

13 White hake

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*This assessment of the white hake (*Urophycis tenuis*) stock is an operational assessment of the existing 2013 benchmark ASAP assessment (NEFSC 2013). Based on the previous assessment the stock was not overfished, and overfishing was not occurring. This assessment updates commercial fishery catch data, research survey indices of abundance, the ASAP assessment model and reference points through 2014. Additionally, stock projections have been updated through 2018.*

State of Stock: Based on this updated assessment, white hake (*Urophycis tenuis*) stock is not overfished and overfishing is not occurring (Figures 66-67). Retrospective adjustments were not made to the model results. Spawning stock biomass (SSB) in 2014 was estimated to be 28,553 (mt) which is 88% of the biomass target ($SSB_{MSY} proxy = 32,550$; Figure 66). The 2014 fully selected fishing mortality was estimated to be 0.076 which is 40% of the overfishing threshold proxy ($F_{MSY} proxy = 0.188$; Figure 67).

Table 42: Catch and status table for white hake. All weights are in (mt) recruitment is in (000s) and F_{Full} is the fishing mortality on fully selected ages (ages 6 - 9+). Model results are from the current updated ASAP assessment.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	<i>Data</i>									
Commercial discards	93	62	36	171	83	91	54	34	28	33
Commercial landings	2,671	1,703	1,530	1,340	1,712	1,820	2,899	2,771	2,235	1,888
Canadian landings	85	89	56	39	79	104	86	83	43	59
Other landings	0	0	0	0	0	0	0	0	0	0
Catch for Assessment	2,849	1,851	1,621	1,543	1,859	2,002	3,039	2,887	2,306	1,980
	<i>Model Results</i>									
Spawning Stock Biomass	10,752	11,000	13,721	14,988	14,662	18,782	22,824	24,156	25,092	28,553
F_{Full}	0.306	0.19	0.126	0.123	0.149	0.118	0.151	0.136	0.103	0.076
Recruits <i>age1</i>	3,523	4,356	3,533	4,013	3,925	3,505	3,409	3,000	3,674	1,343

Table 43: Comparison of reference points estimated in the 2013 assessment and from the current assessment update. An $F_{40\%}$ proxy was used for the overfishing threshold and was based on long-term stochastic projections which sampled from a cumulative distribution function of recruitment estimates from ASAP from 1963-2012. The annual fishery selectivity, maturity ogive, and mean weights at age used in the projection are the most recent 5 year averages.

	2013	Current
$F_{MSY} proxy$	0.200	0.188
SSB_{MSY} (mt)	32,400	32,550 (26,323 - 40,771)
MSY (mt)	5,630	5,422 (4,589 - 6,470)
Median recruits (age 1) (000s)	4,948	4,608
<i>Overfishing</i>	No	No
<i>Overfished</i>	No	No

Projections: Short term projections of catch and SSB were derived by sampling from a cumulative distribution function of recruitment estimates from ASAP from 1995-2012. The annual fishery selectivity, maturity ogive, and mean weights at age used in the projection are the most recent 5 year averages.

Table 44: Short term projections of total fishery catch and spawning stock biomass for white hake based on a harvest scenario of fishing at $F_{MSY} proxy$ between 2016 and 2018. Catch in 2015 was assumed to be 1,759 (mt) and is also the 2015 OFL.

Year	Catch (mt)	SSB (mt)	F_{Full}
2015	1,759	28,829 (24,458 - 33,954)	0.066
2016	4,985	29,304 (24,851 - 34,376)	0.188
2017	4,627	27,320 (23,386 - 31,685)	0.188
2018	4,393	26,119 (22,742 - 29,940)	0.188

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).
 1. *Catch at age information is not well characterized due to possible mis-identification of species in the commercial and sea sampling data, particularly in early years, low sampling of commercial landings in some years, and sparse discard data, particularly in early years.*
 2. *Since the commercial catch is aged primarily with survey age/length keys, there is considerable augmentation required, mainly for ages 5 and older. The numbers at age and mean weights at age in the catch for these ages may therefore not be well specified.*
 3. *White hake may move seasonally into and out of the defined stock area.*
 4. *There are no commercial catch at age data prior to 1989 and the catchability of older*

ages in the surveys is very low. This results in a large uncertainty in starting numbers at age.

