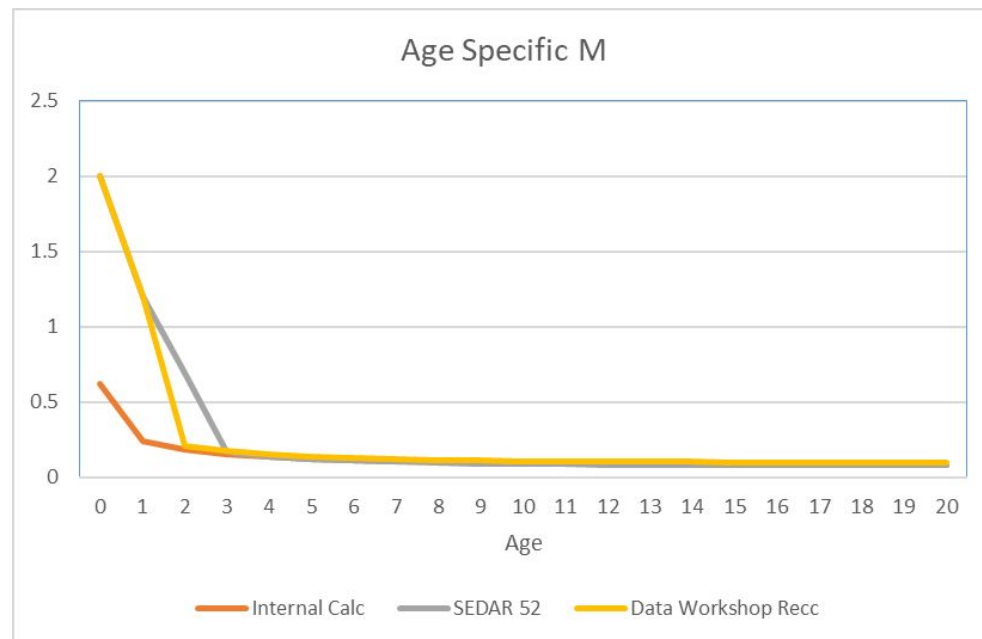
- Per life history group recommendation, proceed with SSB.
- Use spatially and temporally varying estimates of growth and maturity, as appropriate
- Run SSB vs. TEP sensitivities as part of the OA to identify yield/risk tradeoffs stemming from productivity measure decision.

# Natural Mortality Sensitivities



# M Options

- Note an increase in max age from 48 to 57 since S52
- External Calculation
  - Lorenzen scaled to Hoenig estimate (S52)
  - Lorenzen scaled to Lutjanid Then et al estimate
- Internal Calculation
  - Lorenzen scaled M across a range of ages (2-20)



# Sensitivity Results

	NLL	LnR0	Virgin SSB mt	Virgin Recr 1000s	Dep StartYr	Dep. EndYr
<b>Internal</b>	16,270	10.32	901,930	30,301	0.82	0.16
<b>Data Workshop</b>	16,509	11.74	564,131	125,974	0.74	0.25
<b>S52</b>	16,531	11.93	363,253	151,103	0.57	0.33

