

8 Georges Bank winter flounder

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*This assessment of the Georges Bank winter flounder (*Pseudopleuronectes americanus*) stock is an operational assessment of the existing 2014 operational VPA assessment which included data for 1982-2013 (Hendrickson et al. 2015). Based on the previous assessment the stock was not overfished and overfishing was not occurring. This assessment updates commercial fishery catch data, research survey biomass indices, and the analytical VPA assessment model and reference points through 2014. Additionally, stock projections have been updated through 2018.*

State of Stock: Based on this updated assessment, the Georges Bank winter flounder (*Pseudopleuronectes americanus*) stock is overfished and overfishing is occurring (Figures 41-42). Retrospective adjustments were made to the model results. Spawning stock biomass (SSB) in 2014 was estimated to be 2,883 (mt) which is 43% of the biomass target for an overfished stock ($SSB_{MSY} = 6,700$ with a threshold of 50% of SSB_{MSY}; Figure 41). The 2014 fully selected fishing mortality (F) was estimated to be 0.778 which is 145% of the overfishing threshold ($F_{MSY} = 0.536$; Figure 42).

Table 27: Catch input data and VPA model results for Georges Bank winter flounder. All weights are in (mt), recruitment is in (000s) and F_{Full} is the average fishing mortality on ages (ages 4-6). Catch and model results are only for the most recent years (2005-2014) of the current updated VPA assessment.

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
	<i>Data</i>									
US landings	2,012	825	795	947	1,658	1,252	1,801	1,911	1,675	1,114
CA landings	73	55	12	20	12	45	52	83	12	12
US discards	118	110	188	143	91	138	129	113	47	46
CA scall dr discards	145	135	44	69	252	109	88	79	29	47
Catch for Assessment	2,348	1,125	1,039	1,179	2,013	1,544	2,070	2,186	1,763	1,219
	<i>Model Results</i>									
Spawning Stock Biomass	4,426	4,478	4,316	3,931	4,282	4,997	5,157	4,829	4,645	5,275
F_{Full}	0.679	0.265	0.309	0.371	0.459	0.365	0.507	0.5	0.533	0.379
Recruits <i>age</i> 1	3,840	6,106	9,566	12,874	11,355	5,789	7,650	6,519	6,217	6,575

Table 28: Comparison of reference points estimated in the 2014 assessment and the current operational assessment and stock status during 2013 and 2014, respectively. An estimate of F_{MSY} was used for the overfishing threshold and was based on long-term stochastic projections.

	2014	Current
F_{MSY}	0.44	0.536
SSB_{MSY} (mt)	8,100	6,700 (4,370 - 10,610)
MSY (mt)	3,200	2,840 (1,850 - 4,480)
Median recruits (age 1) (000s)	13,235	9,880
<i>Overfishing</i>	No	Yes
<i>Overfished</i>	No	Yes

Projections: Short-term projections of biomass were derived by sampling from a cumulative distribution function of recruitment estimates (1982-2013 year classes) from the final run of the ADAPT VPA model. The annual fishery selectivity, maturity ogive, and mean weights-at-age used in the projection are the most recent 5 year averages (2010-2014). An SSB retrospective adjustment factor of 0.546 was applied in the projections.

Table 29: Short-term projections of catch (mt) and spawning stock biomass (mt) for Georges Bank winter flounder based on a harvest scenario of fishing at 75% of F_{MSY} between 2016 and 2018. Catch in 2015 was assumed to be 1,150 (mt).

Year	Catch (mt)	SSB (mt)	F_{Full}
2015	1,150	2,623 (1,802 - 3,813)	0.362
2016	755	2,295 (1,472 - 3,482)	0.402
2017	830	2,595 (1,894 - 3,594)	0.402
2018	1,110	3,581 (2,390 - 5,948)	0.402

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 estimate of natural mortality based on longevity (max. age = 20 for this stock), which is not well studied in Georges Bank winter flounder, and assumed constant over time. Natural mortality affects the scale of the biomass and fishing mortality estimates. Another source of uncertainty includes the underestimation of catches. Discards from the Canadian bottom trawl fleet were not provided by the CA DFO and the precision of the Canadian scallop dredge discard estimates, with only 1-2 trips per month, are uncertain. The lack of age data for the Canadian spring survey catches requires the use of the US spring survey age/length keys despite selectivity differences. In addition, there are no length or age composition data from the Canadian landings or discards of Georges Bank winter flounder.

