

Figure 1. Statistical areas used for butterfish landings and discard estimates.

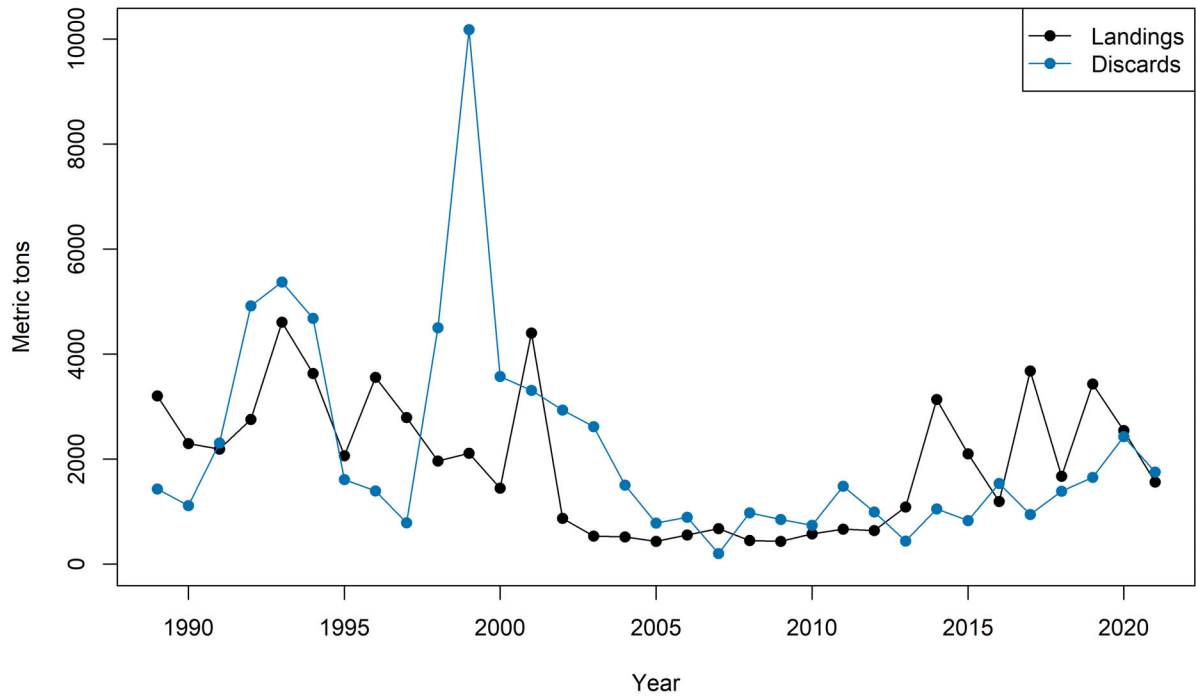


Figure 2. Landings and discards of butterfish, 1989–2021.

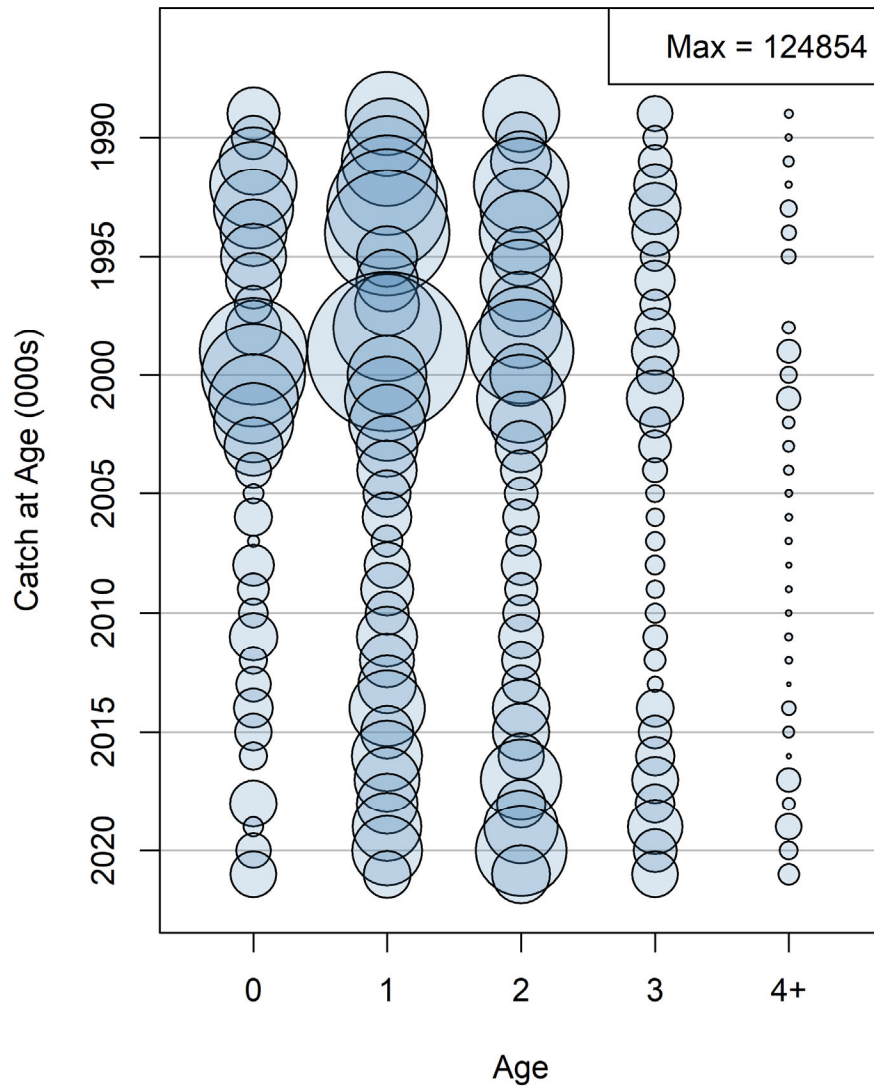


Figure 3. Butterfish commercial catch numbers (000s) at age, 1989–2021.

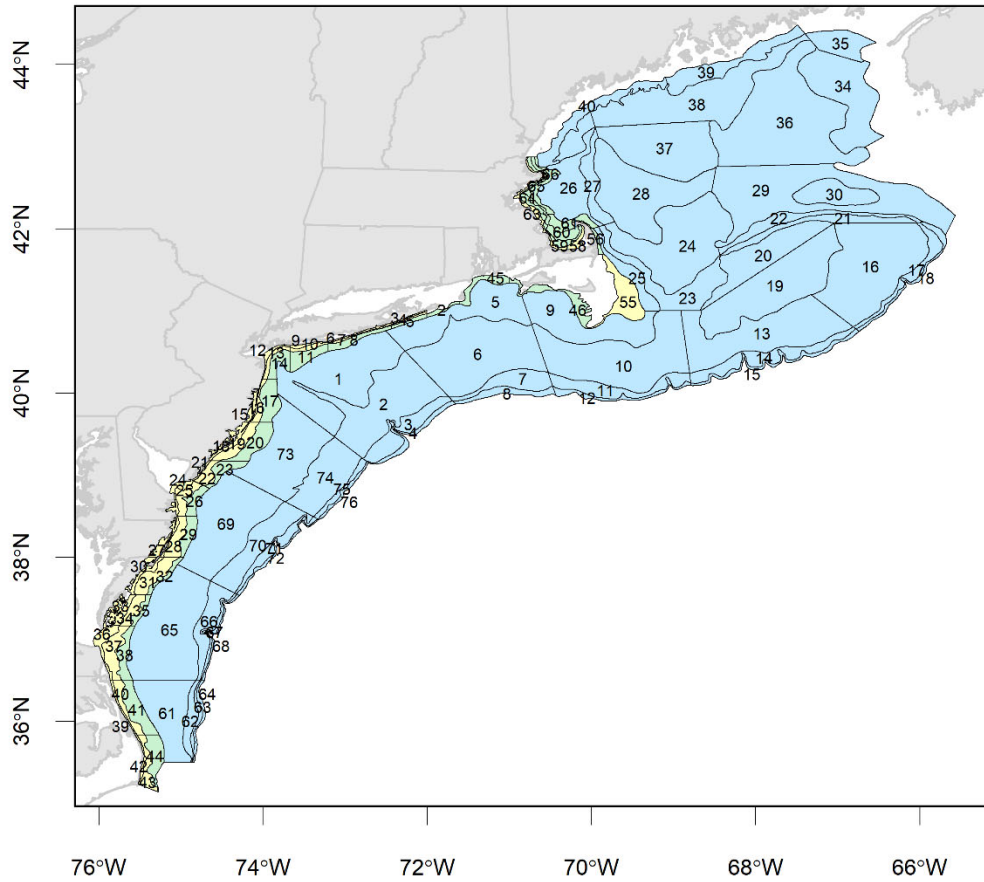


Figure 4. Northeast Fisheries Science Center bottom trawl survey strata. Offshore strata (prefix 01) are in blue while inshore strata (prefix 03) are in green. The shallow inshore strata (< 18 m) that were sampled by the Albatross but are not sampled by the Bigelow are in yellow.

