

**NOAA
FISHERIES
SERVICE**



SAW/SARC-55 Summary (NEFSC CRD#13-01)

Presentation: Jan. 2013

SAW/SARC Process

- 1. SAW Working Groups: Cod WG**
- 2. External Peer Review Panel: Center of Independent Experts (CIE) + SSC.**
 - Emphasis on reviewing just the science/assessment.
- 3. Products: (Reviewer's Reports) + (2 Science Reports)**
 - <http://www.nefsc.noaa.gov/nefsc/saw/> (see SAW55)
 - <http://www.nefsc.noaa.gov/publications/> (see Ref. Docs.)
- 4. Management advice:**
 - SAW/SARC reports support SSC in making ABC recommendation.
 - Primarily developed by Tech. Committees, PDTs, SSC.

**The 55th Northeast Regional
Stock Assessment Review Committee (55th SARC)
Stephen H. Clark Conference Room – Northeast Fisheries Science Center
Woods Hole, Massachusetts
Dec. 3-7, 2012**

SARC Chairman:

**Dr. Pat Sullivan
(Cornell Univ.;
NEFMC SSC)**

SARC Panelists:

**Dr. Noel Cadigan
(Memorial Univ., Canada;
CIE)**

**Dr. John Casey
(CEFAS, UK; CIE)**

**Dr. Steven Holmes
(Scottish Govern. Marine
Lab., UK; CIE)**

**A. Gulf of Maine cod
B. Georges Bank cod**

1. Estimate catch from all sources including landings and discards. Characterize the uncertainty in these sources of data and take into account the recommendations and subsequent work from the March 2012 MRIP workshop. Evaluate available information on discard mortality and, if appropriate, update mortality rates applied to discard components of the catch.
2. Present the survey data and calibration information being used in the assessment (e.g., indices of abundance, recruitment, state surveys, age-length data, etc.). Consider model-based (e.g. GLM) as well as design-based analyses of the survey data in developing trends in relative abundance. Investigate the utility of commercial or recreational LPUE as a measure of relative abundance. Characterize the uncertainty and any bias in these sources of data.
3. Summarize the findings of recent workshops on stock structure of cod of the Northeastern US and Atlantic Canada.
4. Investigate the evidence for natural mortality rates which are time- and/or age-specific. If appropriate, integrate these into the stock assessment (TOR 5).
5. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series, and estimate their uncertainty. Consider feasibility of survey catchability estimates, the starting year for the assessment, estimation of the stock recruitment curve, inclusion of multiple fleets, and whether to use domed or flat selectivity-at-age for the NEFSC surveys. Provide a summary of steps in the model building process. Include a historical retrospective analysis to allow a comparison with previous assessment results. Review the performance of historical projections with respect to stock size, catch recruitment and fishing mortality.

6. State the existing stock status definitions for “overfished” and “overfishing”. Then update or redefine biological reference points (BRPs; point estimates or proxies for B_{MSY} , $B_{THRESHOLD}$, F_{MSY} , and MSY) and provide estimates of their uncertainty. Consider alternative parametric models of the stock recruitment relationship. If analytic model-based estimates are unavailable, consider recommending alternative measurable proxies for BRPs. Comment on the appropriateness of existing BRPs and any “new” (i.e., updated, redefined, or alternative) BRPs.
7. Evaluate stock status with respect to the existing model (from the most recent accepted peer reviewed assessment) and with respect to a new model developed for this peer review. In both cases, evaluate whether the stock is rebuilt.
 - a. When working with the existing model, update it with new data and evaluate stock status (overfished and overfishing) with respect to the existing BRP estimates.
 - b. Then use the newly proposed model and evaluate stock status with respect to “new” BRPs (from Cod TOR-6).

8. Develop and apply analytical approaches to conduct single and multi-year stock projections to compute the pdf (probability density function) of the OFL (overfishing level) and candidate ABCs (Acceptable Biological Catch; see Appendix to the SAW TORs).
 - a. Provide numerical annual projections (3-5 years). Each projection should estimate and report annual probabilities of exceeding threshold BRPs for F, and probabilities of falling below threshold BRPs for biomass. Use a sensitivity analysis approach in which a range of assumptions about the most important uncertainties in the assessment are considered (e.g., terminal year abundance, variability in recruitment).
 - b. Comment on which projections seem most realistic. Consider the major uncertainties in the assessment as well as sensitivity of the projections to various assumptions.
 - c. Describe this stock's vulnerability (see "Appendix to the SAW TORs") to becoming overfished, and how this could affect the choice of ABC.

9. Review, evaluate and report on the status of the SARC and Working Group research recommendations listed in recent SARC reviewed assessments and review panel reports. Identify new research recommendations.

(A.) Gulf of Maine cod



Previous GOM cod Assessment (SARC53 in 2011)