- 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).

The 7-year Mohn's ρ , relative to SSB, was 0.26 in the 2014 assessment and was 0.83 in 2014. The 7-year Mohn's ρ , relative to F, was -0.16 in the 2014 assessment and was -0.51 in 2014. There was a major retrospective pattern for this assessment because the ρ adjusted estimates of 2014 SSB ($SSB_{\rho}=2,883$) and 2014 F ($F_{\rho}=0.778$) were outside the approximate 90% confidence region around SSB (3,783 - 6,767) and F (0.254 - 0.504). 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 5,275 to 2,883 and the 2014 F_{Full} from 0.379 to 0.778.

- Based on this stock assessment, are population projections well determined or uncertain?
Population projections for Georges Bank winter flounder are reasonably well determined.

- 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 only change made to the Georges Bank winter flounder assessment, other than the incorporation of an additional year of data, involved fishery selectivity. During the 2014 assessment update, stock size estimates of age 1 and age 2 fish were not estimable in the VPA during year $t + 1$ (CVs near 1.0). When age 2 stock size is not estimated in year $t + 1$, the VPA model calculates the stock size of age 1 fish (i.e., recruitment) in the terminal year by using the age 1 partial recruitment (PR) value to derive the F at age 1 in the terminal year. The age 1 PR value used in the 2014 assessment update was 0.001. However, when this same age 1 PR value was used in a VPA run for the current assessment update, the low PR value combined with the low age 1 catch in 2014 resulted in an unlikely high stock size estimate for age 1 recruitment in 2014 (i.e., 41,587,000 fish) when compared to survey observations of the same cohort (i.e., age 1 in 2014 and age 2 in 2015). In order to obtain a more realistic estimate of age 1 recruitment in 2014, I allowed the VPA model to estimate age 2 stock size in 2015 (and thereby avoided the use of an age 1 PR value in the age 1 stock size calculation for 2014) and used the back-calculated PR values from this VPA run to derive a new PR-at-age vector which was used in the final 2015 VPA run. Similar to the 2014 assessment update, the final 2015 VPA run did not include the estimation of age 2 stock size and the new PR-at-age vector was computed using the same methods as in the 2014 assessment. Full selectivity occurs at age 4. For the 2015 assessment update, fishery selectivity for ages 1-3 was changed from the 2014 assessment values of 0.001, 0.10 and 0.43, respectively, to 0.01, 0.08 and 0.55, respectively. Differences between estimates of F, SSB and R values from the final 2015 VPA run, with the new PR vector, and a 2015 VPA run that utilized the PR vector from the 2014 assessment are shown in Table G30 (see SASINF).

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

The overfished and overfishing status of Georges Bank winter flounder has changed in the current assessment update due to a worsening of the retrospective error associated with fishing mortality and SSB.

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

The Georges Bank winter flounder assessment could be improved with discard estimates from the Canadian bottom trawl fleet and age data from the Canadian spring bottom trawl surveys.

- Are there other important issues?
None.

8.1 Reviewer Comments: Georges Bank winter flounder

Recommendation: The Panel concluded that the updated assessment with retrospective adjustment was acceptable as a scientific basis for management advice. The revised partial recruitment assumption for VPA calibration was well justified.

Alternative Assessment Approach: Not applicable

Sources of Uncertainty: The major source of uncertainty is the retrospective pattern. The magnitude of the retrospective pattern is substantially greater than the 2014 update assessment. The decrease in estimates of stock size from the previous update is largely influenced by updated survey indices. The natural mortality assumption was revised in the SAW52 benchmark assessment, but the assumption is based on limited longevity information. The catch is underestimated and uncertain, because the magnitude of Canadian trawl discards is unknown. The Panel also noted that age composition of the Canadian survey and fishery is not sampled, and that weight at age and maturity at age have declined since 2008. The MSY reference point is conditional on an assumed steepness value.

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.). Survey data should be updated to monitor rebuilding or persistent decreases and better sampling of the magnitude and age composition of Canadian discards is needed. Dedicated age samples are needed for the Canadian survey and fishery.

