

11 Witch flounder

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*This assessment of the witch flounder (*Glyptocephalus cynoglossus*) stock is an operational assessment of the 2012 assessment (NEFSC 2012) and the 2008 benchmark assessment (NEFSC 2008). This assessment updates commercial fishery catch data, research survey indices, and the analytical assessment model through 2014. Additionally, stock projections have been updated through 2018. Reference points have been updated.*

State of Stock: witch flounder (*Glyptocephalus cynoglossus*) stock is overfished and overfishing is occurring (Figures 56-57). Retrospective adjustments were made to the model results. Spawning stock biomass (SSB) in 2014 was estimated to be 2,077 (mt) which is 22% of the SSB_{MSY} proxy (9,473; Figure 56). The 2014 fully selected fishing mortality was estimated to be 0.687 which is 246% of the F_{MSY} proxy (0.279; Figure 57). A retrospective adjustment to F_{Full} and SSB in 2014 was required but did not lead to a change in status.

Table 36: Catch and model results table for witch flounder. All weights are in (mt), recruitment is in (000s). In this report, F_{Full} is defined as the average fishing mortality on ages 8 and 9 (unweighted). The 2014 retrospective adjusted values for F_{Full} and SSB are 0.687 and 2,077, respectively.

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	<i>Data</i>										
Commercial Landings	2,917	2,652	1,863	1,076	1,009	954	759	870	1,038	686	570
Commercial Discards	312	148	86	89	63	105	90	74	70	50	35
Catch for Assessment	3,229	2,800	1,949	1,165	1,072	1,059	850	944	1,108	737	604
	<i>Model Results</i>										
Spawning Stock Biomass	4,167	3,642	2,592	2,395	2,571	2,653	2,363	2,309	2,477	2,494	3,129
F_{Full}	0.936	0.859	0.899	0.568	0.658	0.583	0.671	0.633	0.78	0.637	0.428
Recruits Age3	4,268	3,546	3,619	4,992	4,713	3,730	3,229	5,388	7,740	3,876	10,160

Table 37: Biological references points for witch flounder from the previous and current assessments are given. An $F_{40\%}$ proxy was used for the overfishing threshold and biomass and catch proxies were based on long-term stochastic projections.

	2012	Current
F_{MSY}	0.27	0.279
SSB_{MSY} (mt)	10,051	9,473
MSY (mt)	2,075	1,957
Median Recruits Age 3 (000s)	9,301	8,517
<i>Overfishing</i>	Yes	Yes
<i>Overfished</i>	Yes	Yes

Projections: Short term projection recruitment was sampled from a cumulative distribution function derived from ADAPT VPA (with split time series between 1994 and 1995) estimated age 3 recruitment between 1982 and 2013. Average 2010-2014 partial recruitment, average 2010-2014 mean weights, and maturation ogive representing 2011-2015 maturity data were used.

Table 38: Short term projections of median total fishery yield and spawning stock biomass for witch flounder based on a harvest scenario of fishing at F_{MSY} between 2016 and 2018. Catch in 2015 has been estimated at 637 mt; initial 2015 stock sizes for ages 3 to 11+. The SSB retrospective adjustment factor (0.6638) was applied to all ages.

Year	Catch (mt)	SSB (mt)	F_{Full}
2015	637	2556	0.437
2016	513	3201	0.279
2017	712	4143	0.279
2018	879	5163	0.279

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).

An important source of uncertainty is the retrospective pattern where fishing mortality is underestimated and spawning stock biomass and recruitment are overestimated.

- 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 7-year Mohn's ρ , relative to SSB, was 0.61 in the 2012 assessment and was 0.51 in 2014. The 7-year Mohn's ρ , relative to F, was -0.33 in the 2012 assessment and was -0.38 in 2014. There was a major retrospective pattern for this assessment because the ρ adjusted estimates of 2014 SSB ($SSB_{\rho}=2,077$) and 2014 F ($F_{\rho}=0.687$) were outside the approximate 90% confidence region around SSB (2,643 - 3,864) and F (0.321 - 0.603). A retrospective adjustment was made for both the determination of stock status and for projections of catch in 2016. The retrospective adjustment changed the 2014 SSB from 3,129 to 2,077 and the 2014 F_{Full} from 0.428 to 0.687.

