

draft working paper for peer review only



White hake

2015 Assessment Update 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 white hake (*Urophycis tenuis*) stock is an operational update of the 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 biomass, and the ASAP assessment model and reference points through 2014. Stock projections have been updated through 2018.

State of Stock: Based on this updated assessment, the white hake (*Urophycis tenuis*) stock is not overfished and overfishing is not occurring (Figures 1-2). 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 1). 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 2).

Table 1: Catch and ASAP results 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 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 2: 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 3: 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).

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 to fill in missing ages, 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 apparently been culling extra-large fish out of the large category. However, there was no market category to input these fishes into the landings until June 2014. The length compositions are distinct from 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?

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 pattern 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 affect 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 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 of the 2014 SSB.
- 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 a also a new market category for heads and age structures could be acquired from these is an otolith length/total length relationship can be established.
- Are there other important issues?
None.

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. <http://www.nefsc.noaa.gov/publications/crd/crd1310/>

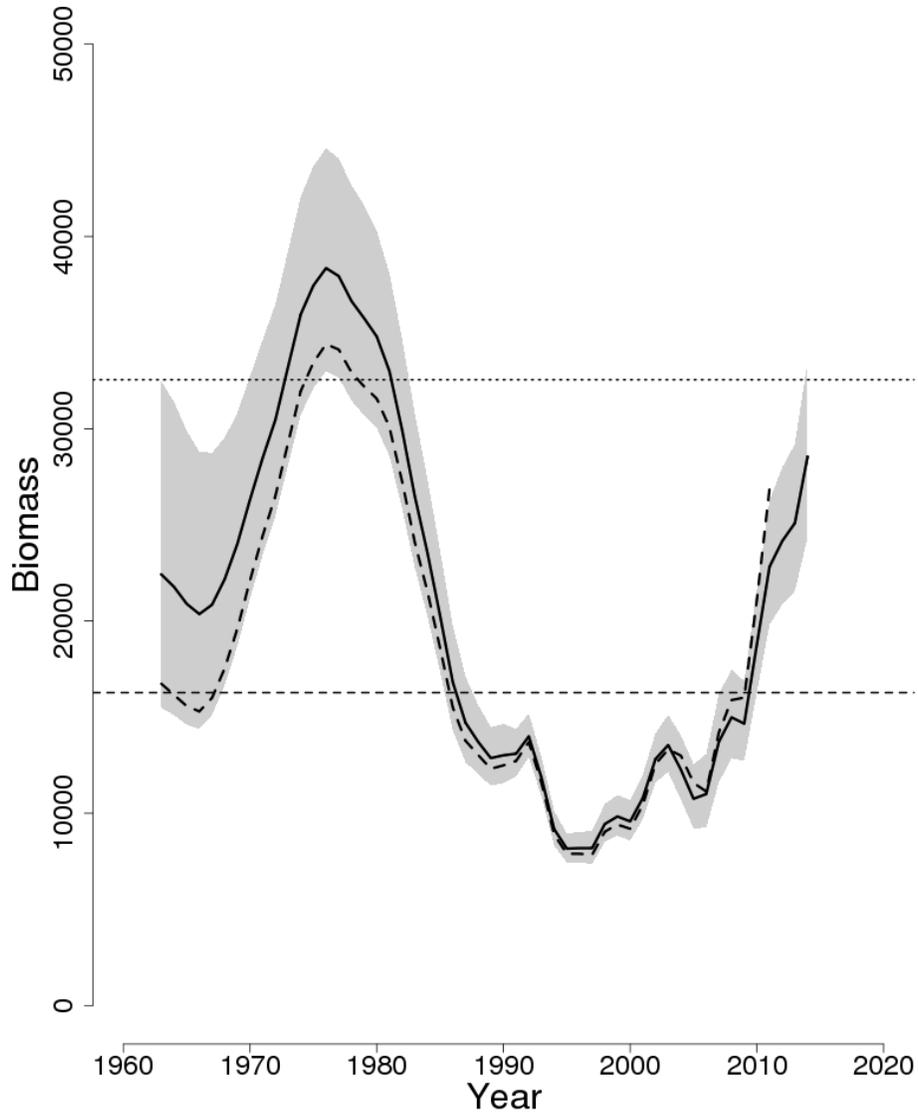


Figure 1: Trends in spawning stock biomass of white hake between 1963 and 2014 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{Threshold}$ ($\frac{1}{2} SSB_{MSY}$ proxy; horizontal dashed line) as well as SSB_{Target} (SSB_{MSY} proxy; horizontal dotted line) based on the 2015 assessment. The approximate 90% lognormal confidence intervals are shown.