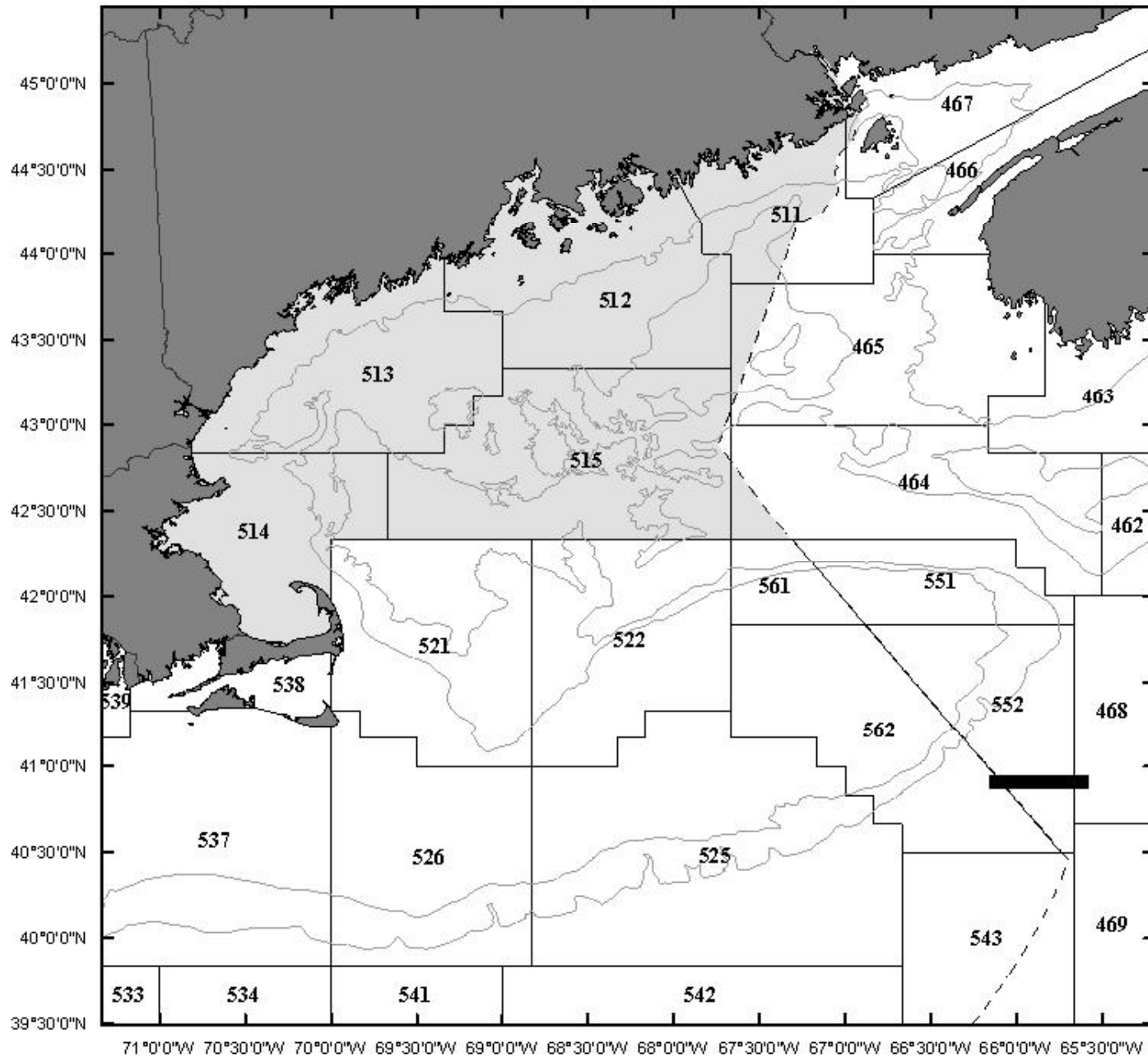
- 1. overfished**
- 2. overfishing**

- **Stock is overfished and overfishing is occurring (based on both models).**
- **Review Panel notes long history of overfishing this stock.**
- **Most recent survey indices are at or near lowest values in their time series, and industry may not catch quota. Available information points to a low stock concentrated in western Gulf. Vulnerability of stock is increased.**
- **(Model) Starting Year: Panel had concerns about using pre-1982 data and SR curves based on the early data. (e.g., Bio sampling [length and age] prior to 1982 was poor, rec catch data not available until 1981). Review Panel recommended 1982 start.**
- **(Model) Natural mortality: Review Panel put forward 2 models: a model with constant M, and model where M increased w/ time. The 2 models seemed equally valid, and gave same stock status.**

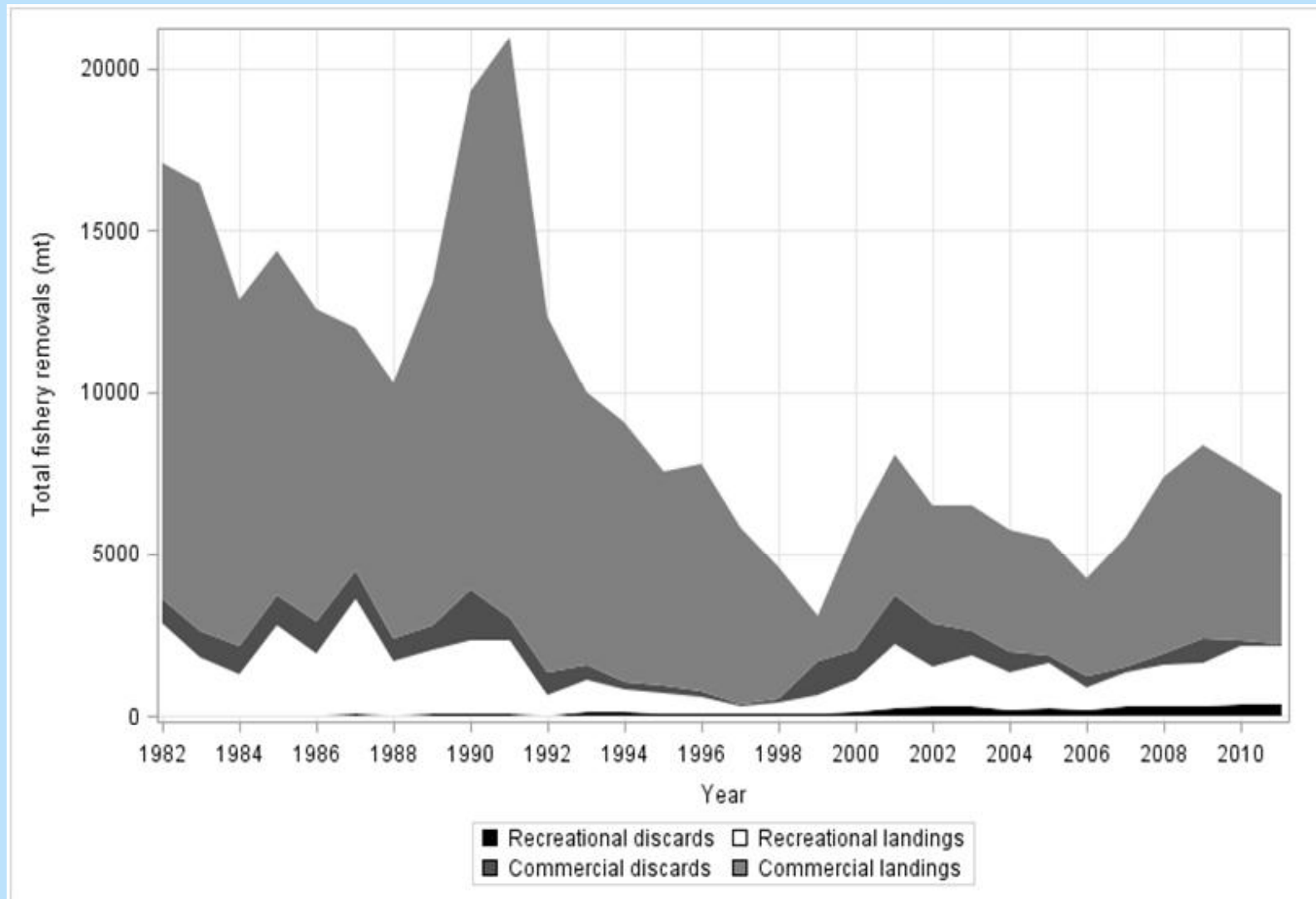
- **(LPUE) Fishery LPUE is not indicative of time trends in the whole stock (i.e., not an abundance index).**
- **(BRP) $F_{40\% SPR}$ was retained as the overfishing proxy for status determination. (M=0.2 assumed)**
- **(Projections) M=0.2 projections and the Mramp projections with M remaining at 0.4 in the short-term were equally realistic.**
- **This Gulf of Maine cod assessment represents the best available science.**

