NOAA FISHERIES SERVICE

SAW/SARC-65 Summary
(NEFSC CRD#18-08)

Public Presentation: Sep. 2018

SAW/SARC Process

1. **SAW Working Groups**

2. **External Peer Review Panel: Center of Independent Experts (CIE) + SSC.**

3. **Products: (Reviewer's Reports) + (2 Science Reports)**
   http://www.nefsc.noaa.gov/nefsc/saw/ (see SAW65)
   http://www.nefsc.noaa.gov/publications/ (see Ref. Docs.)

4. **Management advice:**
   - **SAW/SARC reports support SSC in making ABC recommendation.**

The 65th Northeast Regional Stock Assessment Review Committee

Stephen H. Clark Conference Room – Northeast Fisheries Science Center
Woods Hole, Massachusetts
June 26-29, 2018

SARC Chairman:
Dr. Pat Sullivan
(NEFMC SSC; Cornell U.)

SARC Panelists:
Dr. Coby Needle
(UK; CIE)

Dr. Geoff Tingley
(New Zealand; CIE)

Dr. Cathy Dichmont
(Australia; CIE)

A. Sea Scallop

B. Atlantic Herring

(A.) Scallop

Scallop

Assessment TORs (shortened)

1. Estimate catch from all sources

2. Evaluate fishery independent and fishery dependent indices being used in the assessment

3. Describe condition of Gulf of Maine resource

4. Examine ecosystem influences on stock

5. Estimate annual fishing mortality, recruitment and biomass for the time series

6. Propose biological reference points

7. Evaluate Stock status. Describe condition of the stock

8. Conduct stock projections

9. Review research recommendations and ID new ones

Scallop	SARC Panel Findings (1)

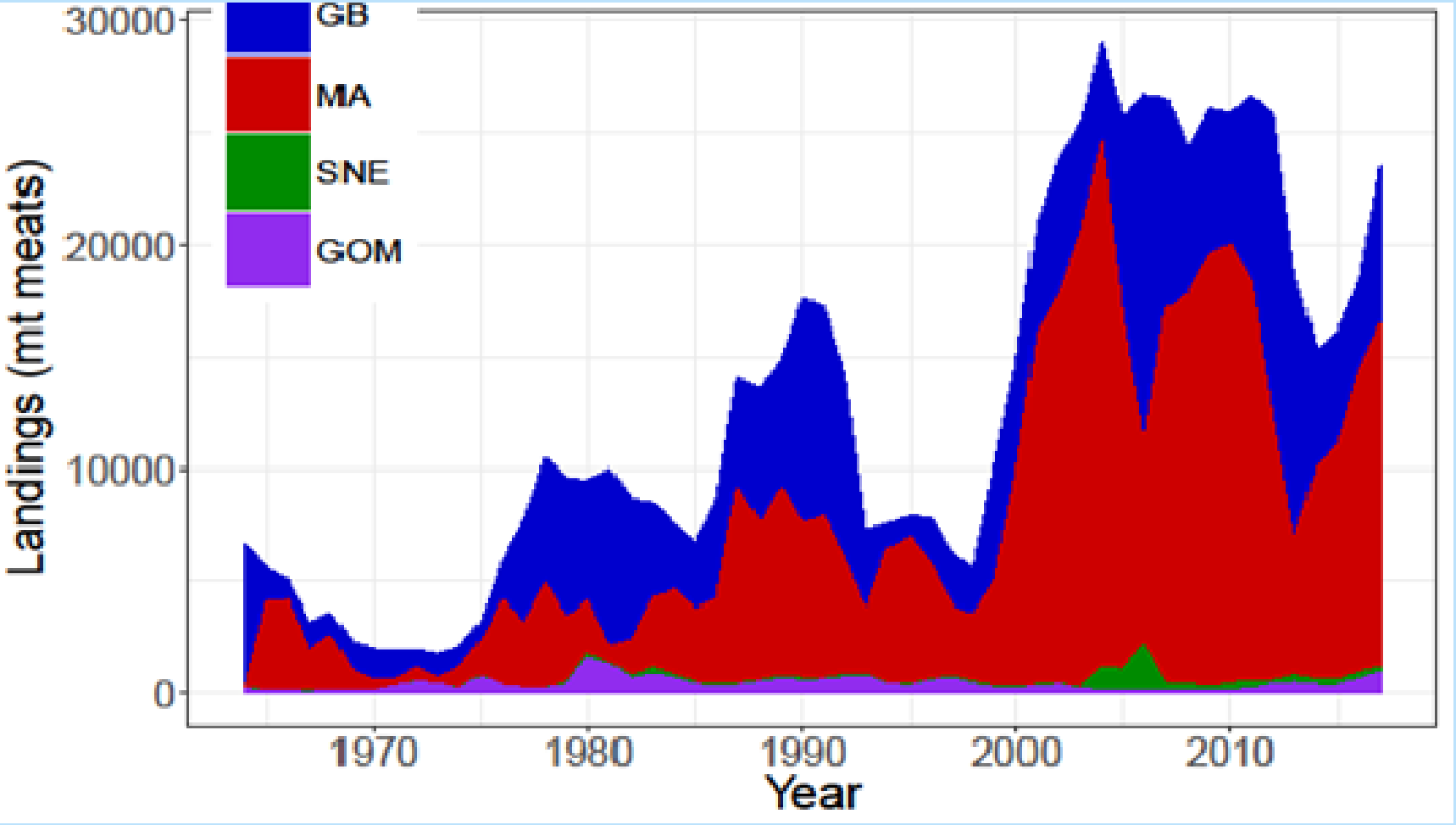
- **Current 2018 assessment is accepted. Current Stock Status: not overfished and not overfishing.**
- **Forward projecting size-structured model, CASA, was implemented appropriately.**
- **Model biomass estimates are sometimes below survey observations. Cause of lack of fit not well determined.**

- **Three models are used in this assessment (CASA SYM SAMS). They are each used to address distinct questions appropriate for assessment and management.**
- **Predicting dynamics of large and dense year classes is highly uncertain.**
- **Under area management, the fishing mortality across all areas is lower than in specific areas where fishing occurs.**