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

Population projections for witch flounder appear to be optimistic; the projected rho adjusted biomass from the last assessment was above the upper confidence bounds of the projected rho adjusted 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.

TOGA (Type, Operation, Gear, Acquisition) values were used for haul criteria for

NEFSC surveys for 2009 onward and minor changes in the use of observer data for discard estimates were made to the current witch flounder assessment. These changes had a negligible effect on the assessment and stock status.

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

No change in stock status has occurred for witch flounder since the previous assessment.

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

Extensive studies have examined the causes of retrospective patterns with no definitive conclusions other than a change in model does not resolve the issue.

- Are there other important comments?

The VPA analysis was performed with survey time series split between 1994 and 1995. This time split corresponds to changes in the commercial reporting methods as well as other regulatory management changes.

11.1 Reviewer Comments: Witch flounder

Recommendation: The Panel concluded that the updated stock assessment with retrospective adjustment was acceptable as a scientific basis for management advice and agreed with the status determination that the stock is overfished and overfishing is occurring. The Panel accepted the current rho-adjusted projections as basis for the 2016-2018 overfishing limits but these limits may be optimistic. All data updates and survey revisions were accepted by the Panel.

Alternative Assessment Approach: Not applicable

Source of Uncertainty: A major source of uncertainty is the retrospective pattern. The current assessment model underestimates fishing mortality and overestimates spawning stock biomass. Compared to the 2012 assessment, the magnitude of the retrospective pattern has increased slightly for F and decreased slightly for SSB.

Research Needs: The Panel recommends that the sources of the retrospective pattern need to be addressed. Considering that retrospective patterns are a common problem, the generic problem may be most appropriately addressed in a research track topic, and all possible sources of the retrospective problem should be investigated (misspecified natural mortality, changes in natural mortality, under-reported catch, changes in survey catchability and misspecified selectivity, etc.).

For the next benchmark assessment, the Panel recommended exploring a statistical catch-at-age model to investigate possible doming in the catch selectivity.

References:

Northeast Fisheries Science Center. 2008. Assessment of 19 Northeast Groundfish Stocks through 2007: Report of the 3rd Groundfish Assessment Review Meeting (GARM III), Northeast Fisheries Science Center, Woods Hole, Massachusetts, August 4-8, 2008. US Dep Commer, NOAA Fisheries, Northeast Fish Sci Cent Ref Doc. 08-15; 884 p + xvii. [CRD08-15](#)

Northeast Fisheries Science Center. 2012. Assessment or Data Updates of 13 Northeast Groundfish Stocks through 2010. US Dep Commer, NOAA Fisheries, Northeast Fish Sci Cent Ref Doc. 12-06; 789 p. [CRD12-06](#)