GOM cod

Stock assessment area

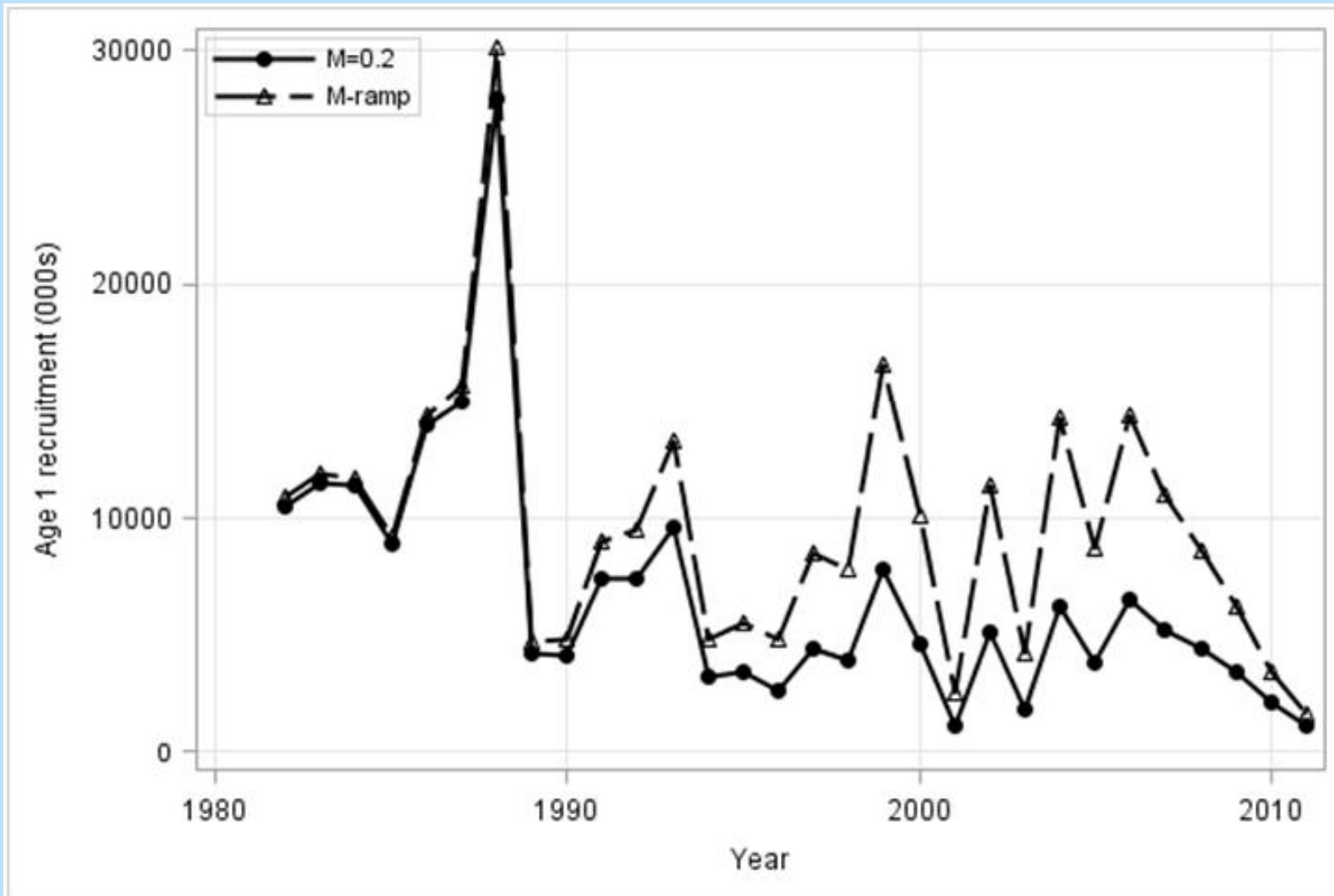


Total Catch of GOM cod (1982-2011)



