draft working paper for peer review only

Southern New England-Mid Atlantic Yellowtail 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

Compiled September 2015

This assessment of the Southern New England-Mid Atlantic Yellowtail flounder (Limanda ferruginea) stock is an operational update of the existing 2012 benchmark ASAP assessment (NEFSC 2012). Based on the previous assessment the stock was not overfished, and overfishing was not ocurring. This assessment updates commercial fishery catch data, research survey indices of abundance, weights at age and the analytical ASAP assessment model and reference points through 2014. Additionally, stock projections have been updated through 2018

State of Stock: Based on this updated assessment, Southern New England-Mid Atlantic Yellowtail flounder (*Limanda ferruginea*) stock is overfished and overfishing is occurring (Figures 1-2). Spawning stock biomass (SSB) in 2014 was estimated to be 502 (mt) which is 26% of the biomass target for an overfished stock (SSB_{MSY} *proxy* = 1,959; Figure 1). The 2014 fully selected fishing mortality was estimated to be 1.64 which is 469% of the overfishing threshold proxy (F_{MSY} *proxy* = 0.35; Figure 2).

Table 1: Catch and model results for Southern New England-Mid Atlantic Yellowtail flounder. All weights are in (mt) recruitment is in (000s) and F_{Full} is the fishing mortality on fully selected ages (ages 4 and 5). Model results are from the current updated VPA assessment.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
					Data					
Commercial discards	104	187	296	391	268	177	145	221	185	109
Commercial landings	242	209	205	192	185	113	243	342	461	516
Foreign Catch	0	0	0	0	0	0	0	0	0	0
Total Catch for Assessment	346	396	502	583	453	291	388	563	646	625
					Model Results					
Spawning Stock Biomass	603	896	1,350	1,390	1,277	1,342	1,367	1,204	893	502
F_{Full}	0.81	0.82	0.66	0.59	0.46	0.3	0.41	0.72	1.01	1.64
Recruits $age1$	7,463	5,363	2,315	3,450	3,009	2,695	4,467	1,221	1,925	435

Table 2: Comparison of reference points estimated in an earlier 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.

	2012	Current
F_{MSY} *proxy*	0.32	0.35
SSB_{MSY} (mt)	2,995	1,959 (1,298 - 2,840)
MSY (mt)	773	541 (361 - 776)
Median recruits (age 1) (000s)	9,652	7,634
Overfishing	No	Yes
Overfished	No	Yes

Projections: Short term projections of biomass were derived by sampling from a cumulative distribution function of recruitment estimates from ASAP. Following the previous and accepted benchmark formulation, recruitment was based on the more recent estimates of the model time series (i.e. corresponding to year classes 1990 through 2013) to reflect the low recent pattern in recruitment. The annual fishery selectivity, maturity ogive, and mean weights at age used in projection are the most recent 5 year averages; retrospective adjustments were applied in the projections.

Table 3: Short term projections of total fishery catch and spawning stock biomass for Southern New England-Mid Atlantic Yellowtail flounder based on a harvest scenario of fishing at F_{MSY} *proxy* between 2017 and 2018. Catch in 2015 was assumed to be 450 (mt).

Year	Catch (mt)	SSB (mt)	F_{Full}
2015	450	175 (85 - 389)	3.38
2016	31 (15 - 120)	132 (60 - 404)	0.35
2017	92 (41 - 160)	434 (189 - 787)	0.35
2018	184 (96 - 333)	920 (463 - 1,651)	0.35

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).

  The largest source of uncertainty is the emergence of the retrospective in this updated assessment. This retrospective bias has resulted in the reduction SSB estimates and F estimates to increase with additional years of data Further, the basis for recruitment assumption for stock status determination and population forecast (i.e. the inclusion of historical recruitment values versus contemporary basis of recruitment) is another source of uncertainty. Although recent estmated recruitment likely reflect the realistic conditions for the stock,the basis for recruitment selection is not clearly understood.