Scallop	Panel Recommendations

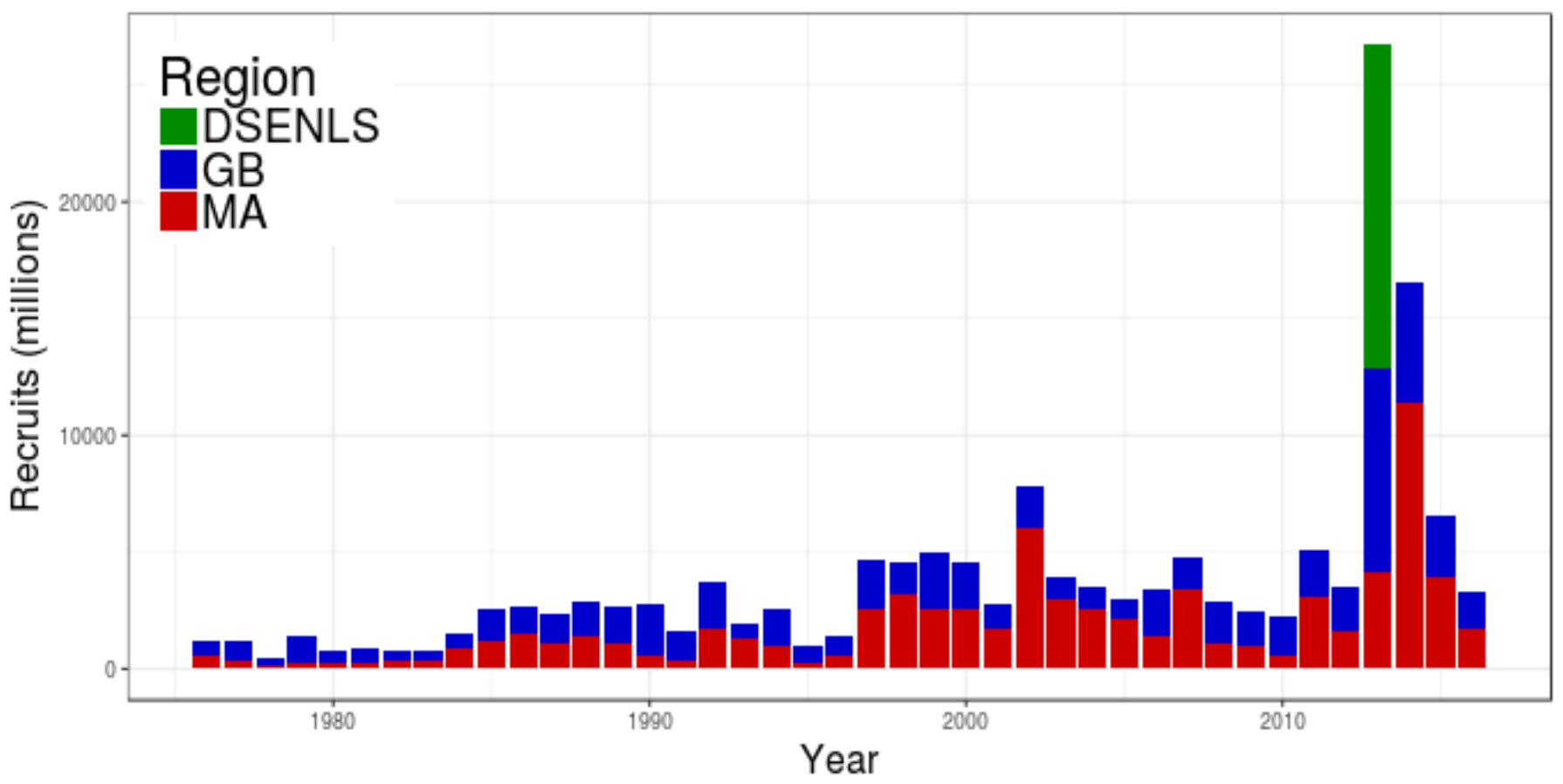
- **Investigate cause of lack of fit between some survey vs model population estimates.**
- **Estimate dredge efficiency and its uncertainty at high scallop density.**
- **Be sure that “optical survey” selectivity is consistent and fully comparable with other survey indices/methods.**
- **Gulf of Maine: Evaluate cost-benefits of research surveys and fishery monitoring (landings and discards) relative to socio-economic benefits. Consider data-limited method for management.**
- **Continue developing methods based on gonad weight to describe spawning stock biomass and appropriate biological reference points**

Scallop: Landings by Region 1965-2017



Landings increased in late 1990's. 2008-2017 landings averaged 22,100 mt meats, about twice the long-term mean.