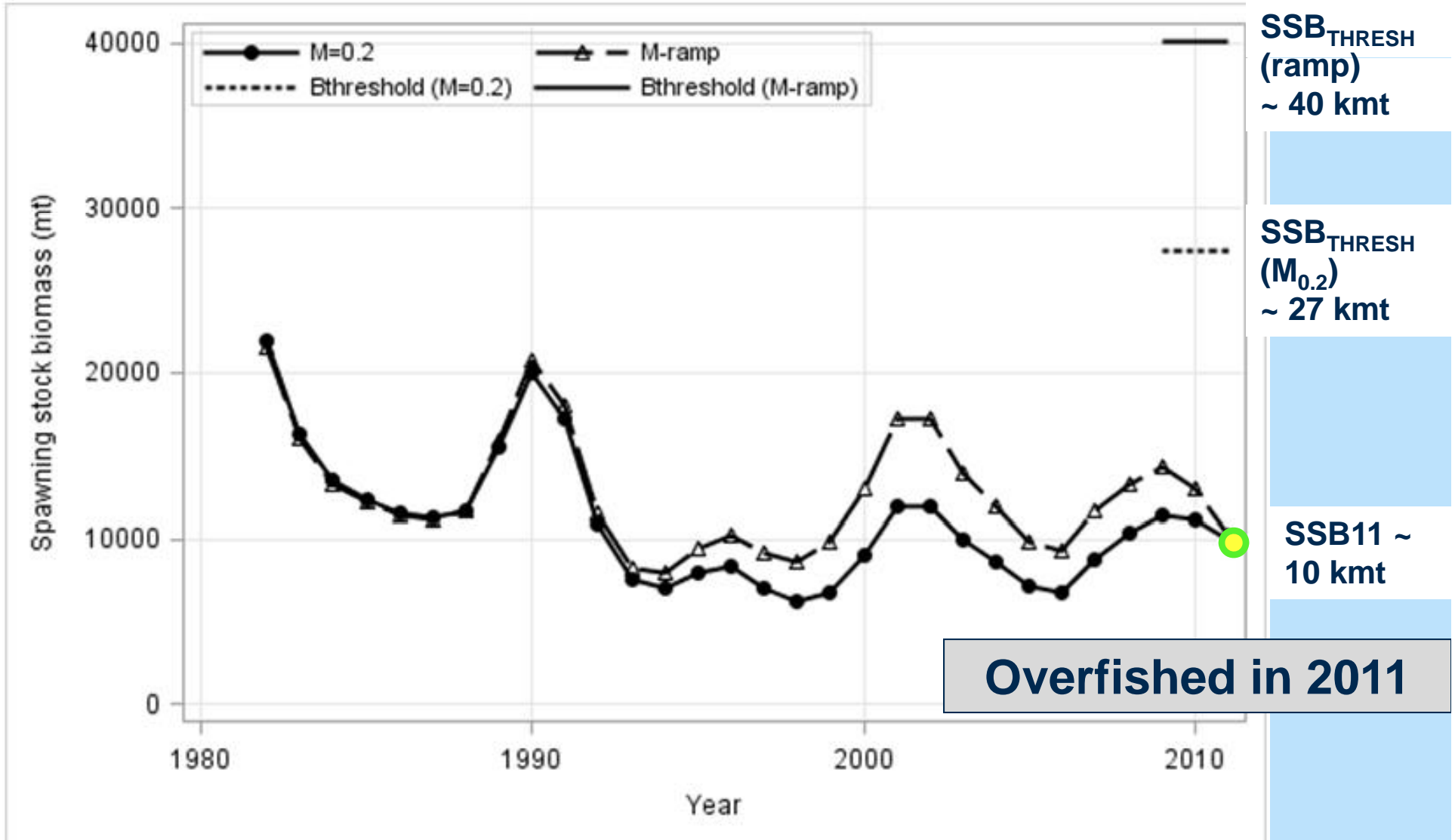
In recent yrs, total catch ranged from 5 – 10 kmt.

GOM cod (2012 Assessment Results, SARC55)



Recruitment has declined the last 5 years to the lowest in the time series.

GOM cod (2012 Assessment Results, SARC55)



Spawning Stock Biomass over time, and associated overfished level, SSB_{Threshold}

GOM cod (2012 Assessment Results, SARC55)

Overfishing in 2011

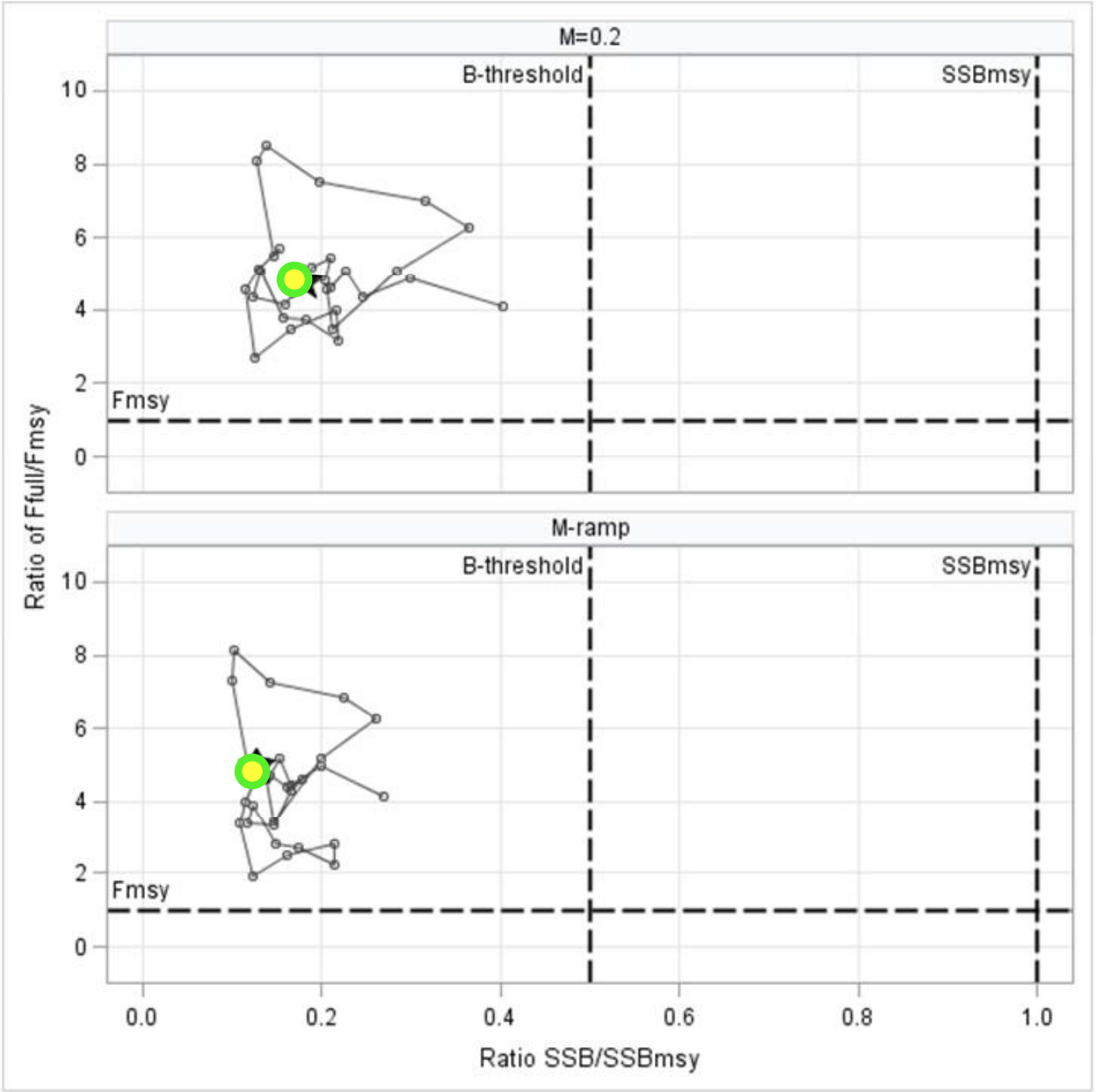


Fishing mortality over time, and associated overfishing level, $F_{\text{Threshold}}$

GOM cod: Biological Reference Points (BRP)

