

## 8 Georges Bank Winter Flounder

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*This assessment of the Georges Bank Winter Flounder (*Pseudopleuronectes americanus*) stock is an operational update of the existing 2015 operational VPA assessment which included data for 1982-2014 (NEFSC 2015). Based on the previous assessment the stock was overfished and overfishing was occurring. This assessment updates commercial fishery catch data, research survey biomass indices, and the analytical VPA assessment model and reference points through 2016. Additionally, stock projections have been updated through 2020.*

**State of Stock:** Based on this updated assessment, the Georges Bank Winter Flounder (*Pseudopleuronectes americanus*) stock is not overfished and overfishing is not occurring (Figures 39-40). Retrospective adjustments were made to the model results. Spawning stock biomass (SSB) in 2016 was estimated to be 3,946 (mt) which is 52% of the biomass target for an overfished stock ( $SSB_{MSY} = 7,600$  with a threshold of 50% of SSB<sub>MSY</sub>; Figure 39). The 2016 fully selected fishing mortality (F) was estimated to be 0.117 which is 22% of the overfishing threshold ( $F_{MSY} = 0.522$ ; Figure 40). However, the 2016 point estimate of SSB and F, when adjusted for retrospective error (54% for SSB and -31% for F), is outside the 90% confidence interval of the unadjusted 2016 point estimate. Therefore, the 2016 F and SSB values used in the stock status determination were the retrospective-adjusted values of 0.117 and 3,946 mt, respectively.

Table 26: 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 fishing mortality on fully selected ages (ages 4-6). Catch and model results are only for the most recent years (2007-2016) of the current updated VPA assessment.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	<i>Data</i>									
US landings	795	947	1,658	1,252	1,801	1,911	1,675	1,114	866	462
CA landings	12	20	12	45	52	83	12	12	13	4
US discards	188	143	91	138	129	113	47	46	20	6
CA scall dr discards	45	68	250	113	88	79	29	44	42	21
Catch for Assessment	1,040	1,178	2,011	1,548	2,070	2,185	1,763	1,216	941	493
	<i>Model Results</i>									
Spawning Stock Biomass	4,411	4,061	4,448	5,291	5,691	5,625	5,281	5,800	7,116	6,083
$F_{Full}$	0.3	0.364	0.441	0.318	0.457	0.424	0.398	0.28	0.122	0.081
Recruits (age 1)	9,677	13,702	13,318	6,795	7,258	5,346	5,668	3,391	800	2,556

Table 27: Comparison of reference points estimated in the 2015 assessment and the current assessment update and stock status during 2014 and 2016, respectively. An estimate of  $F_{MSY}$  was used for the overfishing threshold and was based on long-term stochastic projections.

	2015	2017
$F_{MSY}$	0.536	0.522
$SSB_{MSY}$ (mt)	6,700	7,600 (4,170 - 14,690)
MSY (mt)	2,840	3,500 (1,940 - 6,720)
Median recruits (age 1) (000s)	9,880	9,677
<i>Overfishing</i>	Yes	No
<i>Overfished</i>	Yes	No

**Projections:** Short-term projections of biomass were derived by sampling from a cumulative distribution function of recruitment estimates (1982-2015 YC) from the final run of the ADAPT VPA model. The annual fishery selectivity, maturity ogive (a 3-year moving window), and mean weights-at-age used in the projection are the most recent five-year averages (2012-2016). An SSB retrospective adjustment factor of 0.649 was applied in the projections.