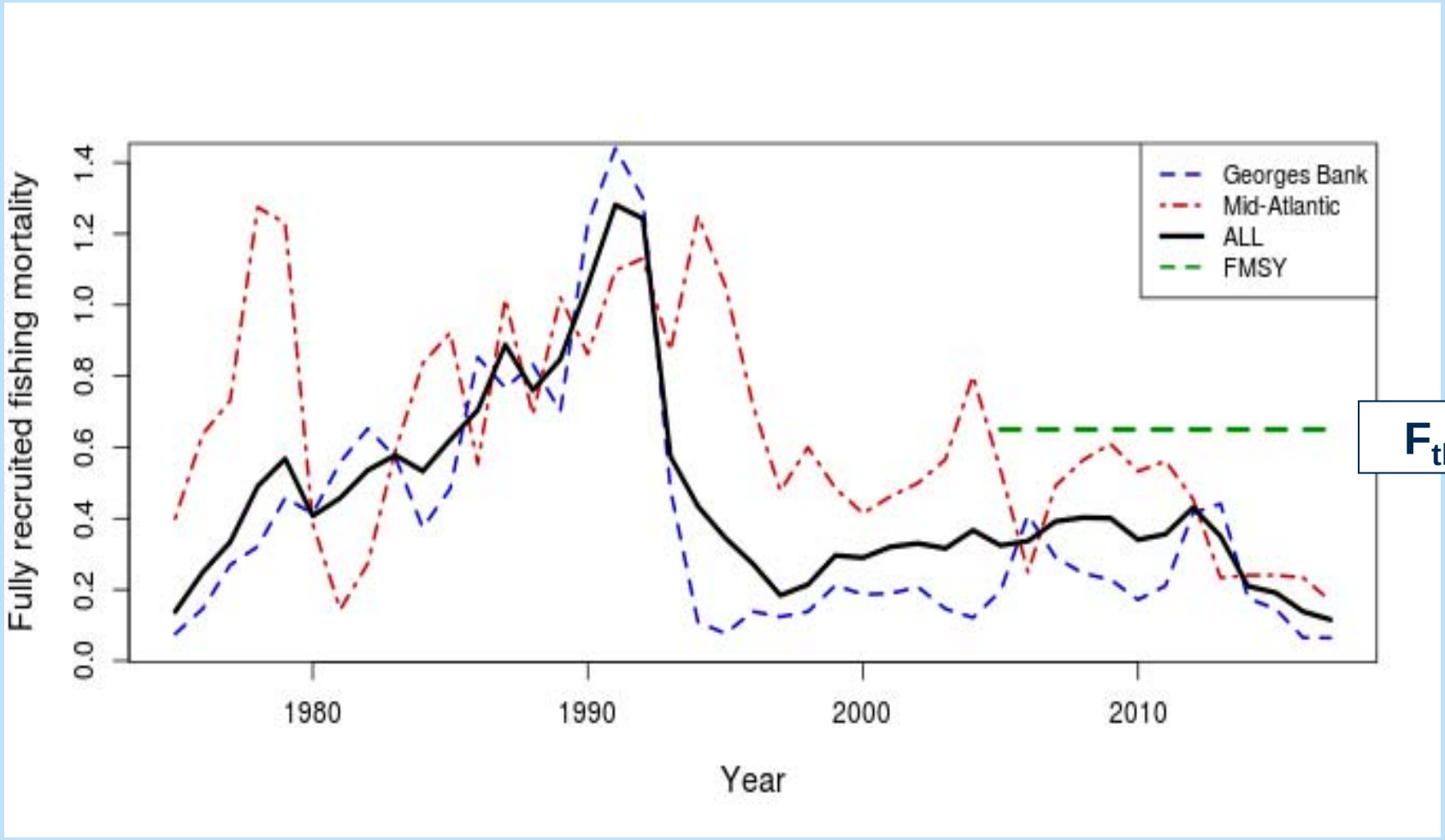
Scallop : Recruitment (1975-2016)



R has been higher in the most recent 20 years. The highest in GBK was the 2012 YC. The highest in Mid-Atl was the 2013 YC.

"DSENLS" : SE corner Nantucket Lightship Closed Area.

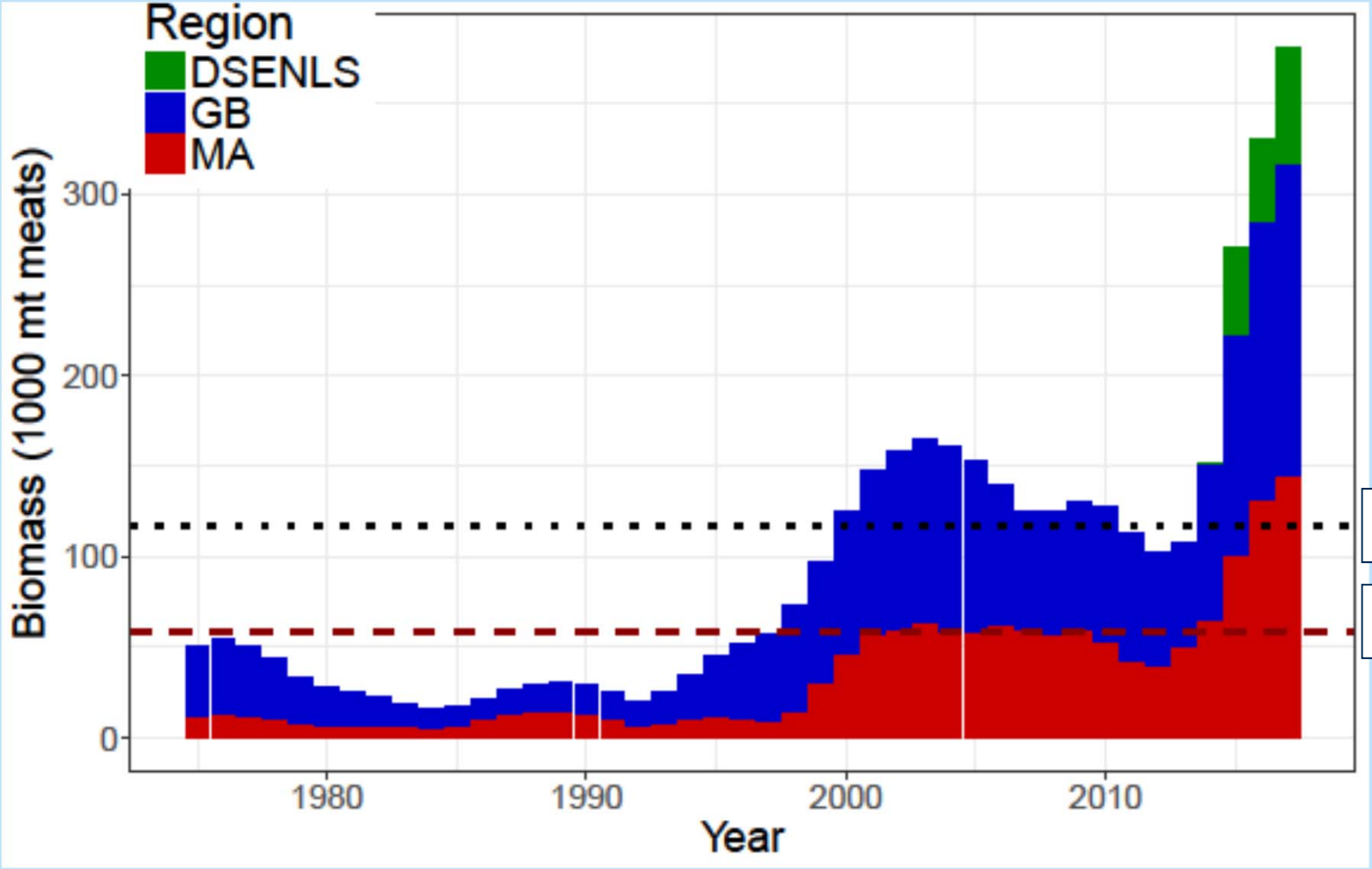
Scallop: Fishing Mortality (1975-2017) and Status



F_{thresh}

F was high in the 1980's and early 1990's. It declined in the mid 1990s. F2017 was the minimum for the time series. Overfishing was not occurring during 2017.