Proxy reference points	$M_{0.2}$	M_{Ramp}
$F_{\text{THRESHOLD}} (F_{40\%})$	0.18	0.18
$SSB_{\text{TARGET}} (\text{MT})$	54,743	80,200
$SSB_{\text{THRESHOLD}} (\text{MT})$	27,372	40,100
$MSY (\text{MT})$	9,399	13,786

GOM cod (2012 Assessment Results, SARC55)



Model: M=0.2

Model: Mramp

Stock is overfished and overfishing, based on both models. 17

- **If recent weak recruitment continues, productivity and rebuilding of the stock will be less than projected.**
- **NEFSC 2011 fall and 2012 spring survey abundance indices were the 4th lowest and the lowest in their time series. MADMF 2012 spring survey index was also lowest in its times series. As the 2012 observations were not incorporated into the assessment model, projections are likely optimistic.**

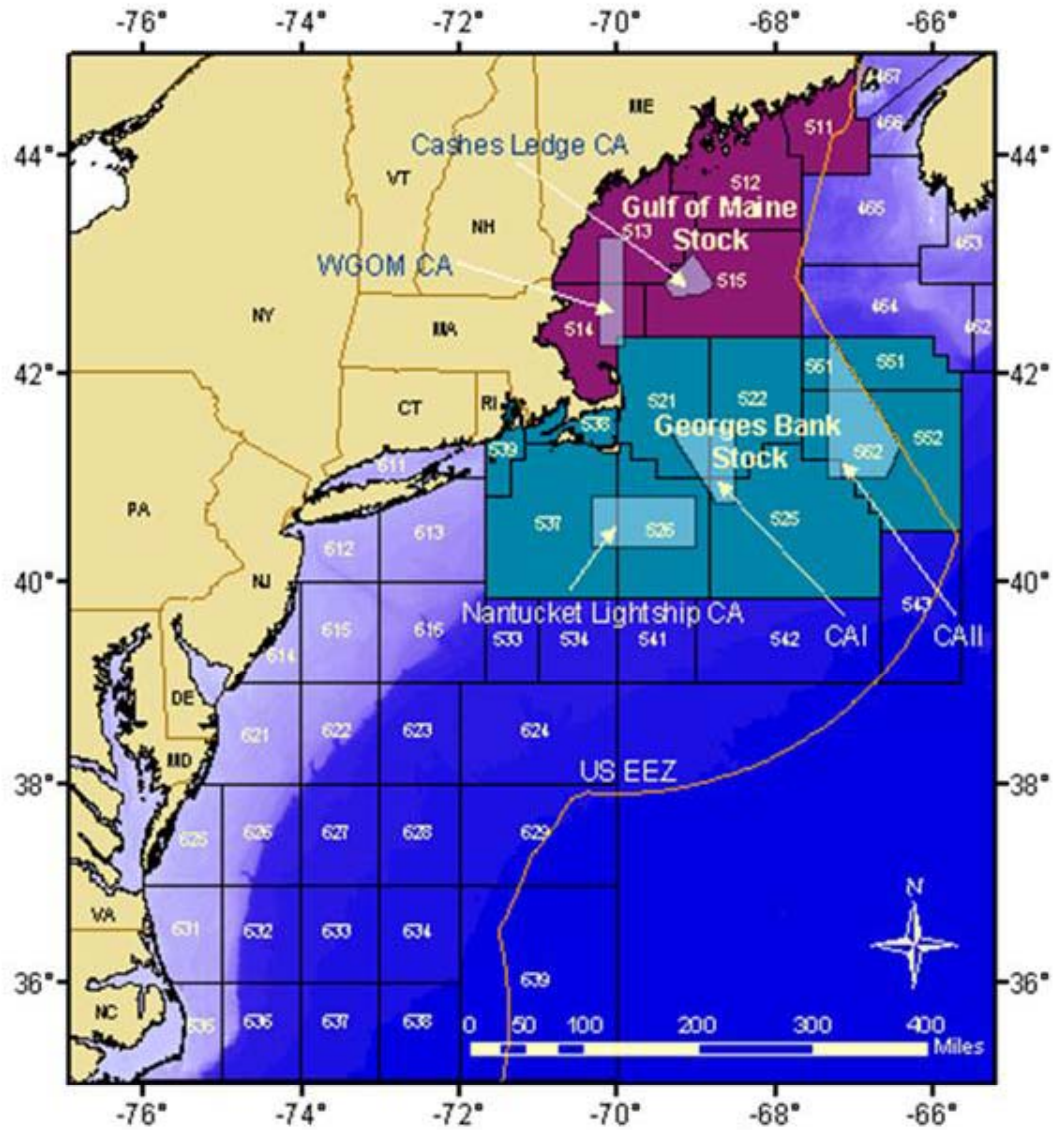
(B.) Georges Bank cod



**Previous GB cod Assessment
(Feb. 2012 Update; CRD12-06)**