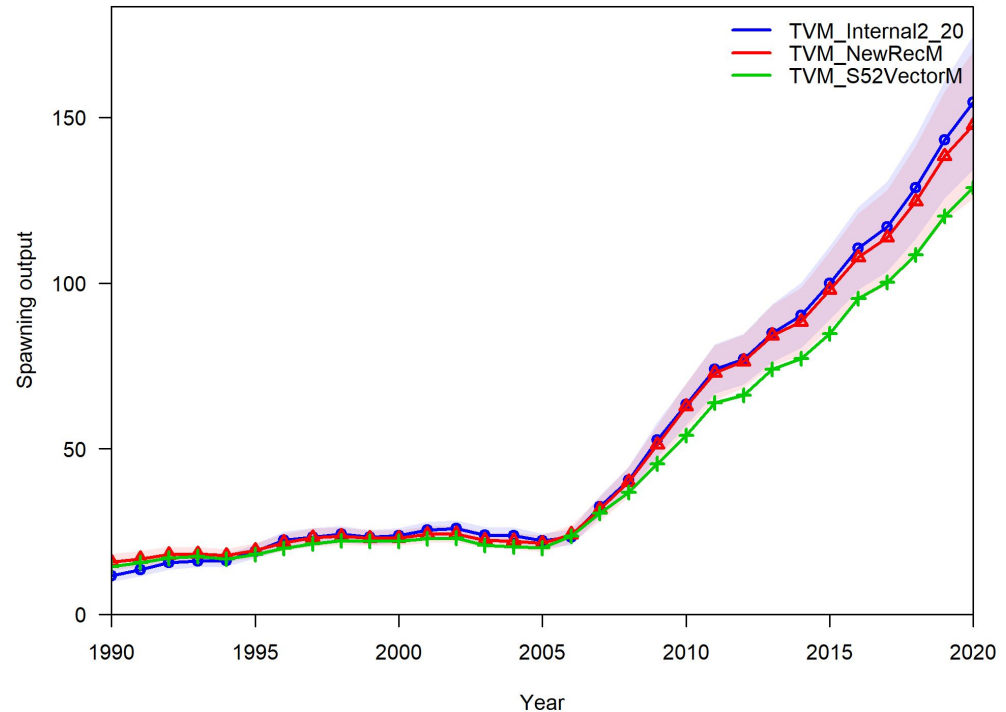
Internal has improved fit but greatly varies in virgin conditions and depletion

- Low age 0 and 1 mortality so model assumes a lower productivity is needed to maintain catches
- External vectors have higher early mortality so model assumes higher productivity to maintain catches