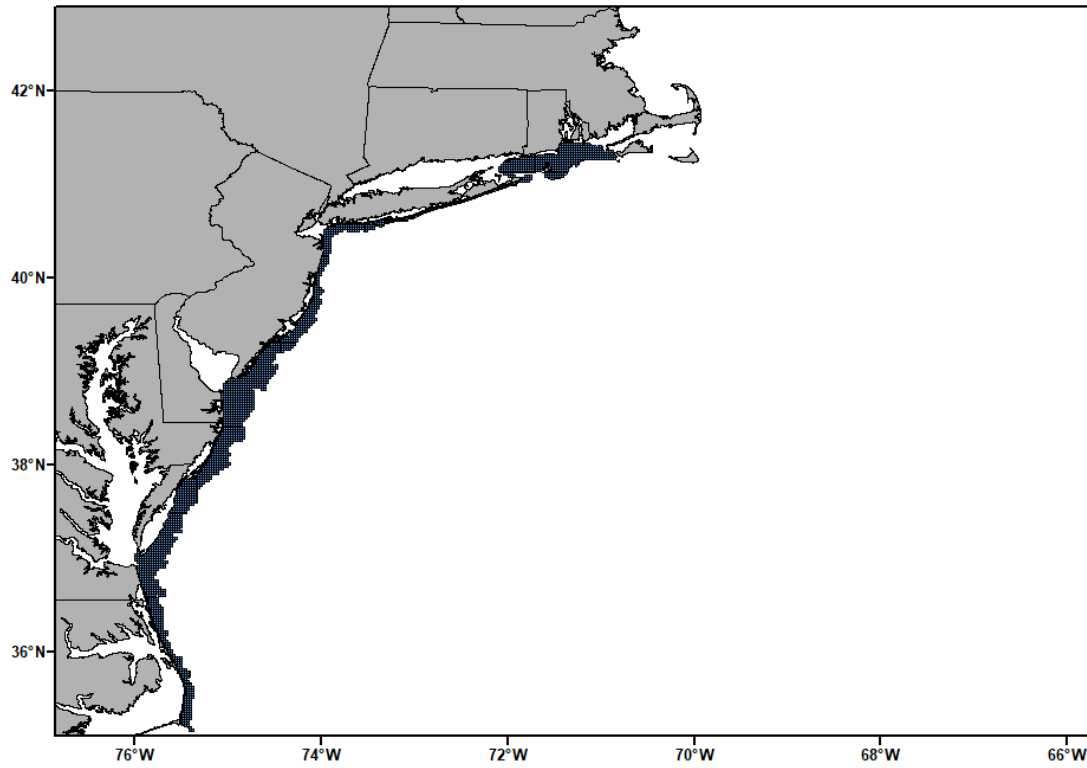


Figure 5. Northeast Area Monitoring and Assessment Program (NEAMAP) bottom trawl survey cells.

NEFSC

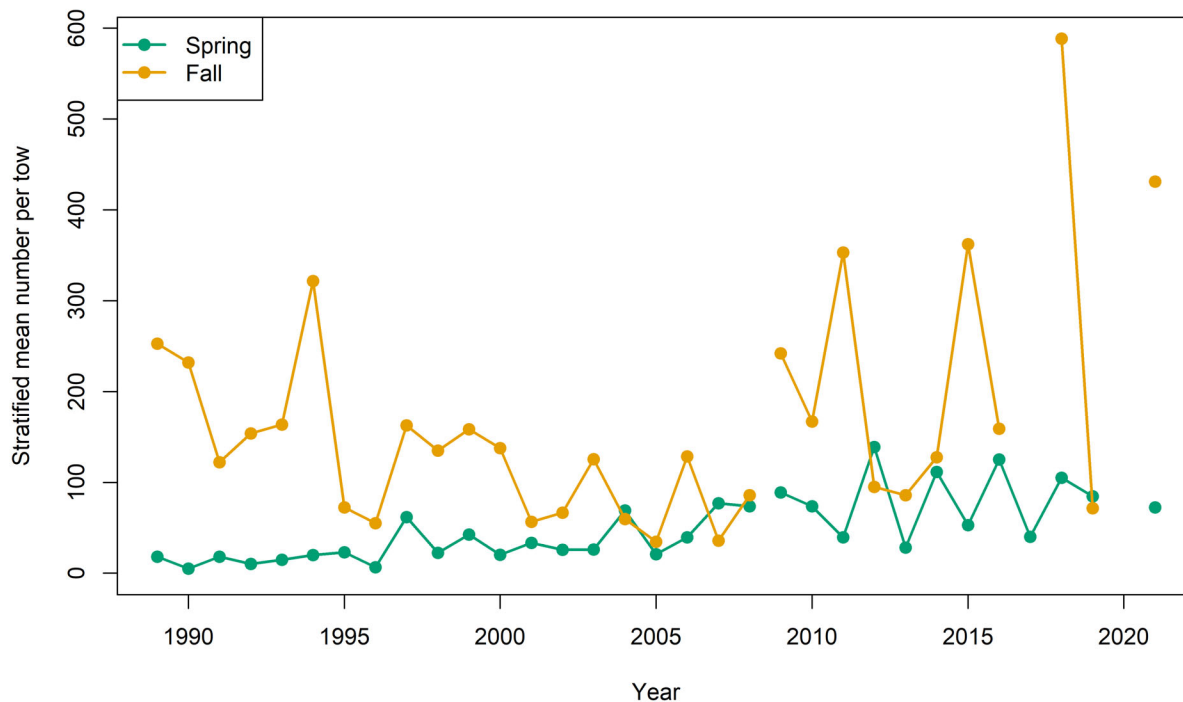


Figure 6. Northeast Fisheries Science Center bottom trawl survey stratified mean number per tow for butterflyfish. Strata for Albatross (1989–2008) and Bigelow (2009–2019) years are shown in Figure 4. The fall 2017 index is NA because only 29 of 77 strata were sampled. No surveys were conducted in 2020 due to COVID-19.

NEFSC Spring

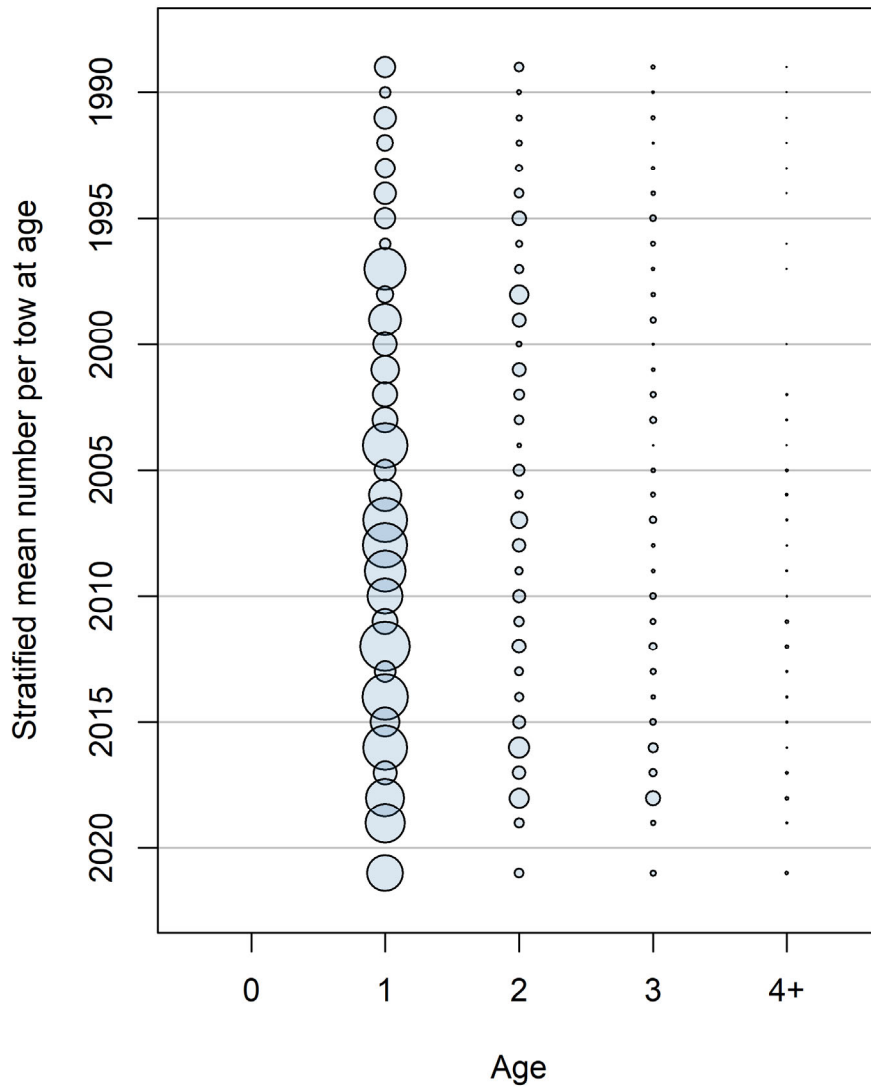


Figure 7. Northeast Fisheries Science Center spring bottom trawl survey stratified mean number per tow at age for butterfish. Bigelow data (2009–2021) are calibrated to Albatross units using the coefficients in Miller et al. (2010) to facilitate cohort tracking. No survey was conducted in 2020 due to COVID-19.

