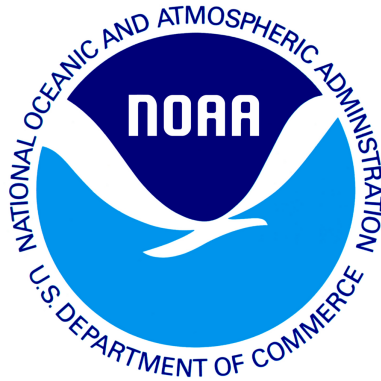


draft working paper for peer review only



Scup

2023 Management Track Assessment Report

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

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This assessment of the Scup (*Stenotomus chrysops*) stock is an update of the existing 2021 Management Track Assessment (NEFSC 2022). Based on the previous assessment the stock was not overfished and overfishing was not occurring. This 2023 Management Track Assessment updates fishery catch data, research survey indices of abundance, the ASAP assessment model, and biological reference points through 2022. Additionally, stock projections have been updated through 2025.

State of Stock: Based on this updated assessment, the Scup (*Stenotomus chrysops*) stock is not overfished and overfishing is not occurring (Figures 1-2). Retrospective adjustments were made to the model results. Adjusted Spawning Stock Biomass (SSB) in 2022 was estimated to be 193,087 mt which is 246% of the biomass target for this stock ($SSB_{MSY} proxy = 78,593$; Figure 1). The adjusted 2022 fully selected fishing mortality was estimated to be 0.098 which is 52% of the overfishing threshold proxy ($F_{MSY} proxy = 0.19$; Figure 2).

Table 1: Catch and model results for Scup. All weights are in (mt), recruitment is in (000s), and F_{Full} is the fishing mortality on fully selected age 4. Model results are unadjusted values from the current updated ASAP assessment.

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	<i>Data</i>									
Commercial landings	8,105	7,239	7,725	7,147	7,007	6,064	6,252	6,177	5,944	5,507
Commercial discards	1,350	981	1,718	2,778	4,733	3,293	2,779	2,611	1,895	2,171
Recreational landings	5,739	4,659	5,527	4,536	6,143	5,887	6,403	5,863	7,540	7,875
Recreational discards	568	480	581	862	1,079	644	560	541	653	738
Catch for Assessment	15,762	13,359	15,550	15,322	18,961	15,888	15,994	15,192	16,032	16,291
	<i>Model Results</i>									
Spawning Stock Biomass	229,544	224,345	202,517	224,568	242,893	240,870	226,966	216,046	184,801	159,050
F_{Full}	0.105	0.093	0.118	0.094	0.1	0.08	0.09	0.092	0.129	0.171
Recruits (age 0)	145,750	360,860	569,175	256,961	119,279	138,889	64,735	118,918	124,873	106,037

Table 2: Comparison of biological reference points estimated in the previous assessment and from the current assessment update. An $F_{40\%}$ proxy was used for the overfishing threshold and SSB and MSY proxies were based on long-term stochastic projections.

	2021	2023
$F_{MSY} proxy$	0.200	0.190
SSB_{MSY} (mt)	90,019	78,593 (55,125 - 113,507)
MSY (mt)	12,671	11,959 (8,447 - 17,427)
Median recruits (age 1) (000s)	123,492	129,293
<i>Overfishing</i>	No	No
<i>Overfished</i>	No	No

Projections: Short term projections of catch (OFL) and Spawning Stock Biomass (SSB) were derived by sampling from an empirical cumulative distribution function of the time series of recruitment estimates from the ASAP model results for 1984-2022. The annual fishery selectivity, maturity ogive, and mean weights at age used in projections are the most recent 5 year averages; retrospective adjustments were applied in the projections.

Table 3: Short term projections of total fishery catch (OFL) and Spawning Stock Biomass (SSB) for Scup based on a harvest scenario of fishing at F_{MSY} proxy between 2024 and 2025. Catch in 2023 was assumed to be 13,458 (mt).

Year	Catch (mt)	SSB (mt)	F_{Full}
2023	13,458	209,407 (155,000 - 286,000)	0.115
2024	20,295	185,475 (138,000 - 252,000)	0.190
2025	18,363	162,716 (121,000 - 221,000)	0.190

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).

Declining trends in growth rates and maturity at age may change the productivity of the stock and in turn affect estimates of the biological reference points. Changes in growth, maturity, and recruitment may be environmentally mediated but mechanisms are 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} ; see Table ??).

