

*draft working paper for peer review only*



## Witch flounder

### *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 witch flounder (*Glyptocephalus cynoglossus*) stock is an operational update 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 1-2). Spawning stock biomass (SSB) in 2014 was estimated to be 3,129 (mt) which is 33% of the  $SSB_{MSY}$  proxy (9,473; Figure 1). The 2014 fully selected fishing mortality was estimated to be 0.428 which is 153% of the  $F_{MSY}$  proxy (0.279; Figure 2). A retrospective adjustment to  $F_{Full}$  and SSB in 2014 was required but did not lead to a change in status.

Table 1: 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 2: 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 3: Short term projections of median total fishery yield and spawning stock biomass for witch flounder based 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?  
*This assessment has a major retrospective pattern (rho adjusted values of  $F_{Full}$  and SSB are outside the associated 90% confidence interval). Mohn's rho values are -0.377 for fishing mortality, 0.507 for SSB, and 1.137 for Age 3 recruits. Adjusted estimates of  $F_{Full}$  and SSB were 0.687 and 2,077 mt, respectively.*
- 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 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.*

**References:**

Northeast Fisheries Science Center. 2008. Assessment of 19 Northeast Groundfish Stocks through 2007: Report of the 3<sup>rd</sup> 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.  
<http://www.nefsc.noaa.gov/publications/crd/crd0815/>

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. <http://www.nefsc.noaa.gov/publications/crd/crd1206/>

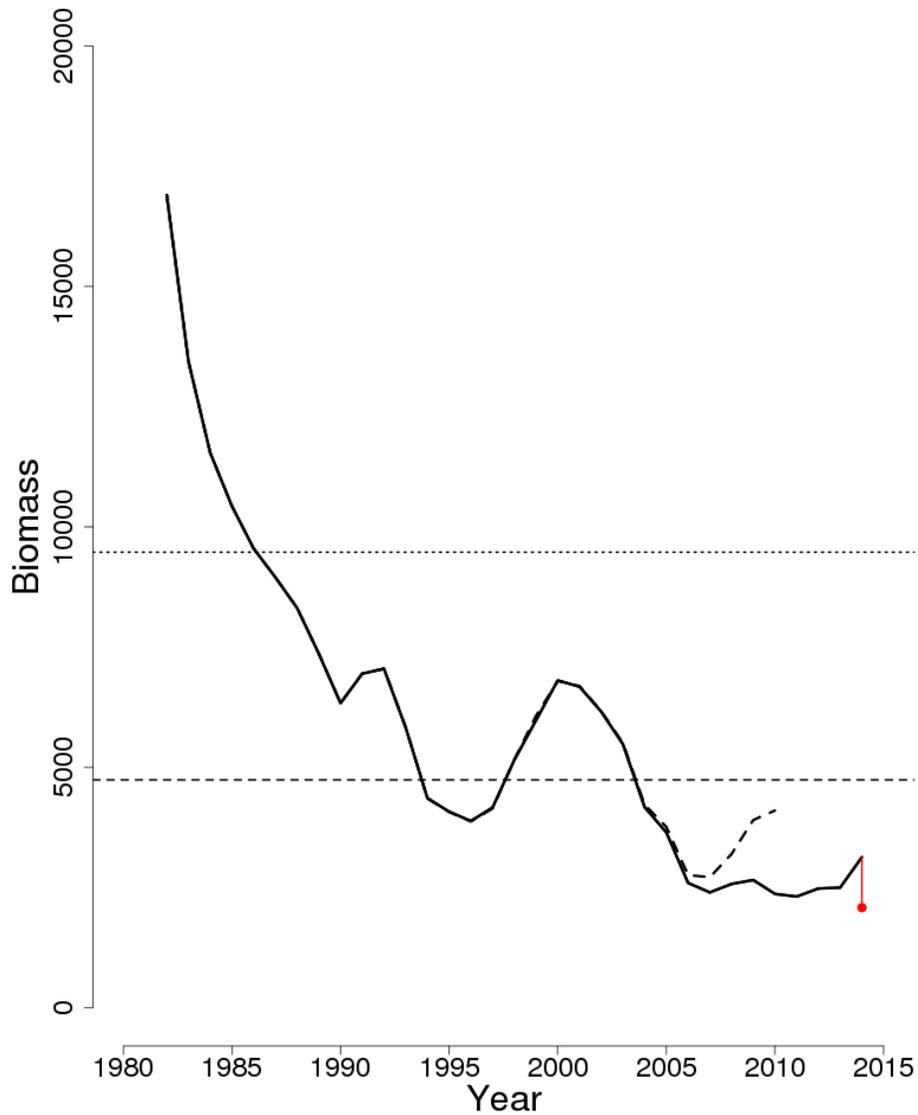


Figure 1: Trends in spawning stock biomass (mt) of witch flounder between 1982 and 2014 from the current (solid line) and previous (dashed line) assessment and the corresponding  $SSB_{Threshold}$  ( $\frac{1}{2} SSB_{MSY}$ ; horizontal dashed line) as well as  $SSB_{Target}$  ( $SSB_{MSY}$ ; horizontal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