- 1. overfished**
- 2. overfishing**

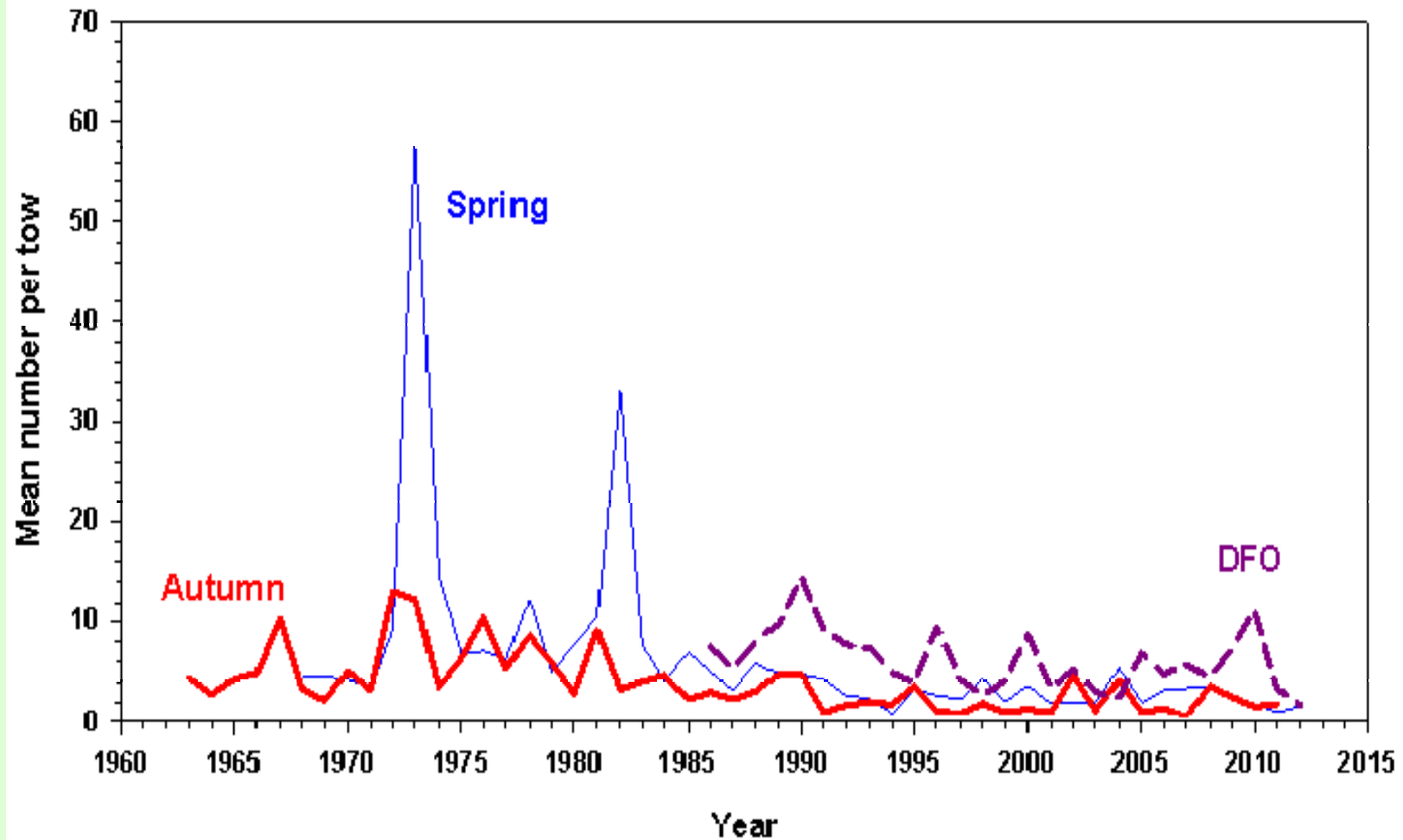
GB cod: Stock Area



- **Stock is overfished and overfishing is occurring .**
- **Panel noted a reduction over time in mean weight at age, truncated age structure, and two decades of poor recruitment.**
- **Panel reached consensus on a single assessment model.**
- **The assessment model with $M = 0.2$ and bias correction is recommended. M , as well as other factors, might be changing and be the cause of the retrospective pattern.**
- **No stock-recruit relationship has been identified for this stock. A proxy F_{MSY} is used ($F_{40\%SPR}$).**
- **(LPUE) Fishery LPUE is not indicative of time trends in the whole stock (i.e., not an abundance index).**
- **This GBK cod assessment represents the best available science.**

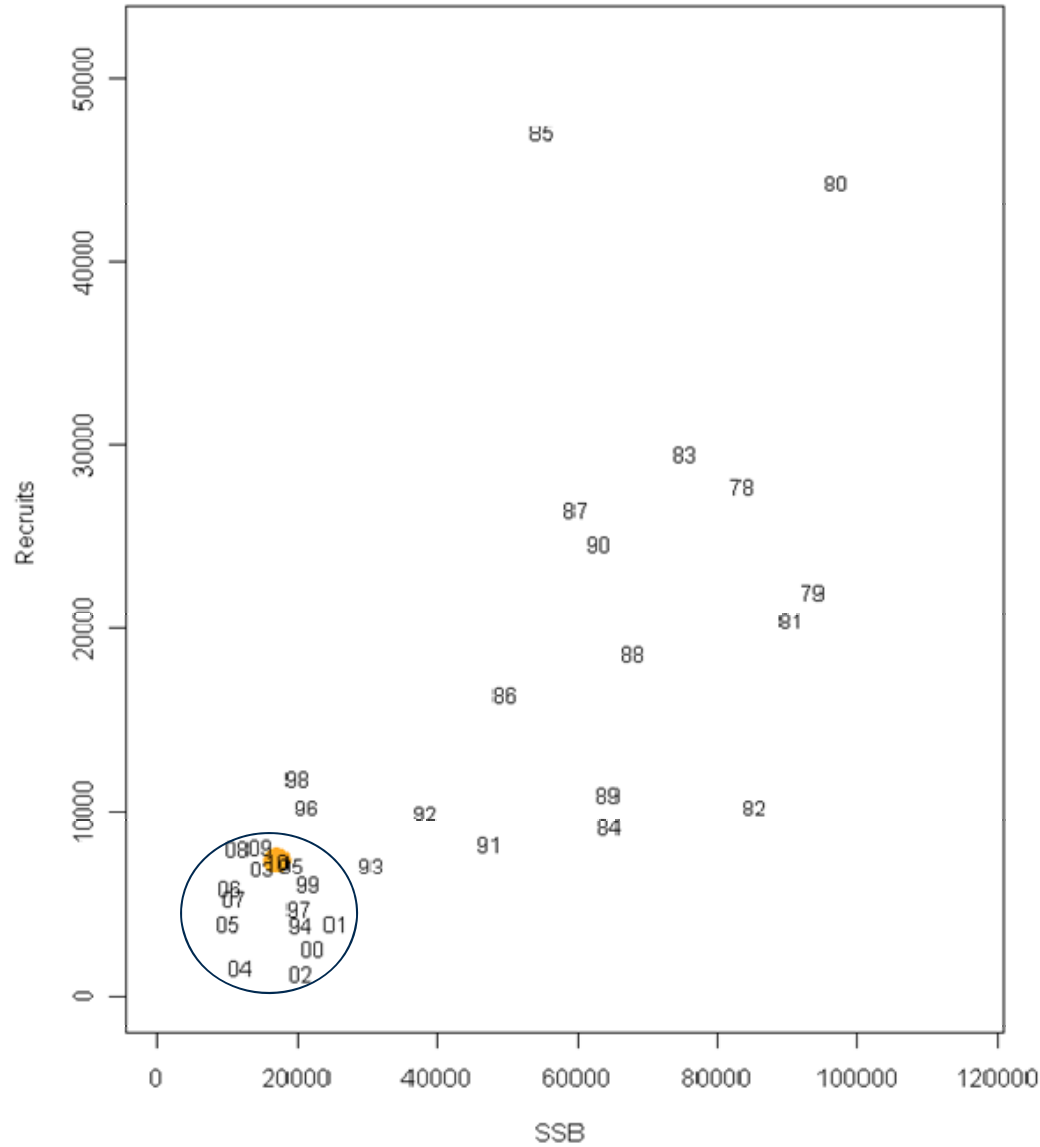
GB cod:

