draft working paper for peer review only

Southern New England Mid-Atlantic winter flounder

2020 Assessment Update Report

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Fisheries Science Center
Woods Hole, Massachusetts

Compiled October 2020

This assessment of the Southern New England Mid-Atlantic winter flounder (Pseudopleuronectes americanus) stock is an operational assessment of the existing banchmark assessment (NEFSC 2011), and follows operational updates in 2015 and 2017. In each assessment since the benchmark the stock was overfished, but overfishing was not occurring (NEFSC 2015, 2017). The current assessment updates commercial fishery catch data, recreational fishery catch data (using new MRIP calibrated data), research survey indices of abundance, and the analytical ASAP assessment models and reference points through 2019. Additionally, stock projections have been updated through 2023.

State of Stock: Based on this updated assessment, the Southern New England Mid-Atlantic winter flounder (*Pseudopleuronectes americanus*) stock is overfished but overfishing is not occurring (Figures 1-2). Retrospective adjustments were not made to the model results. Spawning stock biomass (SSB) in 2019 was estimated to be 3,638 (mt) which is 30% of the biomass target (12,322 mt), and 60% of the biomass threshold for an overfished stock ($SSB_{Threshold} = 6161$ (mt); Figure 1). The 2019 fully selected fishing mortality was estimated to be 0.077 which is 27% of the overfishing threshold ($F_{MSY} = 0.284$; Figure 2).

Table 1: Catch and status table for Southern New England Mid-Atlantic winter flounder. All weights are in (mt), recruitment is in (000s), and F_{Full} is the fishing mortality on fully selected ages (ages 4 and 5). Model results are from the current updated ASAP assessment.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
					Data					
Recreational discards	24	18	11	8	4	13	3	2	4	2
Recreational landings	119	155	126	15	99	39	61	10	10	1
Commercial discards	153	298	482	206	64	82	125	101	108	105
Commercial landings	173	149	134	859	660	661	516	495	326	202
Catch for Assessment	469	620	752	1,087	827	795	704	608	449	310
					Model Results					
Spawning Stock Biomass	5,586	6,577	6,585	6,318	5,209	4,592	3,897	3,667	3,851	3,638
F_{Full}	0.076	0.094	0.117	0.189	0.176	0.178	0.186	0.158	0.111	0.077
Recruits	6,448	4,579	4,251	2,321	4,219	4,955	5,238	3,211	6,185	3,293

Table 2: Comparison of reference points estimated in the 2017 operational assessment and from the current assessment update. F40% was used as a proxy for F_{MSY} and an SSB_{MSY} proxy was calculated from a long-term stochastic projection drawing from the time-series of empirical recruitment. Recruitment estimates are median values of the time-series. 90% CI are shown in parentheses.

	2017	2020
F_{MSY} *proxy*	0.340	0.284
SSB_{MSY} (mt)	24,687	12,322 (6,246 - 21,164)
MSY (mt)	7,532	3,906 (2,014 - 6,624)
Median recruits (000s)	15,802	16,649
Overfishing	No	No
Overfished	Yes	Yes

Projections: Short term projections of biomass were derived by sampling from a cumulative distribution function of the full time-series of recruitment estimates. The annual fishery selectivity, maturity ogive, and mean weights at age used in the projection are the most recent 5 year averages; The model exhibited a minor retrospective pattern in F and SSB so no retrospective adjustments were applied in the projections.

Table 3: Short term projections of total fishery catch and spawning stock biomass for Southern New England Mid-Atlantic winter flounder based on a harvest scenario of fishing at F_{MSY} *proxy* between 2021 and 2023. Catch in 2020 was assumed to be 251 (mt), a value provided by the groundfish PDT. 90% CI are shown next to SSB estimates.