5. Since 2003, dealers have been culling very large fish out of the large market category. However, there was no market category to input into the landings until June 2014. The length compositions are distinct from fish categorized as large and have been identified since 2011. This may bias the age composition of the landings, particularly in 2014 when 2000 of the 5000 large samples were these extra-large fish.

6. A pooled age/length key is used for 1963-1981, fall 2003 (second half of commercial key) and 2014. Age data were not available for 2014 in time for this assessment. The same pooled key that was used for 1963-1981 was used for 2014.

- 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 8).

No retrospective adjustment of spawning stock biomass or fishing mortality in 2014 was required. The pattern in this assessment is considered minor (Mohns rho of 0.18 on SSB, Mohns rho of 0.12 on F) with the adjusted SSB within the 90% CI of the MCMC. However, the Mohns rho for Age 1 estimates is 0.54. This may have an impact on projections if this continues into the future.

- Based on this stock assessment, are population projections well determined or uncertain?

Population projections for white hake are not well determined and projected biomass from the last assessment was outside the confidence bounds of the biomass estimated in the current assessment.

- 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 2011 catch-at-length and age were re-estimated for both landings and discards. For the landings, two samples were adjusted for dorsal length to total length that had been missed in the previous assessment.

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

While stock status of white hake has not changed, the stock has not rebuilt as the projections from the last assessment indicated. This is due to the retrospective pattern in recruitment. The numbers for the 2005-2009 year classes, which were included in the age 2-6 starting numbers in the projections, were over-estimated which led to over-estimating SSB in 2014.

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

Age structures from the observer program are available and should be aged to augment the survey keys. There is also a new market category for heads, and age structures could be acquired from these as an otolith length/total length relationship can be established.

- Are there other important issues?

None.

13.1 Reviewer Comments: White hake

Recommendation: The Panel concluded that the updated stock assessment without retrospective adjustment was acceptable as a scientific basis for management advice and agreed with the status determination that the stock is not overfished and overfishing is not occurring. The Panel accepted the current projections as a basis for the 2016-2018 catch advice. All data updates and revisions were accepted by the Panel.

Alternative Assessment Approach: Not applicable

Sources of Uncertainty: Major sources of uncertainty are the commercial catch, age data, and stock dynamics. The magnitude of the SSB retrospective pattern was less than but near the upper bound of the confidence interval and is a source of uncertainty. The previous assessment overestimated abundance of ages 2-5, which do not contribute much to the estimate of SSB. Therefore, previous projections were overly optimistic. There are two large residuals at the end of the fall survey time series. The spring 2015 survey is not included in the updated benchmark method, but the index is less than the 2014 index. There is possible mis-identification of hake species during commercial and at-sea sampling and sparse discard data. The recent addition of an extra-large market category and the mis-match between samples and landings statistics may bias the age composition of landings. Age/length data from surveys are used to estimate commercial catch age composition and pooled age/length keys were used for 1963-1981, fall 2003 and 2014. Numbers and weights of ages 5 and older are likely the most uncertain due to low sample sizes. There are also potential seasonal movements in and out of the stock area that are not accounted for in the current assessment model.

Research Needs: For the next benchmark assessment, the Panel recommended that more age samples be processed, particularly for large sizes, and that staff should investigate the appropriate way to estimate age composition of fish in the extra-large market category. In addition, methods to account for size structure information without pooling age/length keys should be explored. Given that the last two years of survey data were not fit well in the model, the Panel recommended monitoring the model predictions of survey trends closely for major deviations in the future.