The 7-year Mohn's ρ , relative to SSB, was -0.14 in the 2021 assessment and was -0.21 in 2022. The 7-year Mohn's ρ , relative to F, was 0.20 in the 2021 assessment and was 0.42 in 2022. There was a major retrospective pattern for this assessment because the ρ adjusted estimates of 2022 SSB ($SSB_{\rho}=193,087$) and 2022 F ($F_{\rho}=0.098$) were outside the approximate 90% confidence regions around SSB (131,720 - 192,050) and F (0.14 - 0.208). A retrospective adjustment was made for both the determination of stock status and for projections of catch and biomass in 2024 and 2025. The retrospective adjustment changed the 2022 SSB from 159,050 to 193,087 and the 2022 F_{Full} from 0.171 to 0.098.

- 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 Scup are reasonably well determined.

- 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.

No major changes, other than the addition of three years of data, were made to the Scup assessment for this update. Minor changes to the survey input CVs and fishery and survey input Effective Sample Sizes improved model diagnostics but had limited affects on the model results.

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

As in recent assessments for Scup the stock status remains as not overfished and overfishing not occurring.

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

The current fishing mortality rate is relatively low, but recent below average recruitment has resulted in a decrease in SSB. SSB is projected to continue to decrease in the short term.

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

The Scup assessment could likely be improved with more intensive sampling of the fishery catch.

- Are there other important issues?

Sufficient length and age sampling of the fishery catch needs to be maintained.

References:

NEFSC. 2022. Northeast Fisheries Science Center. Management Track Assessment June 2021. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 22-10; 79 p. <http://www.nefsc.noaa.gov/publications/crd/crd2210/>.