Table 28: Short-term projections of catch (mt) and spawning stock biomass (mt) for Georges Bank Winter Flounder based on a harvest scenario of fishing at  $F_{MSY}$  between 2018 and 2020. Catch in 2017 was assumed to be 574 (mt)

Year	Catch (mt)	SSB (mt)	$F_{Full}$
2017	574	3,026 (2,307 - 3,875)	0.158
Year	Catch (mt)	SSB (mt)	$F_{Full}$
2018	1,083	2,380 (1,780 - 3,091)	0.522
2019	1,095	2,313 (1,707 - 3,571)	0.522
2020	1,600	3,454 (1,916 - 7,841)	0.522

**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, which is based on longevity (max. age = 20). Natural mortality is not well studied in Georges Bank Winter Flounder and is assumed constant over time. Natural mortality affects the scale of the biomass and fishing mortality estimates. Other sources of uncertainty include 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 A/L keys despite selectivity differences. In addition, there are no length or age composition data for the Canadian landings or discards of GB 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 90% confidence intervals for SSB and  $F_{Full}$ ; see Table 8).

*The 7-year Mohn's  $\rho$ , relative to SSB, was 0.830 in the 2015 assessment and was 0.540 in 2016. The 7-year Mohn's  $\rho$ , relative to F, was -0.513 in the 2015 assessment and was -0.308 in 2016. There was a major retrospective pattern for this assessment because the  $\rho$  adjusted estimates of 2016 SSB ( $SSB_{\rho}=3,946$ ) and 2016 F ( $F_{\rho}=0.117$ ) were outside the 90% confidence limits for SSB (4,898 - 7,812) and F (0.064 - 0.106). A retrospective adjustment was made for both the determination of stock status and for projections of catch in 2018. The retrospective adjustment changed the 2016 SSB from 6,083 to 3,946 and the 2016  $F_{Full}$  from 0.081 to 0.117.*

- Based on this stock assessment, are population projections well determined or uncertain? If this stock is in a rebuilding plan, how do the projections compare to the rebuilding schedule?

*Population projections for Georges Bank Winter Flounder were reasonably well determined and projected biomass from the last assessment was within the confidence bounds of the biomass estimated in the current assessment. This stock was required to be rebuilt by 2017.*

- 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 only change made to the Georges Bank Winter Flounder assessment, other than the incorporation of additional data for 2015 and 2016 and updating the most recent five-year averages for fishery selectivity-, proportion mature-, stock weights-, catch weights-, and spawning stock weights-at-age, were the Canadian scallop dredge discard estimates for 2004-2014. The Canadian scallop dredge discards were re-estimated by the CA DFO staff to reflect the discard estimation method they use for the TRAC stock assessments (Sameoto et al. 2013). This change resulted in discard estimates that differed from those included in the most recent GB winter flounder assessment by -8% to 14%. In addition, the updated 2004 CA scallop drdege discard estimate now includes all months of the year; representing an increase of 85%.*

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

*The stock status of Georges Bank Winter Flounder has changed from overfished and overfishing is occurring to not overfished and overfishing is not occurring. This change was attributable to a rapid decline in F, from near 75% of FMSY (= 0.392) in 2013 to 0.081 in 2016, and a gradual increase in SSB from near the SSBMSY threshold (= 3,800 mt) in 2008 to slightly below SSBMSY (= 7,600 mt) in 2015 (7,116 mt). However, SSB then declined to 6,083 mt in 2016. In addition, the Mohn's rho values used to adjust the 2016 F and SSB values were 60% and 65% lower, respectively, than the values from the previous assessment.*

- Provide qualitative statements describing the condition of the stock that relate to stock status.

*Fishing mortality declined rapidly between 2013 and 2016 and is at the lowest level of the time series. Following a decline in the catch mean weights-at-age for the older fish (ages 4-7+), during 2007-2014, mean weights for these ages increased during 2015-2016. The mean length and weight of fish caught in the NEFSC fall and spring bottom trawl surveys*

*has been increasing since 2008 and 2009, respectively. Spawning stock biomass estimates increased during 2008-2015 with a slight decrease in 2016. However, recruitment declined after 2008 and reached a time series low in 2015. Although recruitment increased during 2016-2017, it remained below average and the 2017 estimate is uncertain because it is based solely on the geometric mean of recruitment during 2009-2015.*

- 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

### Assessment Recommendation:

The panel concluded that the operational assessment with adjustments for retrospective bias was acceptable as a scientific basis for management advice, including the decision to use updated Canadian scallop dredge discard estimates for 2004-2014.