References:

NEFSC. 2013. 56th Northeast Regional Stock Assessment Workshop (56th SAW) Assessment Report. US Dep Commer, NOAA Fisheries, Northeast Fish Sci Cent Ref Doc. 13-10; 868 p. [CRD13-10](#)

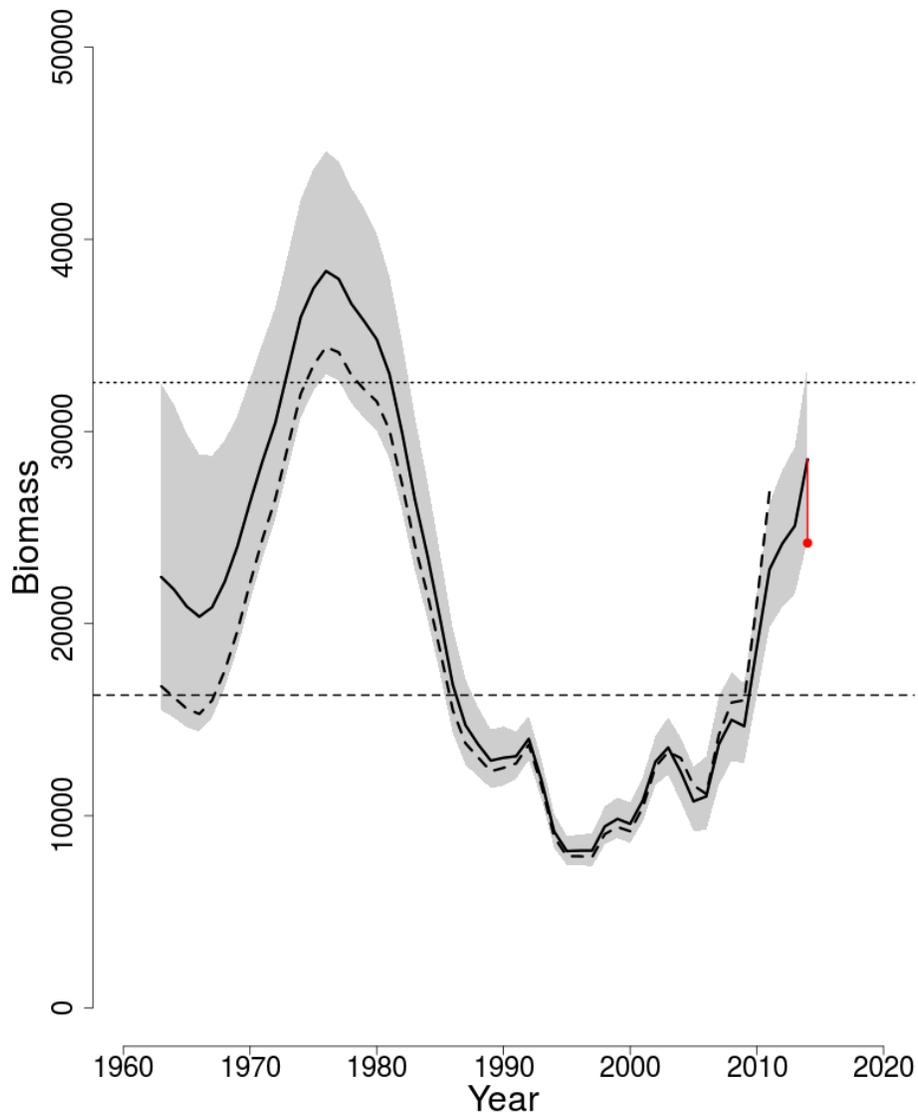


Figure 66: Trends in spawning stock biomass of white hake between 1963 and 2014 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{Threshold}$ ($\frac{1}{2} SSB_{MSY}$ proxy; horizontal dashed line) as well as SSB_{Target} (SSB_{MSY} proxy; horizontal dotted line) based on the 2014 assessment. The red dot indicates the rho-adjusted SSB values that would have resulted had a retrospective adjustment been made (see Special Comments section). The approximate 90% lognormal confidence intervals are shown.