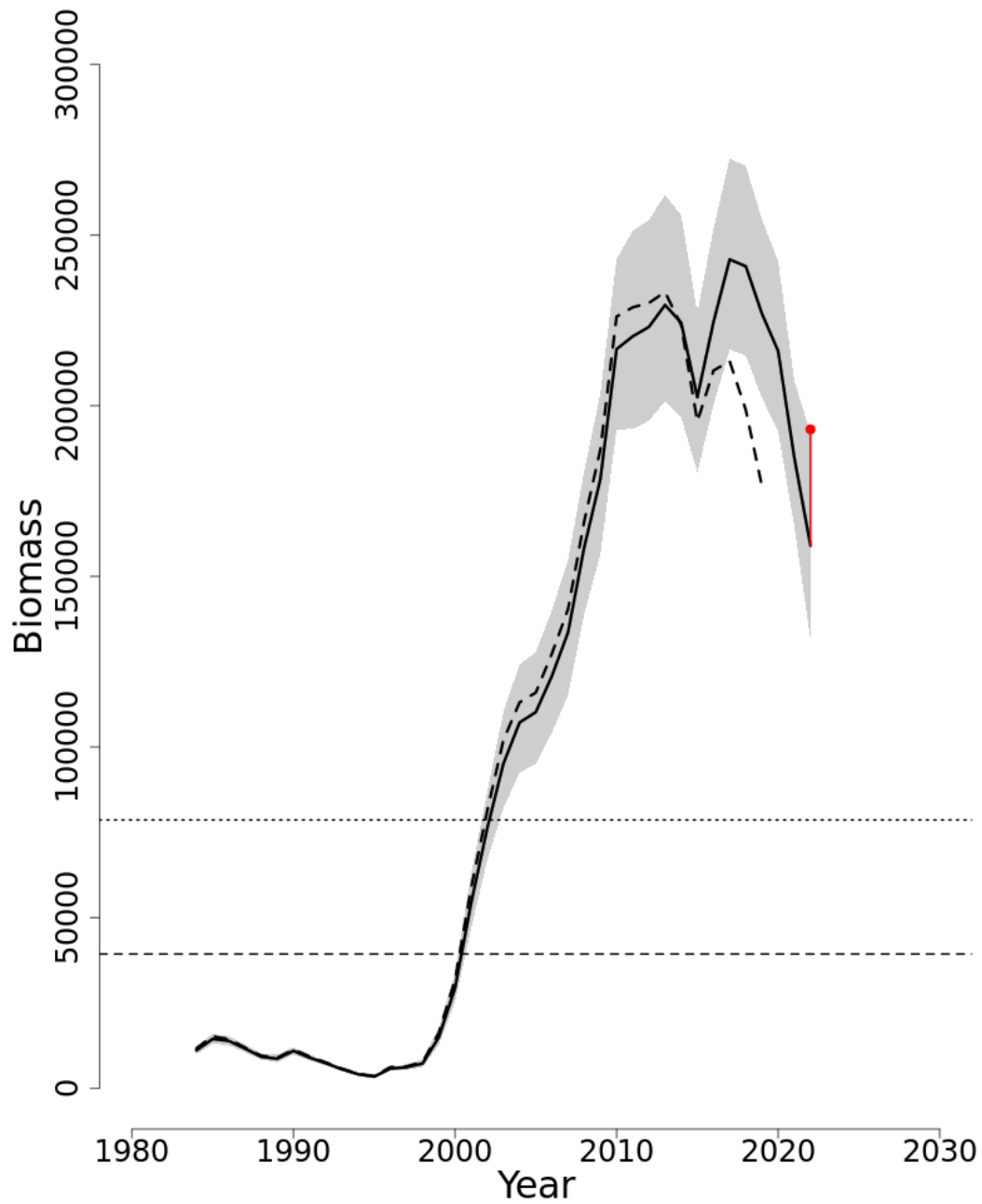


Figure 1: Trends in SSB of Scup between 1984 and 2022 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{Threshold}$ ($\frac{1}{2} SSB_{MSY}$ proxy; horizontal dashed line) as well as SSB_{Target} (SSB_{MSY} proxy; horizontal dotted line) based on the 2023 assessment. SSB was adjusted for a retrospective pattern and the adjustment is shown in red. The approximate 90% lognormal confidence intervals are shown.

