draft working paper for peer review only

Gulf of Maine winter flounder

2022 Management Track Assessment Report

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National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Fisheries Science Center
Woods Hole, Massachusetts

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This assessment of the Gulf of Maine winter flounder (Pseudopleuronectes americanus) stock is a management track assessment of the existing 2020 area-swept management track assessment (NEFSC 2022). Based on the previous assessment the biomass status is unknown but overfishing was not occurring. This assessment updates commercial and recreational fishery catch data, research survey indices of abundance, and the area-swept estimates of 30+ cm biomass based on the fall NEFSC, MDMF, and MENH surveys.

State of Stock: Based on this updated assessment, the Gulf of Maine winter flounder (*Pseudopleuronectes americanus*) stock biomass status is unknown and overfishing is not occurring (Figures 1-2). Retrospective adjustments were not made to the model results. Biomass (30+ cm mt) in 2021 was estimated to be 5,093 mt (Figure 1). The 2021 30+ cm exploitation rate was estimated to be 0.033 which is 14% of the overfishing exploitation threshold proxy (E_{MSY} *proxy* = 0.23; Figure 2).

Table 1: Catch and status table for Gulf of Maine winter flounder. All weights are in (mt) and E_{Full} is the exploitation rate on 30+ cm fish. Biomass is estimated from survey area-swept for non-overlaping strata from three different fall surveys (MENH, MDMF, NEFSC) using an updated q estimate of 0.81 based on the wing spread from the sweep study (Miller et al., 2020).

	2016	2017	2018	2019	2020	2021
			Data			
Recreational discards	11	5	2	2	1	1
Recreational landings	41	161	80	42	51	43
Commercial discards	3	3	3	4	2	6
Commercial landings	185	210	158	102	81	118
Catch for Assessment	240	378	243	150	134	168
			Model Results			
30+ cm Biomass	3,037	3,039	2,610	2,620	NA	5,093
E_{Full}	0.079	0.124	0.093	0.057		0.033

Table 2: Comparison of reference points estimated in an earlier assessment and from the current assessment update. An $E_{40\%}$ exploitation rate proxy was used for the overfishing threshold and was based on a length based yield per recruit model from the 2011 SARC 52 benchmark assessment.

	2020	2022
E_{MSY} *proxy*	0.23	0.23
B_{MSY}	Unknown	Unknown
MSY (mt)	Unknown	Unknown
Overfishing	No	No
Overfished	Unknown	Unknown

Projections: Projections are not possible with area-swept based assessments. Catch advice was based on 75% of $E_{40\%}$(75% E_{MSY} *proxy*) using the terminal year fall area-swept estimate assuming q=0.81 on the wing spread which was updated using the average efficiency from 2009-2021 from the sweep experiment (Miller et al., 2020). Updated 2021 fall 30+ cm area-swept biomass (5,093 mt) implies an OFL of 1,171 mt based on the E_{MSY} *proxy* and a catch of 879 mt for 75% of the E_{MSY} *proxy*. Catch advice (OFLs and ABCs) from the 2020 managment track assessment was based on the average of the last two years of the fall surveys to make better use of the available new information and to help stabilize the catch advice. Alternatively, since the 2020 surveys are not available due to covid, using the average of updated 2021 and 2022 spring and 2021 fall 30+ cm area-swept biomass (4,660 mt) implies an OFL of 1,072 mt based on the E_{MSY} *proxy* and a catch of 804 mt for 75% of the E_{MSY} *proxy*.

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).

  The largest source of uncertainty with the direct estimates of stock biomass from survey area-swept estimates originates from the survey gear catchability (q). Biomass and exploitation rate estimates are sensitive to the survey q assumption. However this 2022 update does incorporate the use of a re-estimated q through an average estimate of efficiency from 2009-2021 fall and 2009-2022 spring (q=0.81 fall and q=0.70 spring) from the sweep study for the NEFSC survey. This updated q assumption (0.81) results in a lower estimate of 30+ biomass (5,093 mt) relative to the 2020 estimate q=0.71 assumption (5,783 mt) from the updated fall surveys. Another major source of uncertainty with this method is that biomass based reference points cannot be determined and overfished status is unknown.

- 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}

  The model used to determine status of this stock does not allow estimation of a retrospective pattern. An analytical stock assessment model does not exist for Gulf of Maine winter flounder. An analytical model was no longer used for stock status determination at SARC 52 (2011) due to concerns with a strong retrospective pattern. Models have difficulty with the apparent lack of a relationship between a large decrease in the catch with little change in the indices and age and/or size structure over time.