### Alternative Assessment Approach:

Not applicable

### Status Recommendation:

Based on this operational assessment, the panel supports the conclusion that the Georges Bank winter flounder stock is not overfished and overfishing is not occurring. This conclusion results in a change from the 2015 operational assessment, indicating that the stock was overfished and that overfishing was occurring. The deadline for rebuilding this stock is 2017. As of 2016 the stock remains well below target biomass. Fishing mortality declined rapidly between 2013 and 2016 and is at the lowest level of the time series. Following a decline in the catch mean weights-at-age for the older fish (ages 4-7+), during 2007-2014, mean weights for these ages increased during 2015-2016. The mean length and weight of fish caught in the National Marine Fisheries Service (NMFS) fall and spring bottom trawl surveys has been increasing since 2008 and 2009, respectively. Spawning stock biomass estimates increased during 2008-2015 but declined slightly in 2016. However, recruitment declined after 2008 and reached a time series low in 2015.

### Key Sources of Uncertainty:

The largest source of uncertainty is the retrospective bias and the estimate of natural mortality, which is based on longevity (max. age = 20). Other sources of uncertainty include the under-estimation of catches. Discards from the Canadian bottom trawl fleet were not provided by the Canadian Department of Fisheries and Oceans (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 for the Canadian landings or discards of Georges Bank winter flounder.

### Research Needs:

The panel recommends that future work be conducted to consider discard estimates from the Canadian bottom trawl fleet and age data from the Canadian spring bottom trawl surveys. Also, the assessment may be improved by converting from a Virtual Population Analysis (VPA) to a statistical catch-at-age model.

**References:**

Sameoto, J., B. Hubley, L. Van Eeckhaute and A. Reeves. 2013. A Review of the standardization of effort for the calculation of discards of Atlantic cod, haddock and yellowtail flounder from the 2005 to 2011 Canadian scallop fishery on Georges Bank. Transboundary Resources Assessment Committee (TRAC) Reference Document 2013/04, 22 pp.

Northeast Fisheries Science Center. 2015. Operational assessment of 20 Northeast groundfish stocks, updated through 2014. U.S. Dept. Commer., Northeast Fish. Sci. Cent. Ref. Doc. 15-24; 251 p.