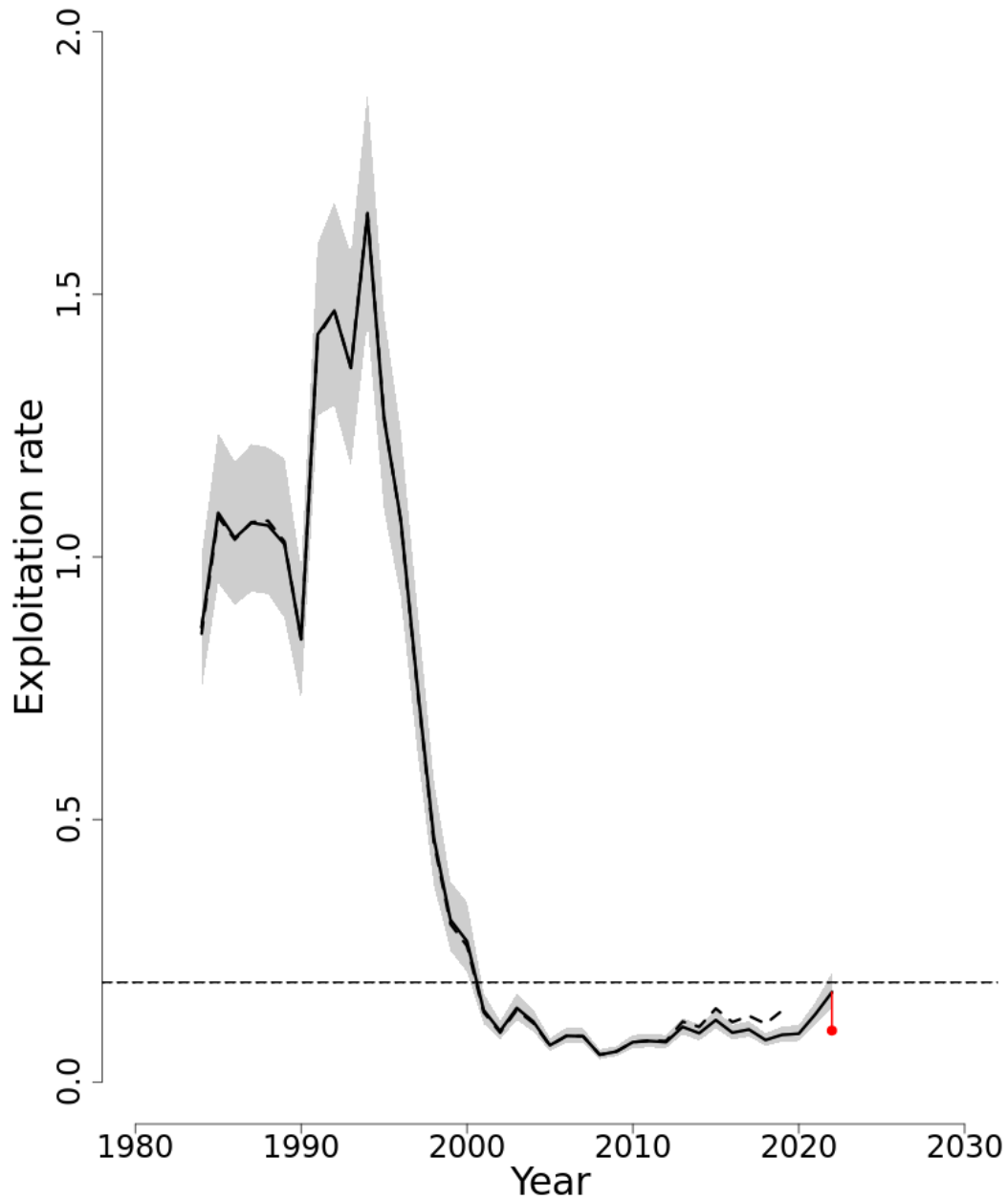


Figure 2: Trends in the fully selected fishing mortality (F_{Full}) of Scup between 1984 and 2022 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{Threshold}$ (F_{MSY} proxy=0.19; horizontal dashed line) based on the 2023 assessment. F_{Full} was adjusted for a retrospective pattern and the adjustment is shown in red. The approximate 90% lognormal confidence intervals are shown.

