



**NOAA**  
**FISHERIES**

- NEFSC

# Summer flounder 2021 Management Track Assessment

- *Paralichthys dentatus*
  
- June 2021

# **Summer flounder 2018 SAW 66**

## **Most recent 'Benchmark' assessment**

**SARC-66 concluded that the summer flounder stock was not overfished nor did it experience overfishing in 2017. The Panel concluded that the SAW WG had reasonably and satisfactorily completed its tasks.**

**Estimates of recreational catch came from newly calibrated MRIP time-series that reflected a revision of both the intercept and effort surveys.**

**The Bigelow indices took into account trawl efficiency at length and wing spread by tow.**

**No factor was identified as strongly influencing the spatial shift to the northeast in spawner biomass or the recent below average recruitment.**

**The assessment showed that recent mortality from all sources was greater than recent recruitment inputs to the stock, resulting in a declining stock trend.**

# **2021 Management Track Assessment**

## **Data and modeling overview**

- **Add 2018-2019 fishery and research survey data to the 2018 SAW 66 assessment model**
- **Update mean weight and maturity averages for BRPs and projections**
- **Update BRPs**
- **Evaluate stock status relative to updated BRPs**
- **Conduct projections for 2022-2023 to determine OFLs**
- **Level 1 Management Track review**
  
- **Backup – Examination of aggregate survey trends or PlanBsmooth using NEFSC BIG survey trends to project trend of catch**

# **TOR 1: Fishery Catch**

- 1. Estimate catch from all sources including landings and discards**

# Commercial Landings

**Comm. Landings: MA to NC, out to edge of shelf**

**Mainly a mixed trawl fishery (>90% of landings)**

**Avg. ~10,000 mt (22 million lb) for 1955-60**

**Avg. < 5,000 mt (11 million lb) for 1968-72**

**Avg. ~13,000 mt (29 million lb) for 1974-87**

**Under quotas, avg. 5,600 mt (12 million lb) for 1993-2017**

**2018: 2,787 mt ( 6.1 million lb), 93% of CQ (3,006 mt)**

**2019: 4,109 mt ( 9.1 million lb), 82% of CQ (4,981 mt)**

**2020: 4,132 mt ( 9.1 million lb), 79% of CQ (5,229 mt)**

# Commercial Discards

- **SBRM (Dobs-flk/Kobs-all)\*Krep-all Estimator**

**Krep-all = Kept (landings) of all species on a trip**  
**Now the Standard NEFSC discard estimator**  
**Now includes Trawl, Scallop Dredge, Gillnet (extra-large mesh monkfish), and 'Other' discards**  
**Variable stratification depending on gear**

- **During 1993-2017: 1,100 mt = about 20% of comm. land.**

**2018: 979 mt = 35% of comm. land.**

**2019: 783 mt = 19% of comm. land.**

**2020: 1,000 mt = 24% of comm. land.**

# Recreational Landings

Uses 'New MRIP'; note 2018 RHL in 'Old MRIP' currency

Avg. ~9,200 mt (20 million lb) for 1981-1992

Under limits, avg. 7,300 mt (16 million lb) for 1993-2017

**2018: 3,447 mt ( 6 million lb), 172% of RHL (2,004 mt)**

**2019: 3,537 mt ( 9 million lb), 105% of RHL (3,486 mt)**

**2020: 4,571 mt (10 million lb), 131% of RHL (3,486 mt)**

# Recreational Discards

Uses 'New MRIP'