- 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 Gulf of Maine winter flounder do not exist for area-swept assessments and stock biomass status is unknown. This stock was never declared as overfished. Catch advice from area-swept estimates tend to vary with interannual variability in the surveys. Consideration was given to using multiple surveys (fall 2021 and spring 2021-2022) to stabilze the biomass estimates and catch advice since 2020 surveys are not available due to covid.

- 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.

  The assumption on q changed from 0.71 to 0.81 for the fall and from 0.62 to 0.70 for the spring using information from the updated average qs from the NEFSC survey (Miller et al., 2020) and incorporation of new survey data were made to this Gulf of Maine winter flounder management track assessment. The 2020 and 2021 commercial catch estimates are based on CAMS in this assessment. However, changes in total removals will not directly affect the estimated biomass or catch advice and total removals still remain far below the overfishing definition. In addition there were some minor changes to the survey indices due to tow based area-swept adjustments.

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

  The overfishing status of Gulf of Maine winter flounder has not changed.

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

  The Gulf of Maine winter flounder has relatively flat survey indices with little change in the size structure over time. There have been large declines in the commercial and recreational removals since the 1980s. This large decline over the time series does not appear to have resulted in a response in the stock's size structure within the catch and surveys nor has it resulted in a change in the survey indices of abundance. However, there have been increases in the fall 2021 and the spring 2021 and 2022 area swept biomass estimates. If increasing biomass trends continue then perhaps this is the beginning of a response to time series lows in exploitation rates.

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

  Direct area-swept assessments could be improved with additional studies on state survey gear efficiency. Quantifying the degree of herding between the doors and escapement under the footrope and/or above the

headrope for state surveys is needed to improve the area-swept biomass estimates. Studies quantifying winter flounder abundance and distribution among habitat types and within estuaries could improve the biomass estimate.

- Are there other important issues?

  The general lack of a response in survey indices and age/size structure are the primary sources of concern with catches remaining far below the overfishing level. Recent increases in the biomass could perhaps be the being of a response to removals being at record lows over the last three years (2019-2021). If recent increases in biomass is a response to the low catches then continuation of keeping catchs near recent levels should result in further increases in biomass.

References:

Northeast Fisheries Science Center. 2022. Fall Management Track Assessments 2020., US Dept Commer, Northeast Fish Sci Cent Ref Doc. 22-08; 168 p.Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026. https://doi.org/10.25923/8n72-q136