Scallop: Spawning Stock Biomass (1975 - 2017) and Status

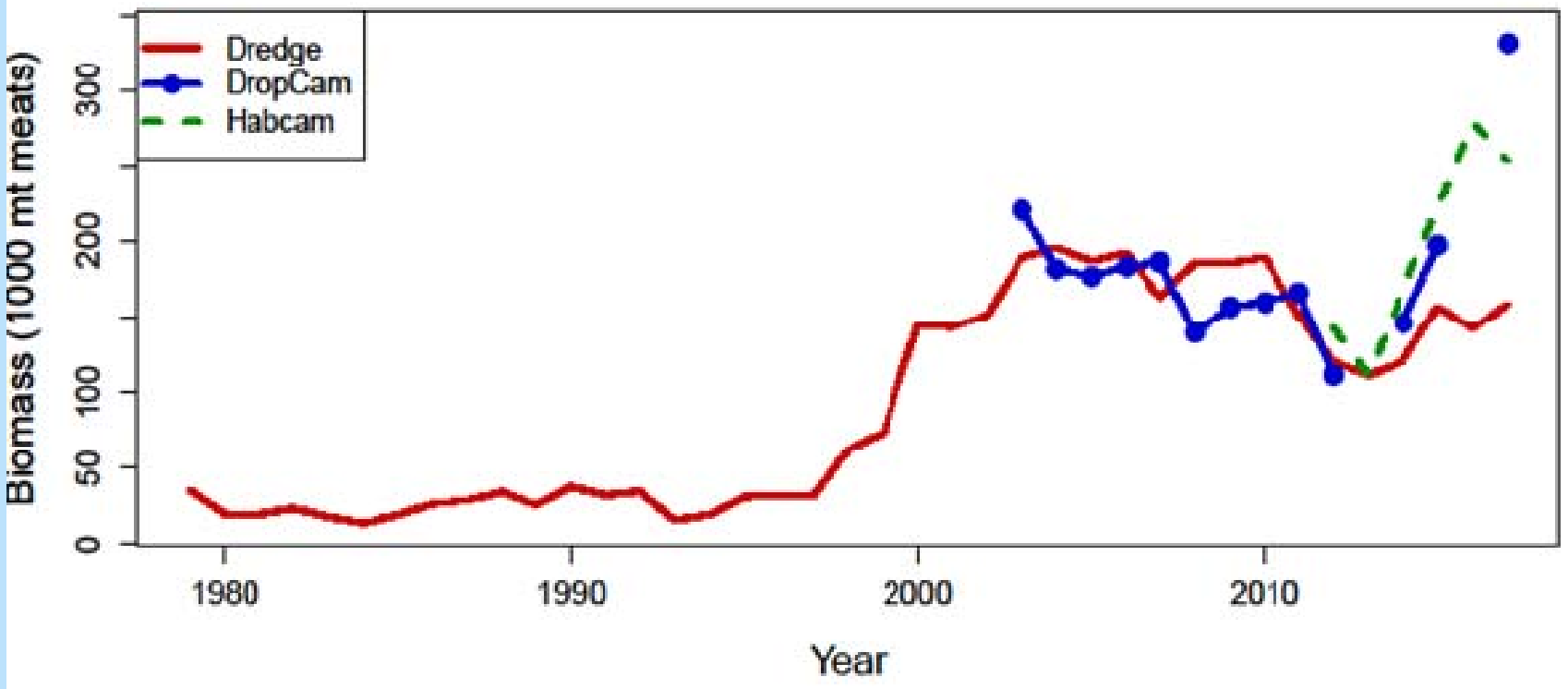


B_{target}

B_{thresh}

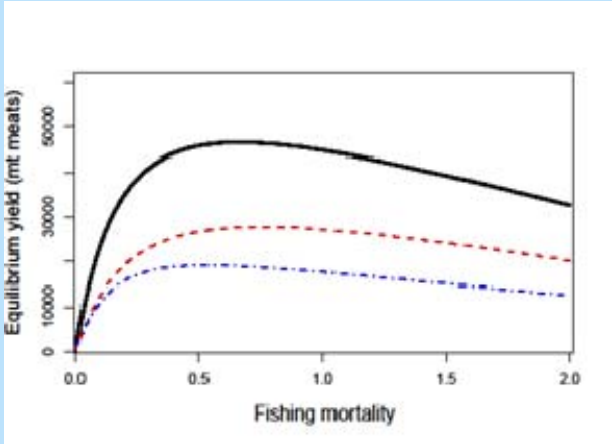
There were 2 periods of increasing SSB. Post-1994 (due to closed areas and gear and effort management). Post-2013 (due to large year classes in both GBK and Mid-Atl). Stock is not overfished, and is well above target.