Avg. ~450 mt (1 million lb) for 1981-1992

Under limits, avg. 1,600 mt (4 million lb) for 1993-2017

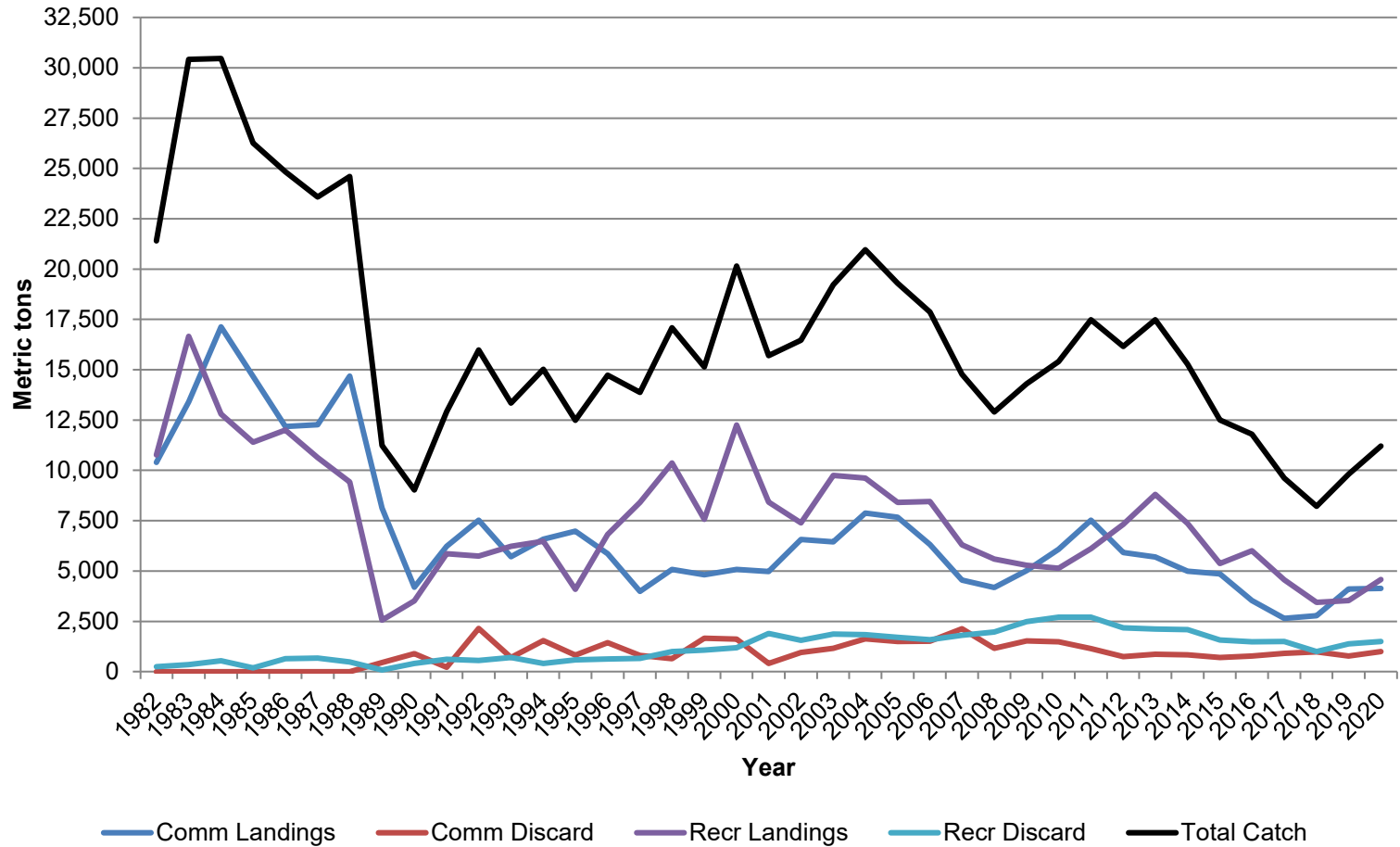
**2018: 1,003 mt ( 2 million lb), 29% of recr landings**