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. CRD11-17

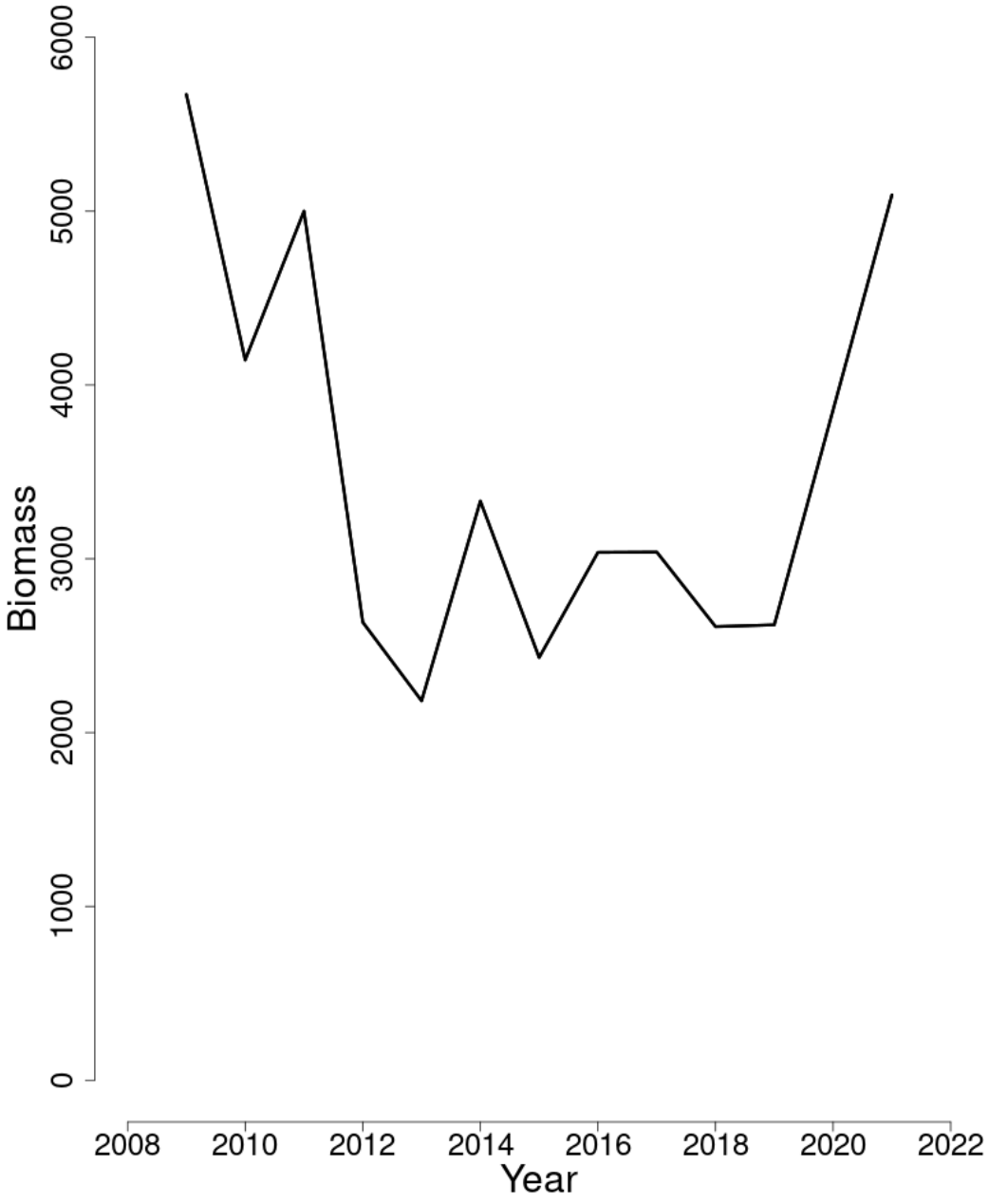

Figure 1: Trends in 30+ cm area-swept biomass of Gulf of Maine winter flounder between 2009 and 2021 from the current assessment based on the fall (MENH, MDMF, NEFSC) surveys.