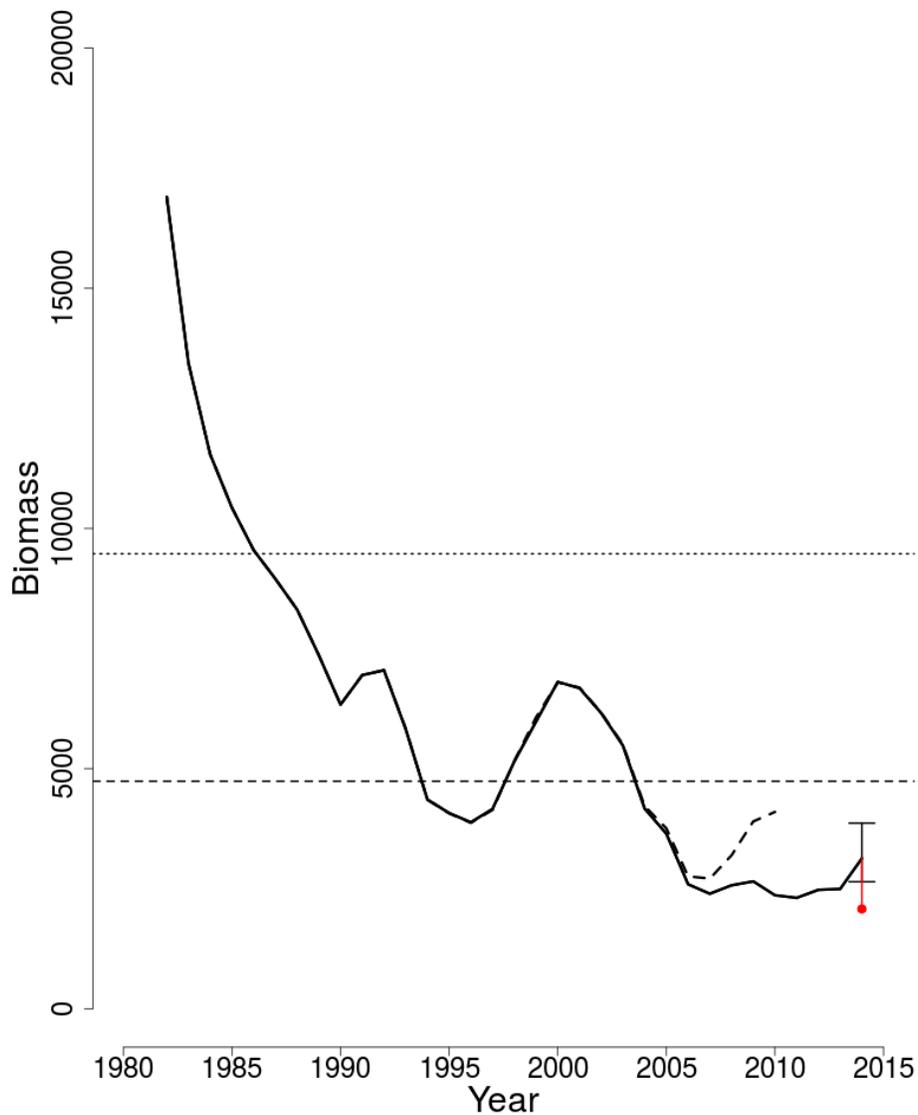


Figure 56: Trends in spawning stock biomass (mt) of witch flounder between 1982 and 2014 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{Threshold}$ ($\frac{1}{2} SSB_{MSY}$; horizontal dashed line) as well as SSB_{Target} (SSB_{MSY} ; horizontal dotted line) based on the current assessment. Red solid vertical line indicates rho adjusted SSB. Black solid vertical line indicates 90% confidence interval for 2014.