**2019: 1,379 mt ( 3 million lb), 39% of recr landings**

**2020: 1,950 mt ( 4 million lb), 43% of recr landings**



## Summer Flounder Fishery Total Catch: 1982-2020 with 'New' MRIP



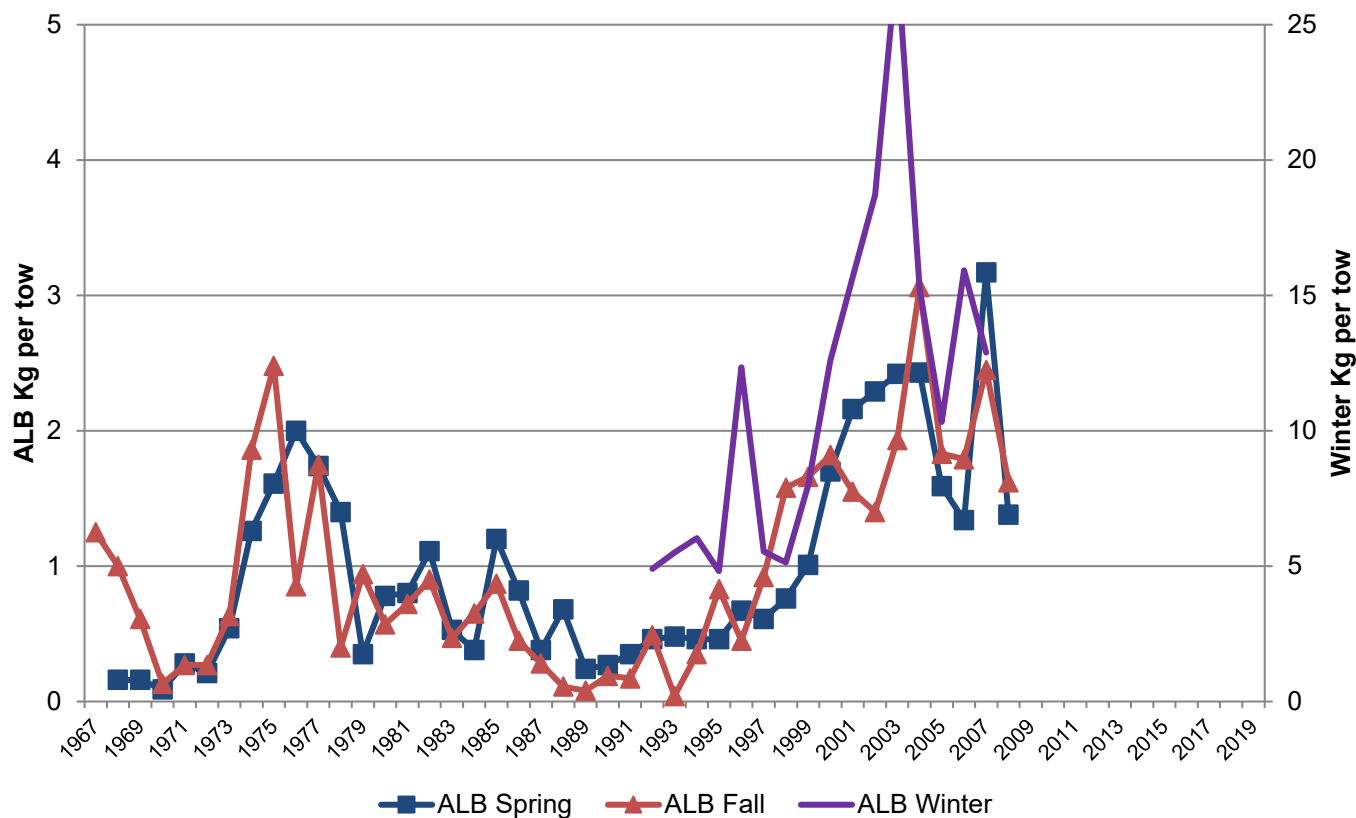
## **TOR 2: Indices of abundance**

**2. Evaluate indices used in the assessment (e.g., indices of relative or absolute abundance, recruitment, state surveys, age-length data, etc.)**