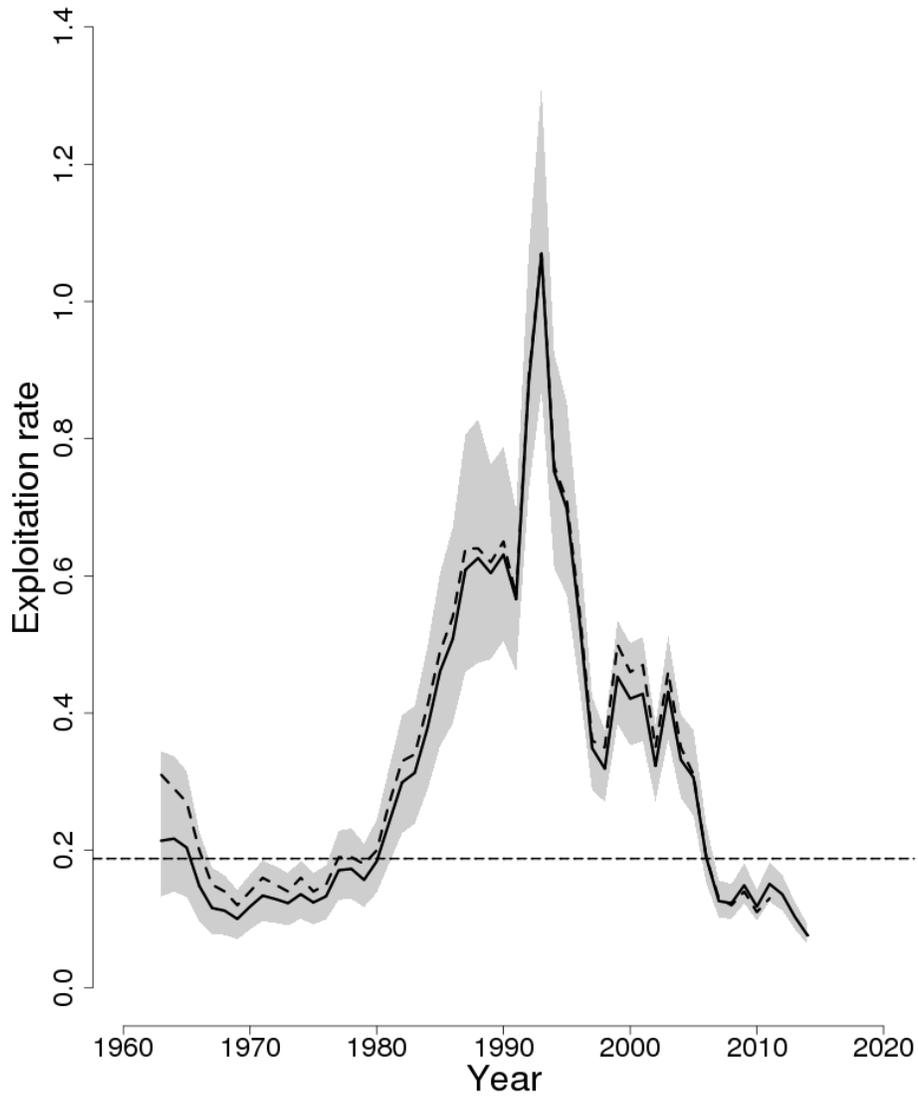


Figure 2: Trends in the fully selected fishing mortality (F_{Full}) of white hake between 1963 and 2014 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{Threshold}$ (F_{MSY} proxy=0.188; horizontal dashed line). based on the 2015 assessment. The approximate 90% lognormal confidence intervals are shown.