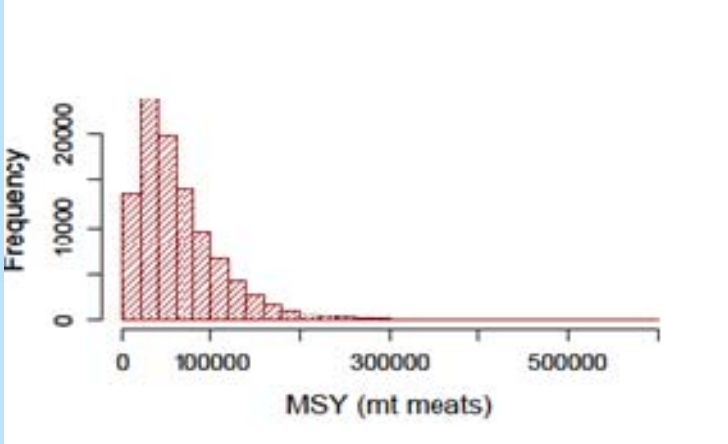
Scallop: Comparison of Surveys

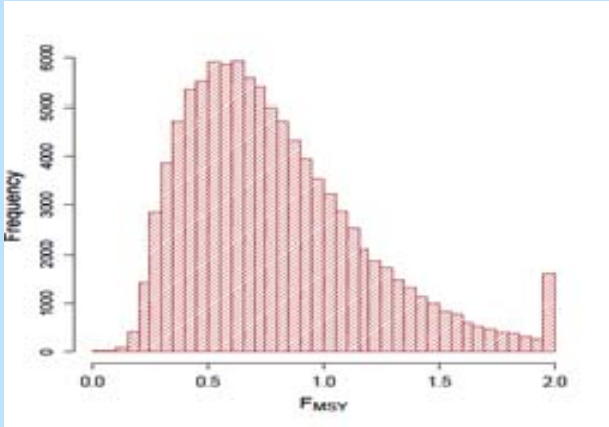


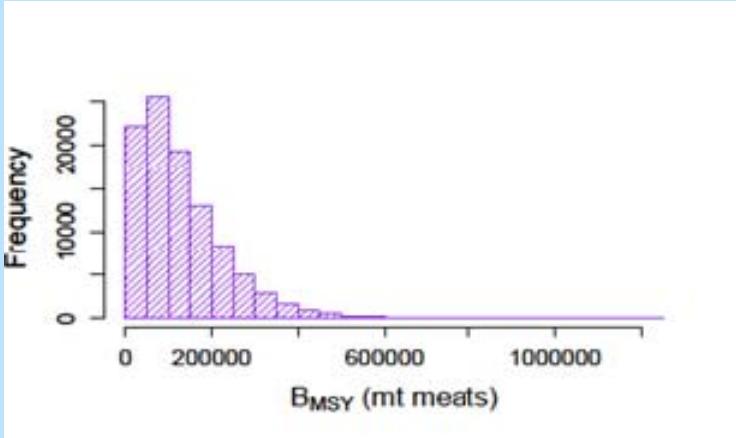
Three surveys are used in the assessment. Biomass estimates are generally similar, except the most recent years. Dredge gear likely has reduced efficiency when scallop density is high. The dredge survey index was adjusted to account for this in the model.

Scallop: Biological Ref. Points







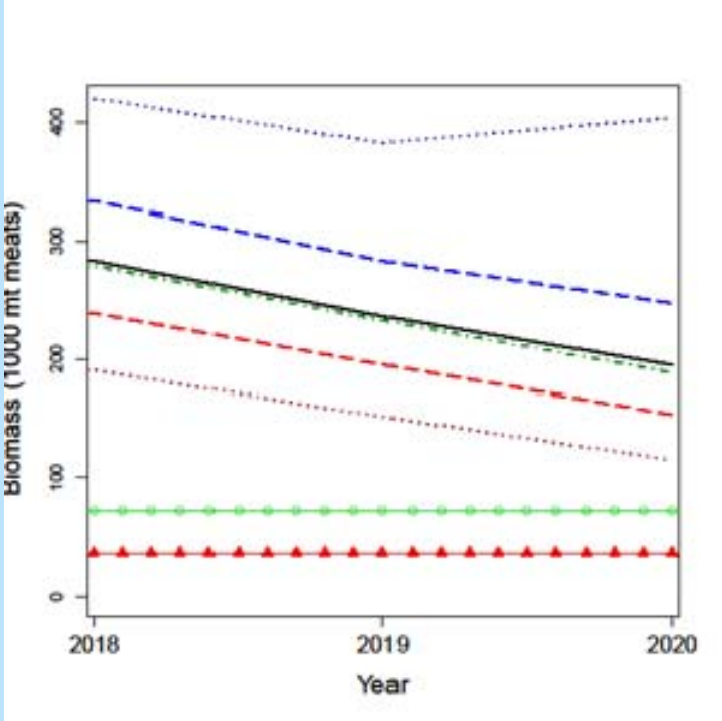


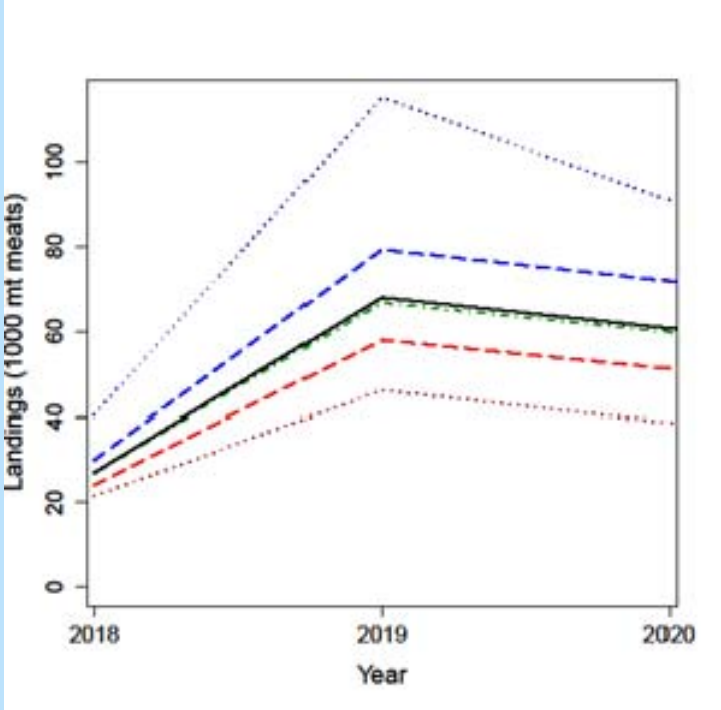
Reference points were calculated by the complex "SYM" model. Biological reference points for the whole stock recommended by the 2018 SARC-65 are F_{MSY} = 0.64, B_{MSY} = 116,766 mt meats, $B_{Threshold}$ = ½ B_{MSY} = 58,383 mt

Example Scallop Projection and “B” Ref. Points

Assumptions:

Fish all areas uniformly at F= 0.58 (Note: Not managed this way.)





More realistic projections are carried out by the Scallop PDT using a complex “SAMS” model.