- Does this assessment model have a retrospective pattern? If so, is the pattern strong, moderate, or mild?

  The model has a major retrospective pattern (Mohns rho SSB=1.06, F= -0.53). When applied to the terminal year point estimates of SSB and F, the rho adjusted values are 2014 SSB rho adjusted=243 mt (61% decrease from the unadjusted SSB) and 2014F rho adjusted= 3.53 (more than a doubling effect (i.e. 2.1 times) on the unadjusted F).

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

  Population projections are uncertain with projected biomass from the last assessment above the confidence bounds of the biomass estimated in the current assessment. Additionally, the projections encountered low percentage of feasible solutions (33%).The infeasible solutions were due to cases where the assumed 2015 catch was greater than the exploitable biomass.

- 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.

There were no major changes to the current stock assessment formulation. However,the criterion for determining acceptable tows on the NEFSC surveys were revised for years the Bigelow year (i.e. 2009-2011) and carried foreward to ensure consistency between the assessment and deck operations. The influence of the revised protocol on the survey indices was inconsequential.

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

  The overfishing and biomass stock status have changed since the previous assessment due to increased catches relative to the stock biomassand the very low recruitment of young fish, contributing very little to the adult biomass.

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

  The emergence of retrospective bias in this assessment is not clearly understood and may result from a variety of sources. Future studiesshould further investigate the source of this retrospective pattern to help improve the underlying diagnostics of the model for providing catch advice for this stock. Recruitment for SouthernNew England yellowtail continues to be weak and it is likely that the stock is in a new productivity regime. Should this pattern of poor recruitment continueinto the future, the ability of the stock to recover will be impeded. Therefore, future studies should build on current knowledge to better understand the causes of poorrecruitment as it may relate to the environment.

- Are there other important issues?

  None.

References:

Alade, L, C. Legault, S.Cadrin. 2008. In. Northeast Fisheries Science Center. 2008. Assessment of 19 Northeast Groundfish Stocks through 2007: Report of the 3^{rd} 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. 54^{th} Northeast Regional Stock Assessment Workshop (54^{th} SAW) Assessment Report. US Dept Commer, NOAA Fisheries, Northeast Fish Sci Cent Ref Doc. 12-18.; 600 p. http://nefsc.noaa.gov/publications/crd/crd1218/