NEFSC Fall

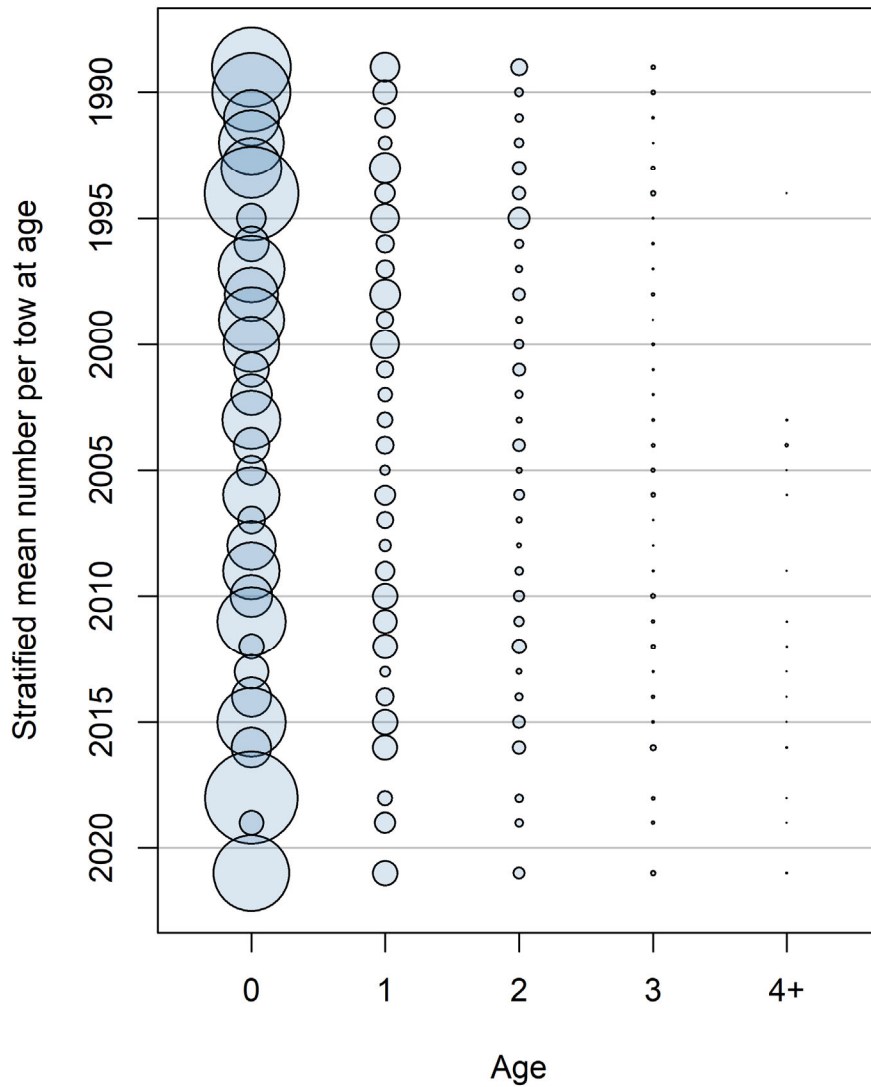


Figure 8. Northeast Fisheries Science Center fall bottom trawl survey stratified mean number per tow at age for butterfish. Bigelow data (2009–2021) are calibrated to Albatross units using the coefficients in Miller et al. (2010) to facilitate cohort tracking. The fall 2017 indices are NA because only 29 of 77 strata were sampled and no ages were collected. No survey was conducted in 2020 due to COVID-19.

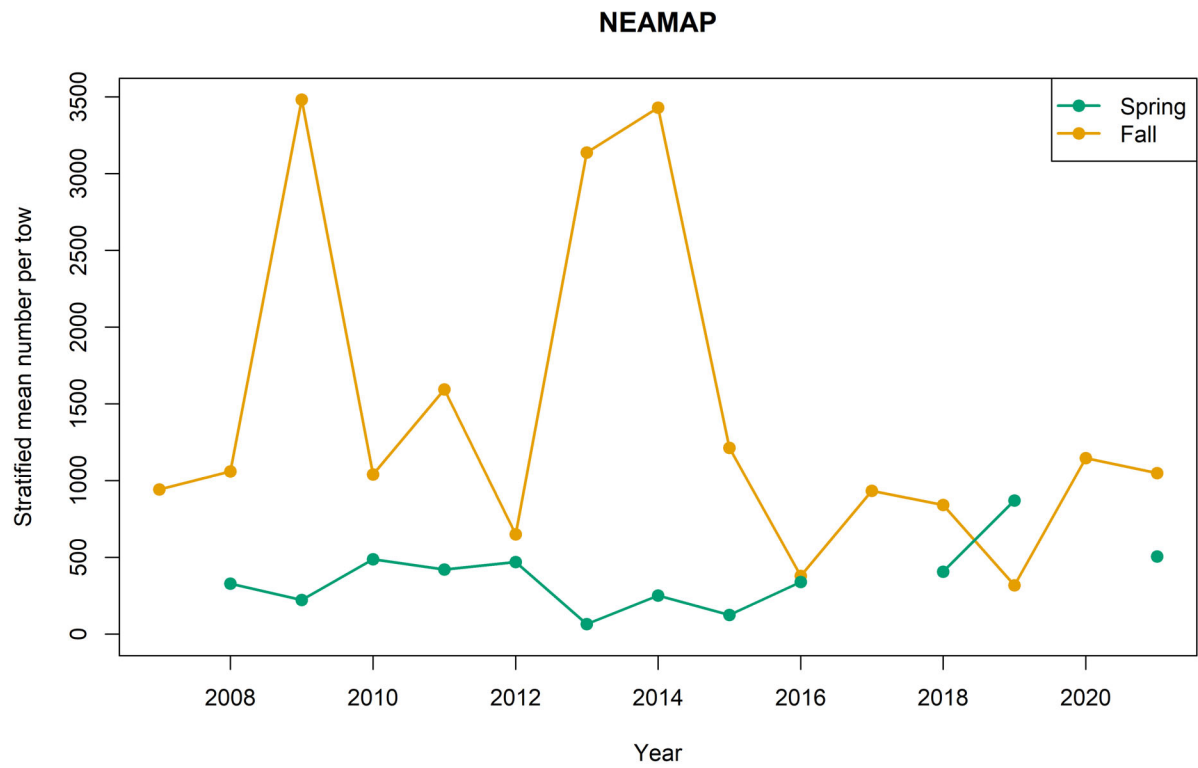


Figure 9. Northeast Area Monitoring and Assessment Program bottom trawl survey arithmetic stratified mean number per tow for butterfish. The spring 2017 index is NA because only 63 of 150 stations were sampled. No spring survey was conducted in 2020 due to COVID-19.