Year	Catch (mt)	SSB (mt)	F_{Full}
2020	251	4,040 (3,310 - 4,906)	0.056

Year	Catch (mt)	SSB (mt)	F_{Full}
2021	1,434	4,313 (3,606 - 5,159)	0.284
2022	1,760	4,871 (4,222 - 5,691)	0.284
2023	2,326	6,335 (4,667 - 11,986)	0.284

Special Comments:

- What are the most important sources of uncertainty in this stock assessment? Explain, and describe qualitatively how they affect the assessment results (such as estimates of biomass, F, recruitment, and population projections).

  A source of uncertainty is the estimate of natural mortality based on longevity, which is not well studied in Southern New England Mid-Atlantic winter flounder, and assumed constant over time. Natural mortality affects the scale of the biomass and fishing mortality estimates. Natural mortality was adjusted upwards from 0.2 to 0.3 during the last benchmark assessment (2011) assuming a max age of 16. However, there is still uncertainty in the true

max age of the population and the resulting natural mortality estimate.

Other sources of uncertainty include the length distribution of the recreational discards. The recreational discards are a small component of the total catch, but the assessment suffers from very little length information used to characterize the recreational discards (1 to 2 lengths in recent years). For this assessment a compiled discard length distribution over all years was used to characterize the recreational discards. In addtion, the paucity of recreational data going forward could be an issue for this assessment.

The population projections are sensitive to the recruitment model chosen, as well as the temporal period selected from which recruitment estimates are drawn.

- Does this assessment model have a retrospective pattern? If so, is the pattern minor, or major? (A major retrospective pattern occurs when the adjusted SSB or F_{Full} lies outside of the approximate joint confidence region for SSB and F_{Full}; see Table **??**).

  The retrospective patterns for both Ffull and SSB are minor and no retrospective adjustment in 2019 was required.

- Based on this stock assessment, are population projections well determined or uncertain? If this stock is in a rebuilding plan, how do the projections compare to the rebuilding schedule?

  Population projections for Southern New England Mid-Atlantic winter flounder are reasonably well determined. However, the results are sensitive to both the recruitment model and the time-period of recruitment used. In addition, while the retrospective pattern is considered minor (within the 90% CI of both F and SSB), the rho adjusted terminal value of F and SSB are close to falling outside of the bounds which would indicate a major retrospective pattern. This would lead to retrospective adjustments being needed for the projections. The stock is in a rebuilding plan with a rebuild date of 2023. A projection using assumed catch in 2020 and F = 0 through 2023 indicated about a 5% chance of reaching the SSB target.

- Describe any changes that were made to the current stock assessment, beyond incorporating additional years of data and the effect these changes had on the assessment and stock status.

  A number of changes were made to the Southern New England Mid-Atlantic winter flounder assessment for this update. Changes and were made to model settings and BRP determination in response to NEFMC SSC concerns with the methodology from the previous benchmark: 'The SSC noted a couple of issues with SNE/MA winter flounder. The first was that the projections were overly optimistic, and this was driven by over estimating recruitment. The SSC noted that we appeared to be in a period of low recruitment, therefore assuming that this recruitment will be higher in the projections was not a reasonable assumption. Additionally, the assessment for this stock was allowing for domed shaped selectivity. This was creating an abundance of cryptic biomass, or biomass seen in the computer output of the population, but which does not show up in catch or survey data.'

  The changes made to the data input and benchmark model for this operational update were: 1. Incorporated new MRIP calibrated time-series, 2. Added a selectivity block from 2010 to present, 3. Forced flat top selectivity for the fleet (Ages 4-7) to get rid of cryptic

biomass, 4. Added NEAMAP Spring Trawl survey index. 5. Shifted from FMSY (assumed B-H S-R relationship) to F40% as a proxy, 6. Used empirical CDF of recruitment time-series for projections instead of assuming B-H stock recruit relationship.

Overall, these changes caused a minor decrease in SSB (getting rid of some cryptic biomass) and cut the SSB reference point in half from 24,687 MT to 12,261 MT. Forcing a flat top selectivity for the fleet increased the SSB retro when compared to the previous operational assessment (Mohn's rho of 0.248 vs 0127). However, the retrospective error for both F and SSB were still considered minor for this assessment.

