Butterfish 2022 Management Track Assessment

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Outline

- Methods
- Results
- Biological reference points
- Projections
- ABC/P* projections

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Background

- Last benchmark for butterfish was 2021 research track
  - Status: not overfished, overfishing not occurring
- Recommended level of review for June 2022 management track
  - Level 1 (direct delivery)

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Methods: model formulation

- WHAM
- Years: 1989–2021
- Ages: 0 to 4+
- M = 1.278
- Fishery
  - 1 fleet (landings + discards)
  - 2 selectivity time blocks (1989–2013 & 2014–2021)

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Methods: model formulation

- Surveys
  - NEFSC fall Albatross (1989–2008)
  - NEFSC fall Bigelow (2009–2021)
  - NEAMAP fall (2007–2021)
  - NEFSC spring Bigelow (2009–2021)
  - NEAMAP spring (2008–2021)
  - Young-of-the-year index that combines state survey data from ME, MA, RI, CT, NJ and DE (2003–2021)

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Methods: model formulation

- Estimate all NAA as random effects with AR(1) correlation by year, but independent across ages
- Logistic-normal age composition likelihood
  - Self weighting
  - Allows more general correlation structure than multinomial
  - Has outperformed the multinomial in simulation studies

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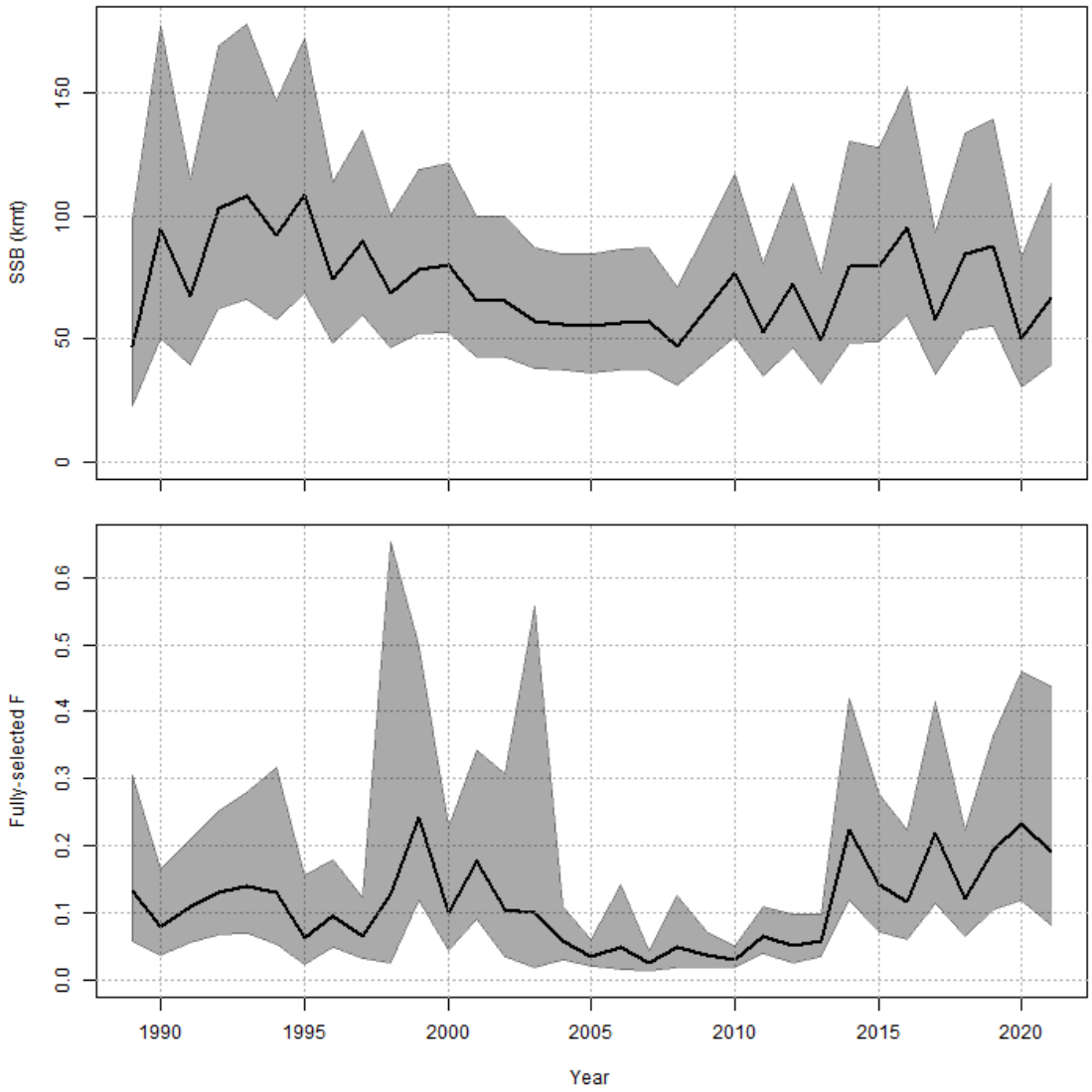