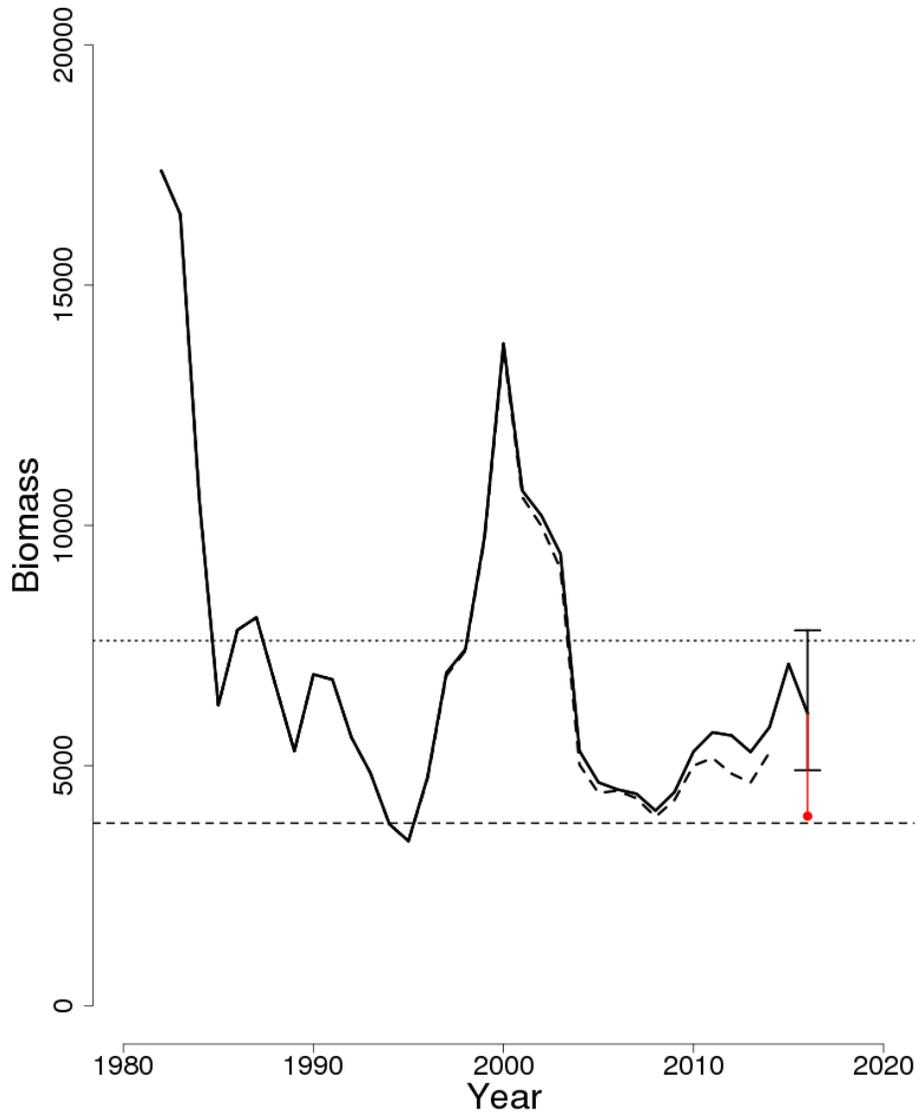


Figure 39: Trends in spawning stock biomass (mt) of Georges Bank Winter Flounder between 1982 and 2016 from the current (solid line) and previous (dashed line) assessments and the corresponding  $SSB_{Threshold}$  ( $\frac{1}{2} SSB_{MSY}$ ; horizontal dashed line) as well as  $SSB_{Target}$  ( $SSB_{MSY}$ ; horizontal dotted line) based on the 2017 assessment. Biomass was adjusted for a retrospective pattern and the adjustment is shown in red. The 90% normal confidence interval is shown for 2016.