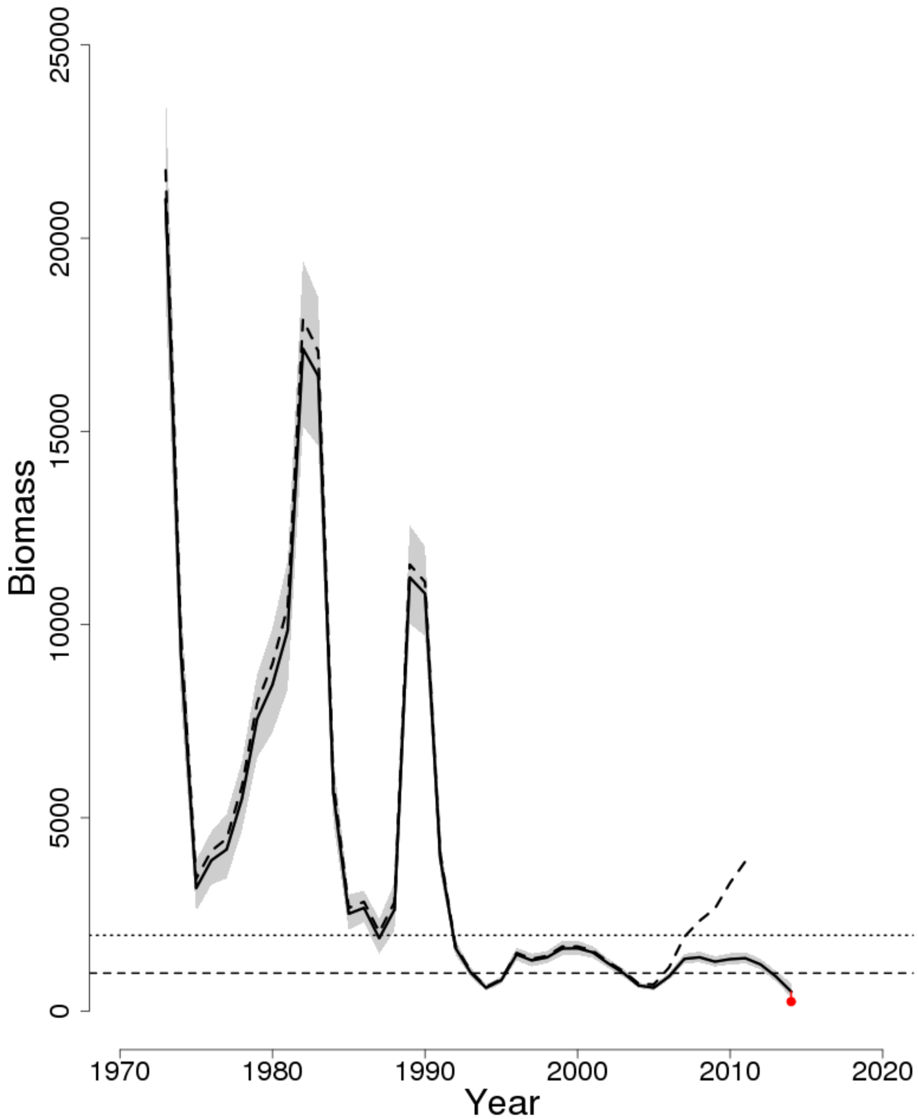

Figure 1: Trends in spawning stock biomass of Southern New England-Mid Atlantic Yellowtail flounder between 1973 and 2014 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{Threshold}$ ($\frac{1}{2}$ SSB_{MSY} *proxy*; horizontal dashed line) as well as SSB_{Target} (SSB_{MSY} *proxy*; horizontal dotted line) based on the 2015 assessment. Biomass was adjusted for a retrospective pattern and the adjustment is shown in red. The approximate 90% lognormal confidence intervals are shown.