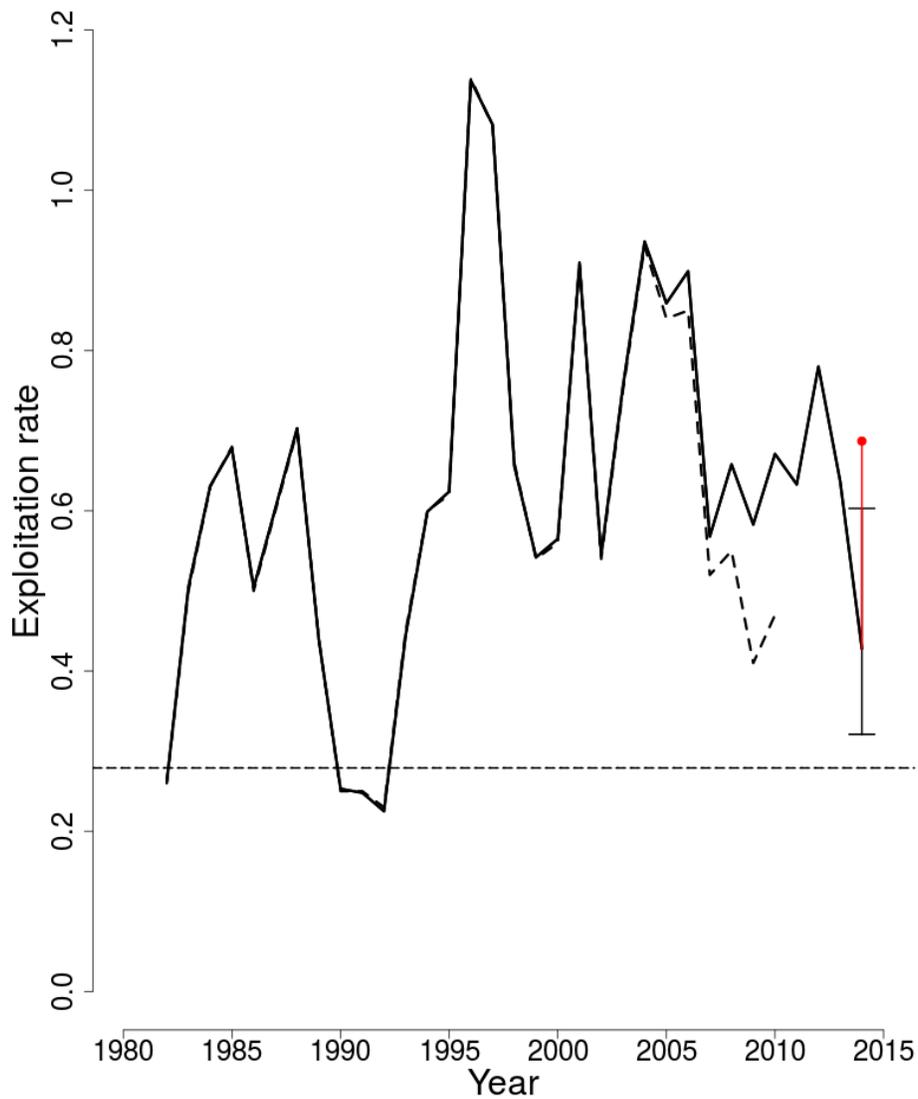


Figure 57: Trends in the fully selected fishing mortality (F_{Full}) of witch flounder between 1982 and 2014 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{Threshold}$ ($F_{MSY}=0.279$; horizontal dashed line) based on the current assessment. Red solid vertical line indicates rho adjusted F_{Full} . Black solid vertical line indicates 90% confidence interval for 2014.