NEAMAP Spring

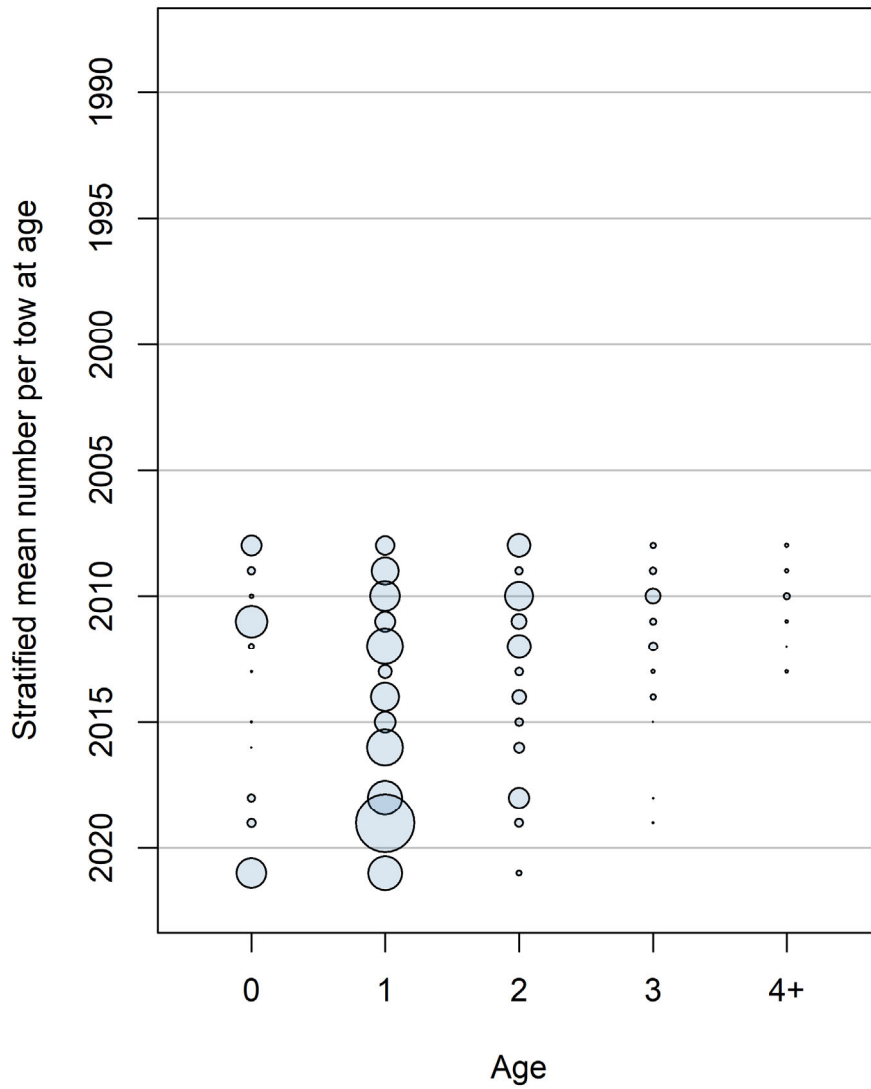


Figure 10. Northeast Area Monitoring and Assessment Program spring bottom trawl survey arithmetic stratified mean number per tow at age for butterfish. The 2017 indices are NA because only 63 of 150 stations were sampled. No spring survey was conducted in 2020 due to COVID-19.

NEAMAP Fall

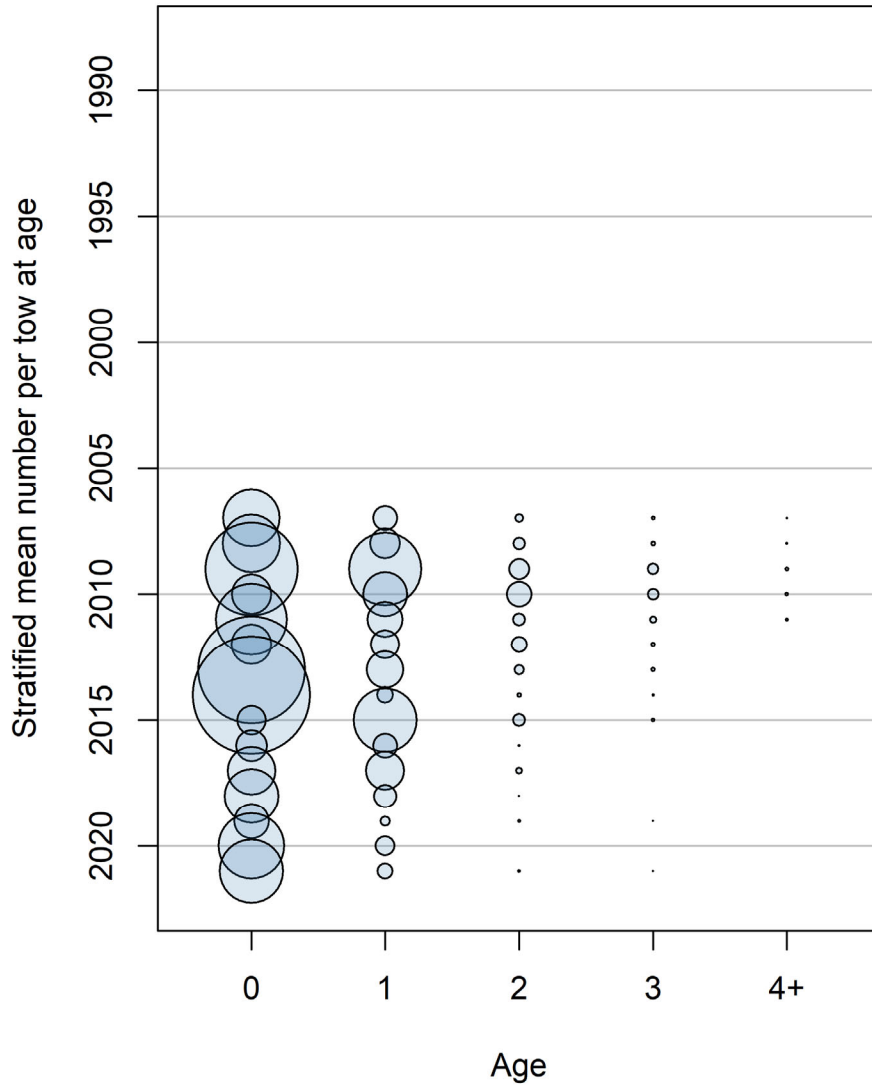


Figure 11. Northeast Area Monitoring and Assessment Program fall bottom trawl survey arithmetic stratified mean number per tow at age for butterfish.

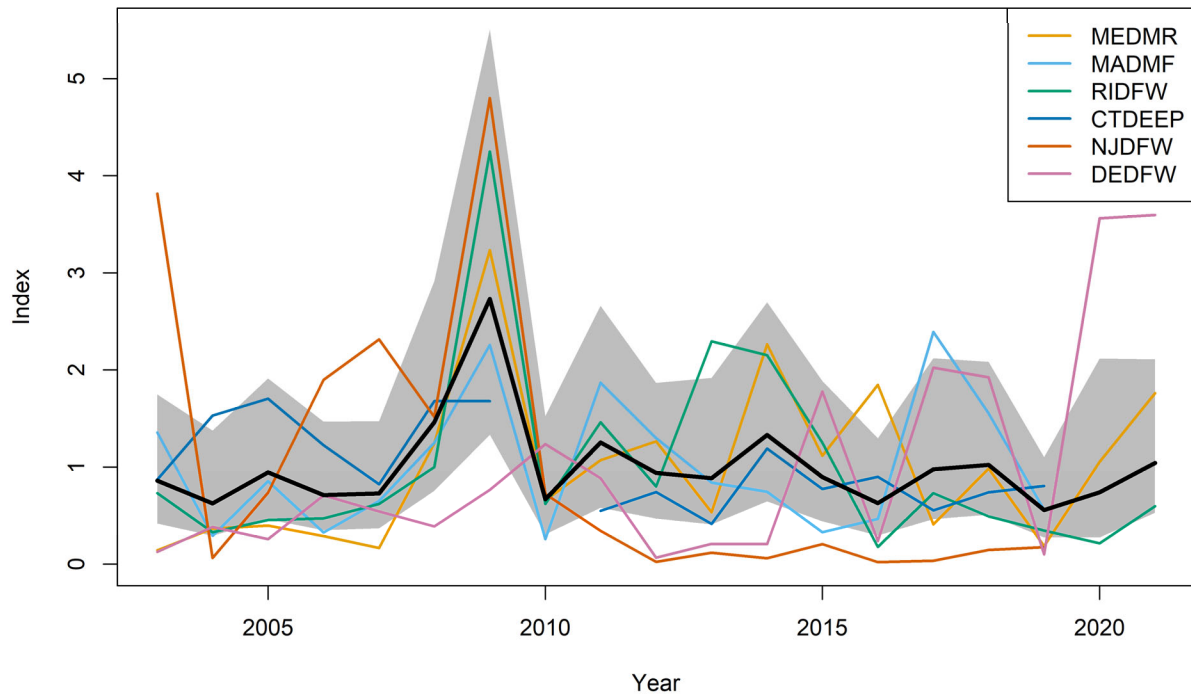


Figure 12. Combined young-of-the-year (YOY) index (black line) and associated 95% credible interval (shaded area). Standardized YOY indices for the state surveys are also shown for comparison. Survey acronyms are: Maine Department of Marine Resources (MEDMR); Massachusetts Division of Marine Fisheries (MADMF); Rhode Island Department of Fish and Wildlife (RIDFW); Connecticut Department of Energy and Environmental Protection (CTDEEP); New Jersey Division of Fish and Wildlife (NJDFW); Delaware Division of Fish and Wildlife (DEDFW).