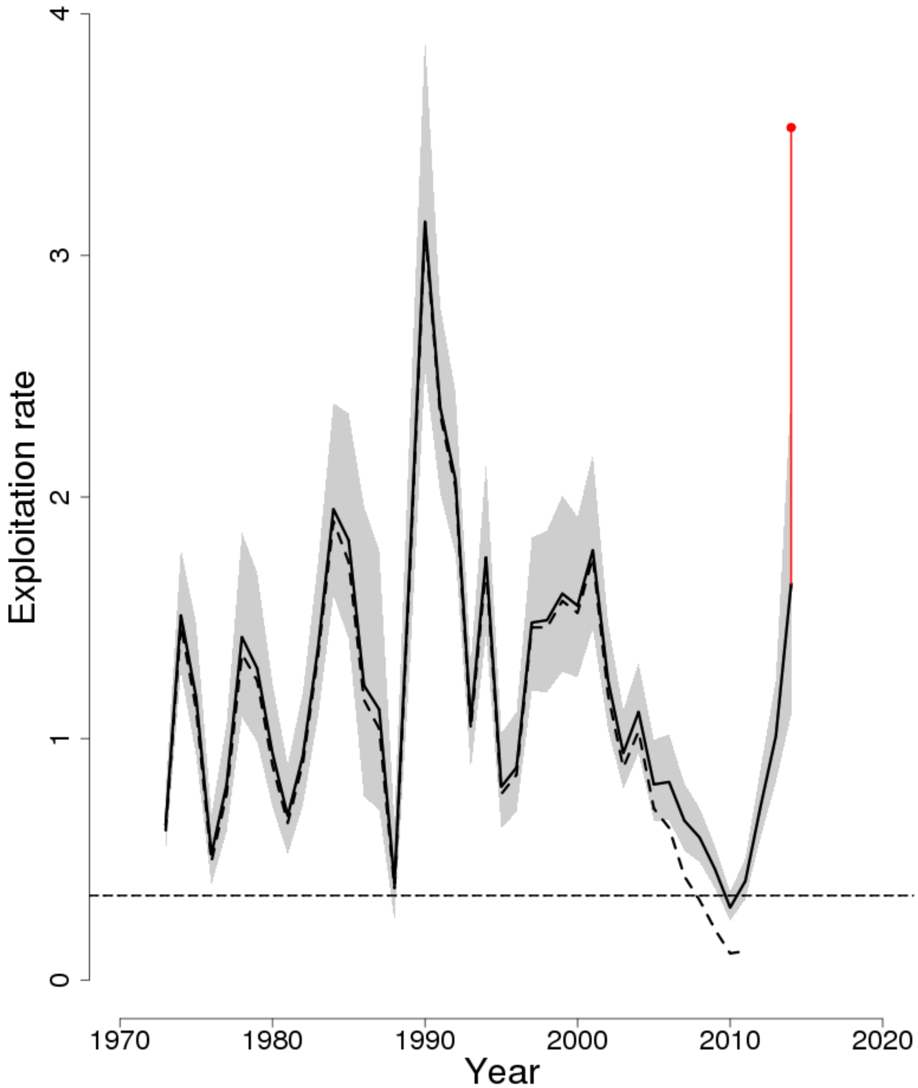

Figure 2: Trends in the fully selected fishing mortality (F_{Full}) of Southern New England-Mid Atlantic Yellowtail flounder between 1973 and 2014 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{Threshold}$ (F_{MSY} *proxy*=0.35; horizontal dashed line). F_{Full} was adjusted for a retrospective pattern and the adjustment is shown in red based on the 2015 assessment. The approximate 90% lognormal confidence intervals are shown.