References:

Hendrickson L, Nitschke P, Linton B. 2015. 2014 Operational stock assessments for Georges Bank winter flounder, Gulf of Maine winter flounder, and pollock. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 15-01; 228 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026. [CRD15-01](#)

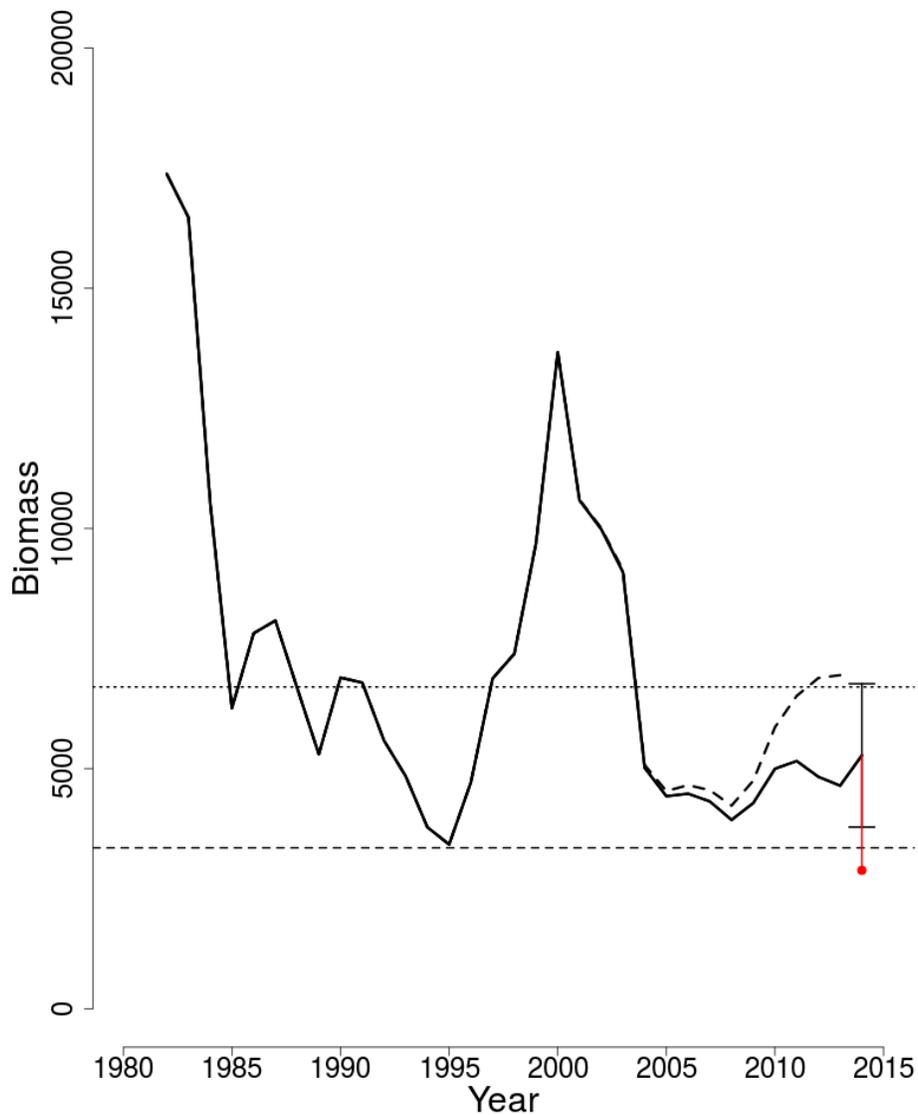


Figure 41: Trends in spawning stock biomass (mt) of Georges Bank winter flounder between 1982 and 2014 from the current (solid line) and previous (dashed line) assessments and the corresponding $SSB_{Threshold}$ ($\frac{1}{2} SSB_{MSY}$; horizontal dashed line) as well as SSB_{Target} (SSB_{MSY} ; horizontal dotted line) based on the 2015 assessment. Biomass was adjusted for a retrospective pattern and the adjustment is shown in red. The approximate 90% normal confidence intervals are shown.