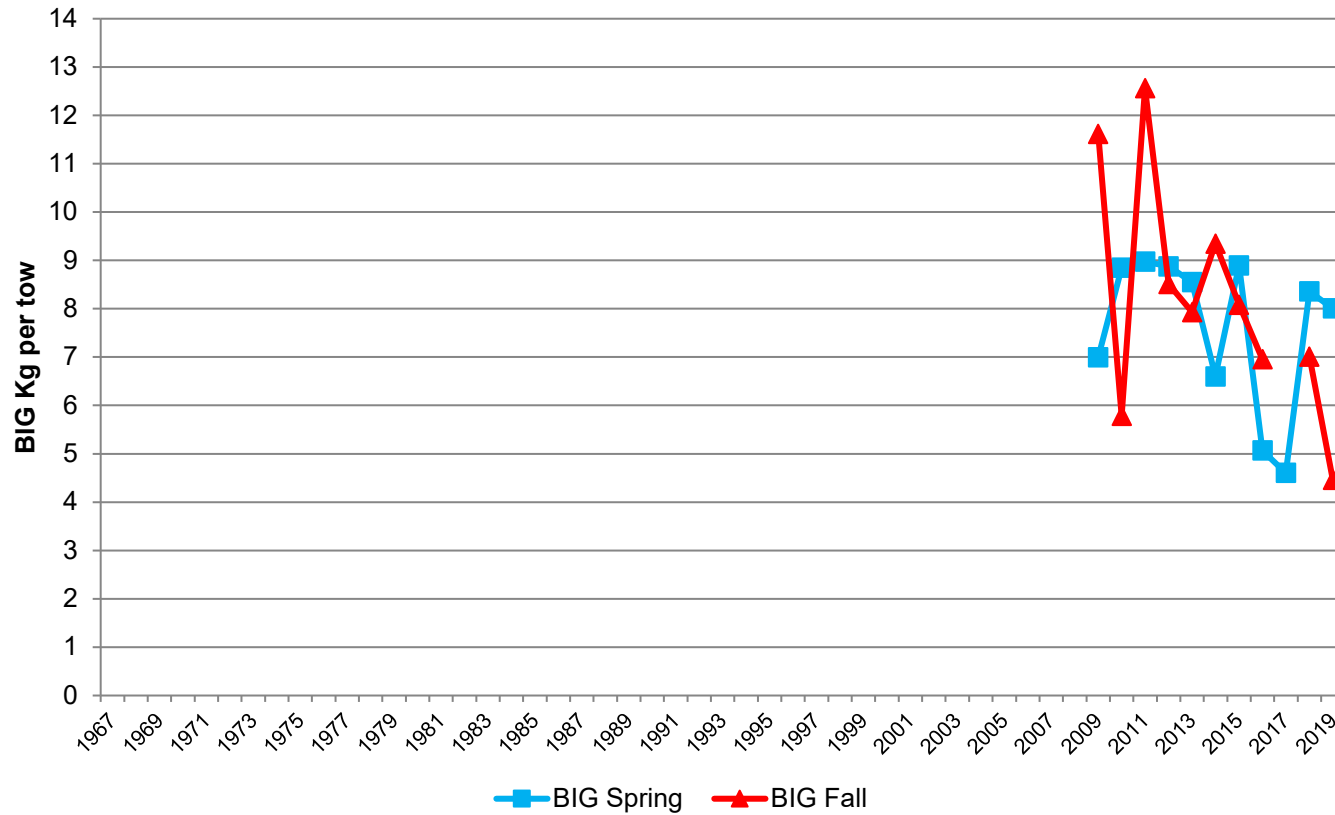
# Research Surveys

- NEFSC Winter 1992-2007, Fall and Spring 1967-2019 (no Fall 2017 or 2020)
- MADMF Spring and Fall 1978-2019, Seine YOY 1982-2020
- RIDFW Fall 1981-2020, Monthly Fixed Station 1990-2020
- URIGSO Narragansett Bay/RI Sound 1959-2020
- CTDEP Spring and Fall 1984-2019
- NYDEC Peconic Bay 1987-2020
- NJDFW Apr-Oct 1988-2019
- DEDFW 16 ft Estuary YOY 1980-2020, 16 ft Bays YOY 1986-2020, 30 ft Mainstem Trawl 1991-2020
- MDDNR YOY 1972-2020
- VIMS Juv. Trawl YOY 1955-2020
- VIMS ChesMMAP 2002-2018
- VIMS NEAMAP Fall and Spring 2007-2019; Fall 2020
- NCDMF YOY 1987-2019
- NEFSC MARMAP 1978-1986 and ECOMON 1999-2015 Larval indices of SSB