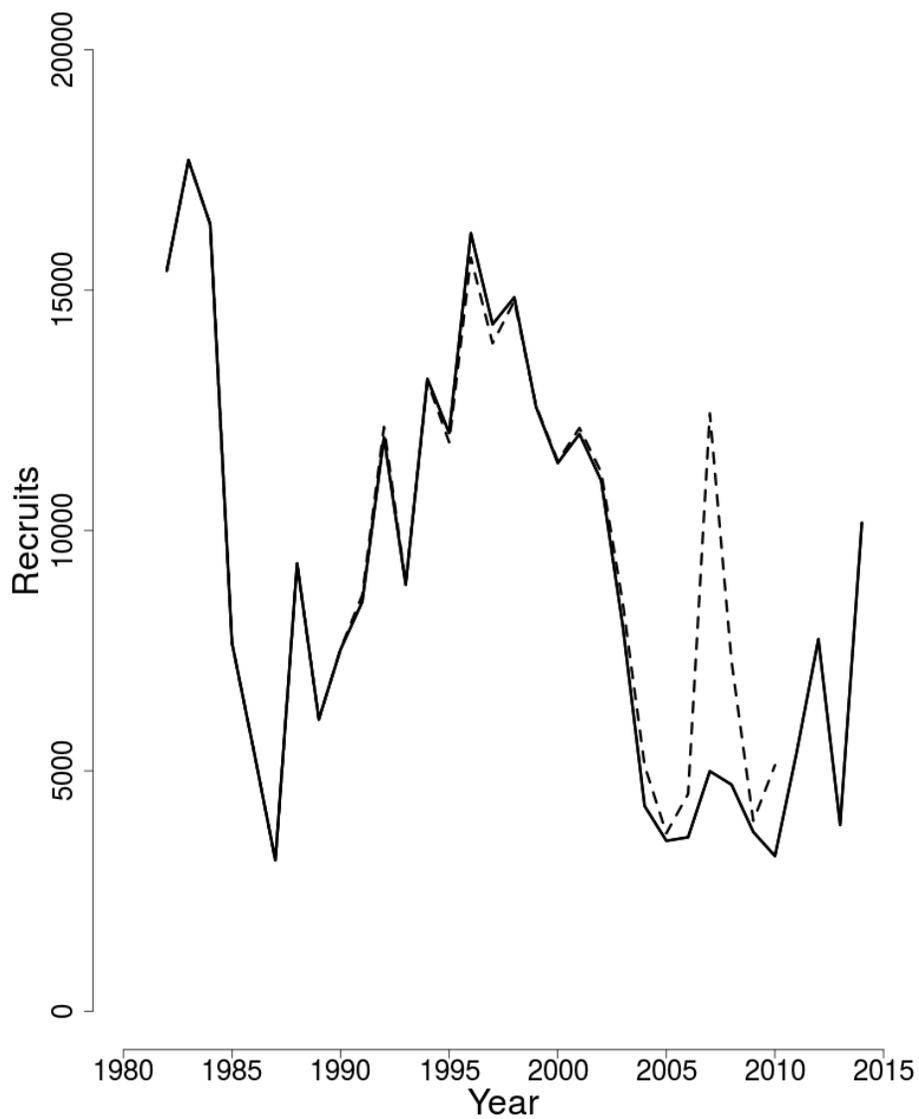


Figure 58: Trends in Age 3 (000s) of witch flounder between 1982 and 2014 from the current (solid line) and previous (dashed line) assessment.

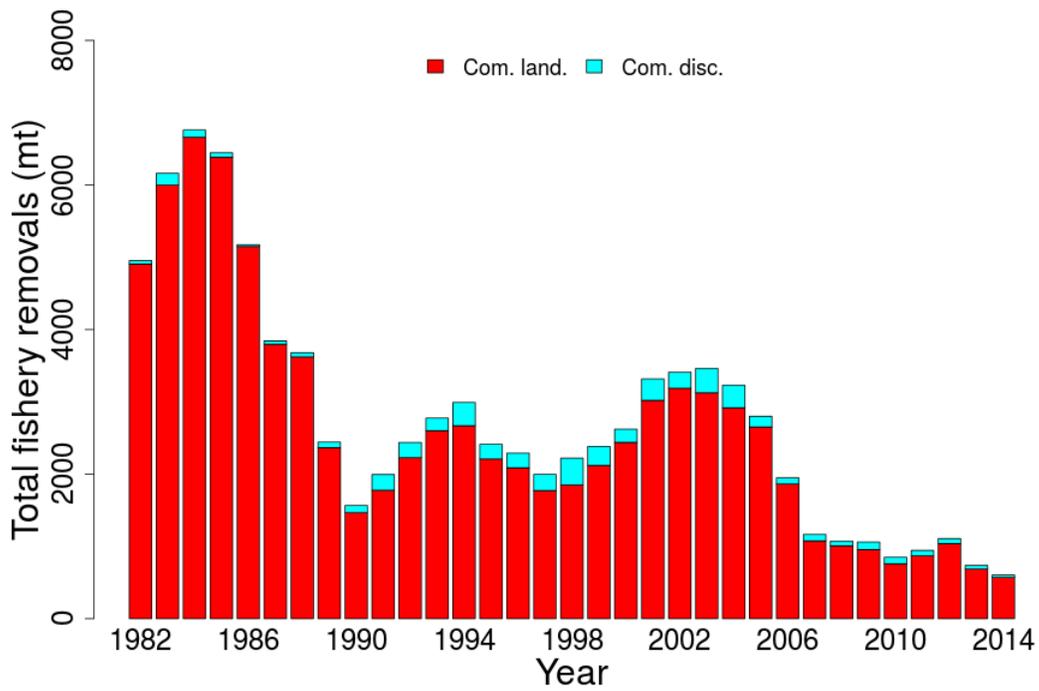


Figure 59: Total catch of witch flounder between 1982 and 2014 by fleet (commercial) and disposition (landings and discards).