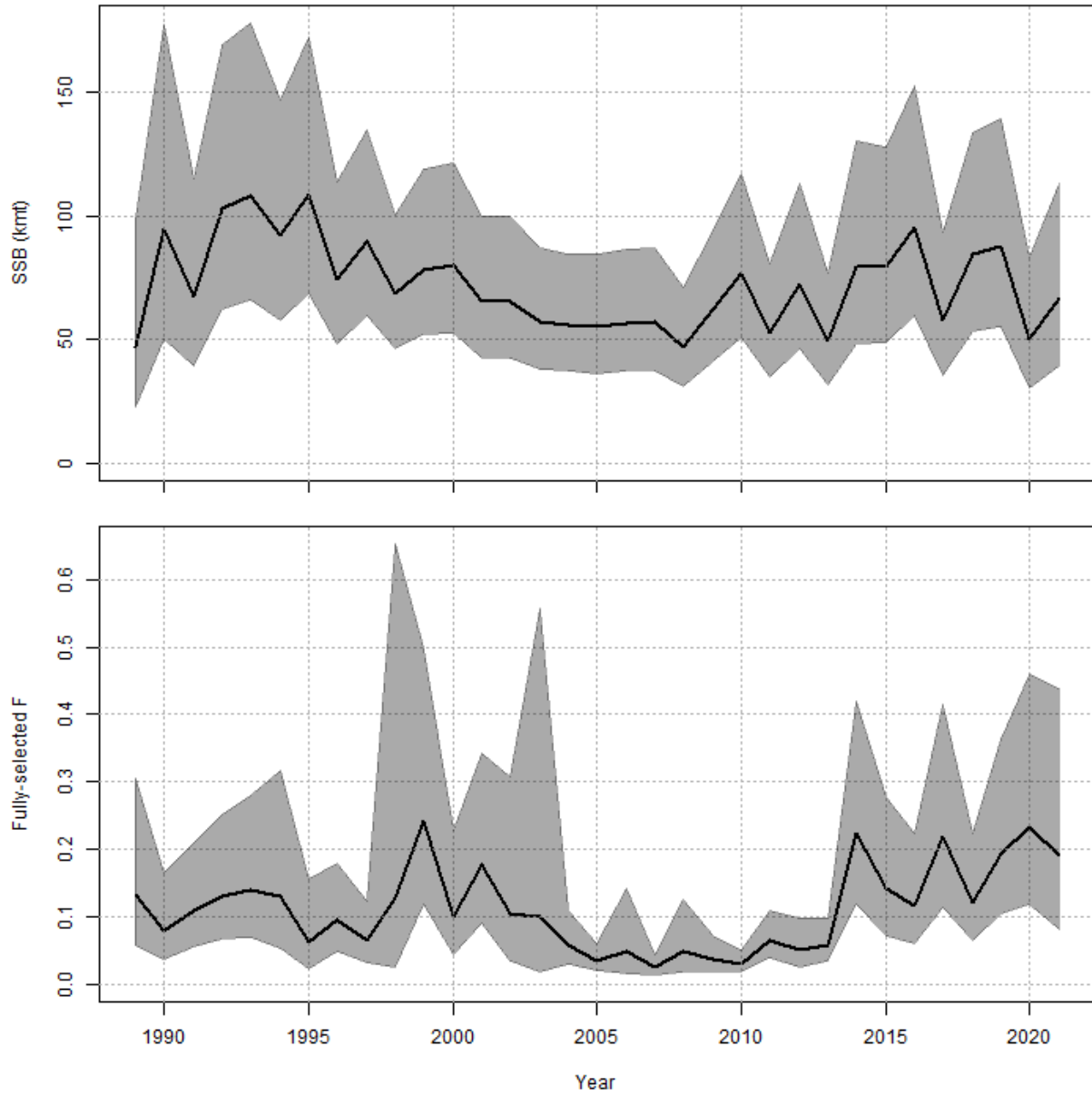


Figure 13. Model estimates of spawning stock biomass and fully selected fishing mortality (age 3), and 95% confidence intervals.

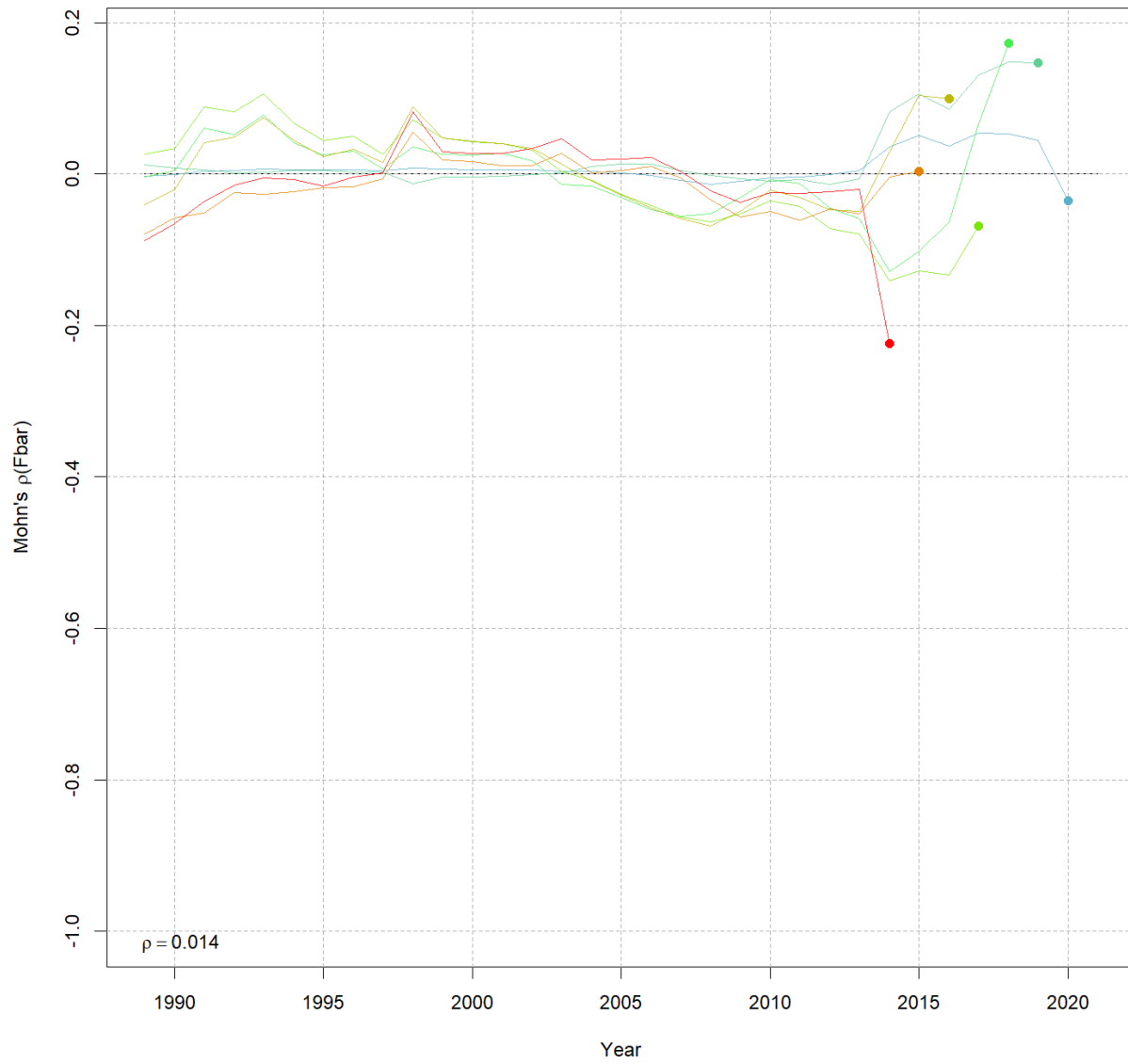


Figure 14. Results of internal model retrospective analysis for fully selected F (age 3).