- If the stock status has changed a lot since the previous assessment, explain why this occurred.

  The stock status of Southern New England Mid-Atlantic winter flounder has not changed since the previous operational updates in 2017 and 2015, and remains the same as the last benchmark assessment in 2011.

- Provide qualitative statements describing the condition of the stock that relate to stock status.

  The Southern New England Mid-Atlantic winter flounder stock shows an overall declining trend in SSB over the time series, with the current estimate (3959 MT) at the time series low. Estimates of fishing mortality have been declining since 2015 and the current value (0.072) is also at a time-series low. Recruitment had a small peak in 2018 (6.4 million), however, it has again dropped below the 10-yr average (4.7 million) in 2019 (3.4 million).

- Indicate what data or studies are currently lacking and which would be needed most to improve this stock assessment in the future.

  The Southern New England Mid-Atlantic winter flounder assessment could be improved with additional studies on maximum age, as well as improved recreational discard length information. In addition, further investigation into the localized struture/genetics of the stock is warranted. Finally, a future shift to ASAP version 4 (during the next research track assessment) will provide the ability to model envirionmental factors that may influence survey catchability and help develop more informed population projections.

- Are there other important issues?
  None.

References:

Northeast Fisheries Science Center. 2011. 52^{nd} Northeast Regional Stock Assessment Workshop (52^{nd} SAW) Assessment Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 11-17; 962 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026.

Northeast Fisheries Science Center. 2015. Operational Assessment of 20 Northeast Groundfish Stocks, Updated through 2014. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 15-24; 251 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA

02543-1026.

Northeast Fisheries Science Center. 2017. Operational Assessment of 19 Northeast Groundfish Stocks, Updated through 2016. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-17; 264 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026.