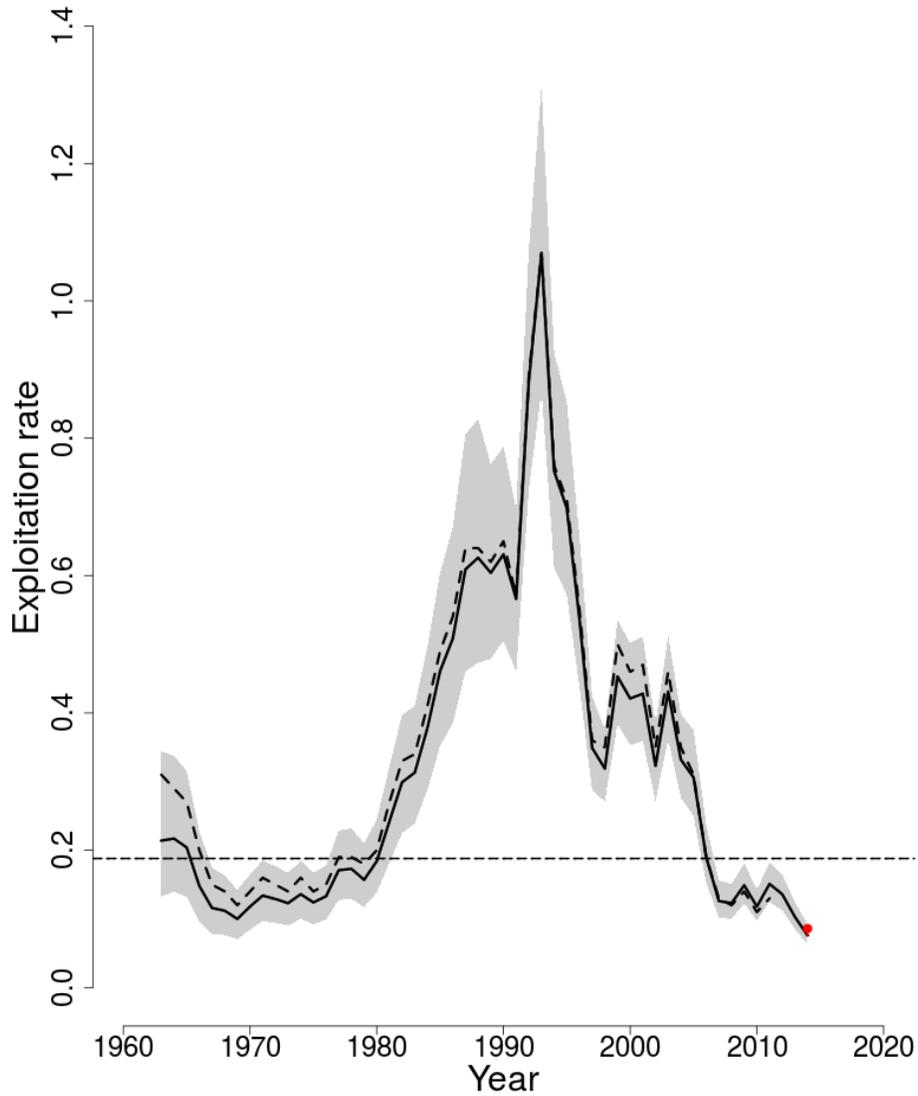


Figure 67: Trends in the fully selected fishing mortality (F_{Full}) of white hake between 1963 and 2014 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{Threshold}$ (F_{MSY} proxy=0.188; horizontal dashed line). The red dot indicates the rho-adjusted SSB values that would have resulted had a retrospective adjustment been made (see Special Comments section). The approximate 90% lognormal confidence intervals are shown.