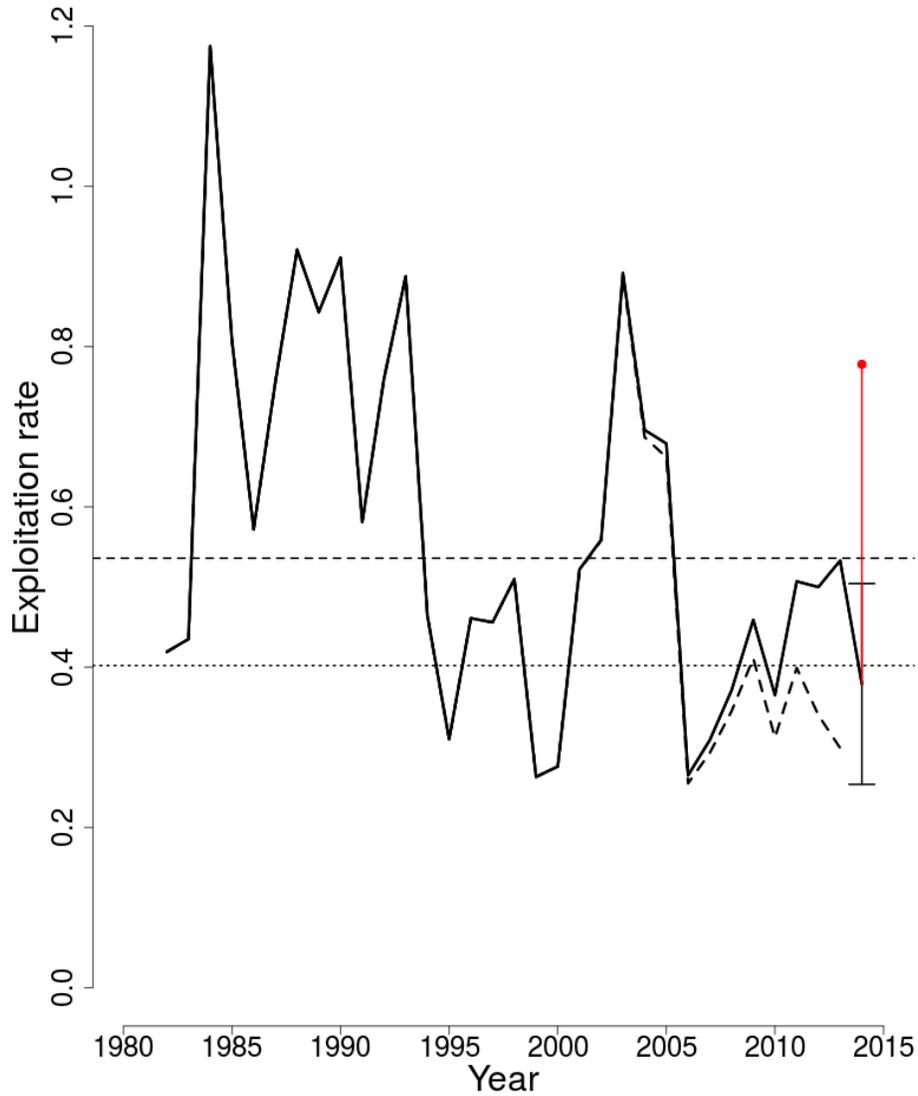


Figure 42: Trends in fully selected fishing mortality (F_{Full}) of Georges Bank winter flounder between 1982 and 2014 from the current (solid line) and previous (dashed line) assessments and the corresponding $F_{Threshold}$ ($F_{MSY}=0.536$; horizontal dashed line) as well as ($F_{Target}=75\%$ of FMSY; horizontal dotted line). F_{Full} was adjusted for a retrospective pattern and the adjustment is shown in red. The approximate 90% normal confidence intervals are also shown.