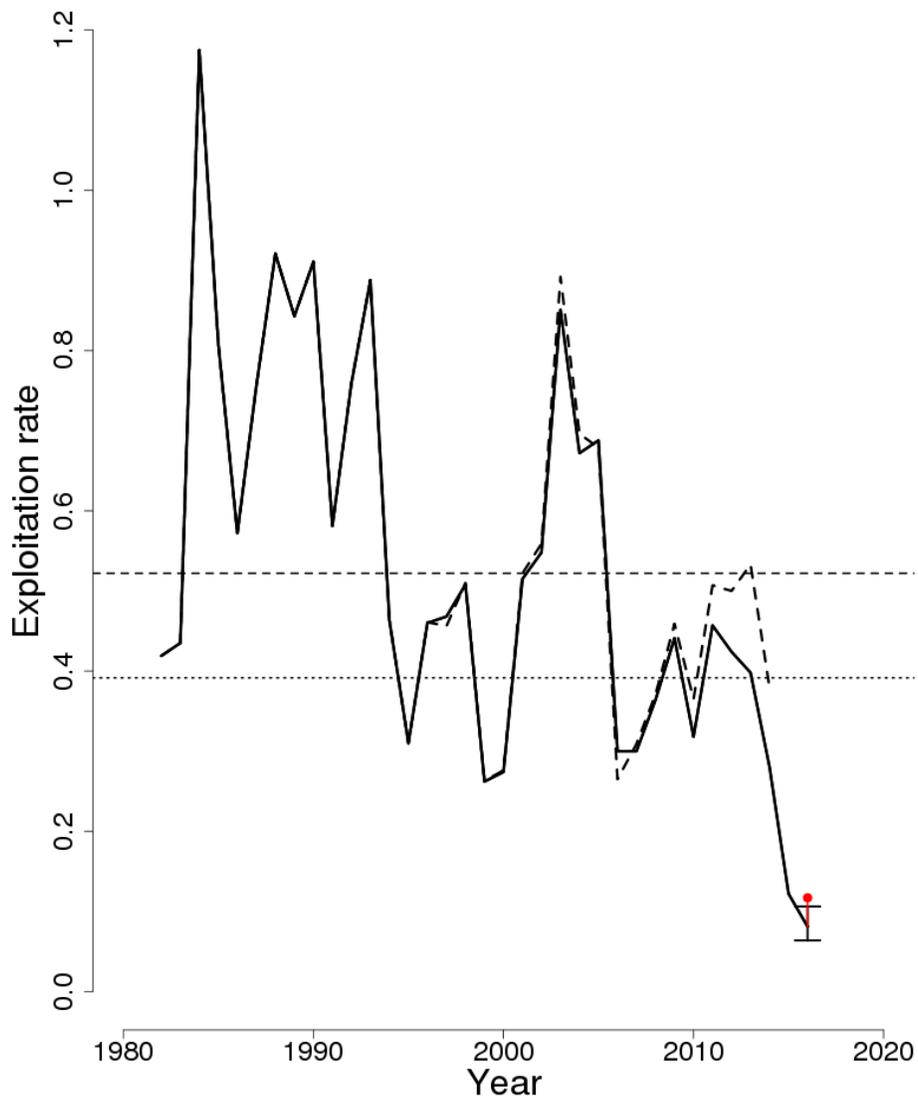


Figure 40: Trends in fully selected fishing mortality ( $F_{Full}$ ) of Georges Bank Winter Flounder between 1982 and 2016 from the current (solid line) and previous (dashed line) assessments and the corresponding  $F_{Threshold}$  ( $F_{MSY}=0.522$ ; horizontal dashed line) as well as ( $F_{Target}=75\%$  of FMSY; horizontal dotted line).  $F_{Full}$  was adjusted for a retrospective pattern and the adjustment is shown in red. The 90% normal confidence interval is shown for 2016.