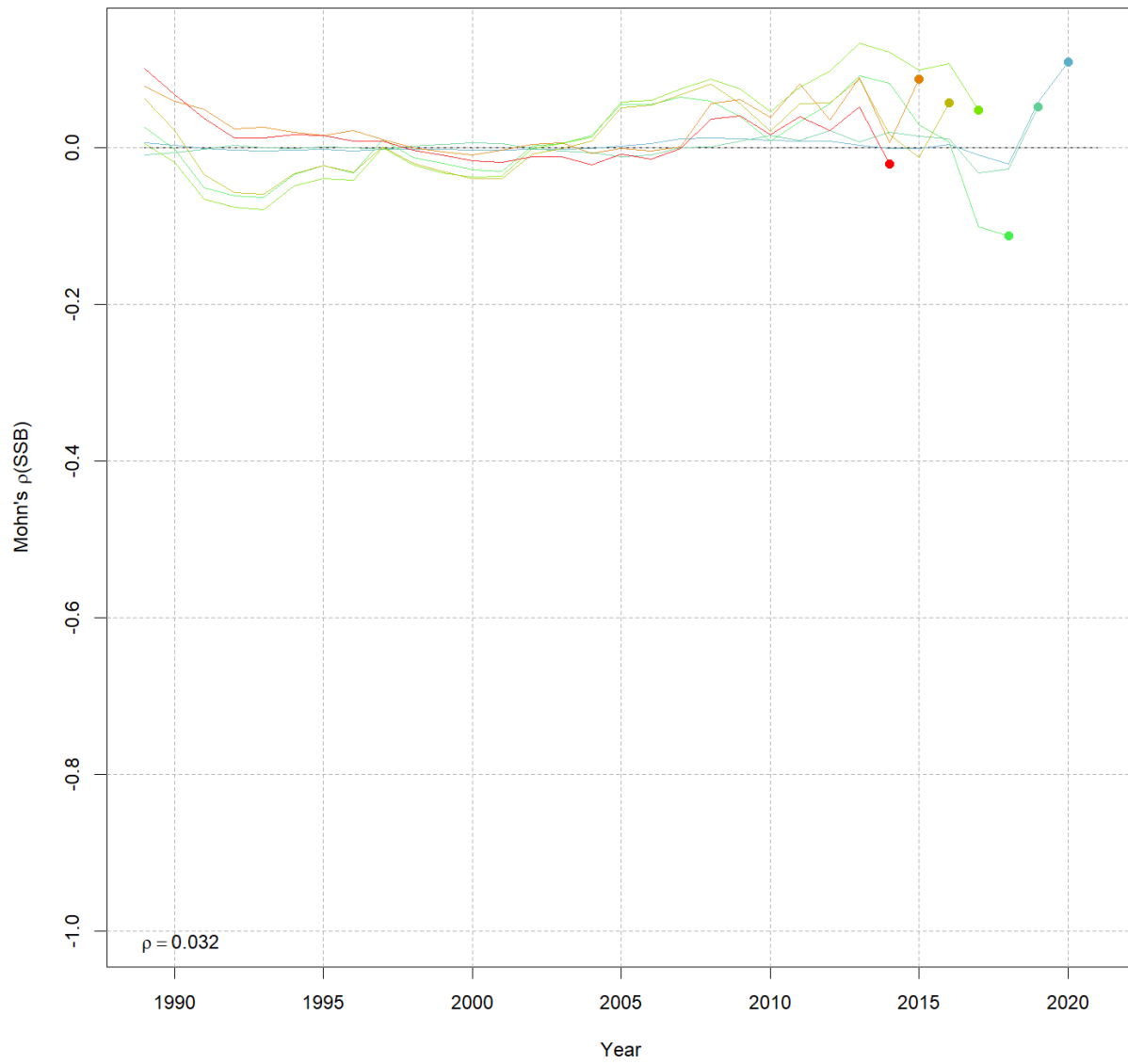


Figure 15. Results of internal model retrospective analysis for spawning stock biomass.

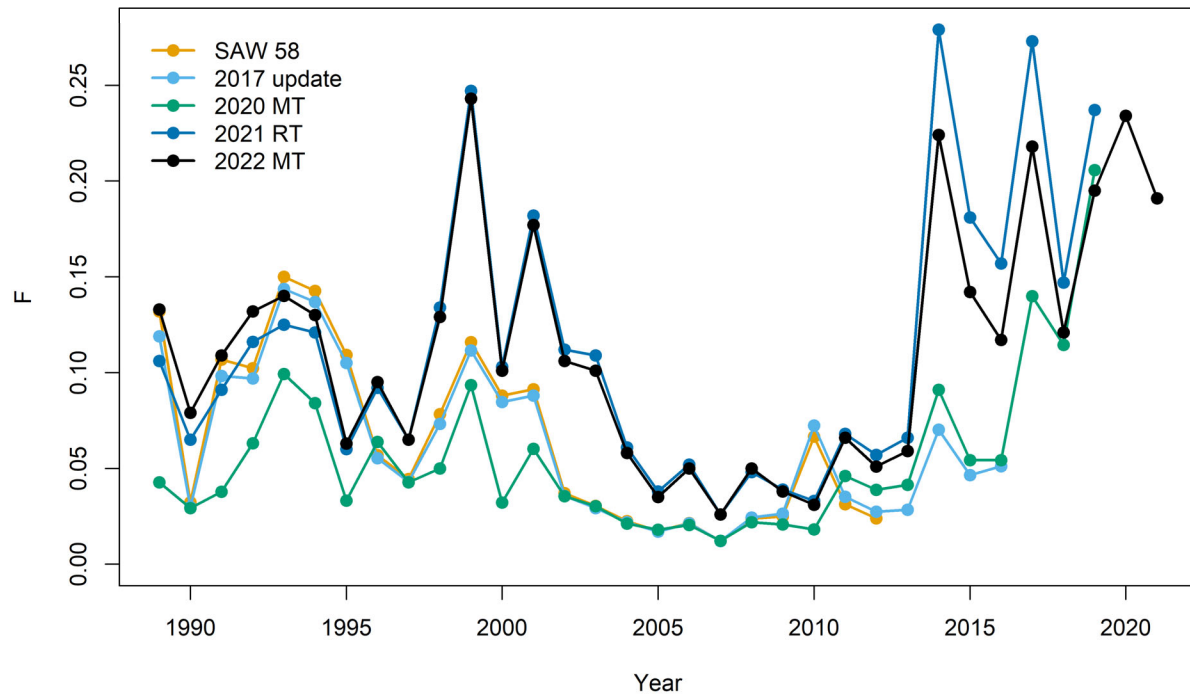


Figure 16. Historical retrospective for butterflyfish fishing mortality from SAW 58, the 2017 model update, the 2020 management track, the 2021 research track and the 2022 management track. Note that for the 2021 RT and 2022 MT models F is fully selected for age 3, whereas for the earlier models it is fully selected for ages 2 to 4+.

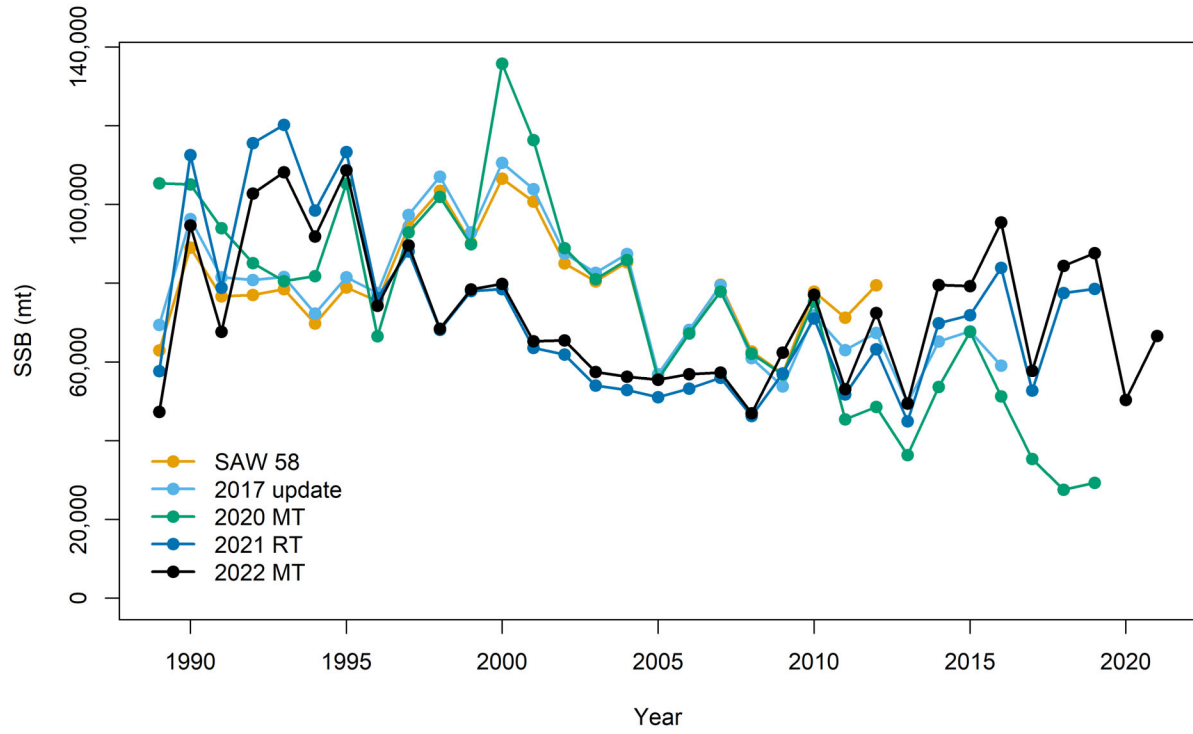


Figure 17. Historical retrospective for butterfish spawning stock biomass from SAW 58, the 2017 model update, the 2020 management track, the 2021 research track and the 2022 management track.