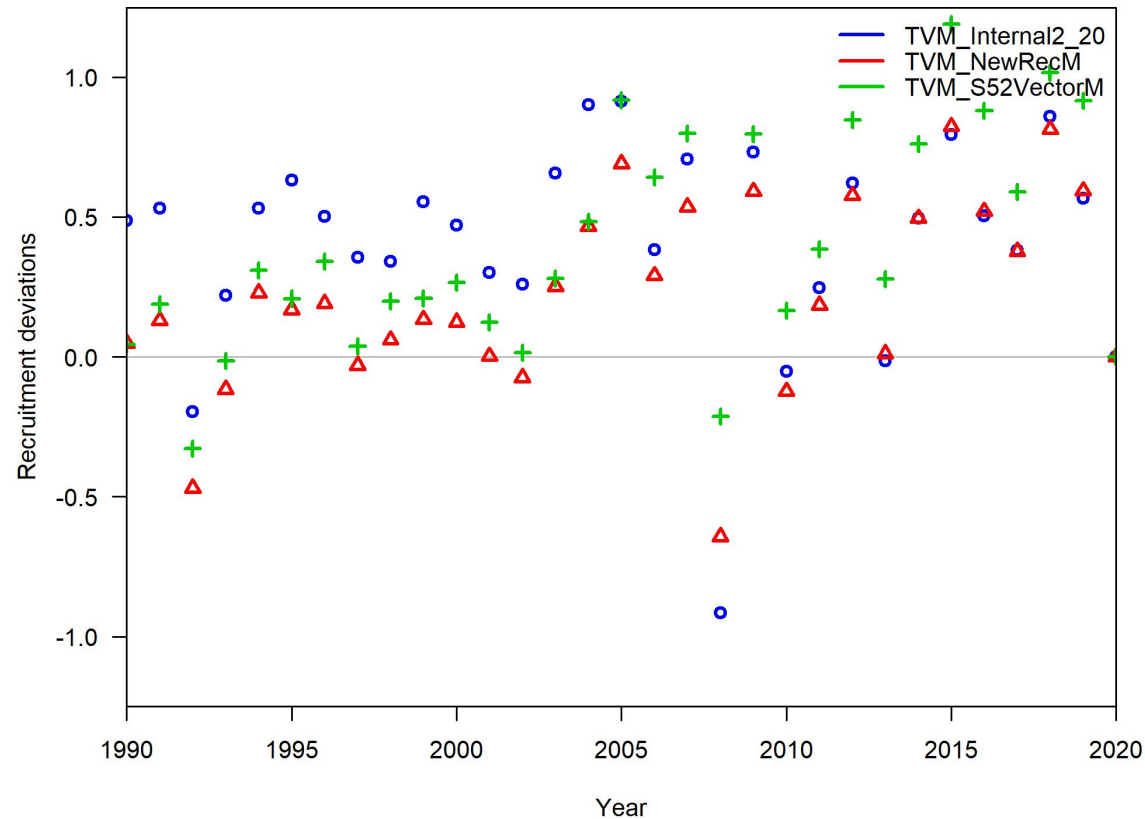
# M influence on spawning output

- Natural mortality influences scaling of population.
- Higher avg.  $M$  used in internal vector and data workshop provided vector.



# M influence on rec devs

- M influences overall scaling but the patterns remain the same.



# Analytical Team Recommendation

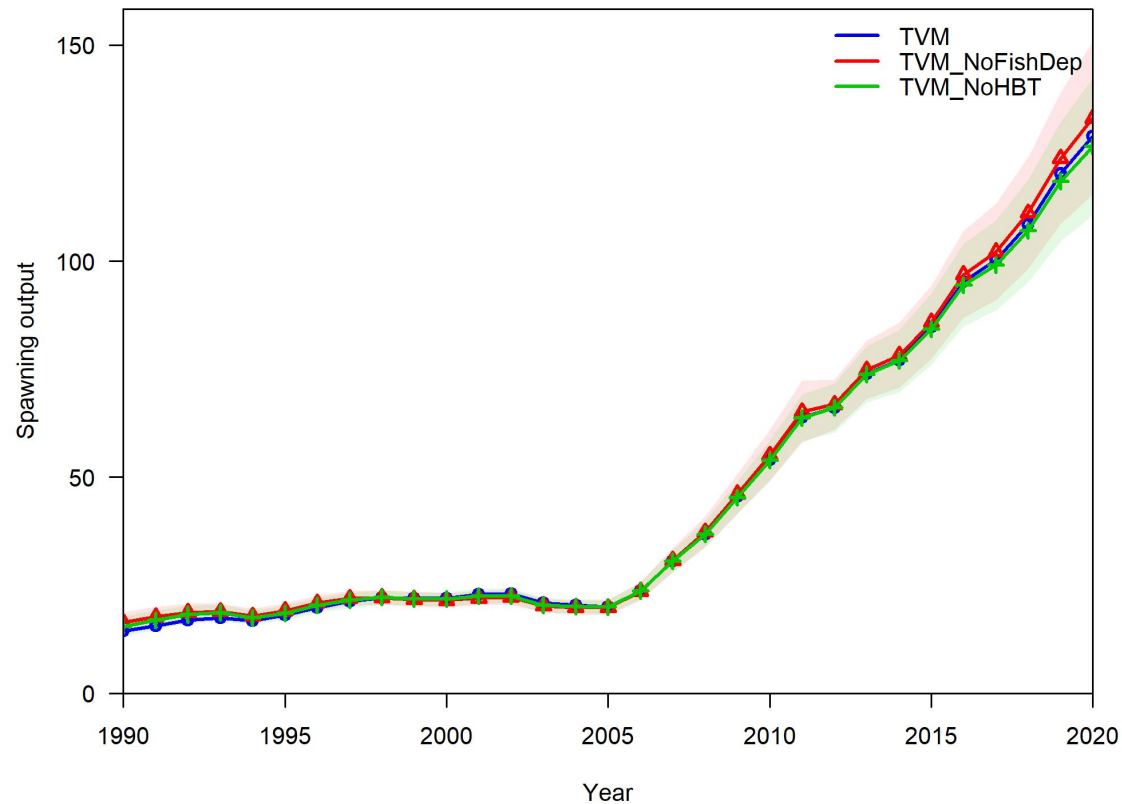
- Continue with the suggestion from the data workshop:
  - Includes high early mortality of age zero and one (2 and 1.2 respectively)
  - Includes updated biological information (max age)