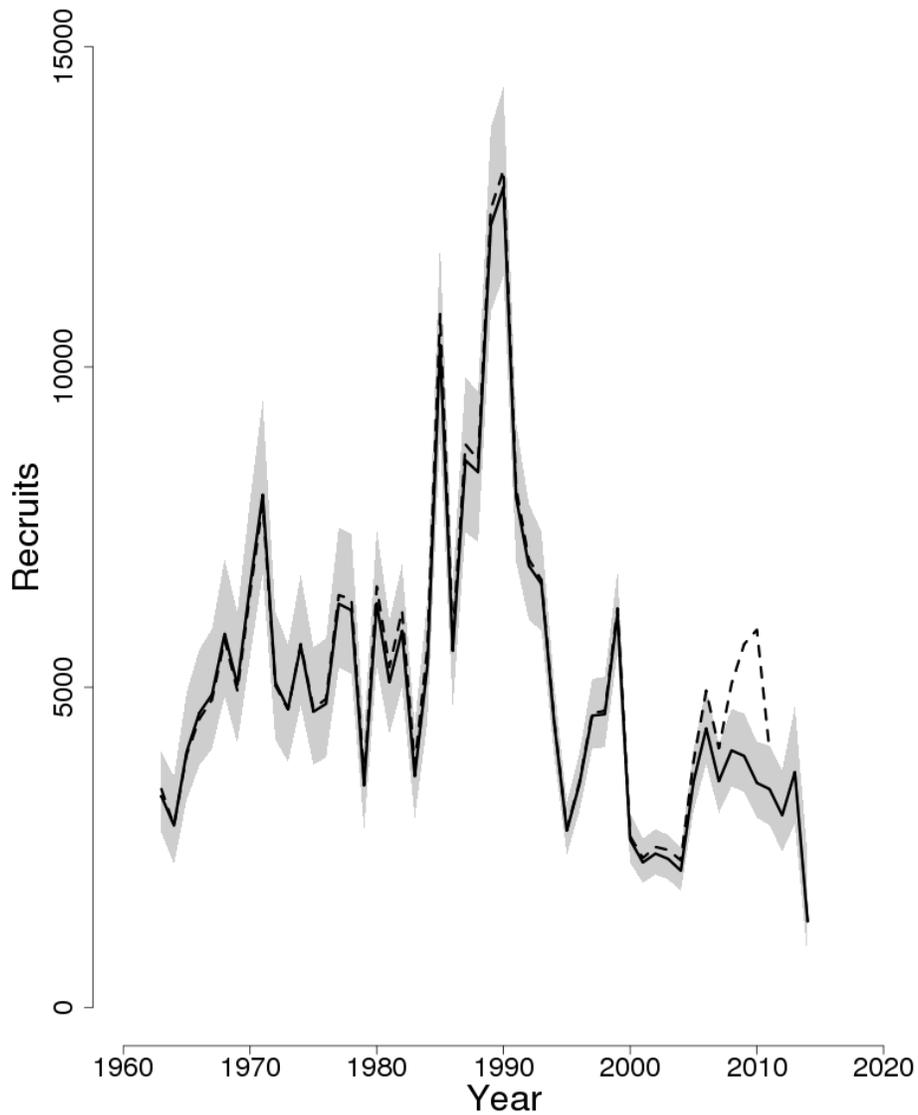


Figure 3: Trends in Recruits (age 1) (000s) of white hake between 1963 and 2014 from the current (solid line) and previous (dashed line) assessment. The approximate 90% lognormal confidence intervals are shown.