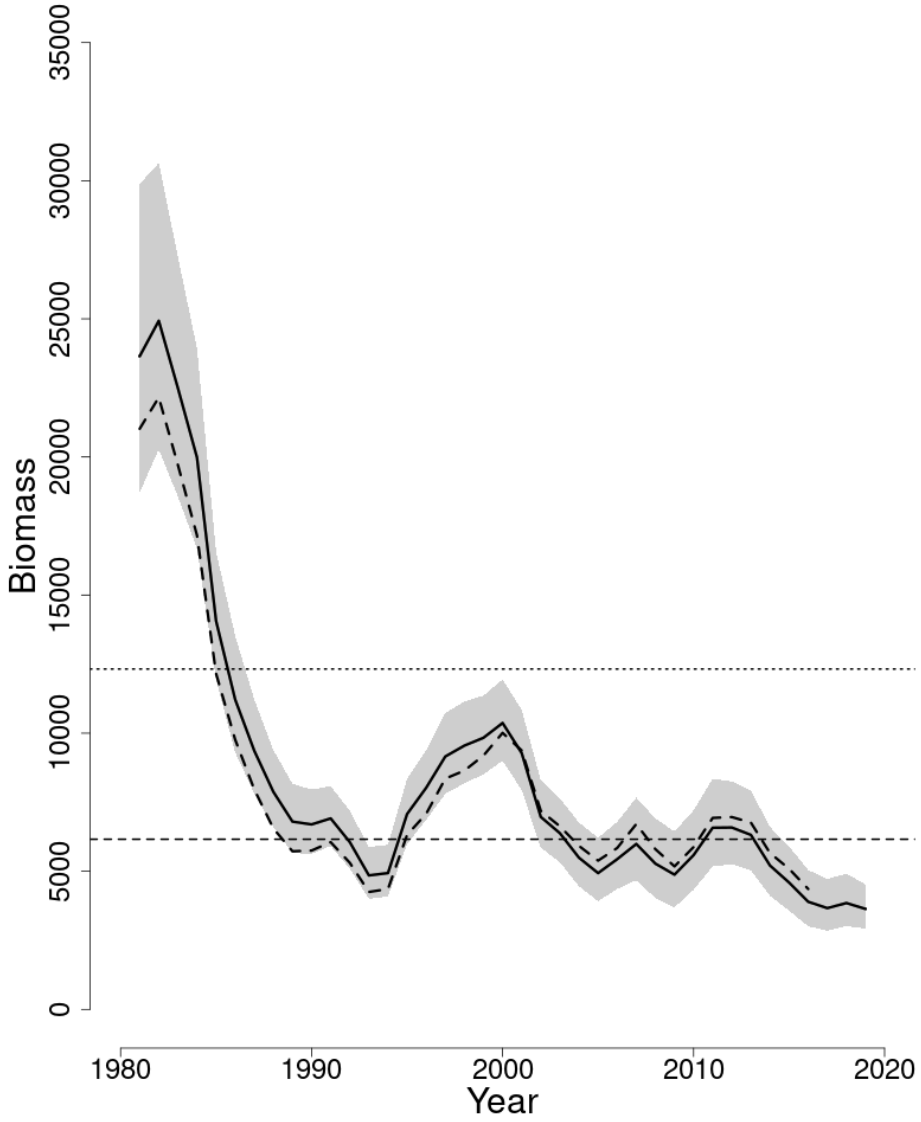

Figure 1: Trends in spawning stock biomass of Southern New England Mid-Atlantic winter flounder between 1981 and 2019 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{Threshold}$ ($\frac{1}{2}$ SSB_{MSY} *proxy*; horizontal dashed line) as well as SSB_{Target} (SSB_{MSY} *proxy*; horizontal dotted line) based on the 2020 assessment. The approximate 90% lognormal confidence intervals are shown.