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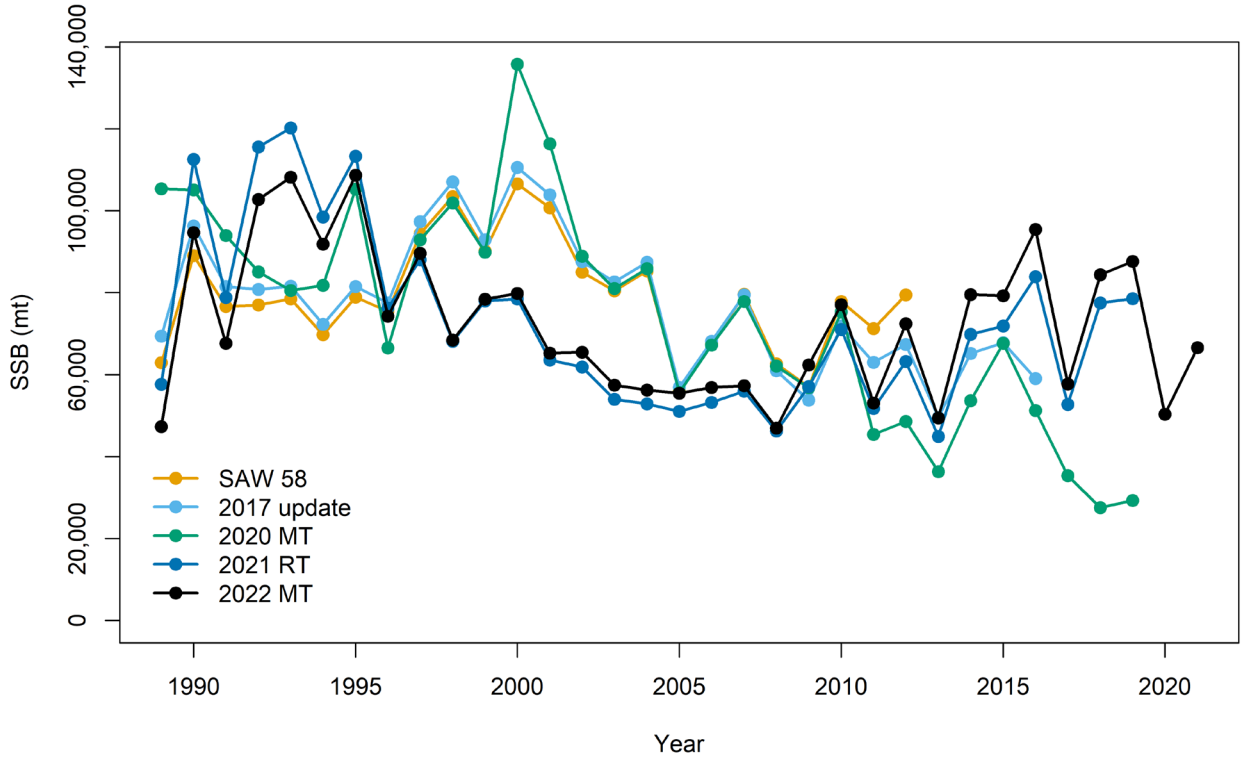
Historical retrospective



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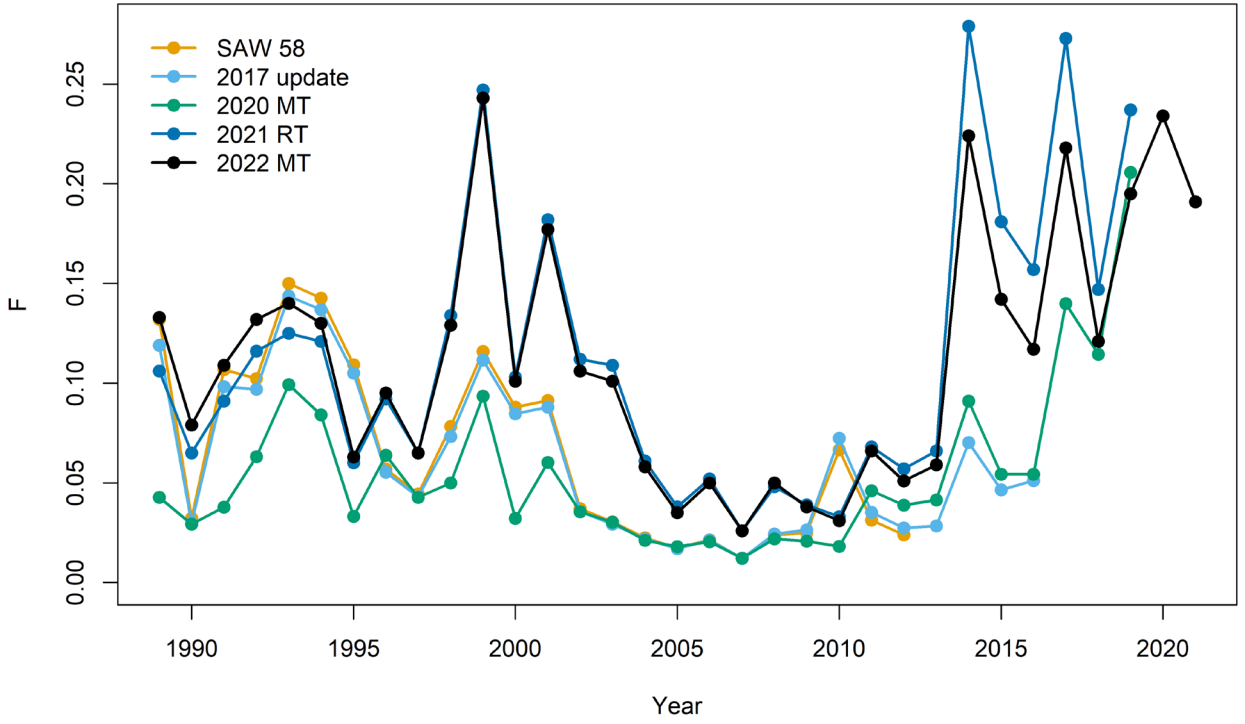