(B.) Herring

Herring

Assessment TORs (shortened)

1. Estimate catch from all sources

2. Evaluate fishery independent and fishery dependent indices being used in the assessment

3. Examine stock distribution, and consumption of herring by predators

4. Estimate annual fishing mortality, recruitment and biomass for the time series

5. Propose biological reference points

6. Evaluate Stock status. Describe condition of the stock

7. Conduct stock projections

8. Consider whether current stock definition is reasonable

9. Review research recommendations and ID new ones

Herring	SARC Panel Findings (1)

- **Current 2018 assessment is accepted. Stock Status: not overfished and not overfishing.**
- **Given low recent recruitment, prognosis for future stock size appears relatively poor.**
- **New reference points : Approaches used to develop BRPs and to rescale the assessment are scientifically sound.**
- **Biological reference points cannot be compared to those from past because they have a different basis.**

- **Acoustic index from trawl survey was important component of assessment.**

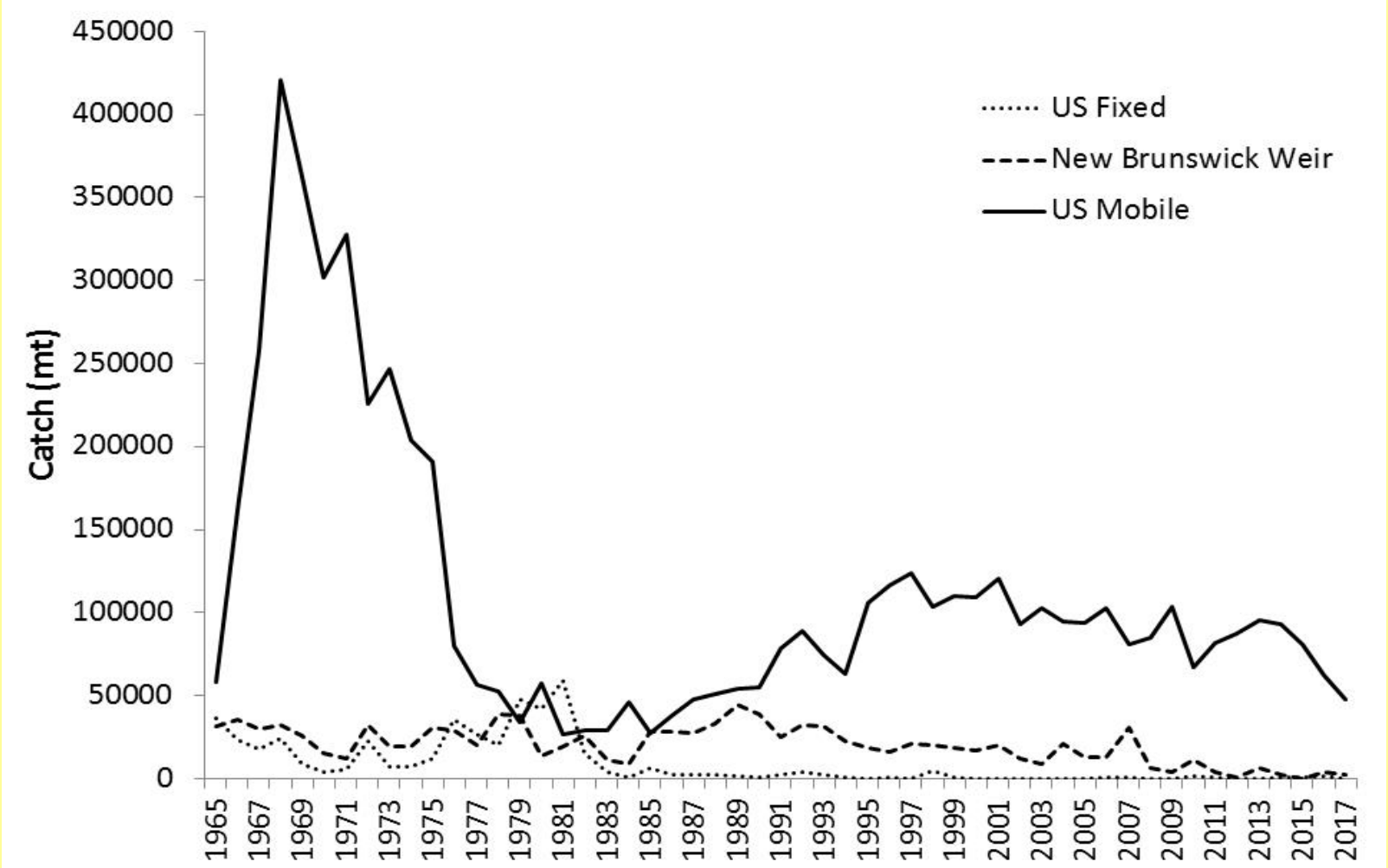
- **Herring fishery was responsible for less removals of herring than natural predators. Consumption estimates did not include marine mammals, seabirds, and some fish predators such as tuna.**