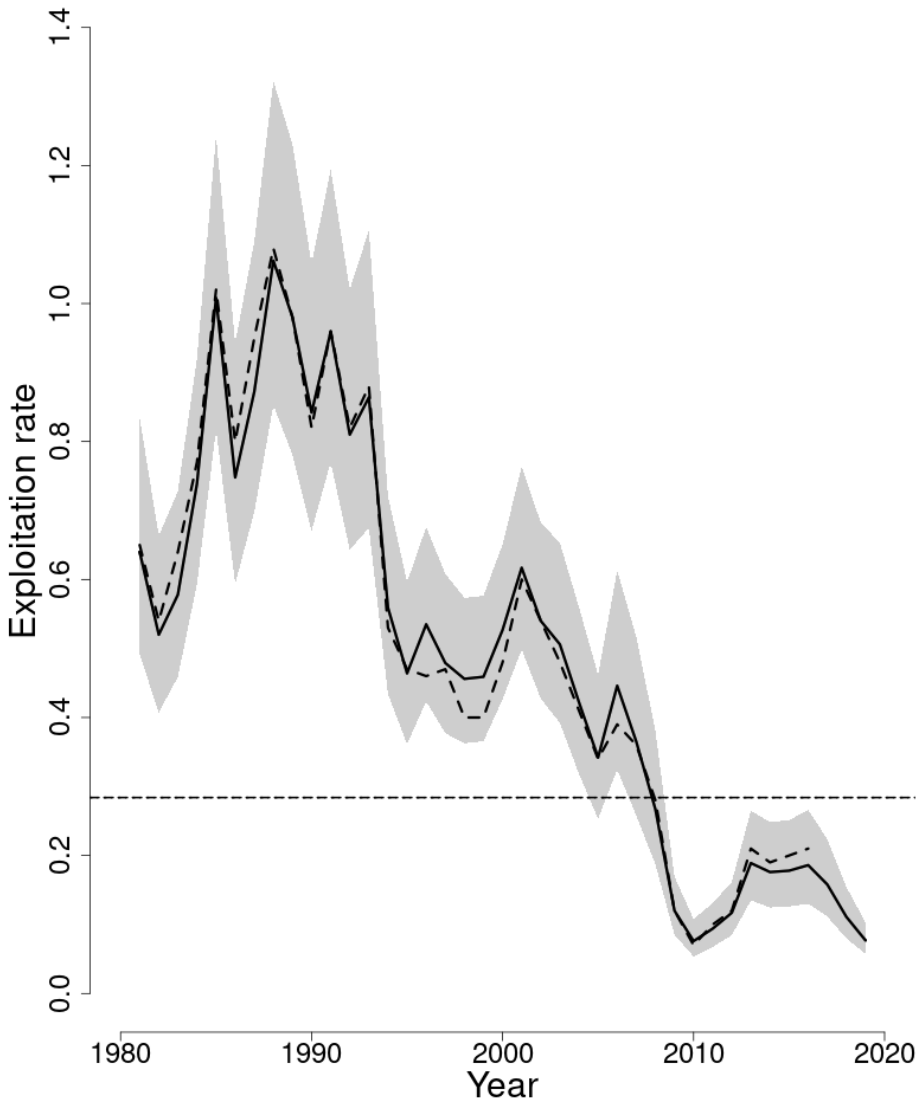

Figure 2: Trends in the fully selected fishing mortality (F_{Full}) of Southern New England Mid-Atlantic winter flounder between 1981 and 2019 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{Threshold}$ (F_{MSY}=0.284; horizontal dashed line) based on the 2020 assessment. The approximate 90% lognormal confidence intervals are shown.