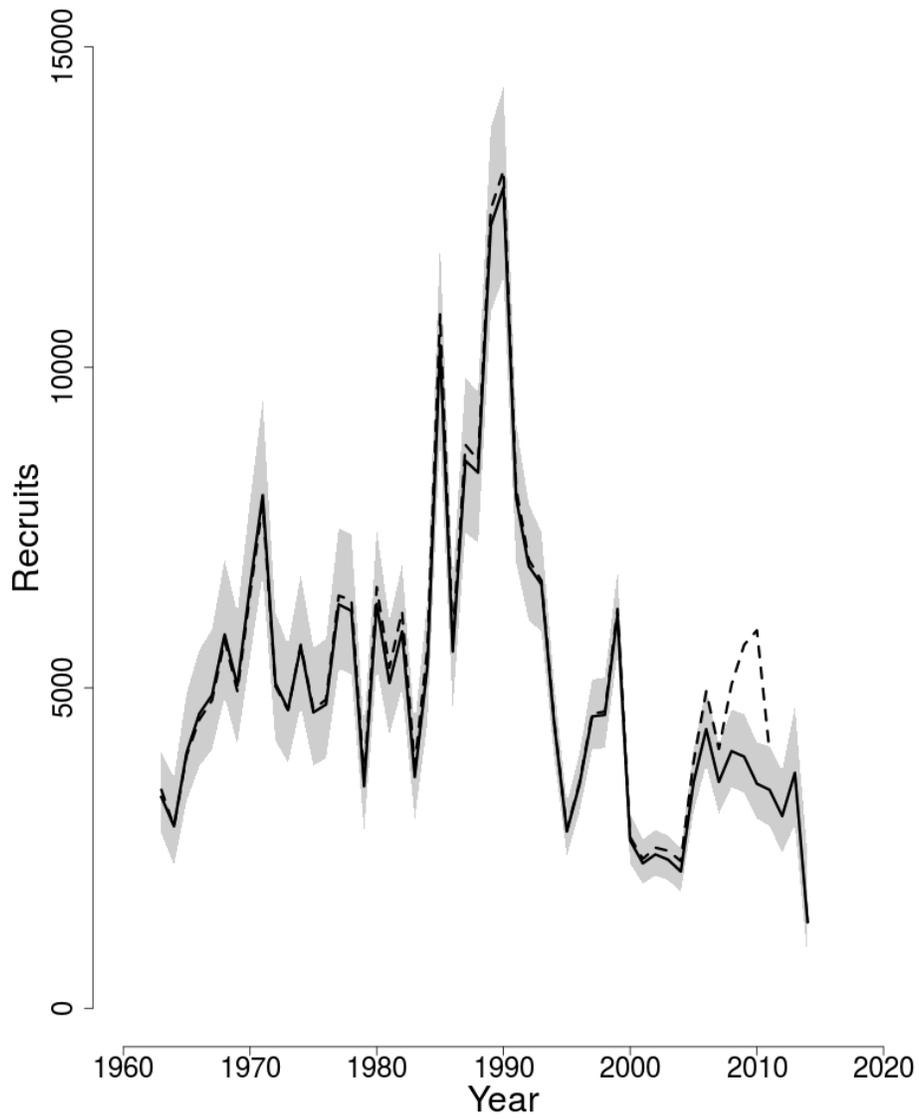


Figure 68: Trends in Recruits (age 1) (000s) of white hake between 1963 and 2014 from the current (solid line) and previous (dashed line) assessment. The approximate 90% lognormal confidence intervals are shown.

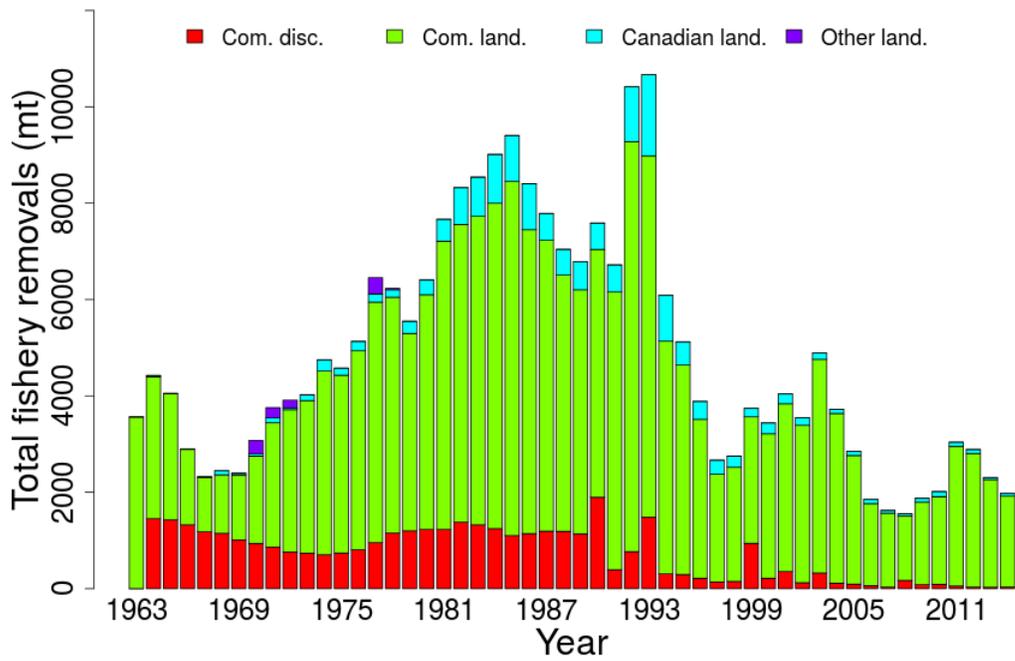


Figure 69: Total catch of white hake between 1963 and 2014 by fleet (commercial, recreational, or Canadian) and disposition (landings and discards).