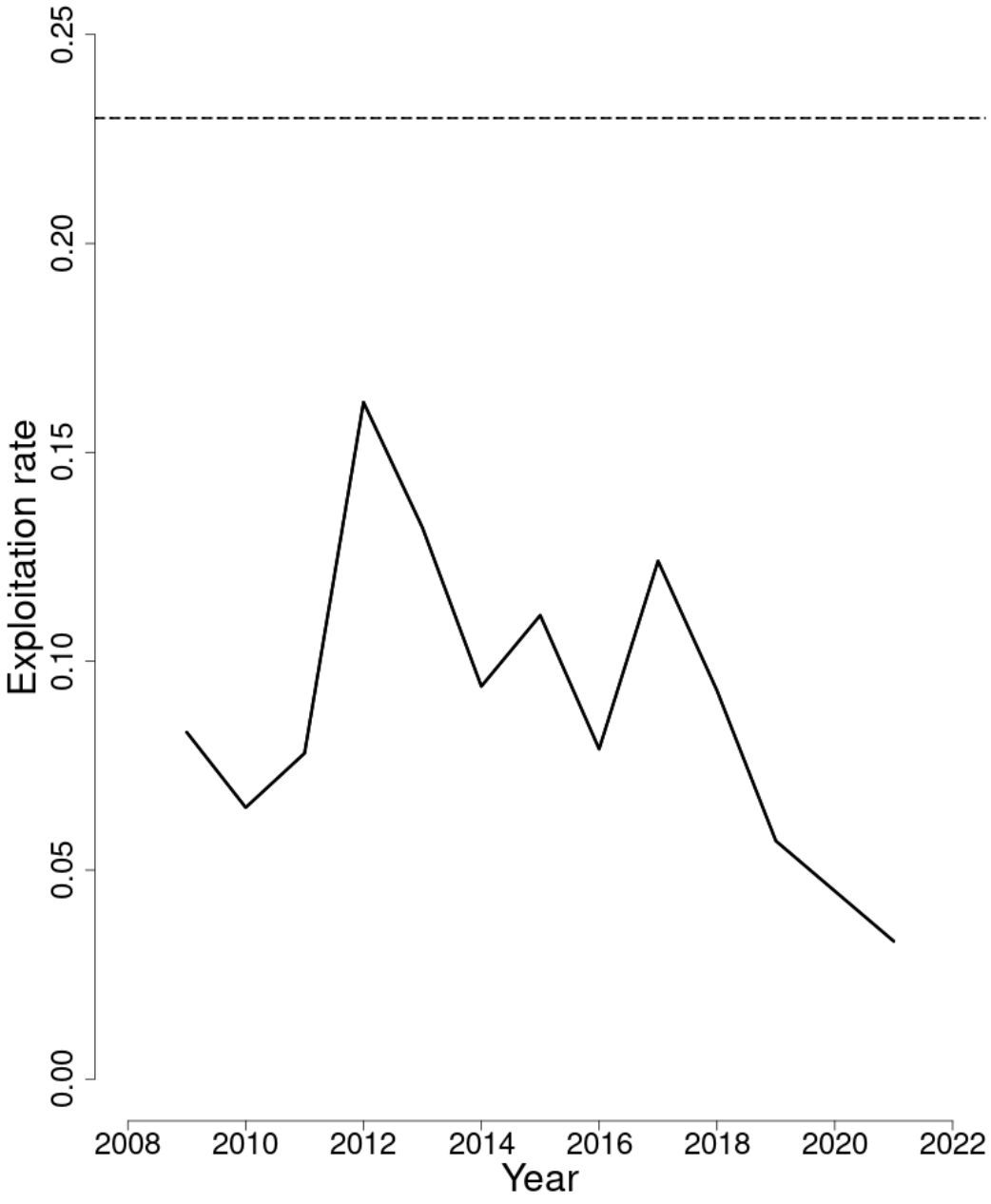

Figure 2: Trends in the exploitation rates (E_{Full}) of Gulf of Maine winter flounder between 2009 and 2021 from the current assessment based on the fall (MENH, MDMF, NEFSC) surveys and the corresponding $F_{Threshold}$ (E_{MSY} *proxy*=0.23; horizontal dashed line).

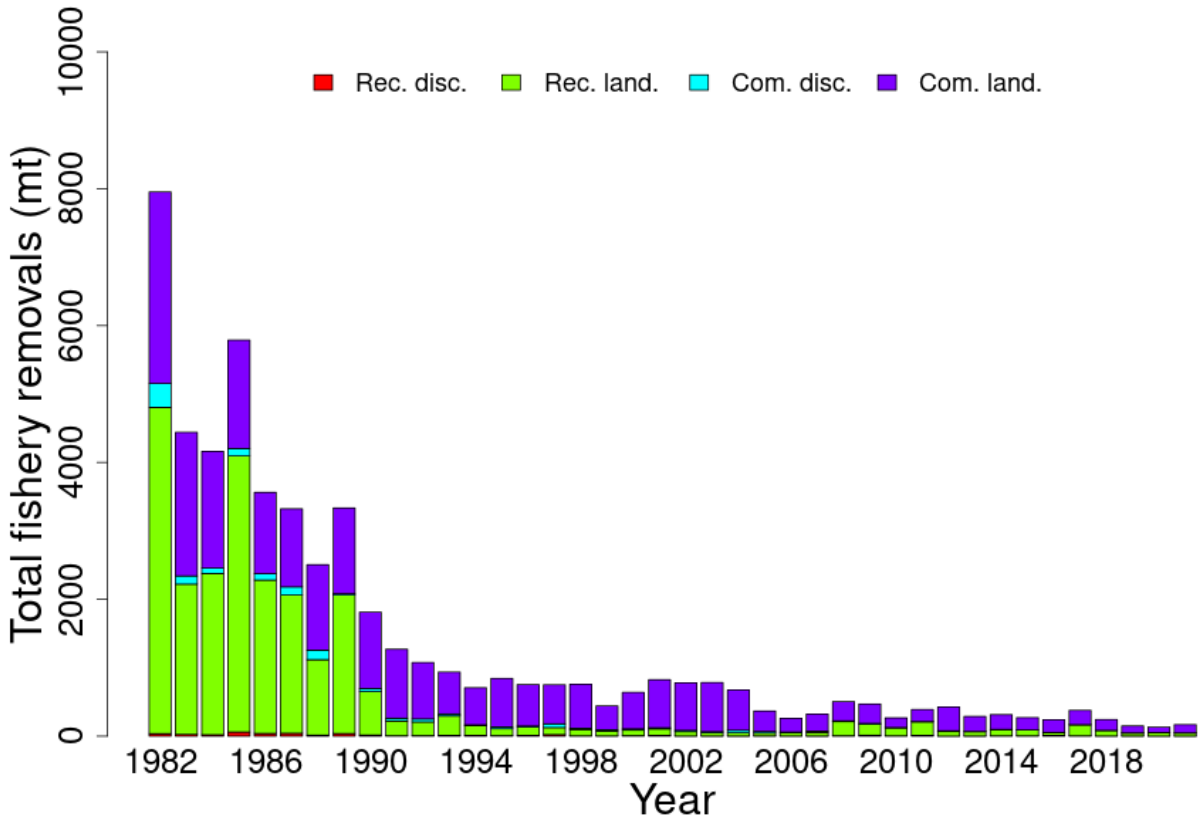

Figure 3: Total catch of Gulf of Maine winter flounder between 2009 and 2021 by fleet (commercial and recreational) and disposition (landings and discards). A 15% mortality rate is assumed on recreational discards and a 50% mortality rate on commercial discards.