# Fishery Dependent Index Removal



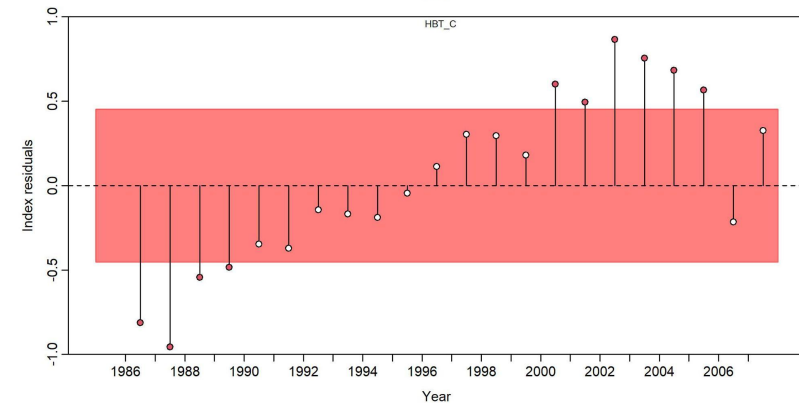
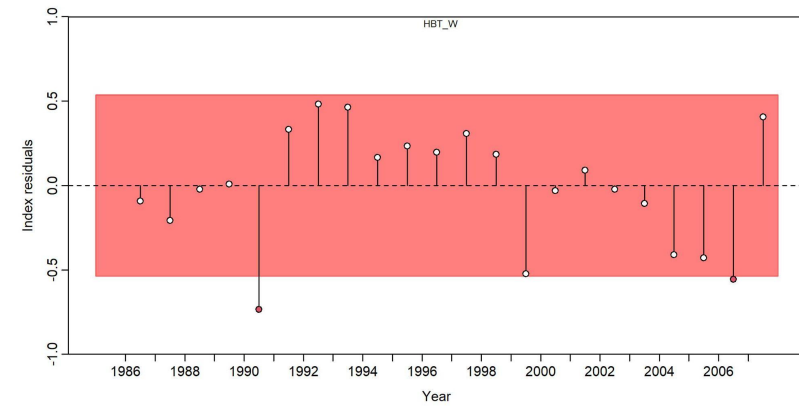
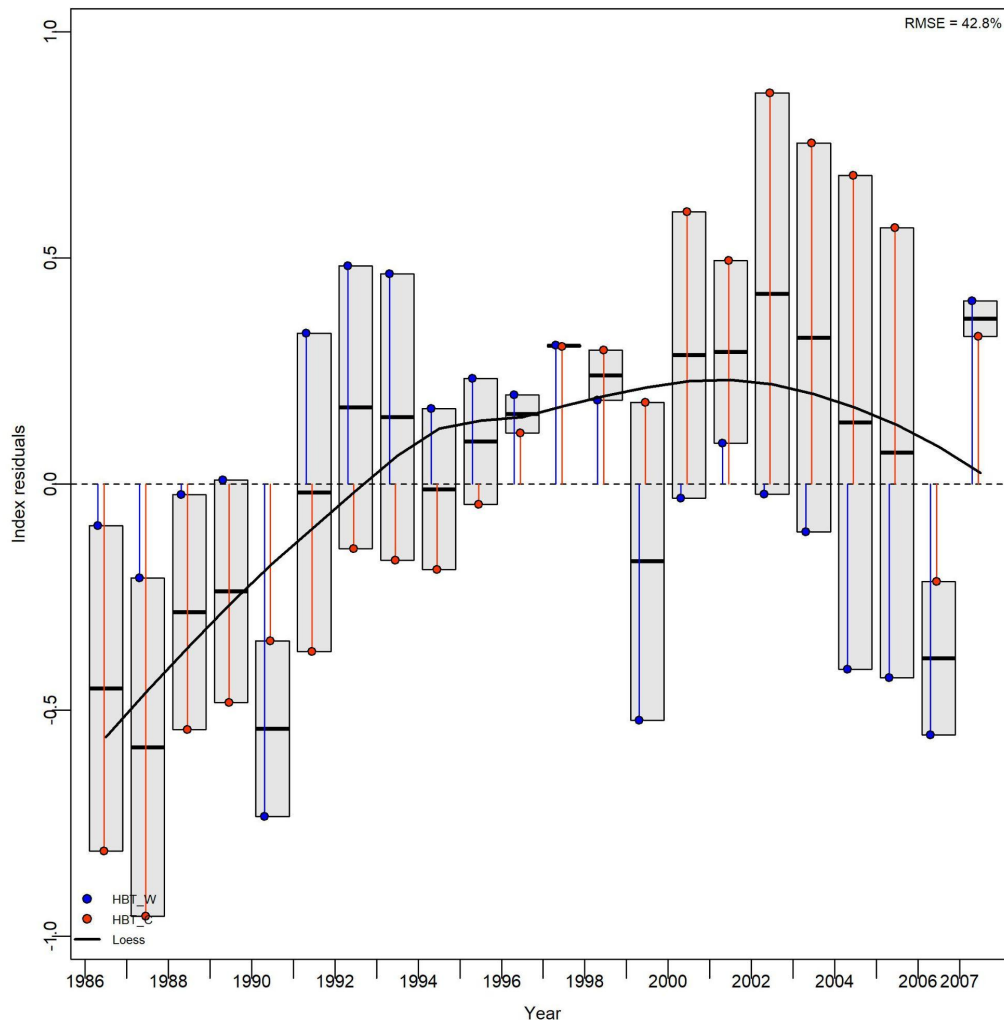
# Model Comparisons