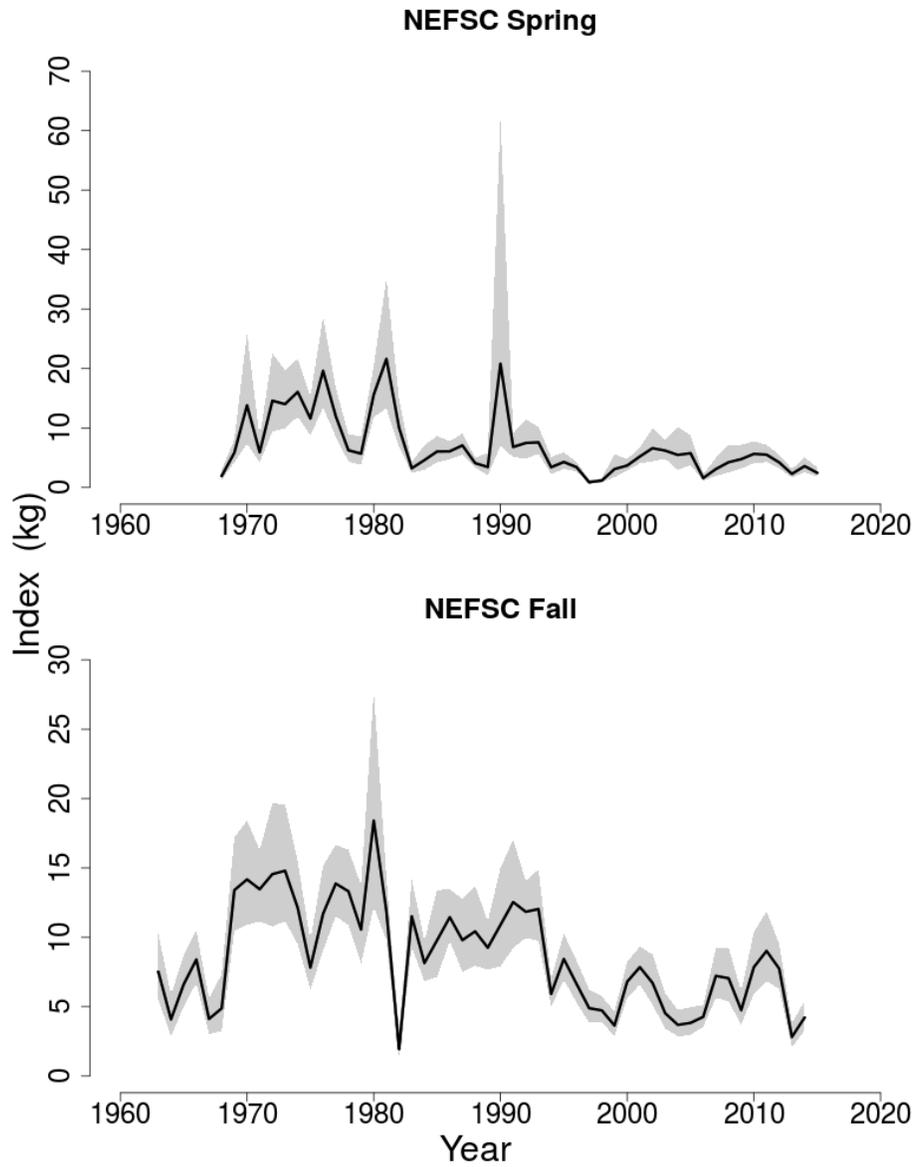


Figure 70: Indices of biomass for the white hake between 1963 and 2015 for the Northeast Fisheries Science Center (NEFSC) spring and fall bottom trawl surveys. The approximate 90% lognormal confidence intervals are shown.