RV Survey Indices



GB cod:

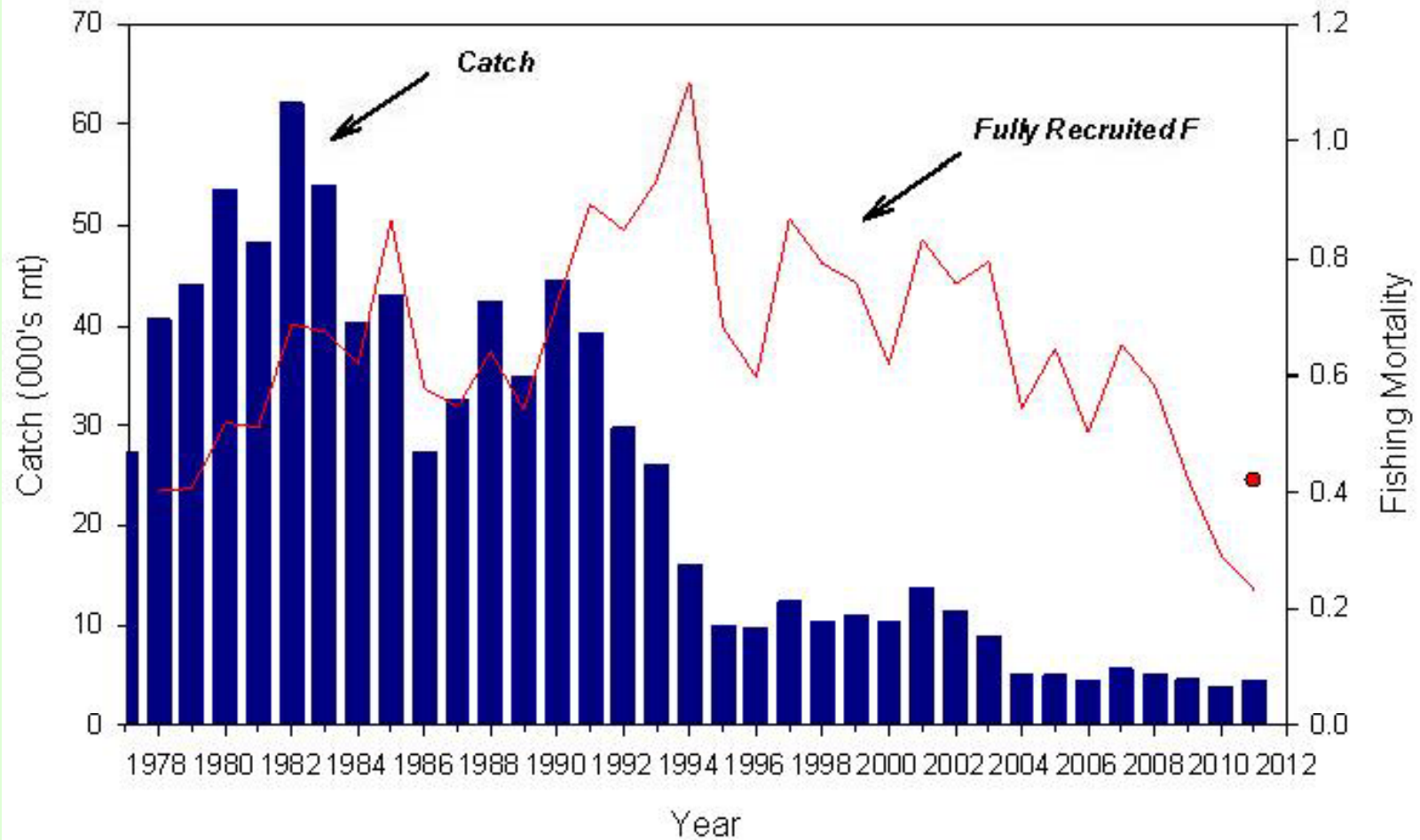
Stock Size and Recruitment



**Note low values
in recent years**

GBK cod:

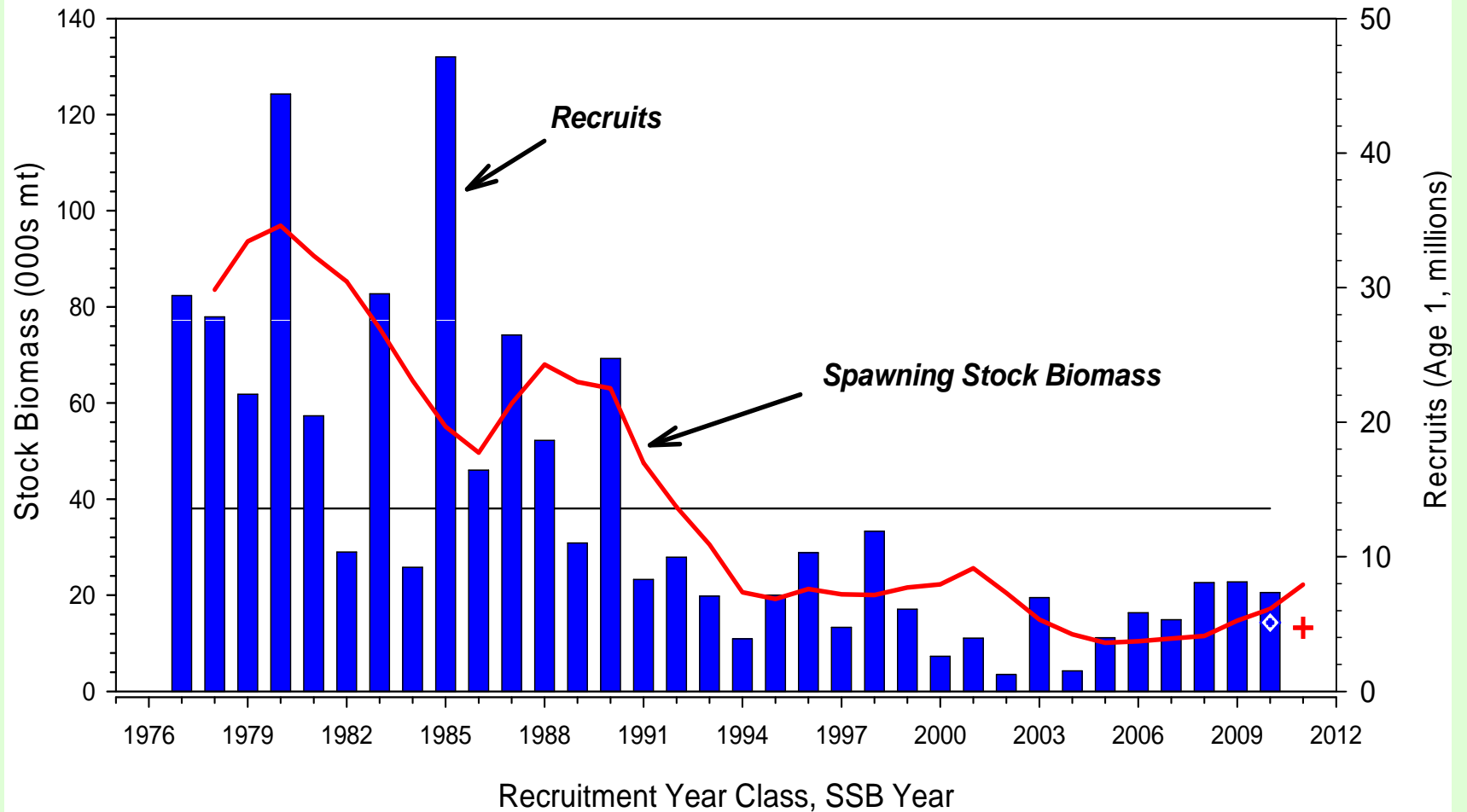
Catch and F (1978-2011)