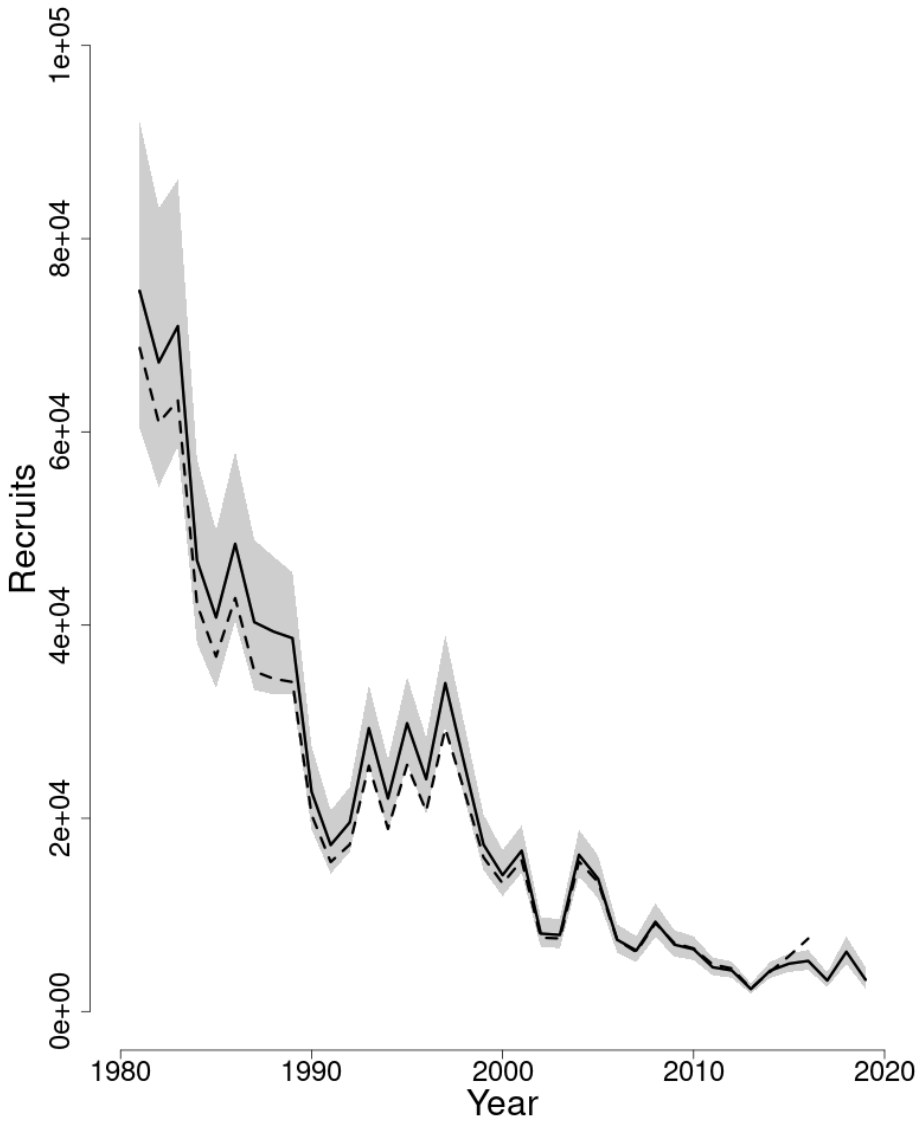

Figure 3: Trends in Recruits (000s) of Southern New England Mid-Atlantic winter flounder between 1981 and 2019 from the current (solid line) and previous (dashed line) assessment. The approximate 90% lognormal confidence intervals are shown.

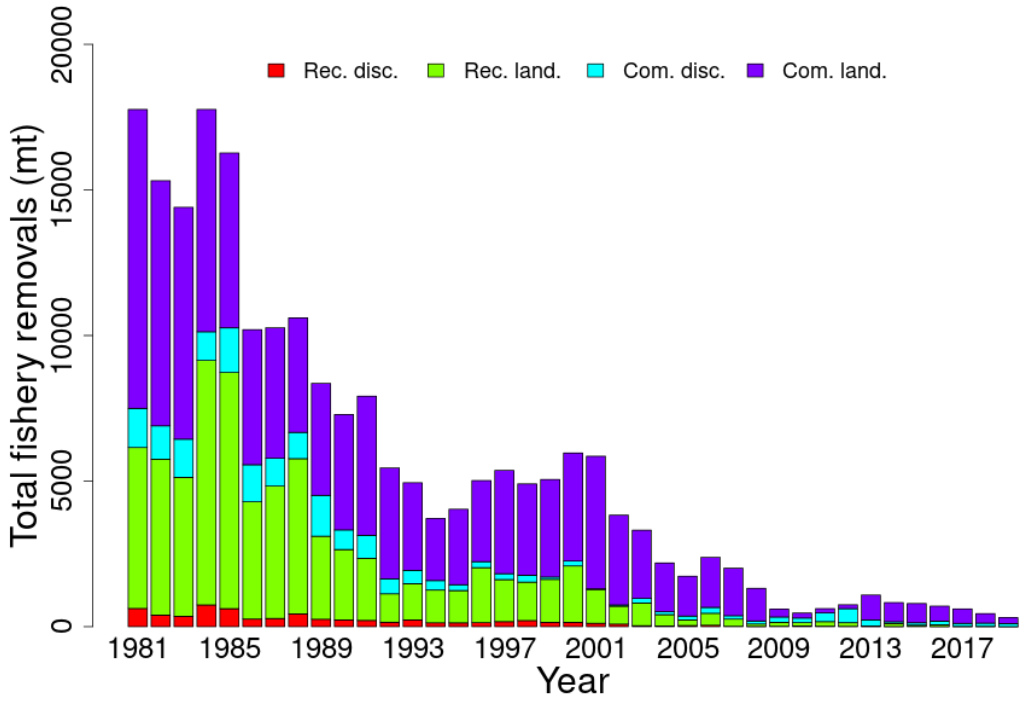

Figure 4: Total catch of Southern New England Mid-Atlantic winter flounder between 1981 and 2019 by fleet (commercial, recreational) and disposition (landings and discards).