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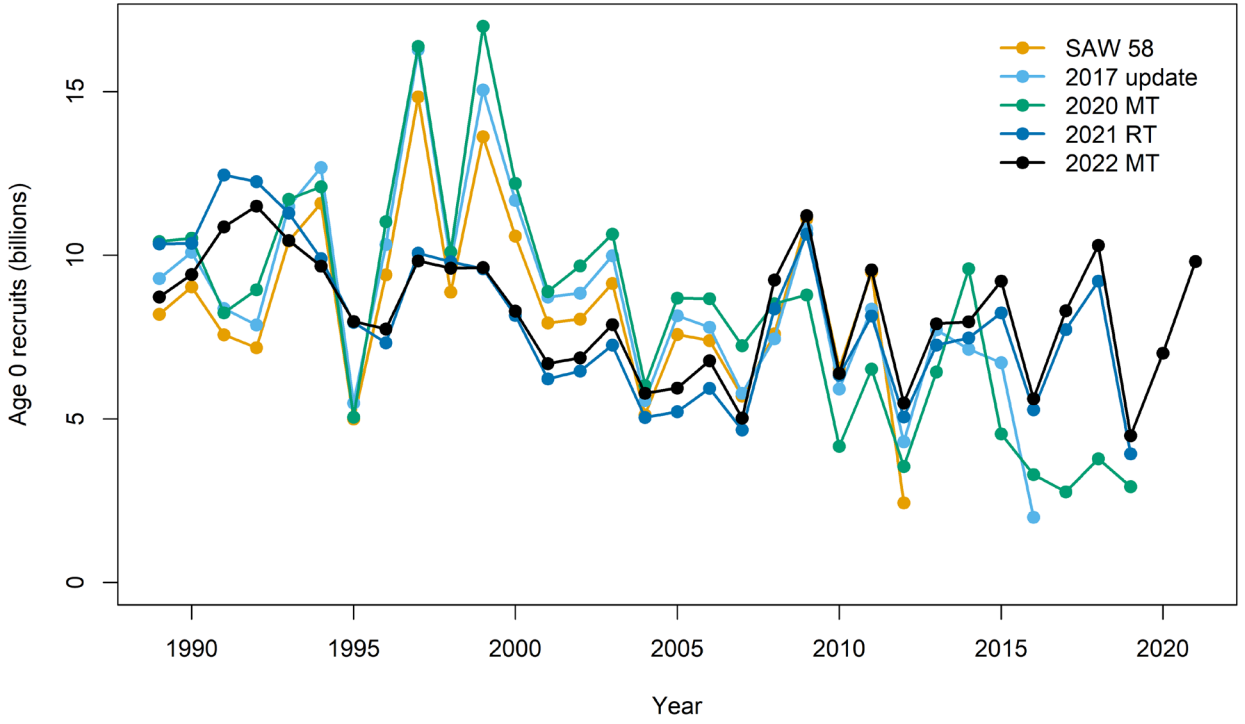
Historical retrospective



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Updated biological reference points

- $F_{50\%SPR}$ and $B_{50\%SPR}$ calculated internally in WHAM assuming
  - Average recruitment over 2011–2021
  - Average SSB per recruit over 2017–2021 (selectivity, maturity, weights at age)
- $F_{50\%} = 5.60$
- $B_{50\%} = 39{,}436$ mt