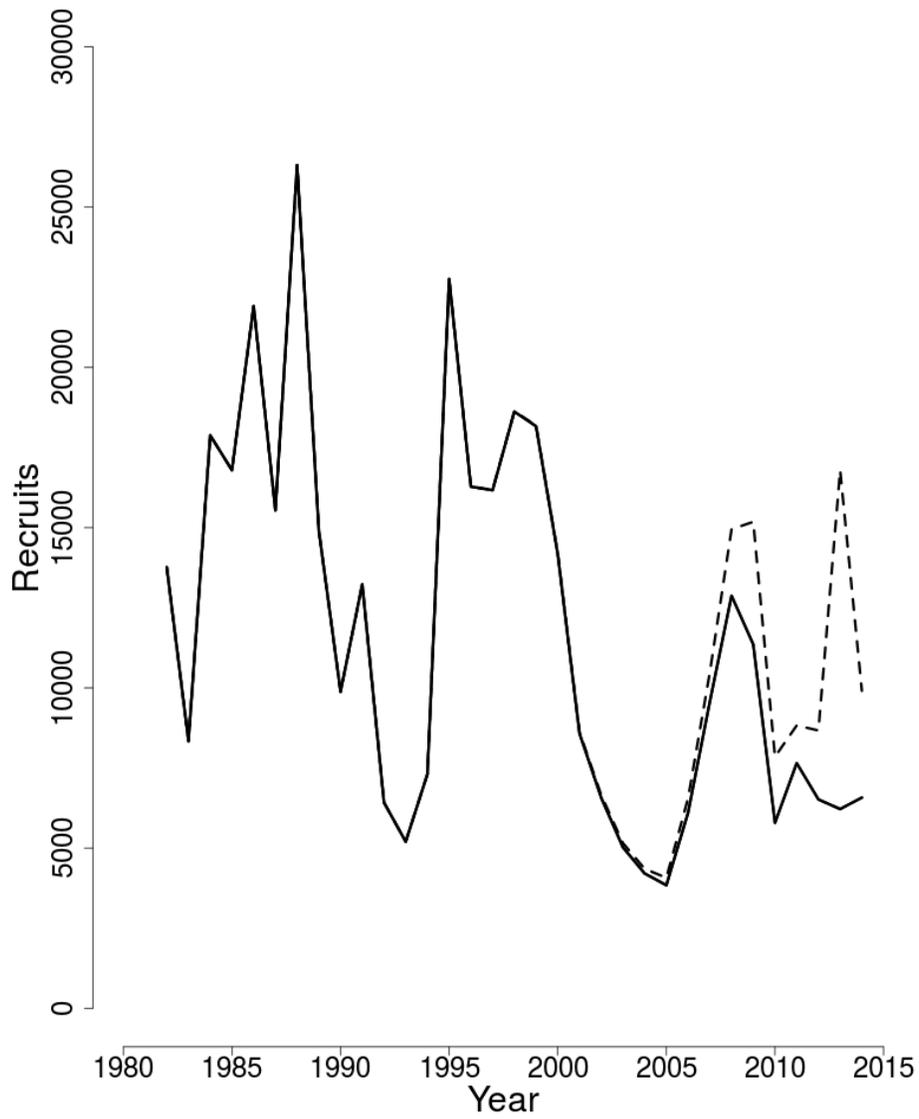


Figure 43: Trends in Recruits (age 1) (000s) of Georges Bank winter flounder between 1982 and 2014 from the current (solid line) and previous (dashed line) assessments. The approximate 90% normal confidence intervals are shown.

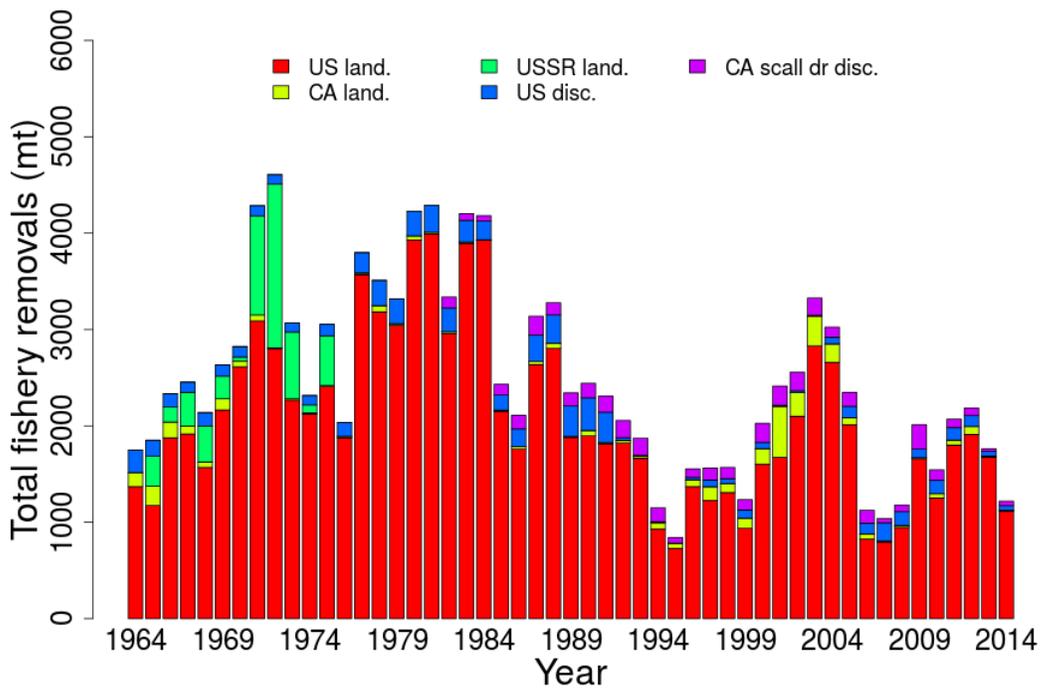


Figure 44: Total catches (mt) of Georges Bank winter flounder between 1982 and 2015 by country and disposition (landings and discards).