● is retrospective adjusted 2011 F

GBK cod:

SSB and R (1978-2011)



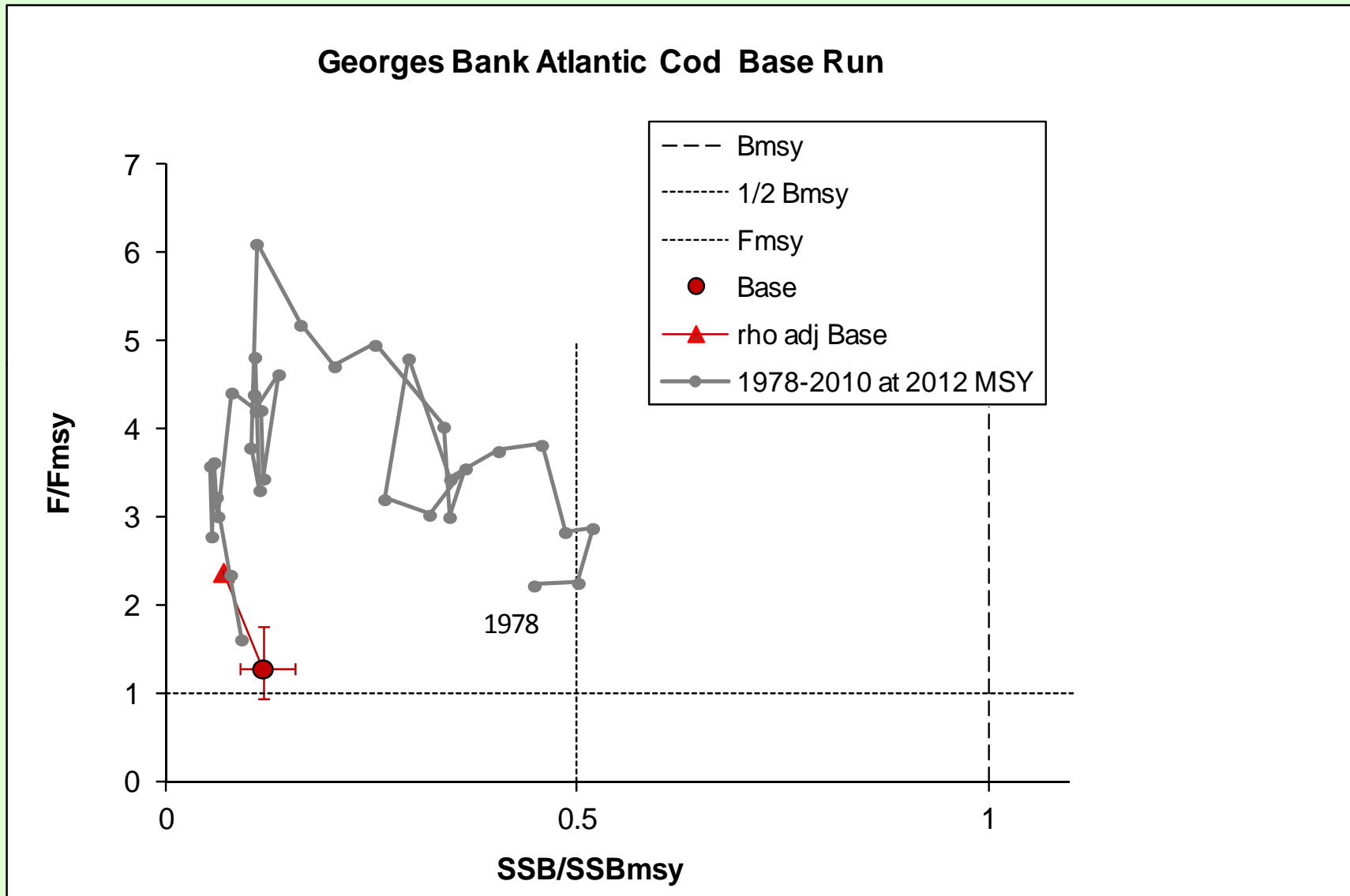
red '+' is retrospective adjusted 2011 SSB

GB cod:

BRPs and Stock Status

Proxy reference points		Population Estimates		Stock Status
$F_{\text{THRESHOLD}} (F_{40\%})$	0.18	F2011 adjusted	0.43	overfishing
$SSB_{\text{TARGET}} (MT)$	186,535	SSB2011 adjusted	13,216	overfished
$SSB_{\text{THRESHOLD}} (MT)$	93,268			
MSY (MT)	30,622			

GB cod (2012 Assessment Results, SARC55)



In 2011, GB cod stock: overfished and overfishing occurring₂₈

GB cod	SARC Panel Comments on Projections
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- **Review Panel chose projections based on $M=0.2$, with starting values adjusted for retro pattern.**
- **This accounted for the retrospective pattern, but did not identify the specific cause(s).**