Removal of fishery dependent indices has little to no impact on spawning output



# HBT surveys

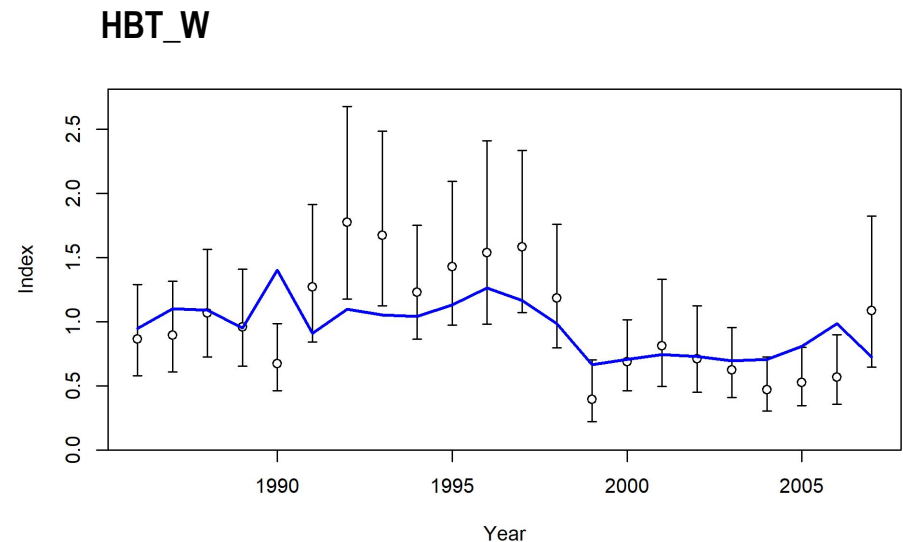
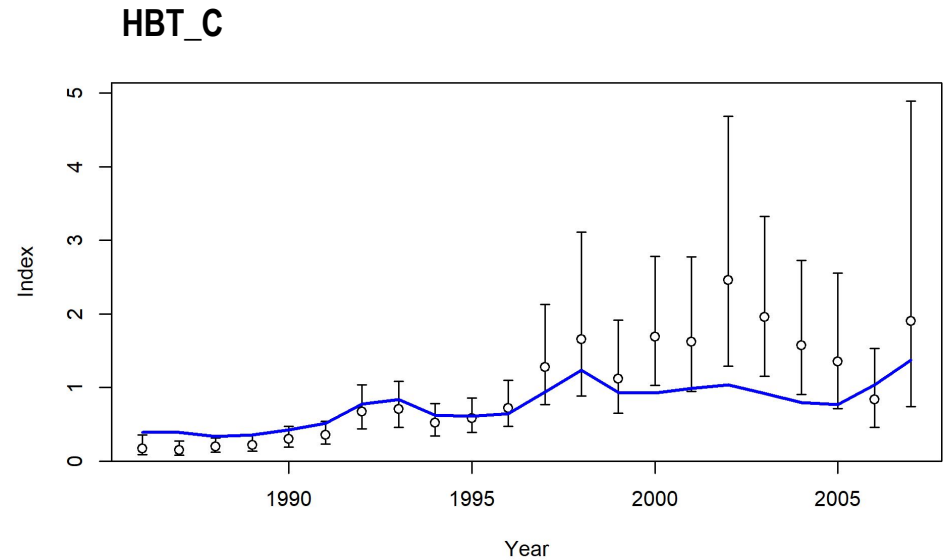
## Consistently an issue