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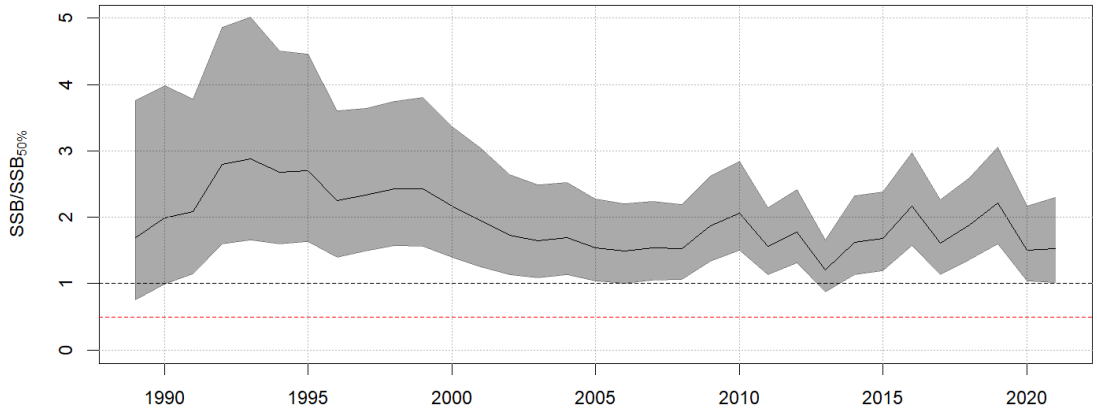

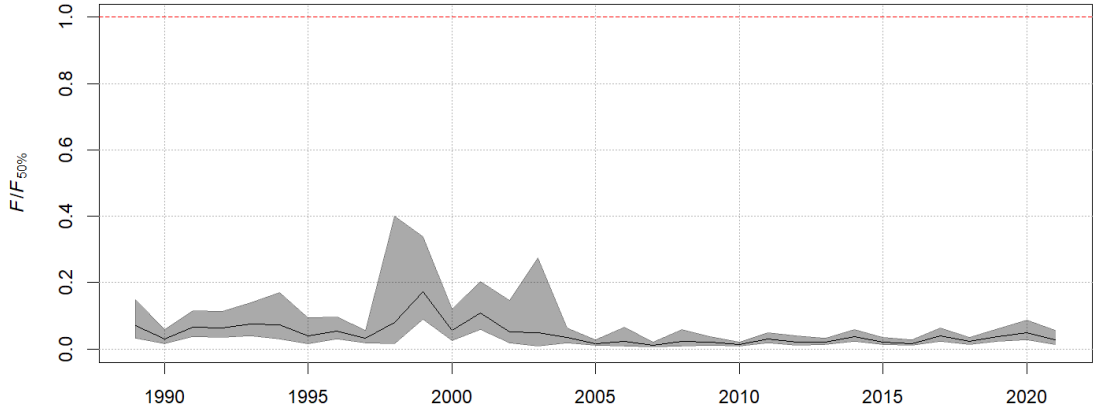

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Panel concerns about $F_{50\%}$

- The Panel had concerns about the high value (>6 per yr, ~ 99.9% mortality for fully selected ages) for the estimated $F_{50\%}$ reference point
- This latter reference point [i.e., F = 2/3M] may be more appropriate given the extremely high value calculated for $F_{50\%}$

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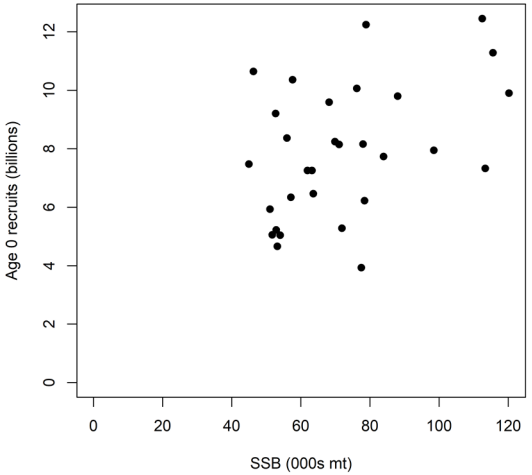
New BRPs

- An $F_{40\%}$ proxy was briefly considered, but was abandoned because it was unrealistically high (i.e., ~10), and $B_{40\%}$ was less than any biomass in the time series
- An ICES B_{loss} approach was considered but abandoned because the stock does not appear to have ever been depleted



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New BRPs

- Assume a symmetrical production curve
  - $B_{MSY} = 0.5 \times B_0$ (in the absence of a stock-recruit curve this equates to $B_{50\%SPR}$)
  - Overfished = $0.5 \times B_{MSY}$
  - Classical theoretical underpinnings
  - Generally in line with the MAFMC's Ecosystem Approach to Fisheries Management guidance for forage fish

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Projections

- Assumption that the NAA deviations follow an AR(1) process is continued into the projection period for consistency
- Assumed same recruitment years as reference points
- Assumed same selectivity, maturity, weights at age as reference points
- Assumed maximum annual catch since the resumption of the directed fishery for 2022
  - 5085 mt (2019)