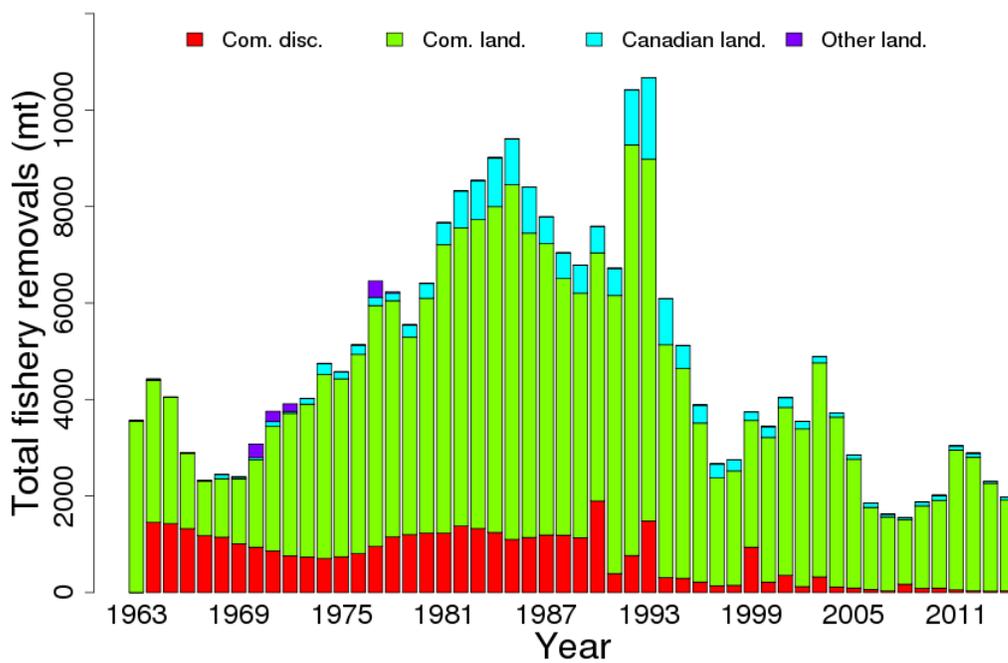


Figure 4: Total catch of white hake between 1963 and 2014 by fleet (commercial, recreational, or Canadian) and disposition (landings and discards).

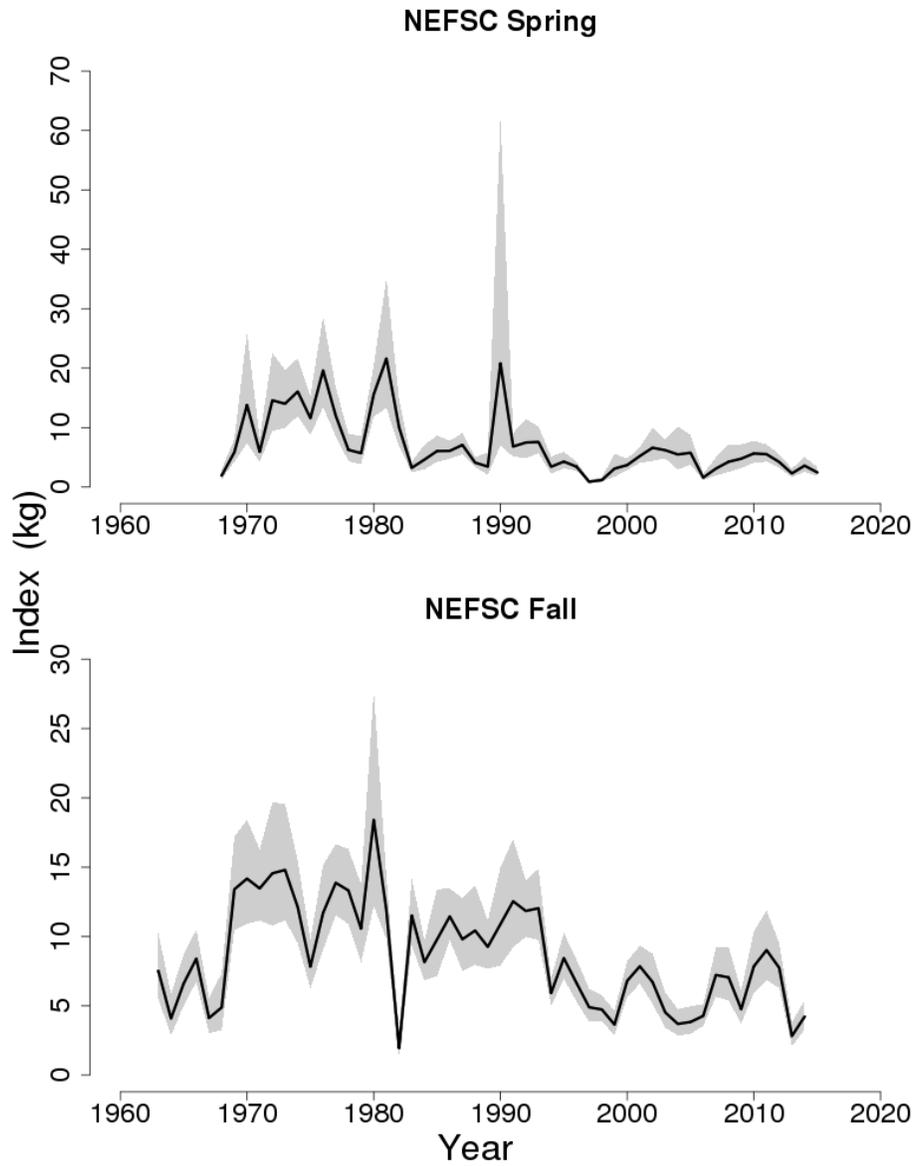


Figure 5: Indices of biomass for the white hake between 1963 and 2015 for the Northeast Fisheries Science Center (NEFSC) spring and fall bottom trawl surveys. The approximate 90% lognormal confidence intervals are shown.