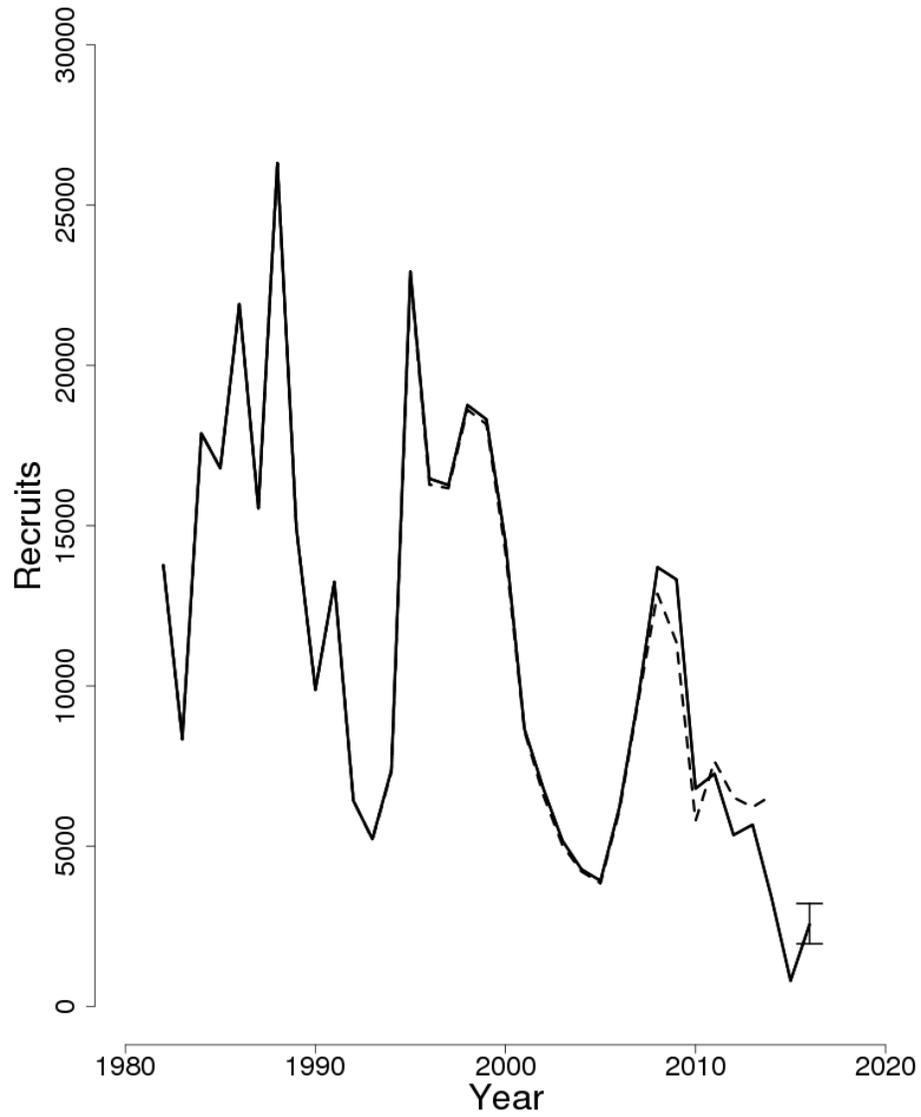


Figure 41: Trends in Recruits (age 1) (000s) of Georges Bank Winter Flounder between 1982 and 2016 from the current (solid line) and previous (dashed line) assessments. The 90% normal confidence interval is shown for 2016.

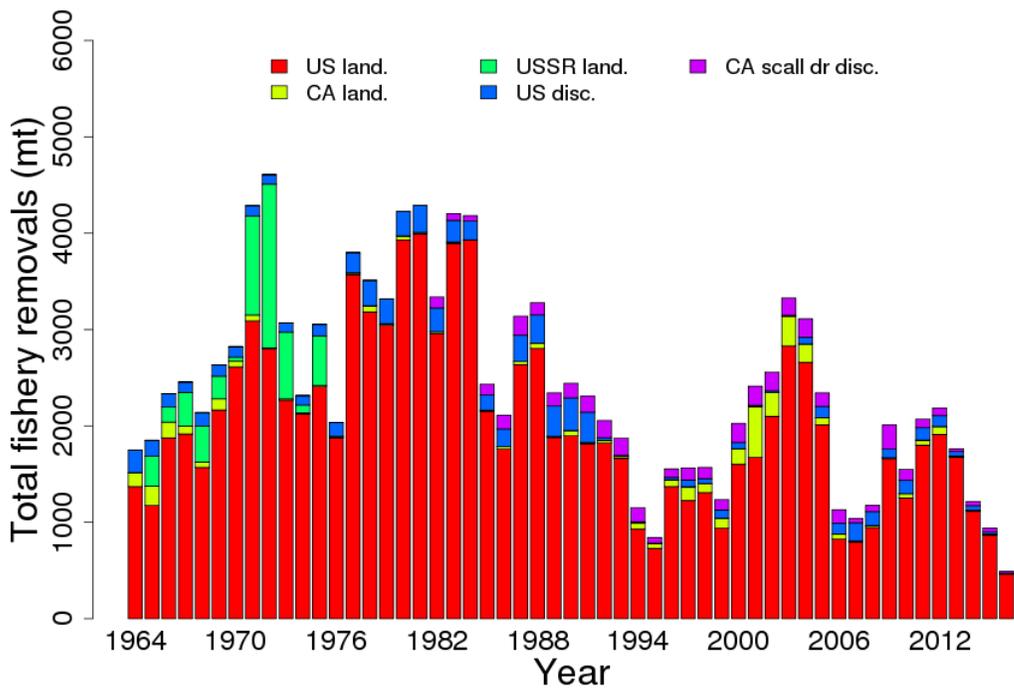


Figure 42: Total catches (mt) of Georges Bank Winter Flounder between 1982 and 2017 by country and disposition (landings and discards).