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Projections

Year	Catch (mt)		SSB (mt)		F
2022	5,085		76,278	(43,316 - 134,322)	0.263
2023	67,900	(36,451 - 126,481)	45,573	(22,253 - 93,330)	5.596
2024	43,109	(22,001 - 84,468)	39,352	(18,230 - 84,948)	5.596

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Uncertainties

- The uncertainty in the reference points (estimation and choice of appropriate BRPs) was not fully considered
- In particular, the uncertainty in the scale of the population was not fully considered because the assumed catchability of NEFSC fall [Albatross] trawl survey heavily affects the $B_{50\%}$ reference point

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Summary

- Level 1 (direct delivery)
  - No peer review necessary
- No change in stock status
  - Not overfished, overfishing not occurring

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Requested projections for 2023–2024

- Fishing at the current F_{MSY} proxy (5.6) with 150% CV
- Fishing at 2/3M (0.85) with 150% CV
- Fishing at 2/3M (0.85) with 100% CV

- All three assume highest annual catch since resumption of directed fishery for 2022
  - 5085 mt (2019)

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Requested projections for 2023–2024

Year	OFL Catch	ABC Catch	ABC F	ABC SSB	ABC P*
2023	67,900	66,076	5.329	46,479	0.490
2024	43,665	39,616	4.838	41,303	0.464

F = 5.6
CV = 150%

Year	OFL Catch	ABC Catch	ABC F	ABC SSB	ABC P*
2023	17,631	17,157	0.824	70,947	0.490
2024	16,113	15,681	0.823	65,210	0.490

F = 0.85
CV = 150%

Year	OFL Catch	ABC Catch	ABC F	ABC SSB	ABC P*
2023	17,631	17,267	0.830	70,896	0.490
2024	16,096	15,764	0.830	65,138	0.490

F = 0.85
CV = 100%

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Backup slides

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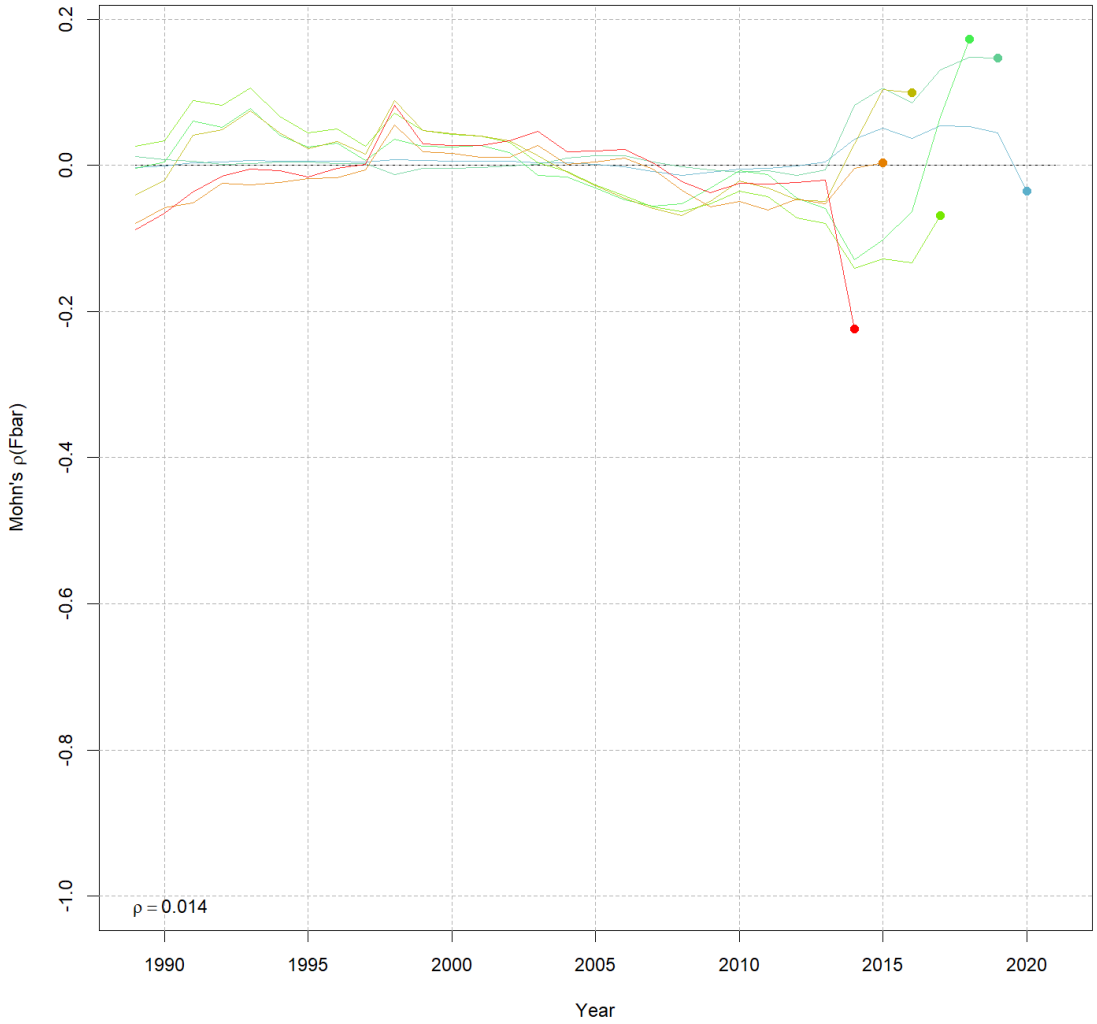