Residual pattern could be tied to impact of management history on index development.

# HBT surveys (Hybrid)

- Surveys fit poorly, were derived from FD data, and included only for their temporal coverage.



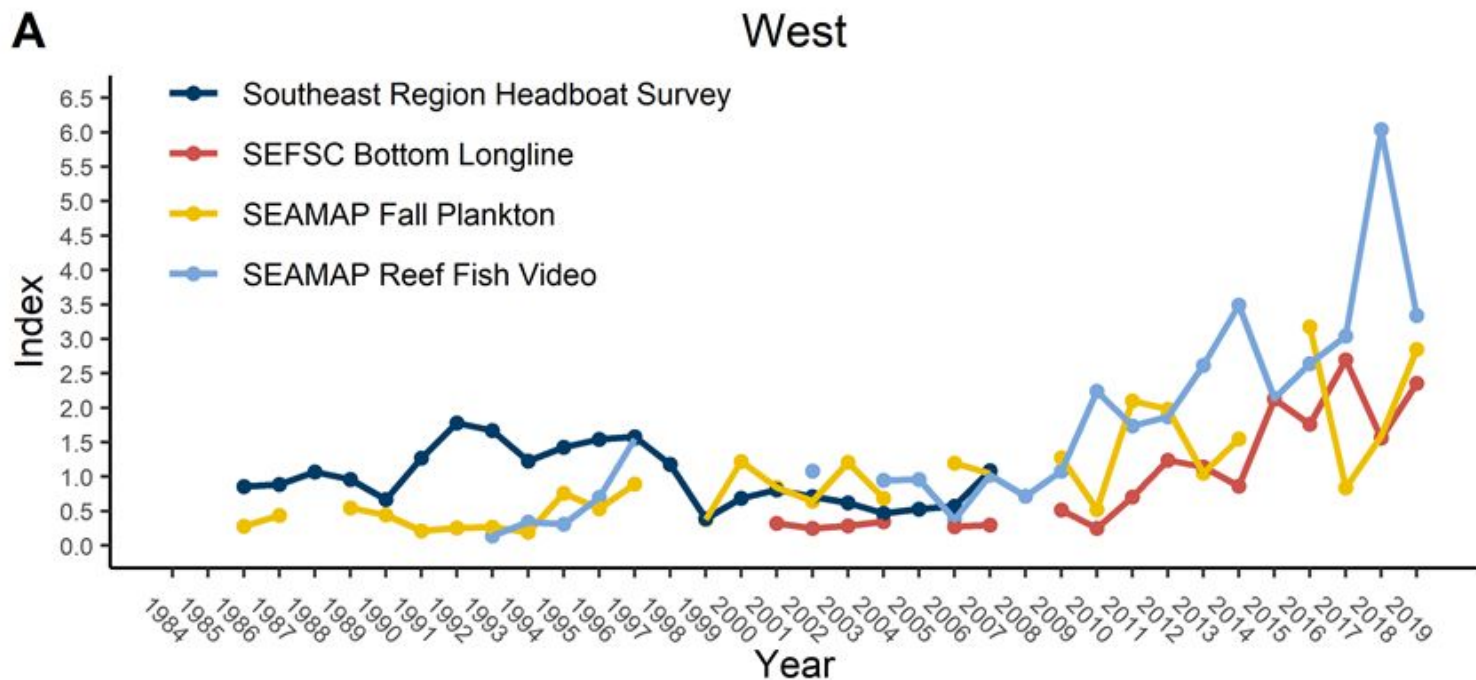


# Data workshop index group suggestions for HBT

- “The west and central indices were recommended by the IWG as suitable to move forward to the assessment phase but with some caveats.”
- “In the western region, the SRHS index can be considered for investigation but may not be needed in favor of a fishery independent survey that covers the same temporal range.”