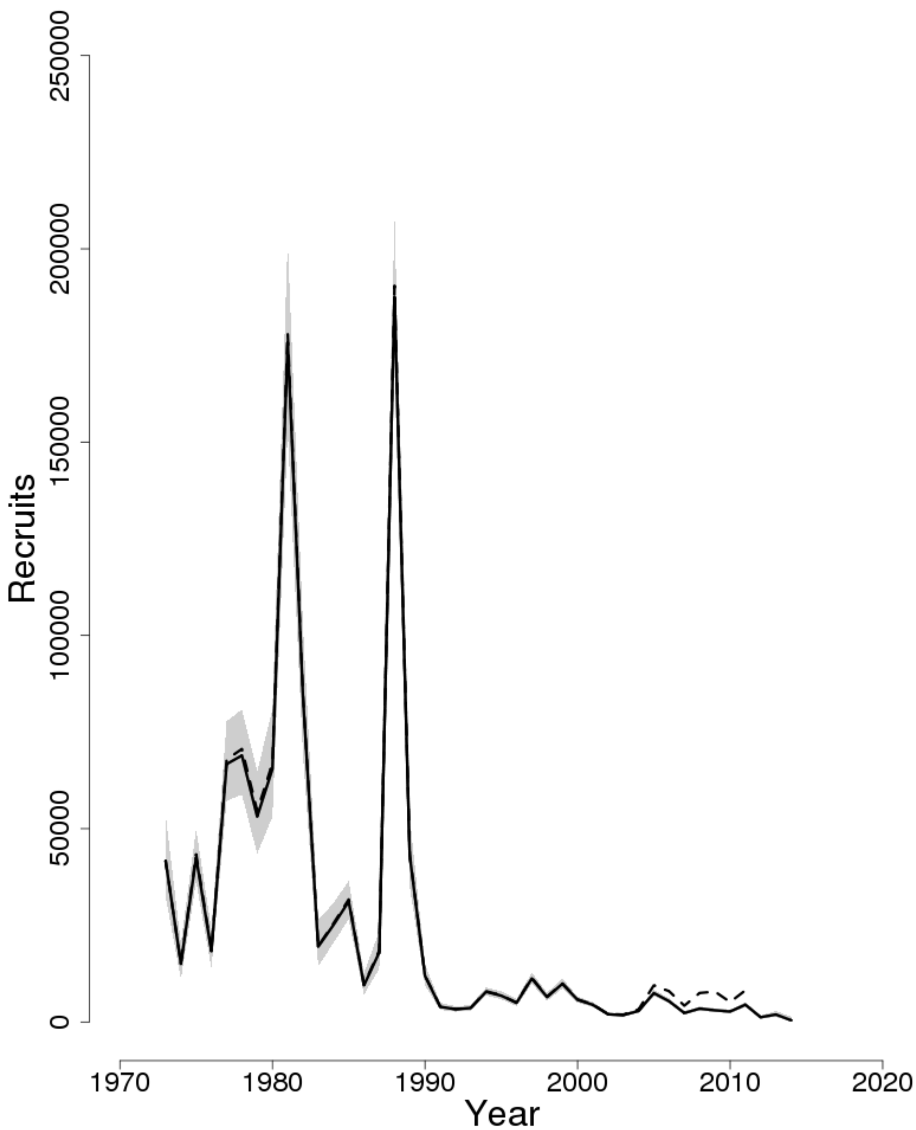

Figure 3: Trends in Recruits (age 1) (000s) of Southern New England-Mid Atlantic Yellowtail flounder between 1973 and 2014 from the current (solid line) and previous (dashed line) assessment. The approximate 90% lognormal confidence intervals are shown.

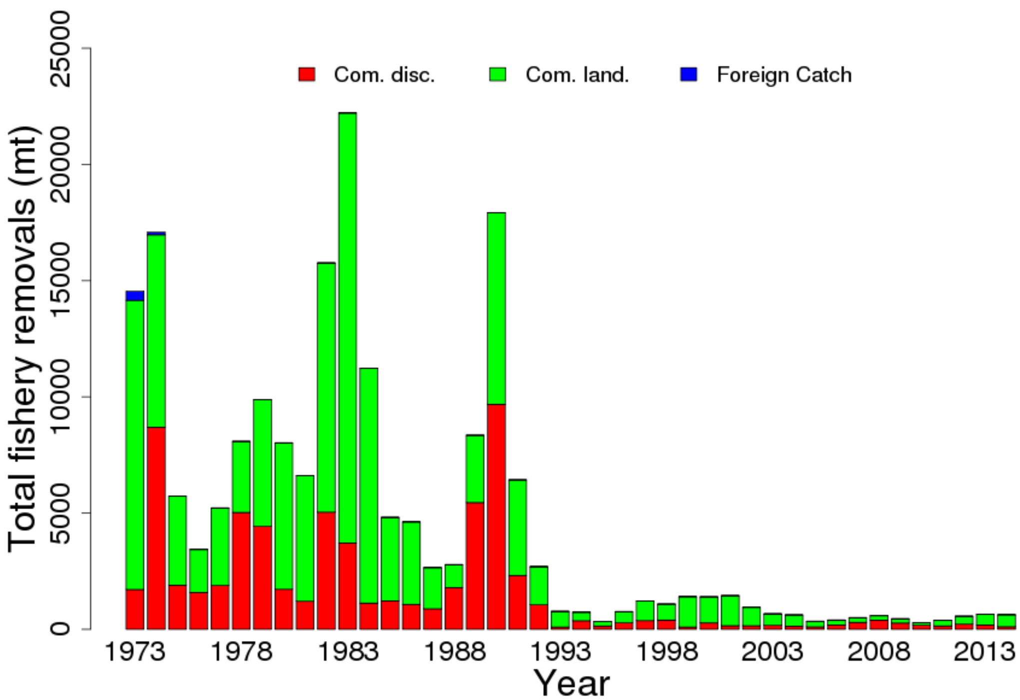

Figure 4: Total catch of Southern New England-Mid Atlantic Yellowtail flounder between 1973 and 2014 by fleet (US domestic and foreign catch) and disposition (landings and discards).