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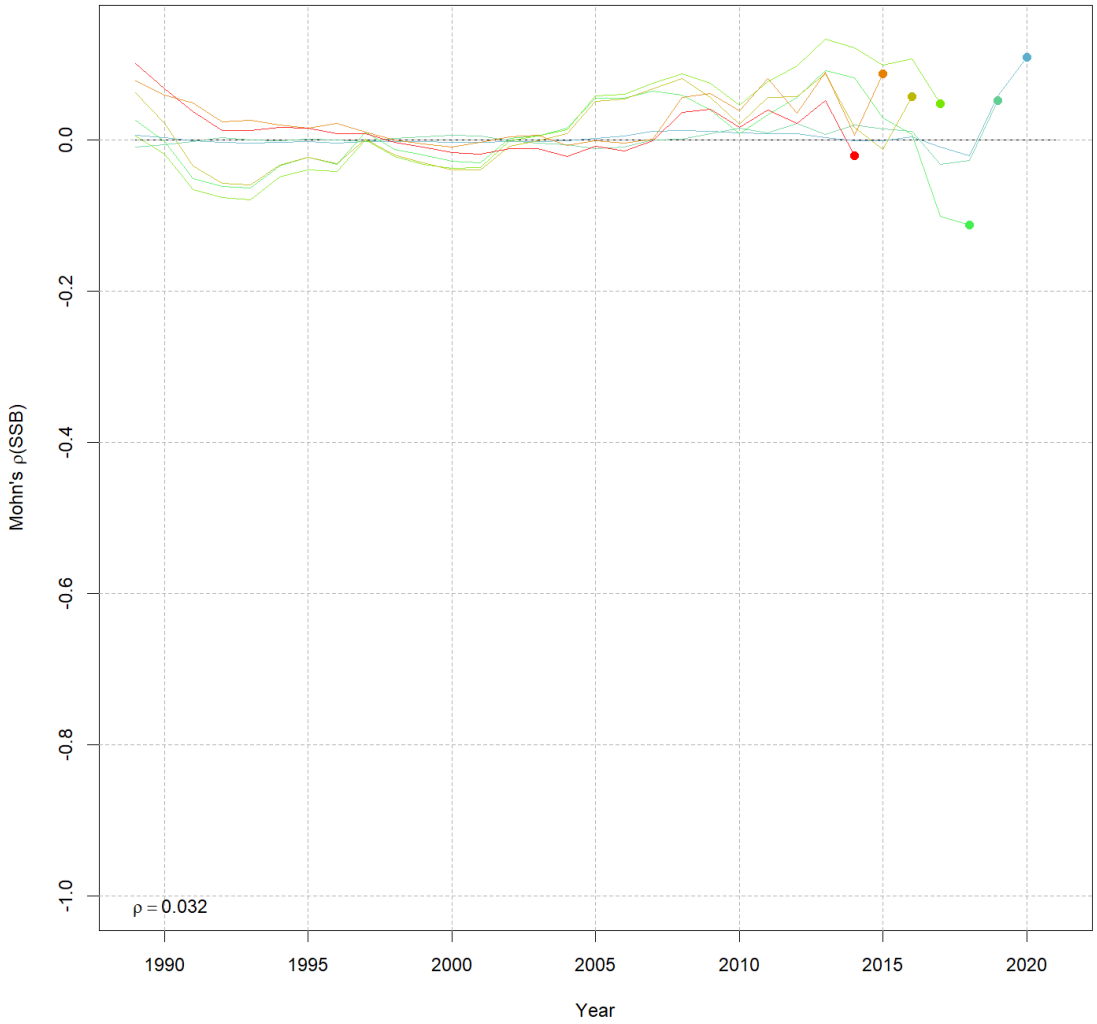

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SAW 58 F_{MSY} proxy

- Previous F_{MSY} proxy = $2/3M$ based on Patterson (1992)
- Concerns with Patterson (1992)
  - Methods used were intended to identify a reference point that would induce stability in biomass, and not necessarily identify an F_{MSY} proxy
  - Used VPA estimates of biomass and exploitation rate, which are known to produce spurious trends under many circumstances (Lapointe et al. 1989, 1992)
  - Use of stock assessment output as data without due consideration of uncertainty has also been criticized (Brooks and Deroba 2015)