- **Assumed *M* : Reasonable justification provided**

Herring	SARC Recommendations

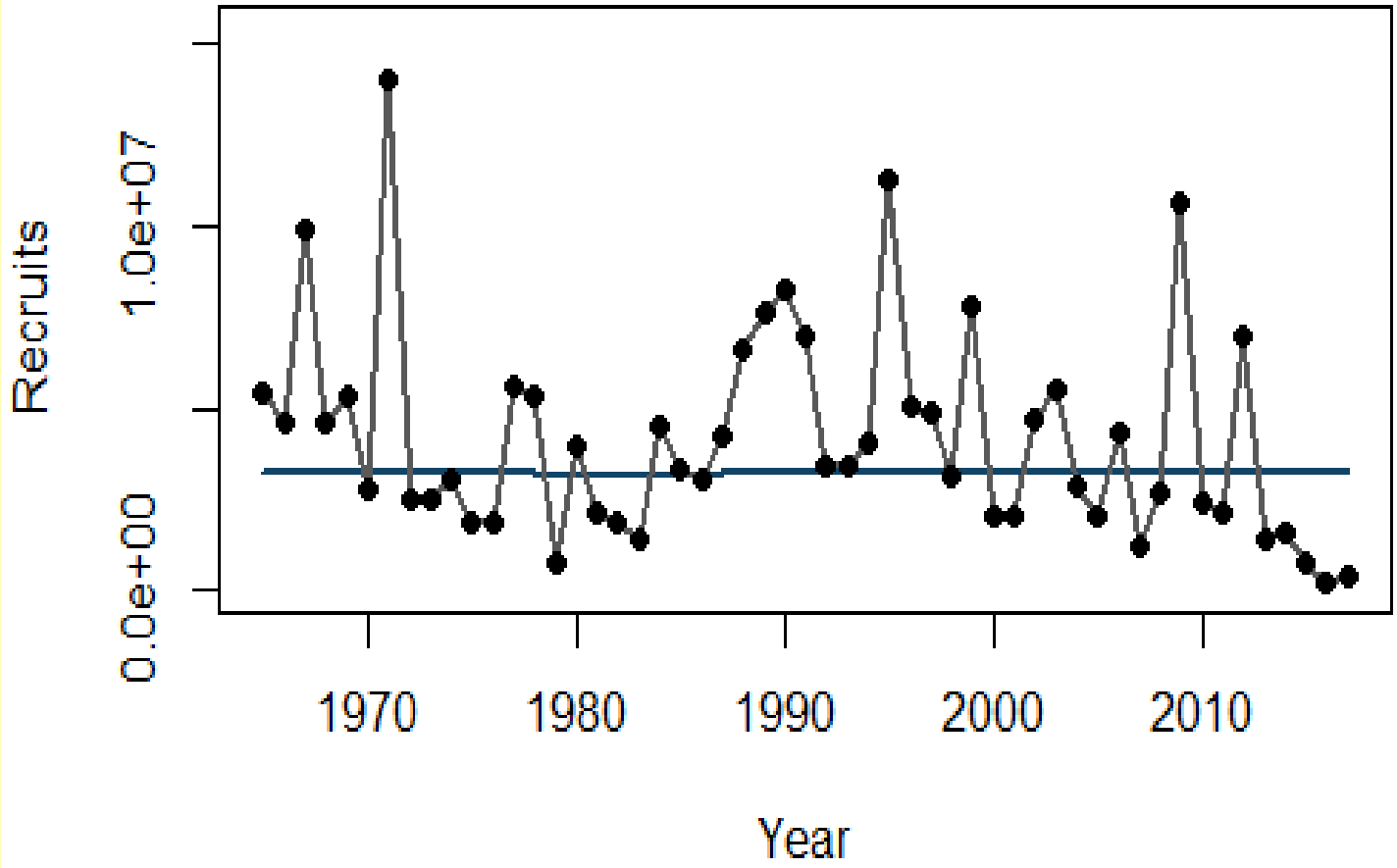
- **Explore alternative management strategies to better understand the implications of stock declines**
- **Continue to examine ecological and environmental factors influencing recruitment and mortality**
- **A directed acoustic survey might complement and serve as a check on acoustic data collected during trawl surveys.**
- **Try to include more species in the estimation of consumption of herring.**
- **Consider alternative approaches to estimate reference point proxies, such as length-based methods**
- **Further exploration of stock structure may be useful**

Herring: Catch by Gear Type, 1965-2017



Mobile gear catch peaked in 60's and 70's due to foreign fleets. Catch has been pretty stable since the 1990s, but has been declining in recent years with increased management measures.

Herring : Recruitment (1975-2017)



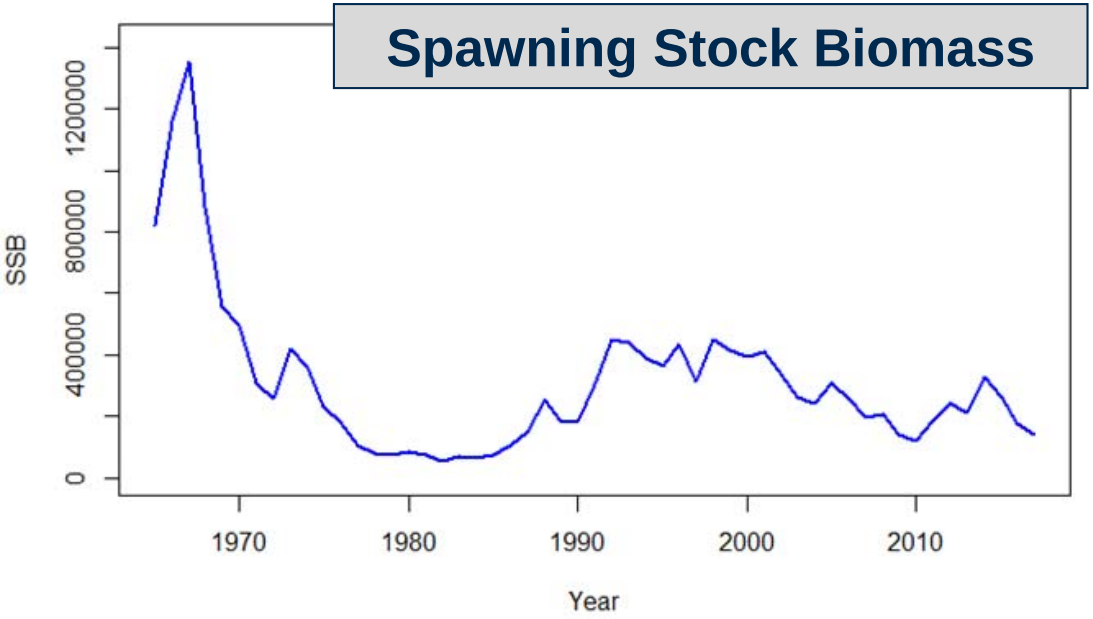
Time series high was in 1971. $R_{age\ 1}$ has been below average since 2013. Lows occurred in 2016 and 2017. There is more uncertainty associated with recent estimates.

Herring Stock Dynamics (1975-2017)

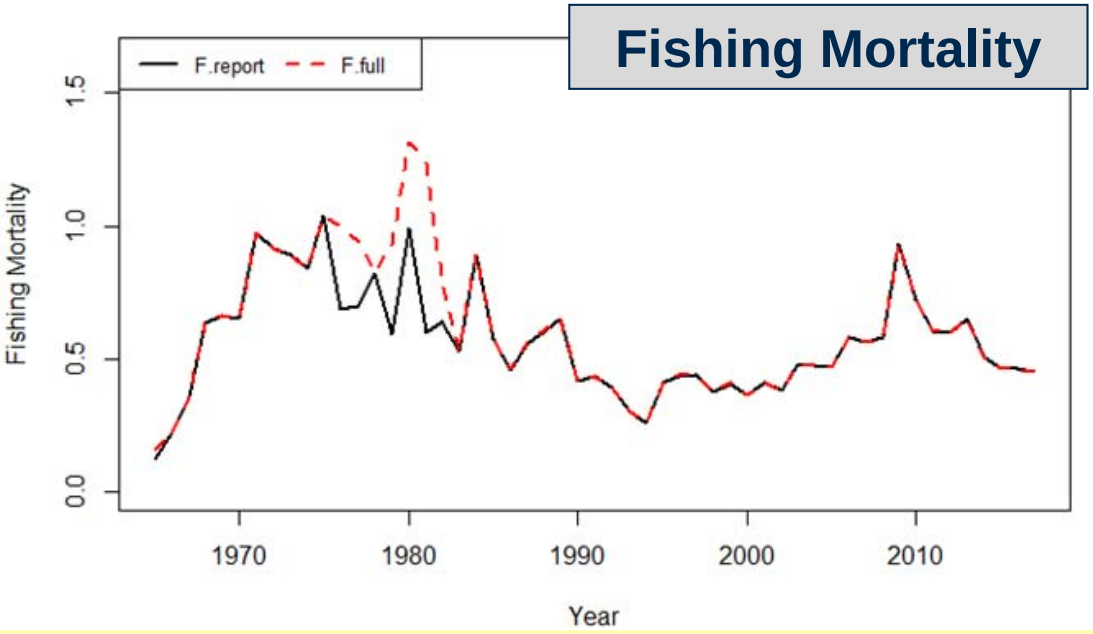
SSB was high in the ‘60s, and declined in the ‘80s. Went up slightly in the ‘90s, but declined again.
SSB_{2017} = 141 kmt.