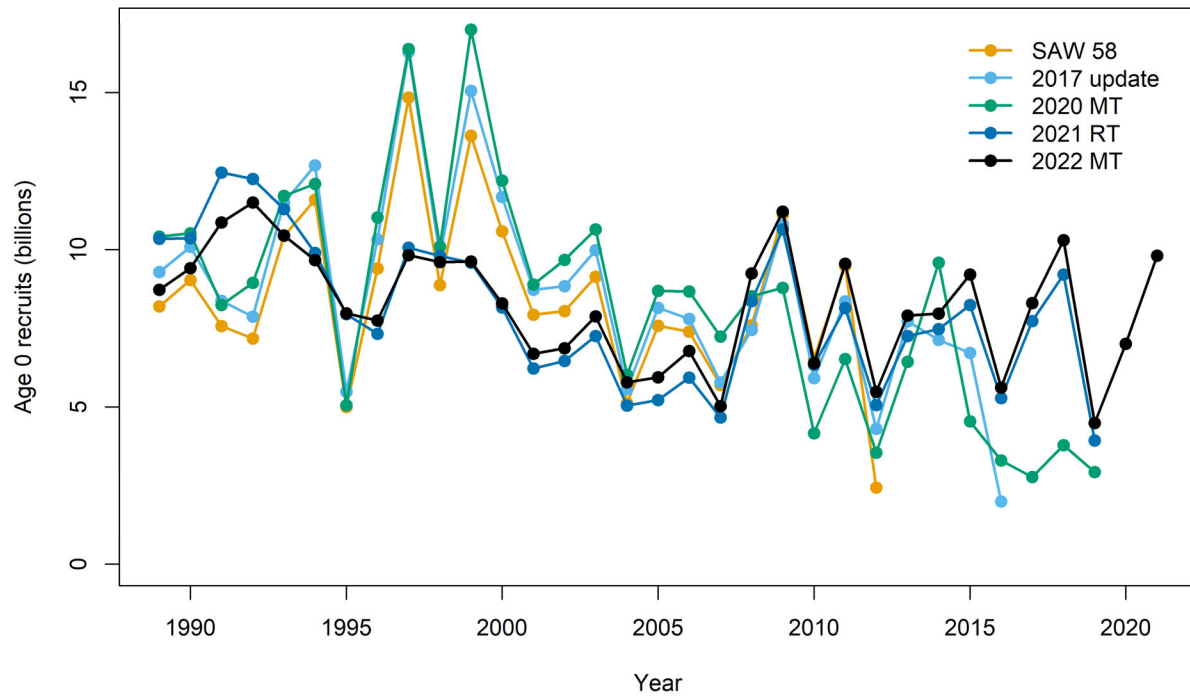


Figure 18. Historical retrospective for butterfish recruitment from SAW 58, the 2017 model update, the 2020 management track, the 2021 research track and the 2022 management track.

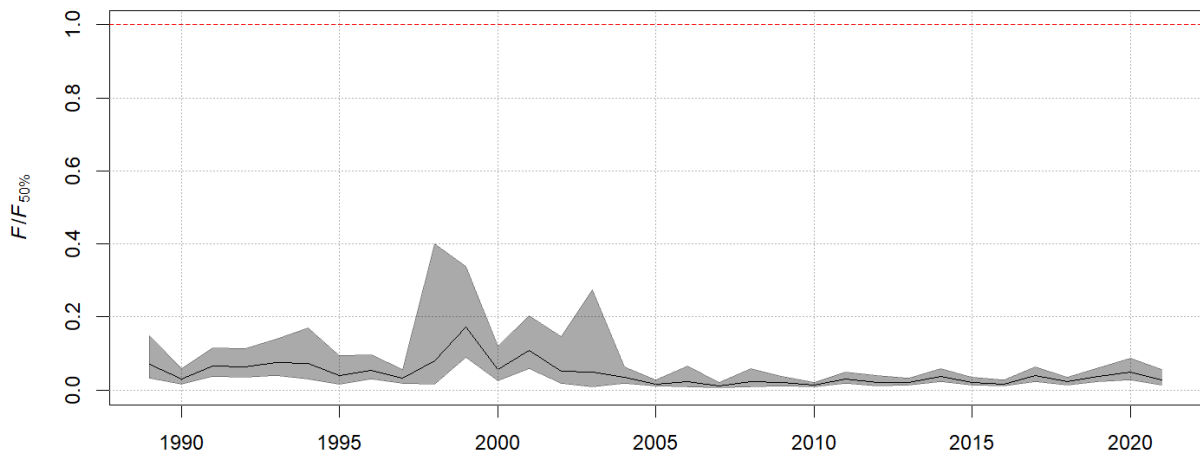
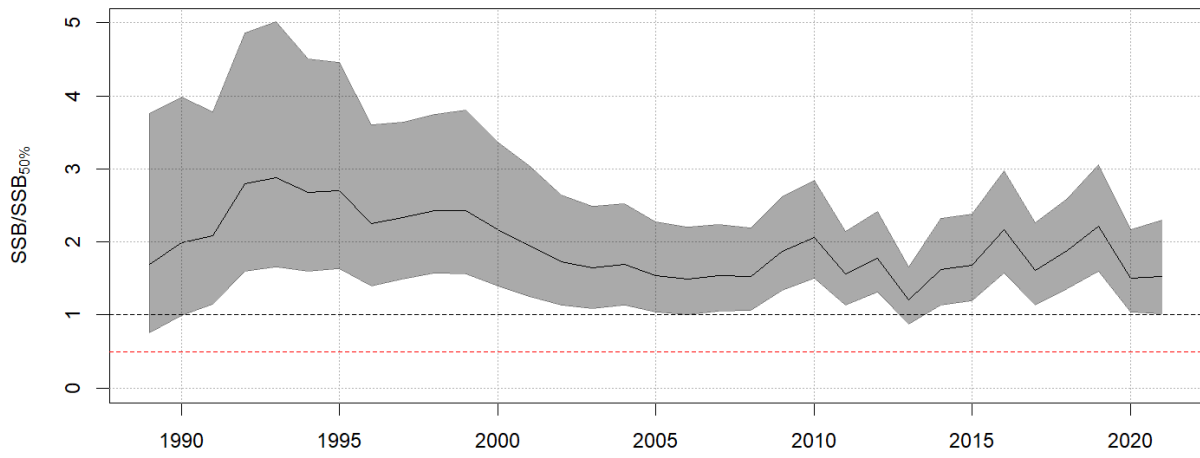


Figure 19. Butterfish stock status, 1989–2021, relative to the revised biological reference points $SSB_{\text{threshold}} = 19,718$ mt, SSB_{MSY} proxy = 39,436 mt, and F_{MSY} proxy = 5.6.

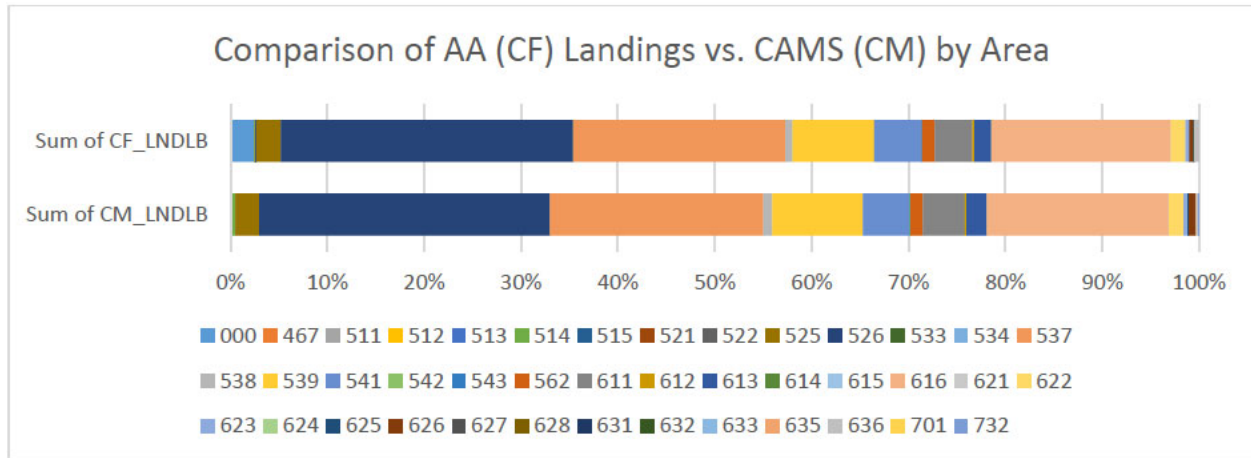


Figure 20. Comparison of commercial landings from the area allocation (AA) tables and the Catch Accounting and Monitoring System (CAMS) by area for 2019. CAMS did assign more landings to areas (only 0.2% unassigned versus 2.5% unassigned in CFDBS). No landings were assigned to areas outside of the stock definition area and no differences were significant.