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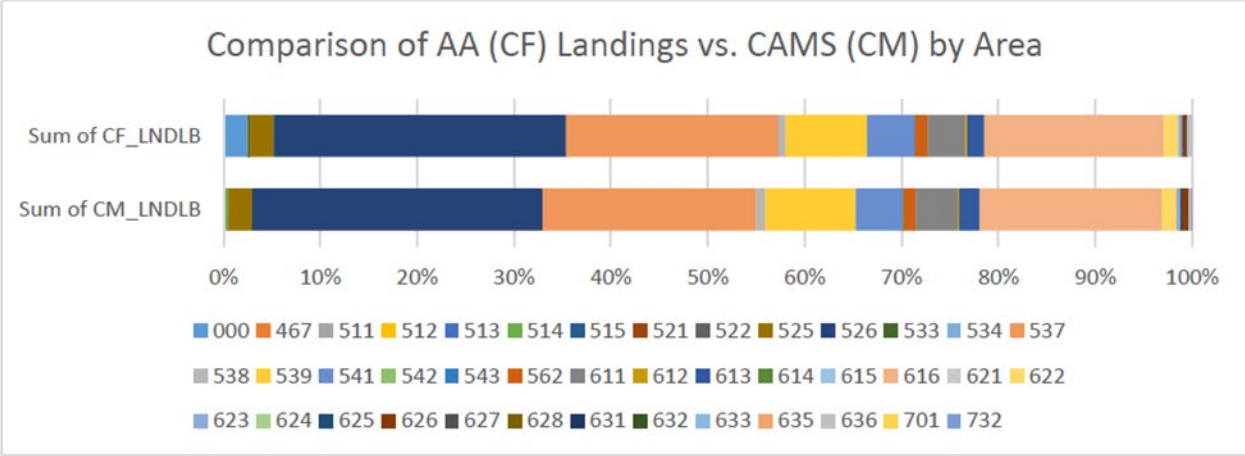
Comparison of AA (CF) Landings vs. CAMS (CM) by Area
Sum of CF_LNDLB
Sum of CM_LNDLB
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
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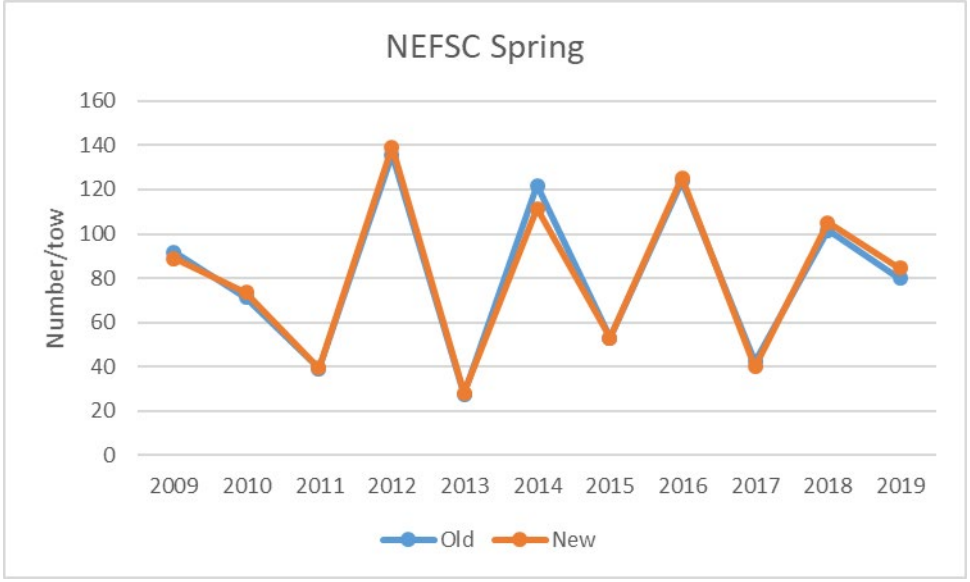