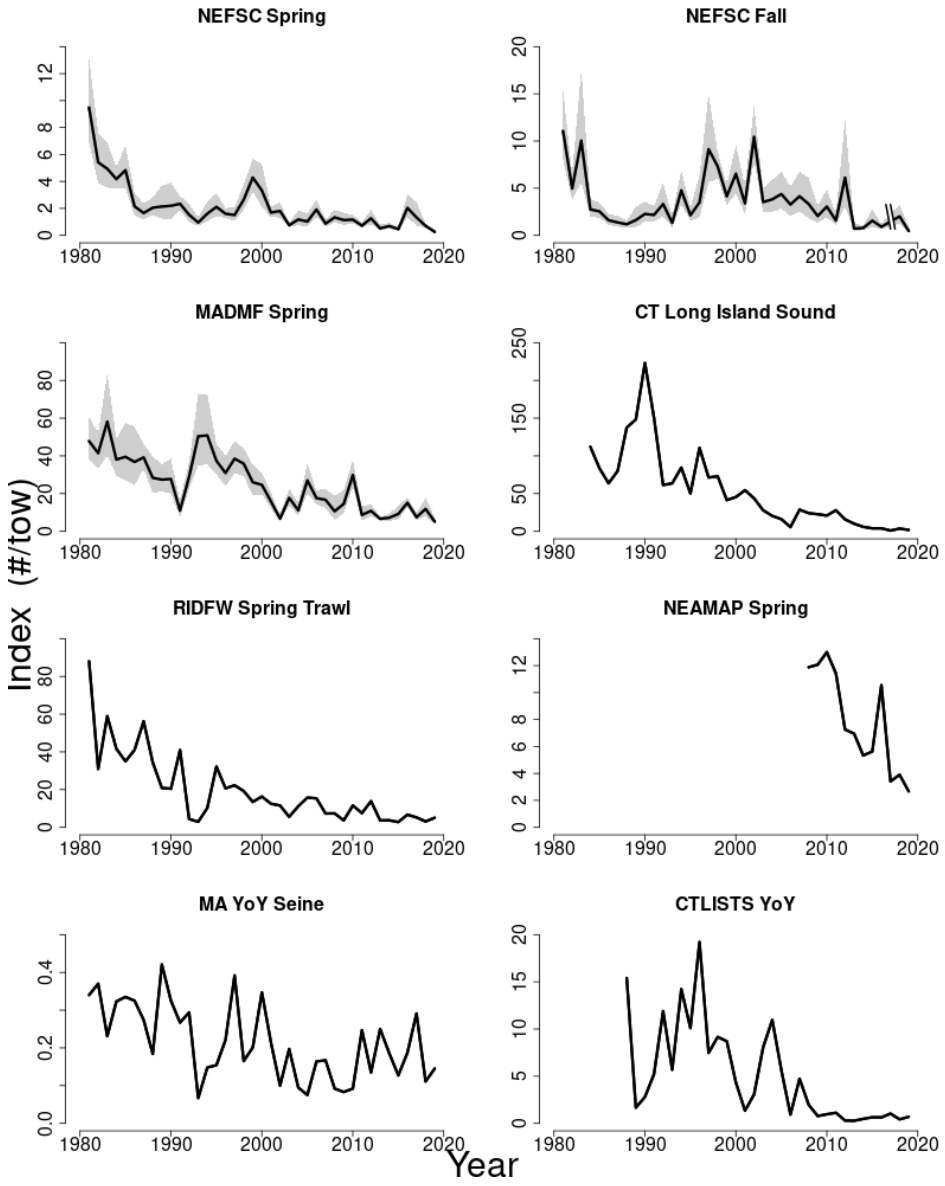

Figure 5: Indices of biomass for the Southern New England Mid-Atlantic winter flounder between 1981 and 2019 for the Northeast Fisheries Science Center (NEFSC) spring and fall bottom trawl surveys, the MADMF spring survey, the CT LISTS survey, the RIDFW Spring Trawl survey, the NJ Ocean Trawl survey, and two YoY surveys from MADMF and CT LISTS. Where available, the approximate 90% lognormal confidence intervals are shown. Slashes through the solid line indicate a hole in the survey time series.