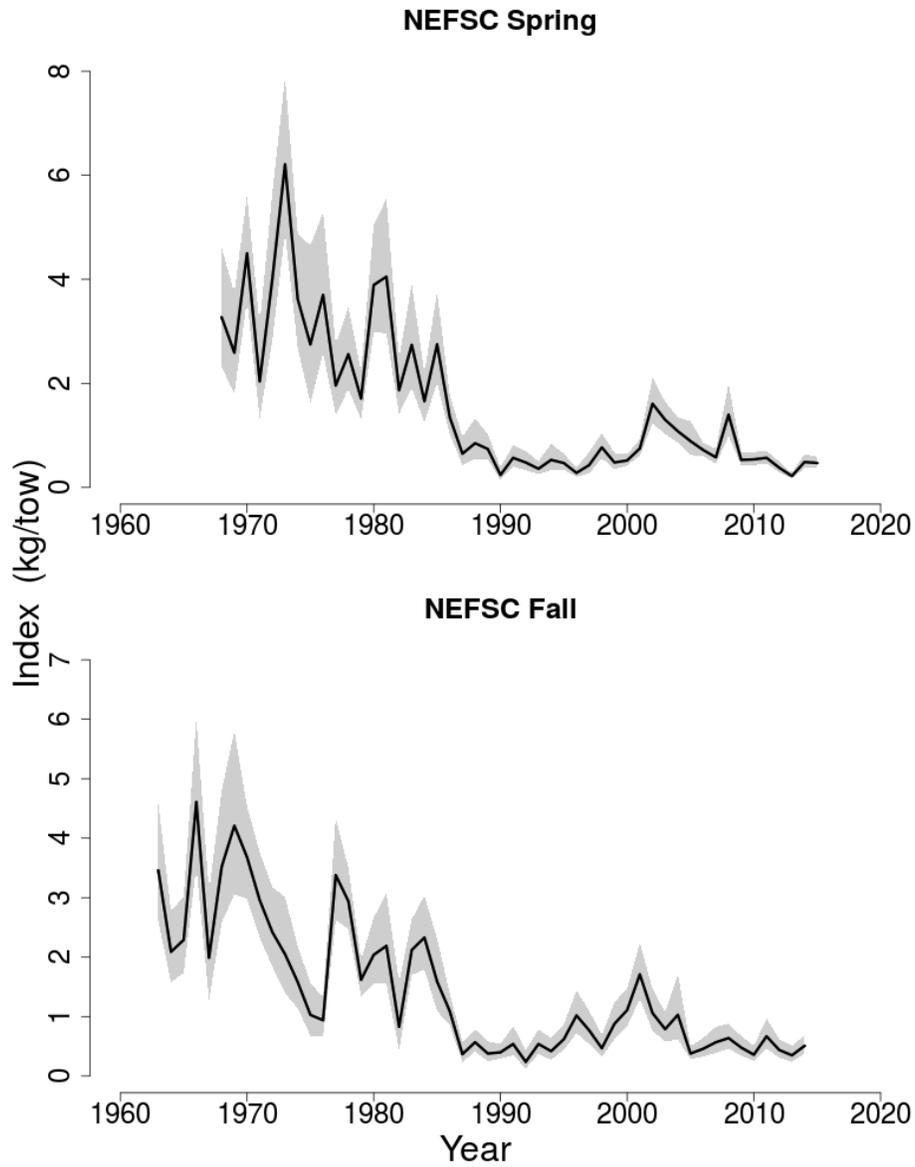


Figure 60: Indices of biomass (kg/tow) for the witch flounder between 1963 and 2015 for the Northeast Fisheries Science Center (NEFSC) spring and fall bottom trawl surveys. The 90% lognormal confidence intervals are shown.