F was high in the ‘70s – ’80s. It declined in the mid 1990s. F_{2017} = 0.45

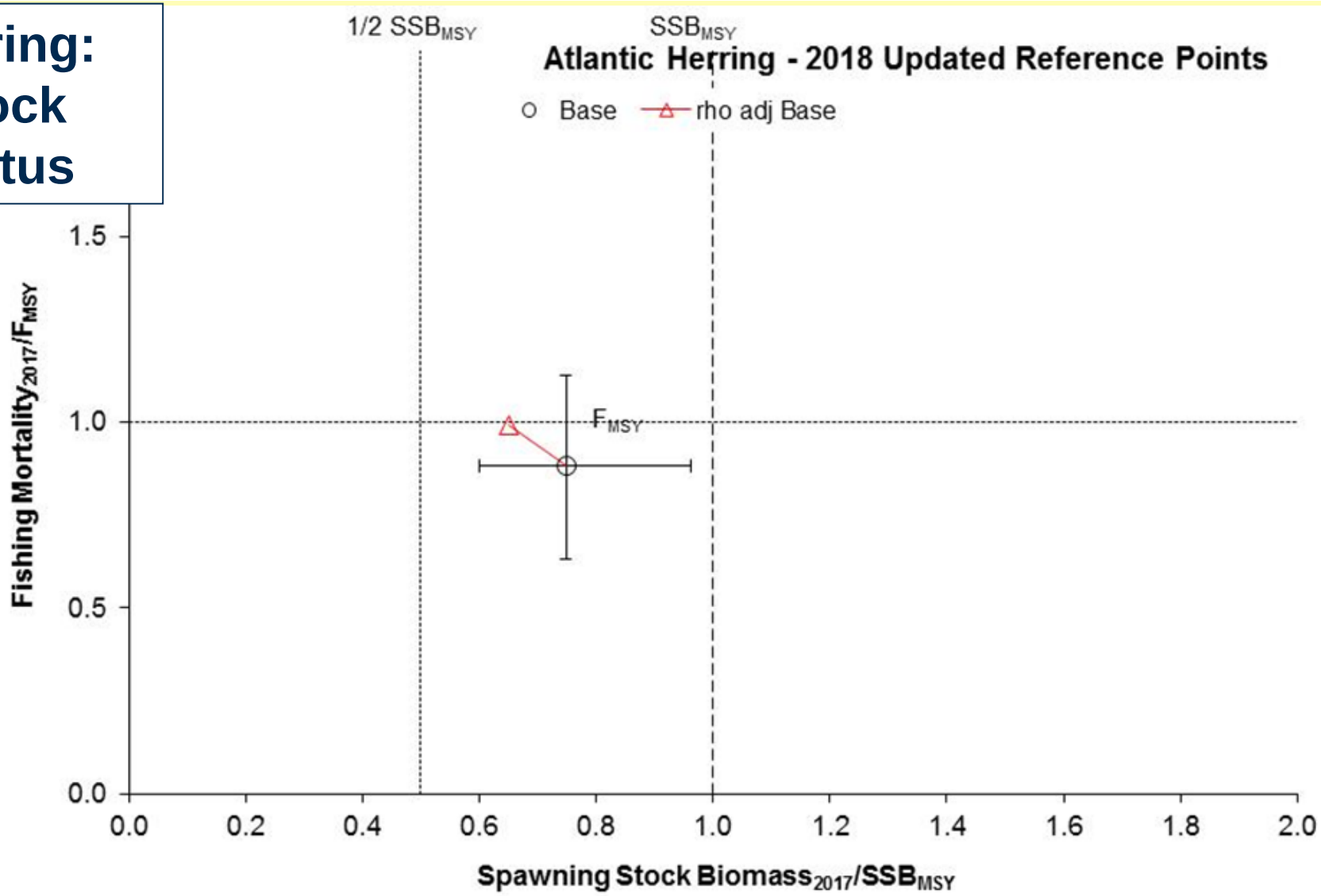
Spawning Stock Biomass



Fishing Mortality



Herring: Stock Status



Proxy reference points were calculated to be $F_{40\%}$ = 0.51, B_{target} proxy = 189,000 mt, $B_{Threshold}$ proxy = ½ $B_{40\%}$ = 94,500 mt. In 2017 the stock was not overfished and overfishing was not occurring.

Example Herring Projections

Assumptions: R'18 is short-term; R'19-'21 based on longterm.
Fish at F_{thresh}= 0.51 during 2019-2021.
Scenario 1. Catch = ABC. Scenario 2. Catch = 0.5xABC

Scenario 1	2018	2019	2020	2021
Catch (mt)	111,000	13,700	31,000	55,700
F_{7-8}	1.7	0.51	0.51	0.51
SSB (mt)	32,900	19,700	31,700	85,800
P(overfishing)	0.95	--	--	--
P(overfished)	0.96	0.94	0.93	0.58

Scenario 2	2018	2019	2020	2021
Catch (mt)	55,000	28,900	38,000	59,400
F_{7-8}	0.58	0.51	0.51	0.51
SSB (mt)	75,300	43,500	42,600	91,000
P(overfishing)	0.69	--	--	--
P(overfished)	0.76	0.92	0.91	0.53

Based on these scenarios, Probability of stock becoming overfished and overfishing occurring would be >50%.