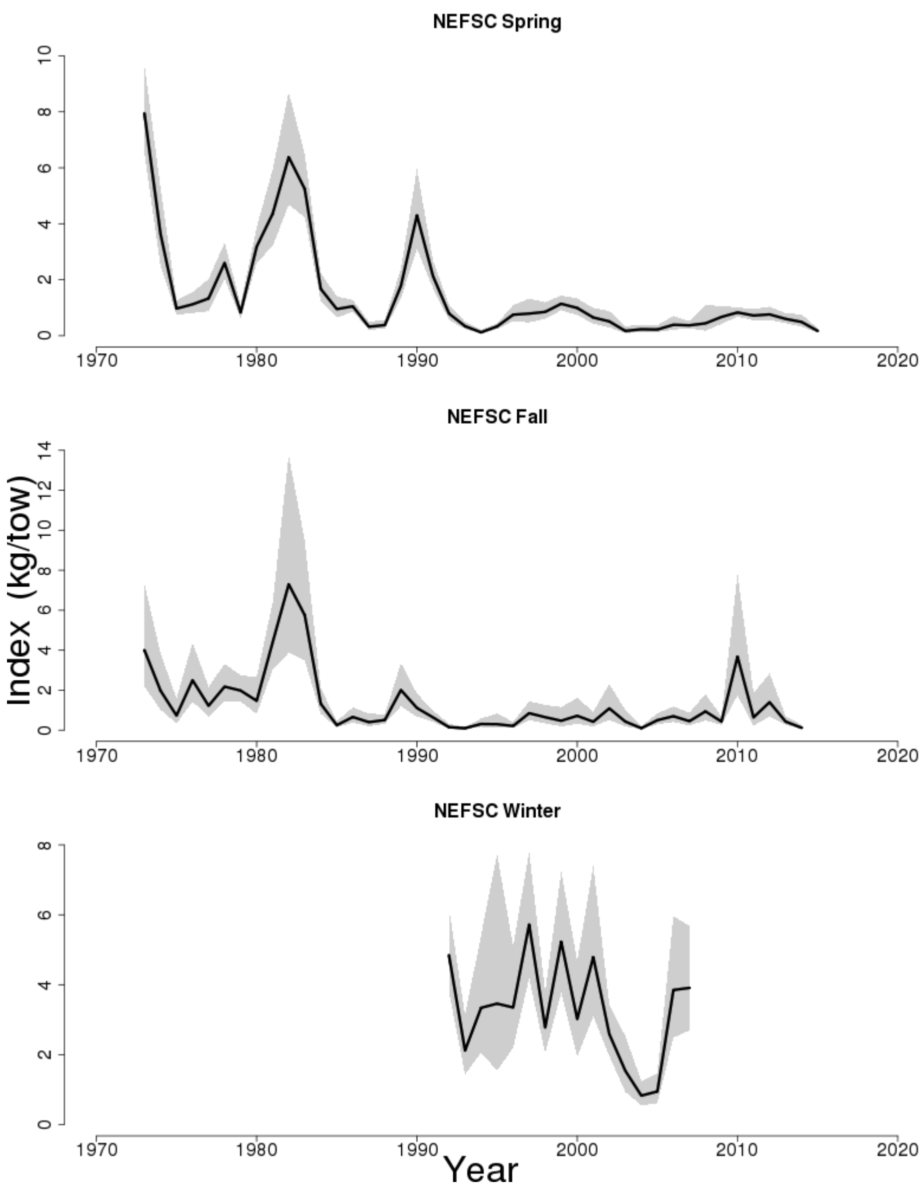

Figure 5: Indices of biomass for the Southern New England-Mid Atlantic Yellowtail flounder between 1973 and 2015 for the Northeast Fisheries Science Center (NEFSC) spring, fall and winter bottom trawl surveys. The approximate 90% lognormal confidence intervals are shown.Note: Larval index was also used in this assessment and is available in the supplemental documentation