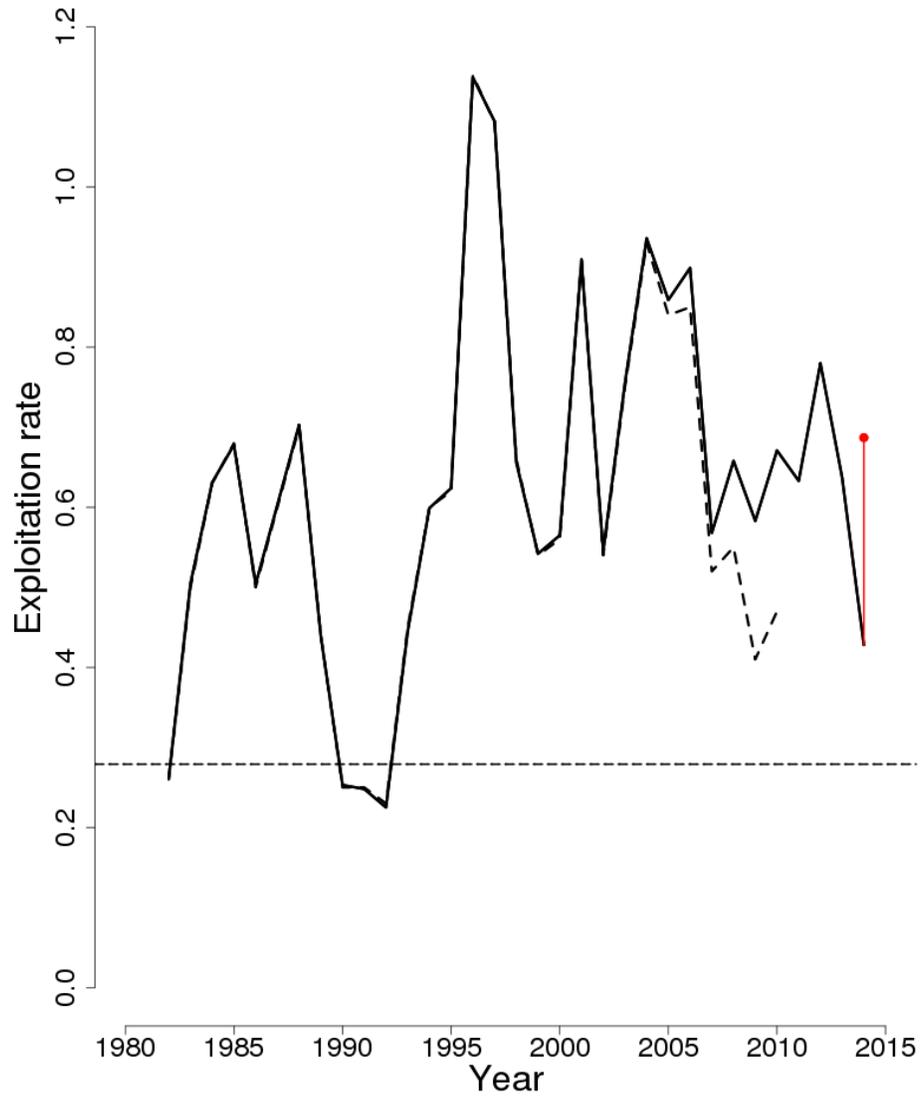


Figure 2: Trends in the fully selected fishing mortality ( $F_{Full}$ ) of witch flounder between 1982 and 2014 from the current (solid line) and previous (dashed line) assessment and the corresponding  $F_{Threshold}$  ( $F_{MSY}=0.279$ ; horizontal dashed line) based on the current assessment. Red solid vertical line indicates rho adjusted  $F_{Full}$ .