# HBT West

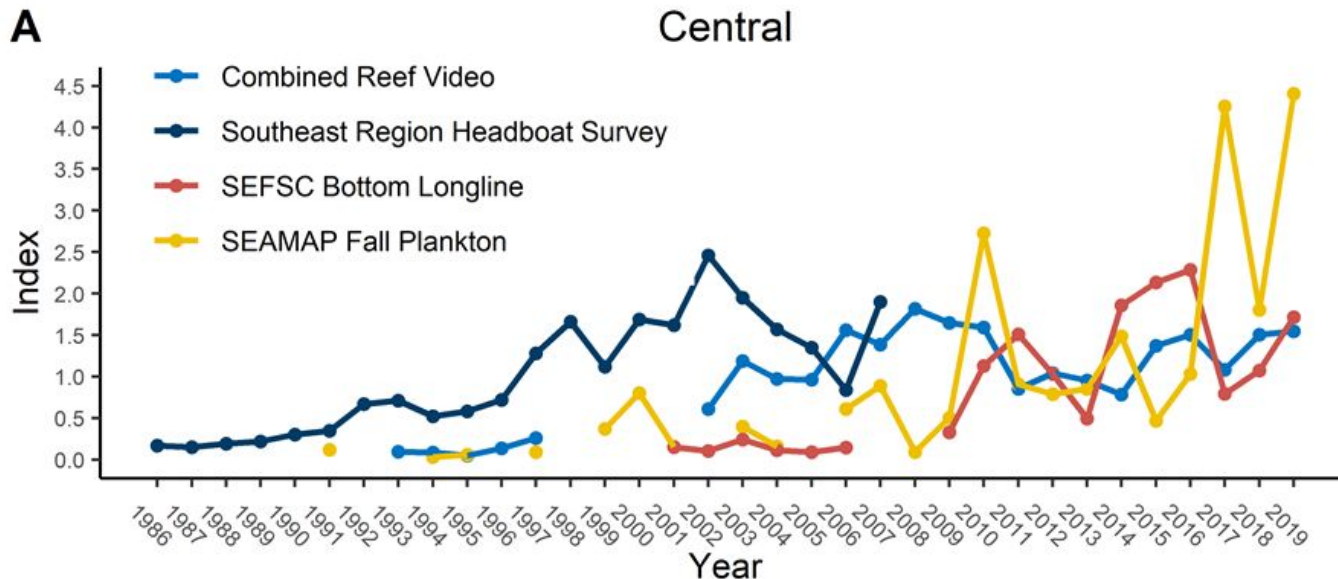
“The assessment team can explore the usefulness of these additional data points to the model. If the west index is used in the assessment model, the assessment analysts should be aware of the potential conflict in relative abundance trends in the early time period between the SRHS data and the other indices for the west.”



# HBT Central

“In the central region, the SRHS index is recommended for use in the assessment, as it was one of the only time series that extended back to 1986.”

- Poor residuals throughout the time series
- No contrasts in abundance early on where it could be useful



# Analytical Team Recommendation

- Remove the HBT indices as they have constantly been an issue to fit, and fail runtests consistently.
- Remaining Fishery Dependent:
  - Commercial Observers East
  - HL E (may be removed pending diagnostics in OA)
- Fishery Independent:
  - SEAMAP summer and fall trawl
  - BLL
  - SEAMAP Plankton
  - GFisher and SEAVid

# Outstanding Concerns to be Addressed in Report

ADT input?

# Discussion/Questions

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