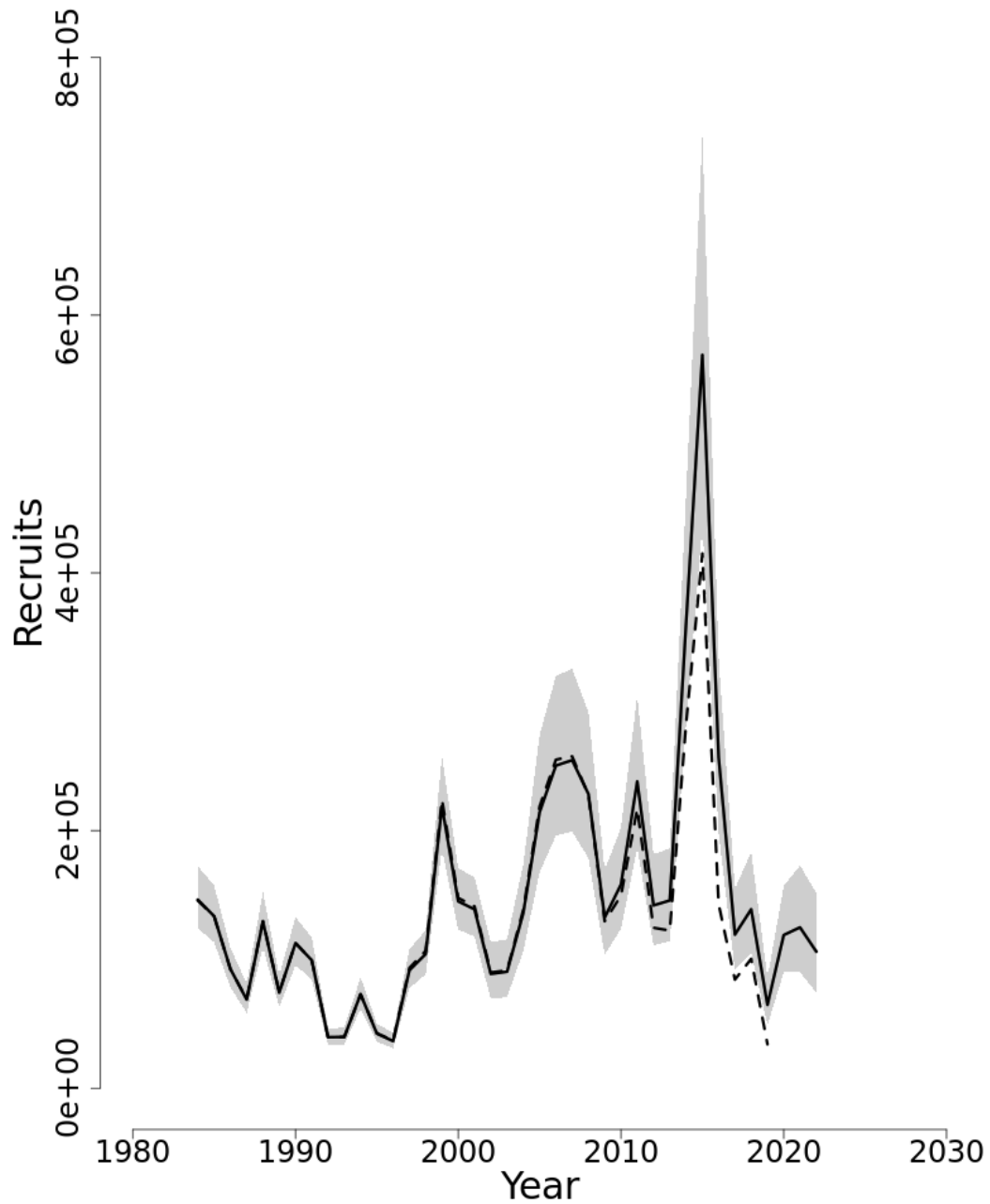


Figure 3: Trends in Recruits (age 0) (000s) of Scup between 1984 and 2022 from the current (solid line) and previous (dashed line) assessment.

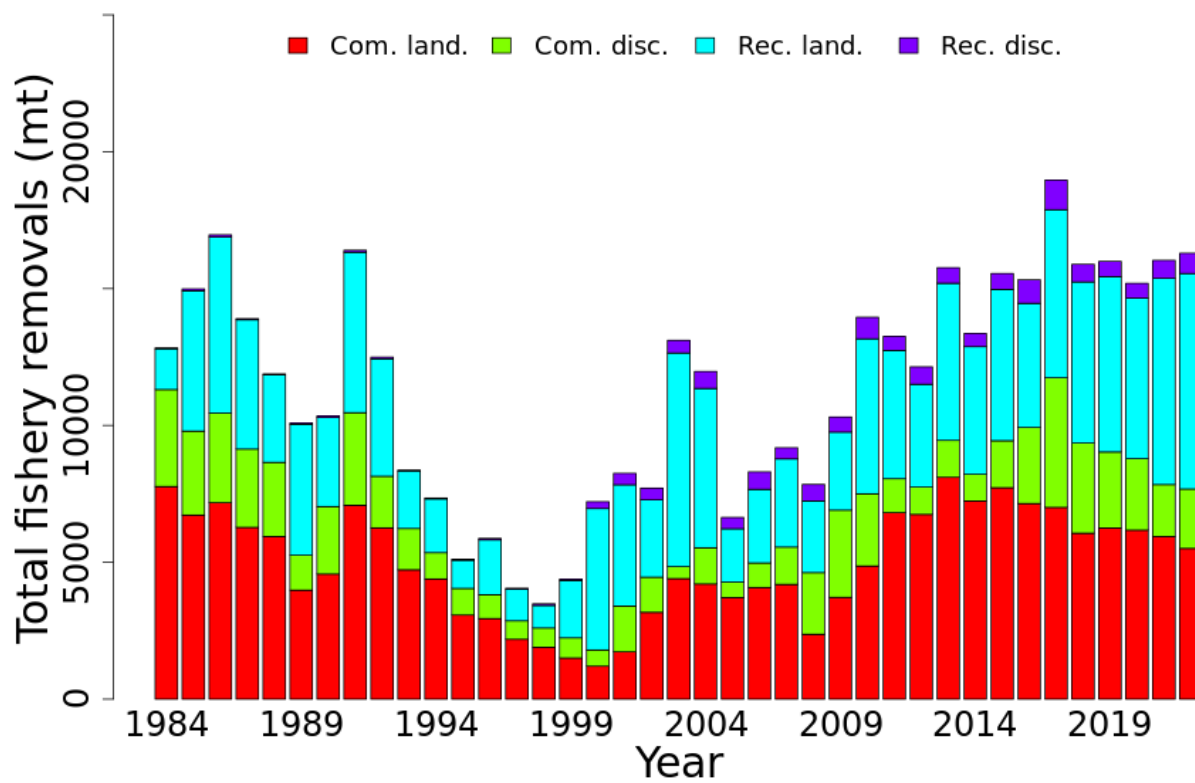


Figure 4: Total catch of Scup between 1984 and 2022 by fishery (commercial and recreational) and disposition (landings and discards).