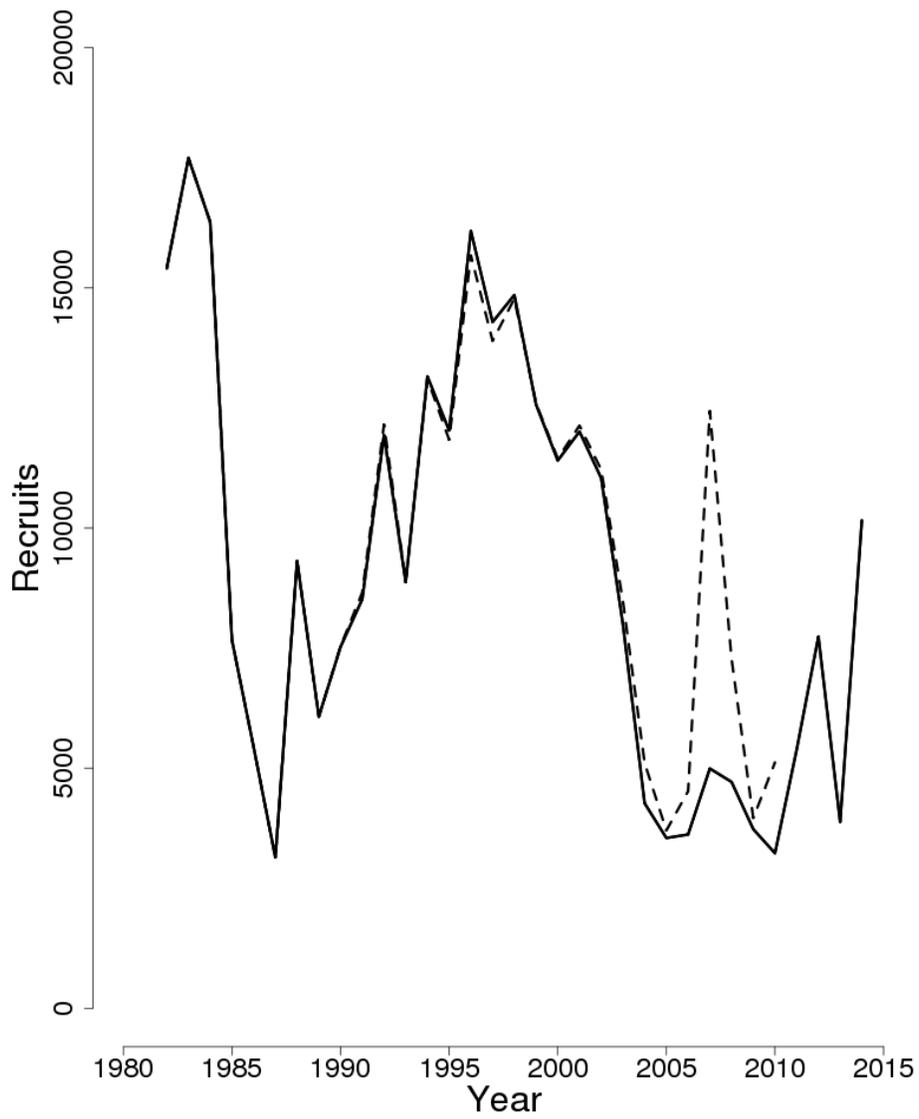


Figure 3: Trends in Age 3 (000s) of witch flounder between 1982 and 2014 from the current (solid line) and previous (dashed line) assessment.