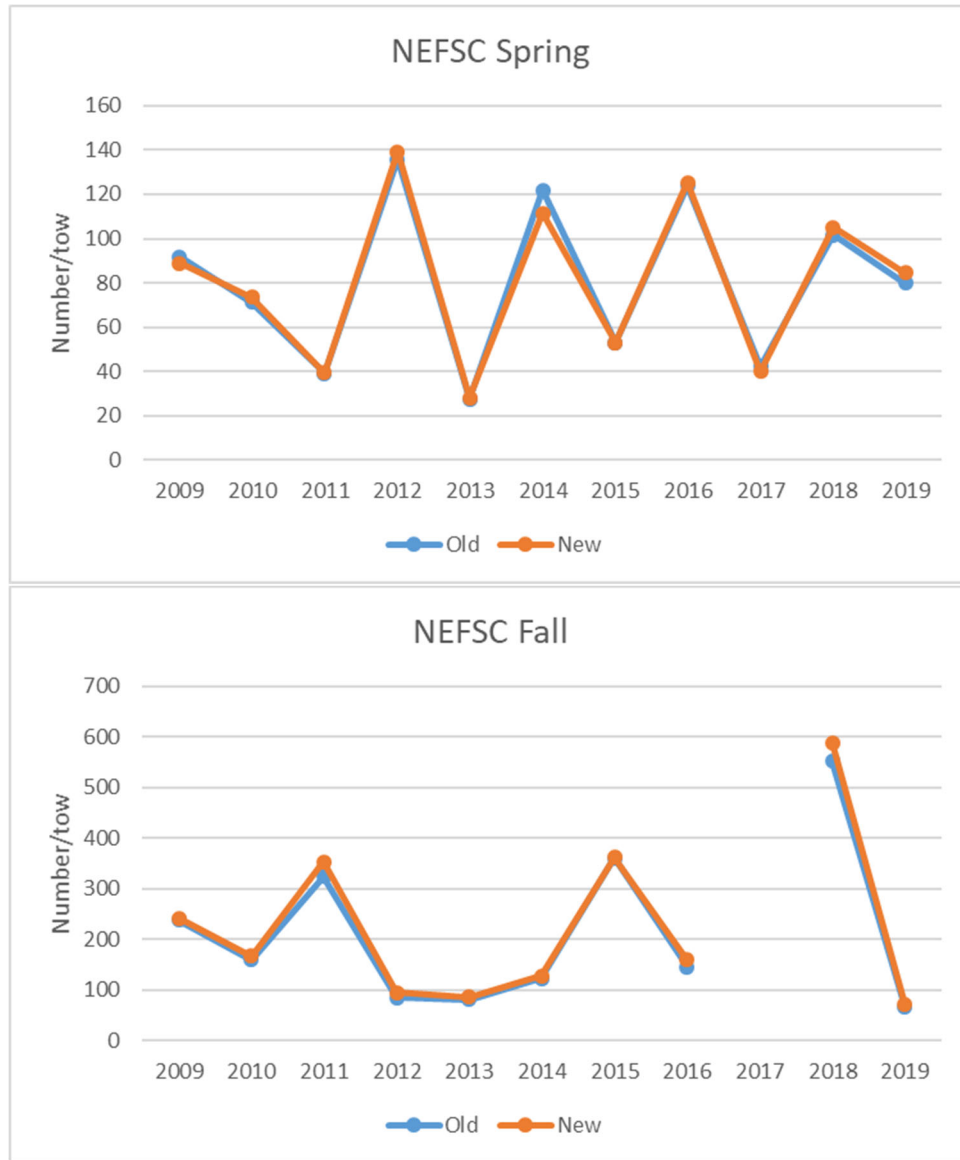


Figure 21. Comparison of Northeast Fisheries Science Center abundance indices for butterfish from the 2021 research track and after the switch to the station-specific swept area based calculations.

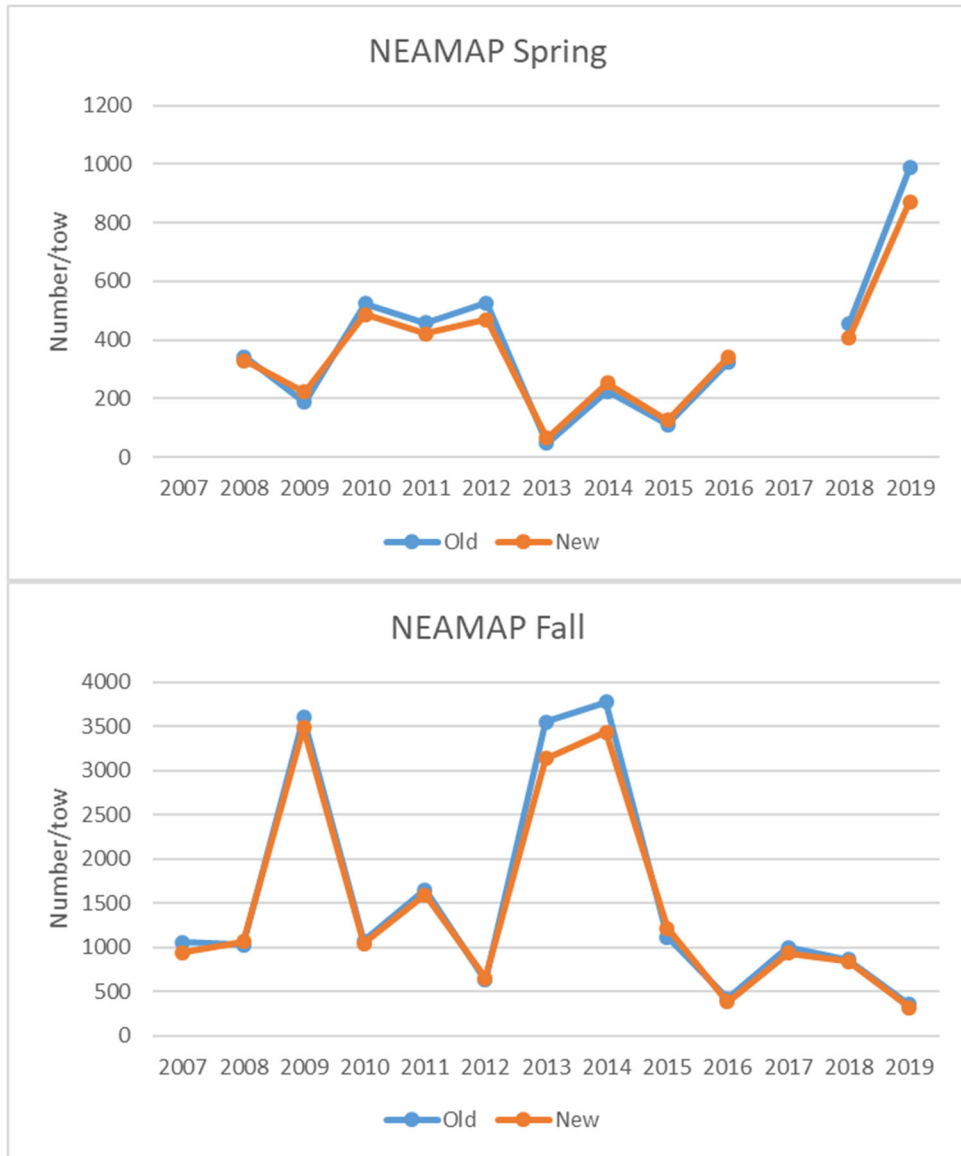


Figure 22. Comparison of Northeast Area Monitoring and Assessment Program abundance indices for butterfish from the 2021 research track and the revised indices after the switch to SAS Proc SurveyMeans.