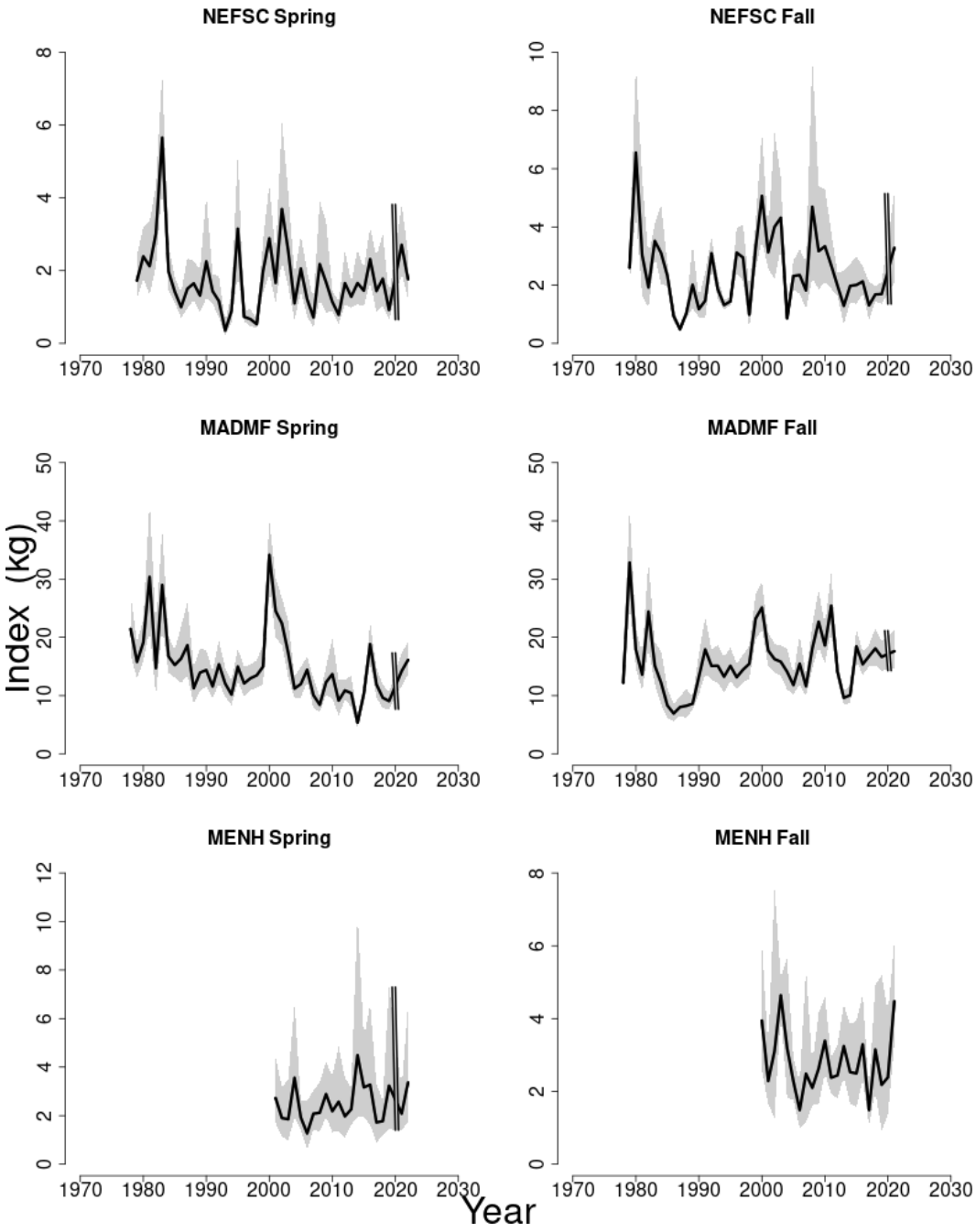

Figure 4: Indices of biomass for the Gulf of Maine winter flounder between 1978 and 2022 for the Northeast Fisheries Science Center (NEFSC), Massachusetts Division of Marine Fisheries (MDMF), and the Maine New Hampshire (MENH) spring and fall bottom trawl (strata 1-3) surveys. NEFSC indices are calculated with gear and vessel conversion factors where appropriate. The approximate 90% lognormal confidence intervals are shown.