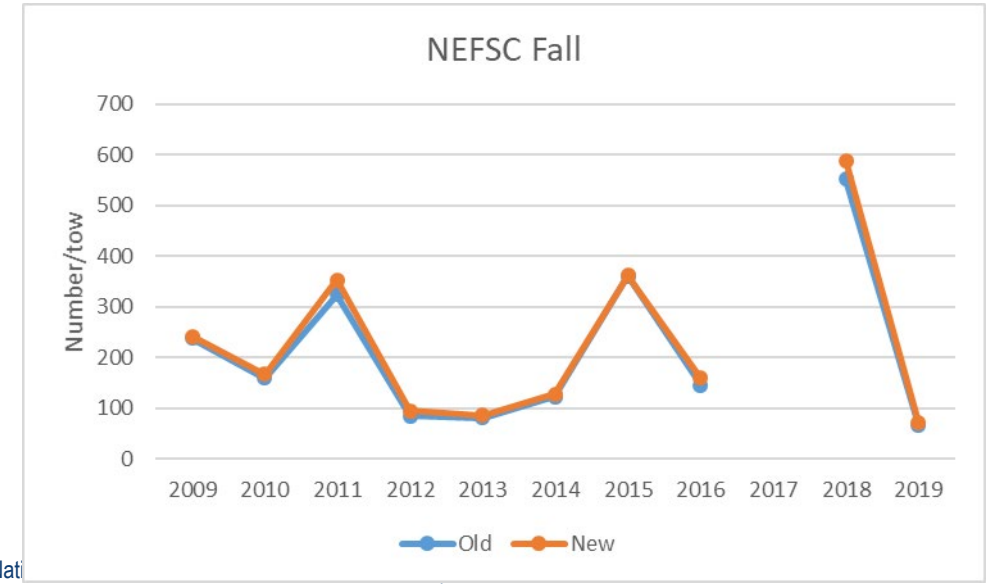

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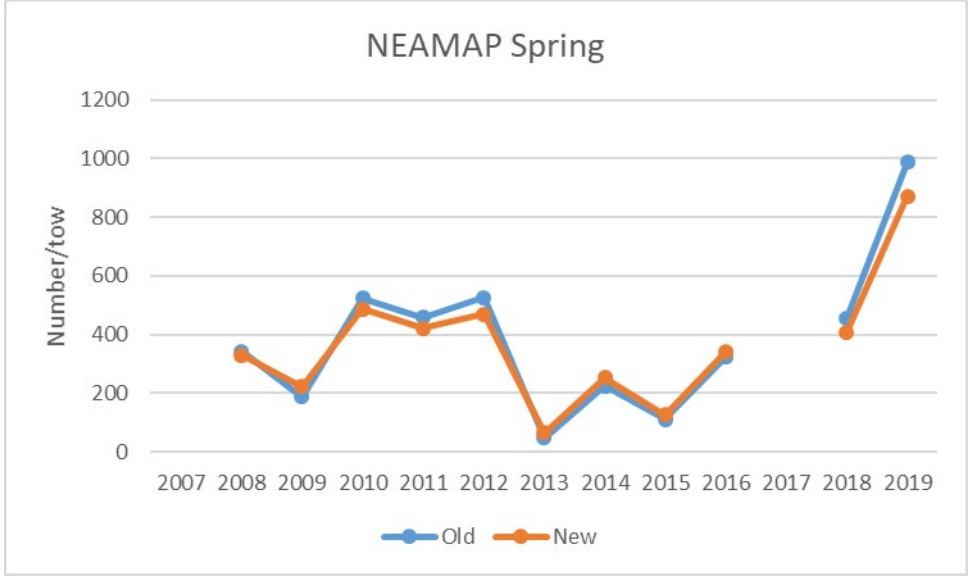

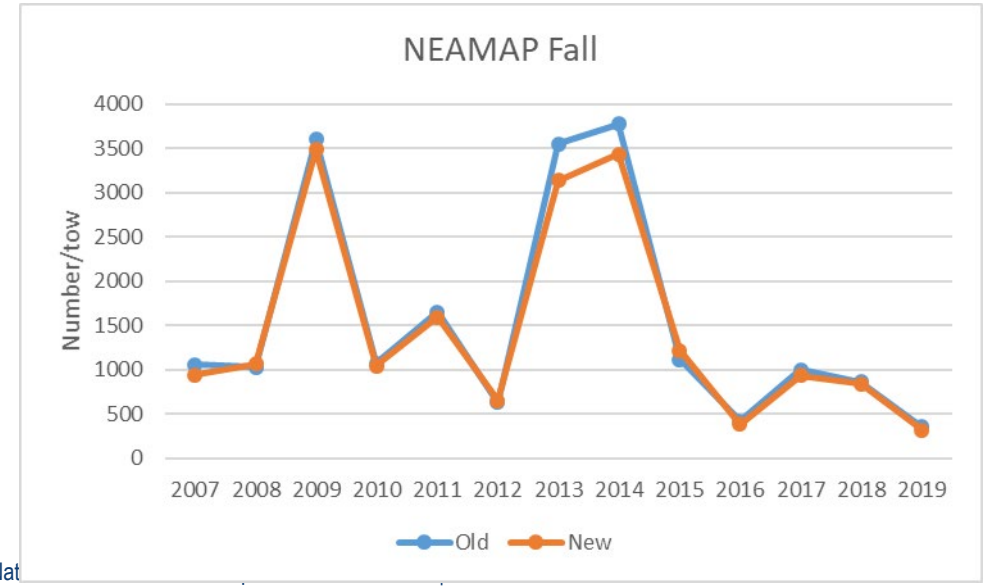

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