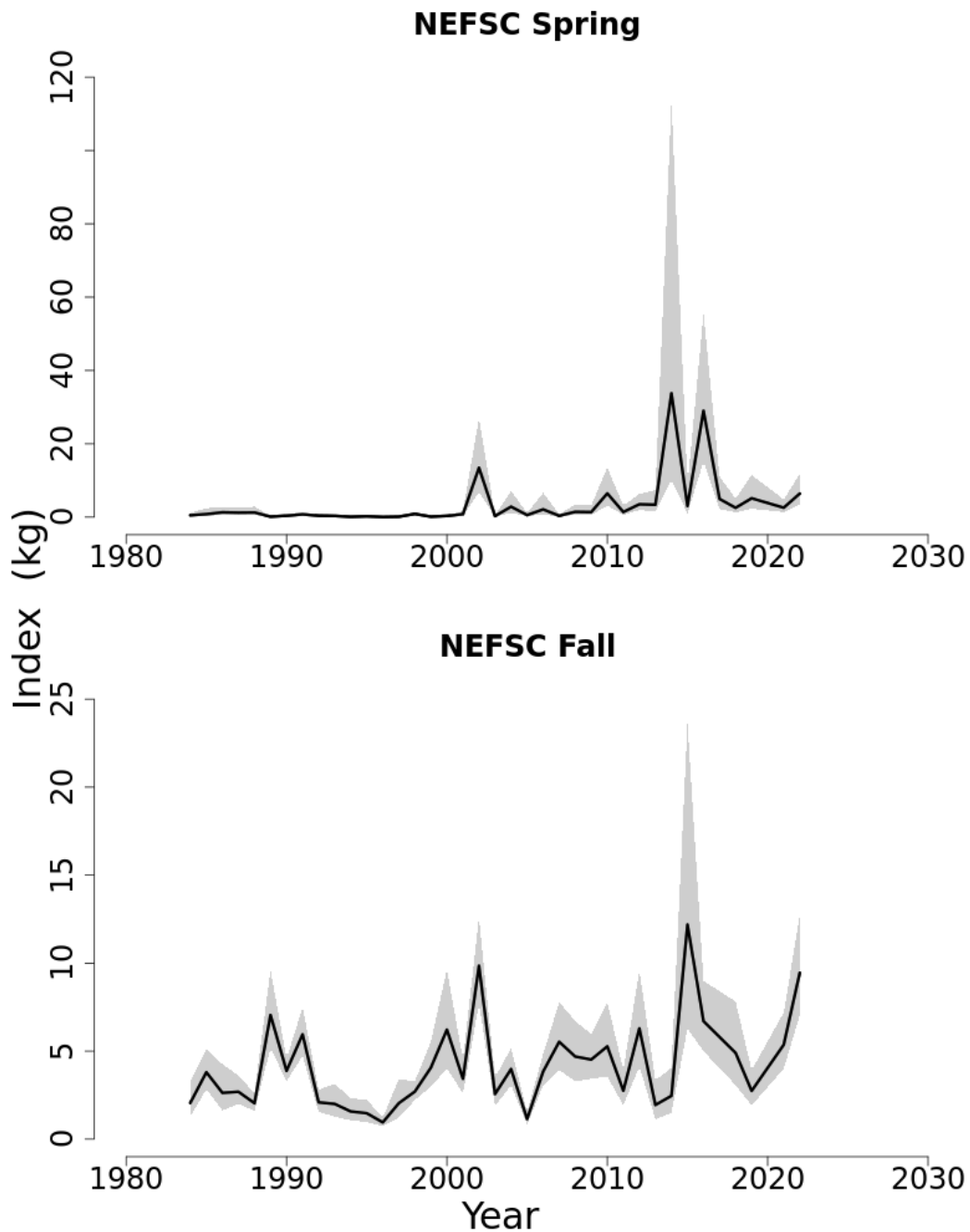


Figure 5: Indices of biomass for Scup between 1984 and 2022 for the Northeast Fisheries Science Center (NEFSC) spring and fall research bottom trawl survey series calibrated to FSV Albatross IV equivalents. The approximate 90% log-normal confidence intervals are shown.