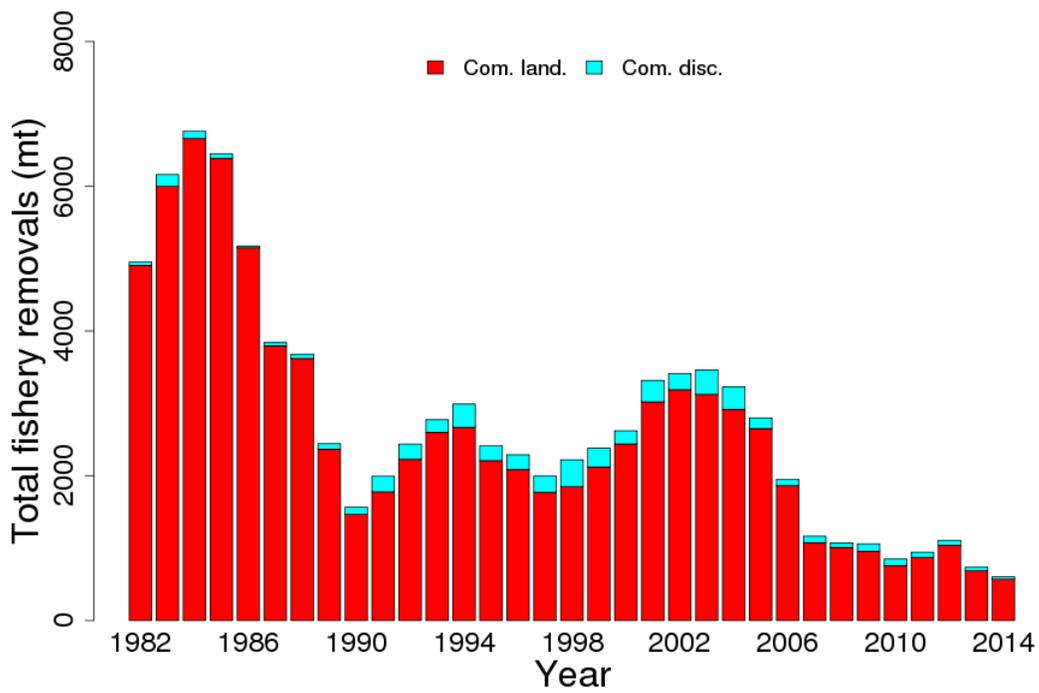


Figure 4: Total catch of witch flounder between 1982 and 2014 by fleet (commercial) and disposition (landings and discards).

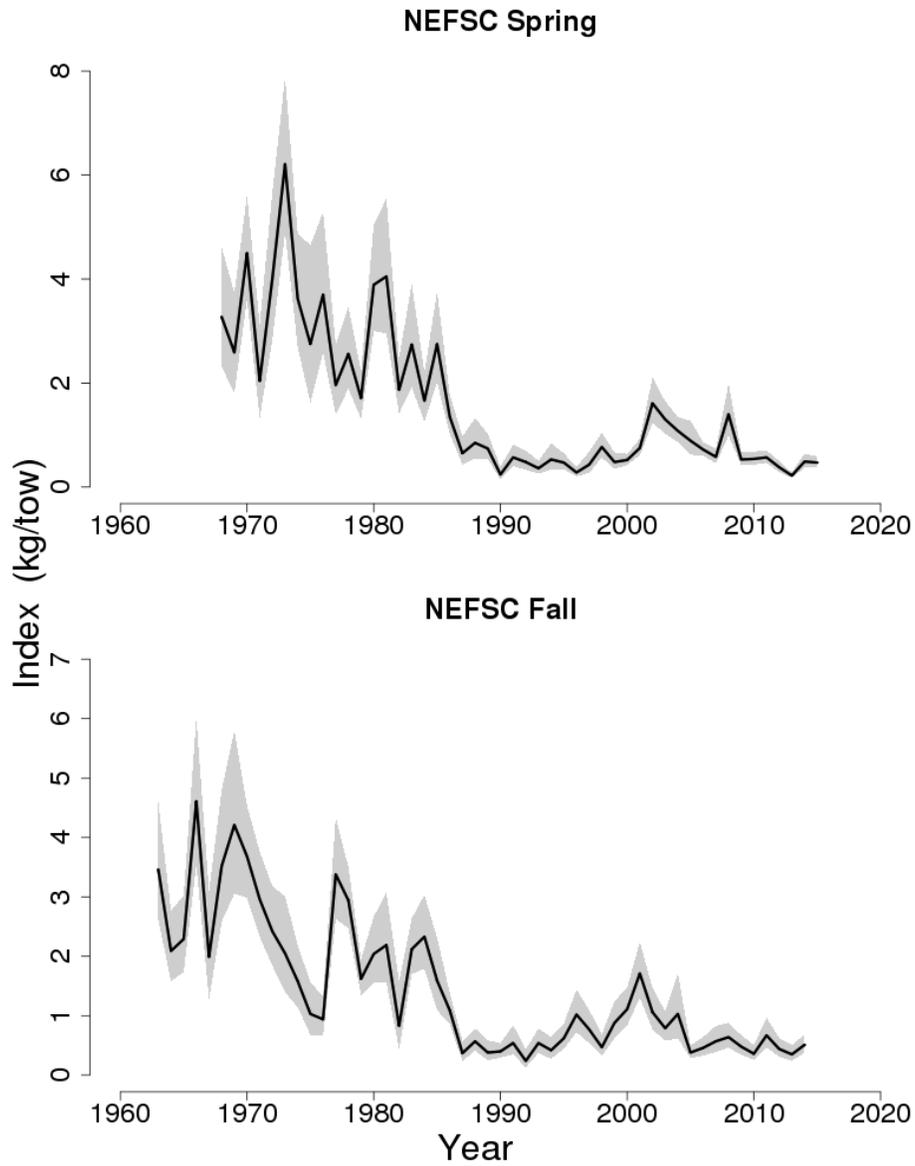


Figure 5: Indices of biomass (kg/tow) for the witch flounder between 1963 and 2015 for the Northeast Fisheries Science Center (NEFSC) spring and fall bottom trawl surveys. The 90% lognormal confidence intervals are shown.