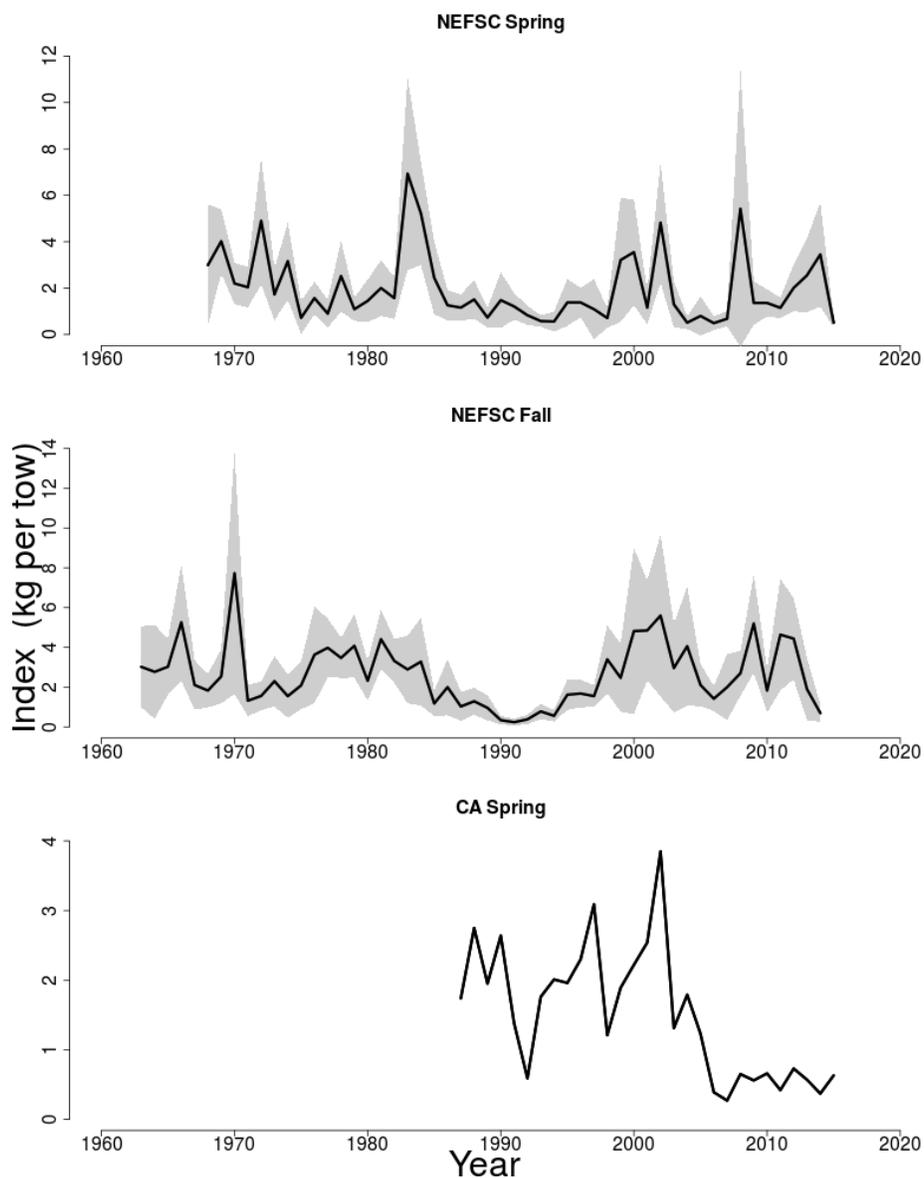


Figure 45: Indices of biomass for the Georges Bank winter flounder for the Northeast Fisheries Science Center (NEFSC) spring (1968-2015) and fall (1963-2014) bottom trawl surveys and the Canadian DFO spring survey (1987-2015). The approximate 90% normal confidence intervals are shown.