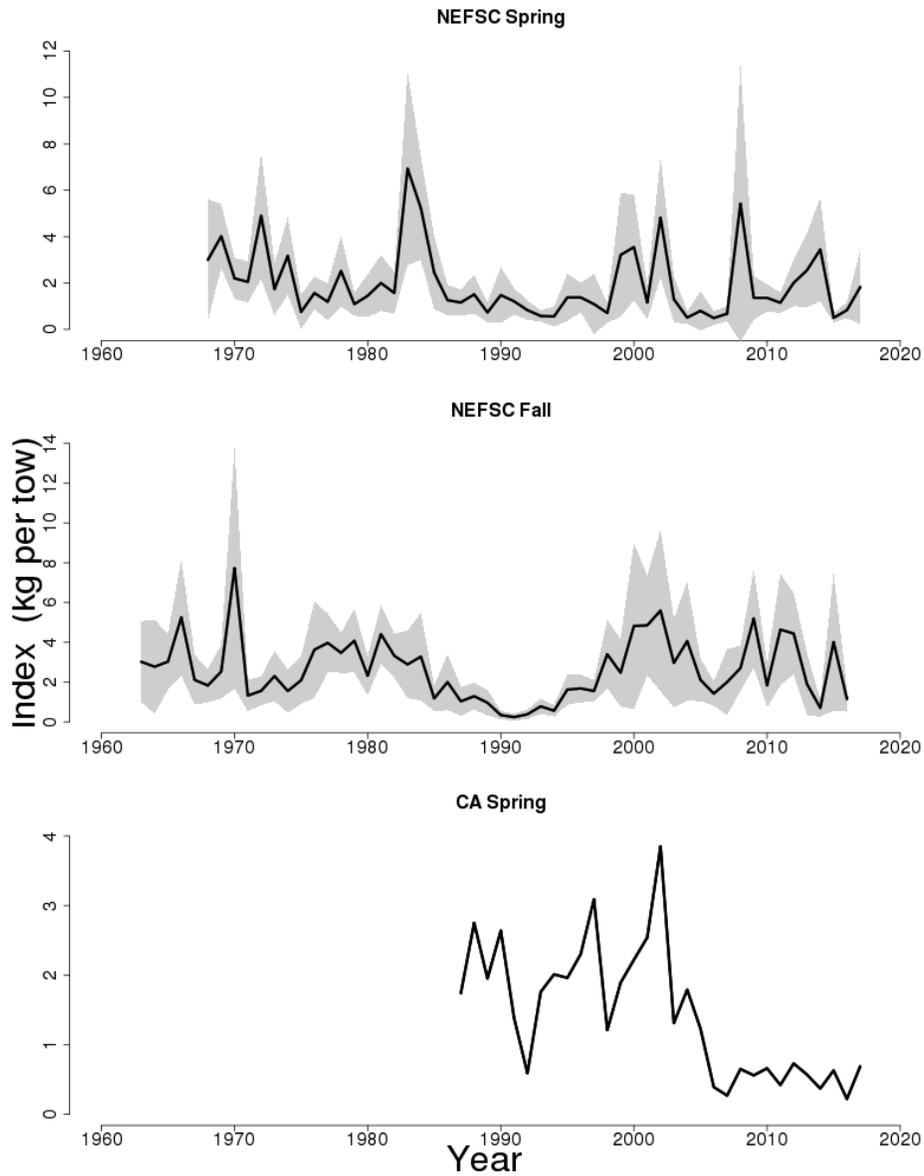


Figure 43: Indices of biomass for the Georges Bank Winter Flounder for the Northeast Fisheries Science Center (NEFSC) spring (1968-2017) and fall (1963-2016) bottom trawl surveys and the Canadian DFO spring survey (1987-2017). The 90% normal confidence interval is shown.