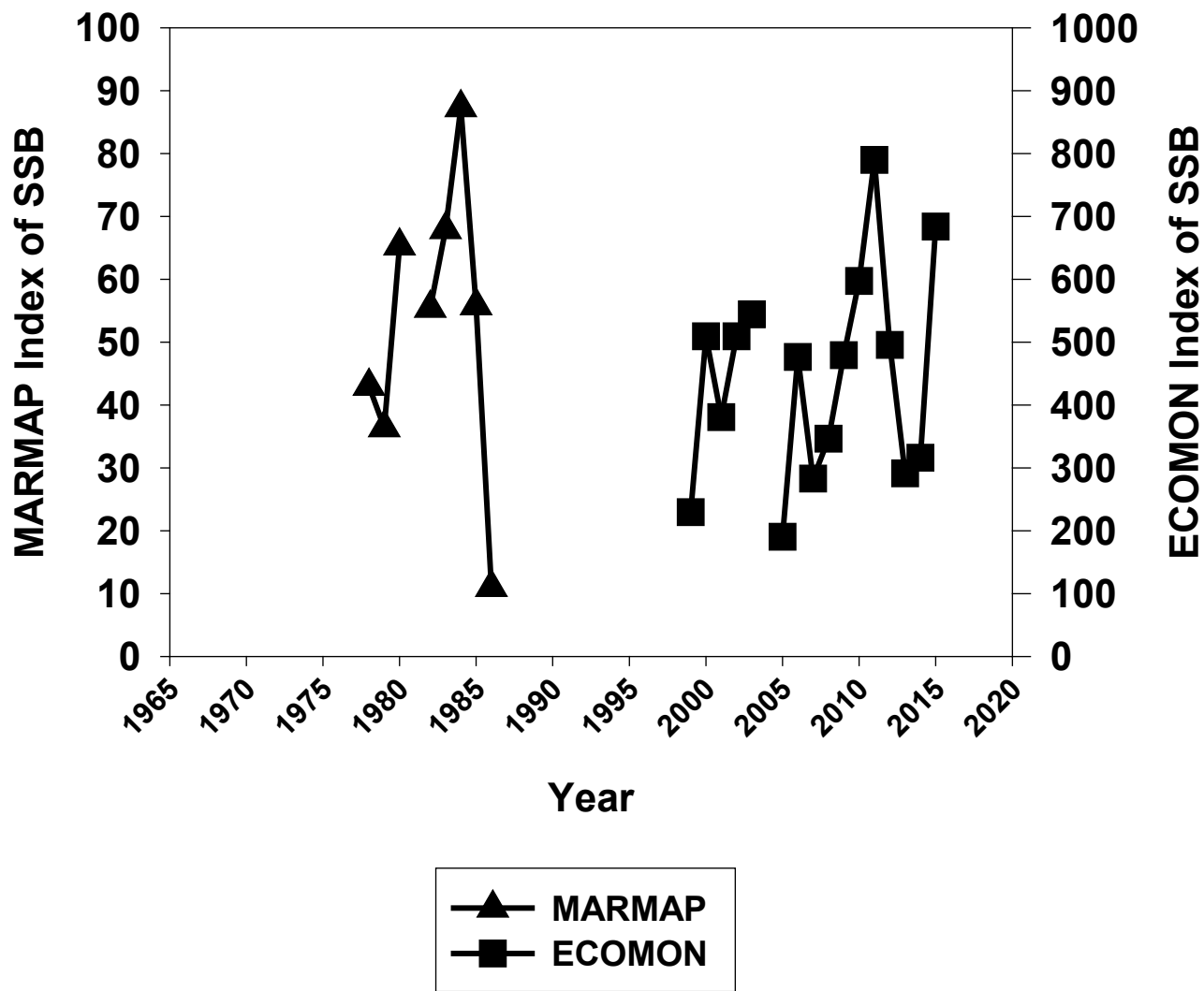
## NEFSC Summer Flounder Biomass Indices: ALB 1967-2008



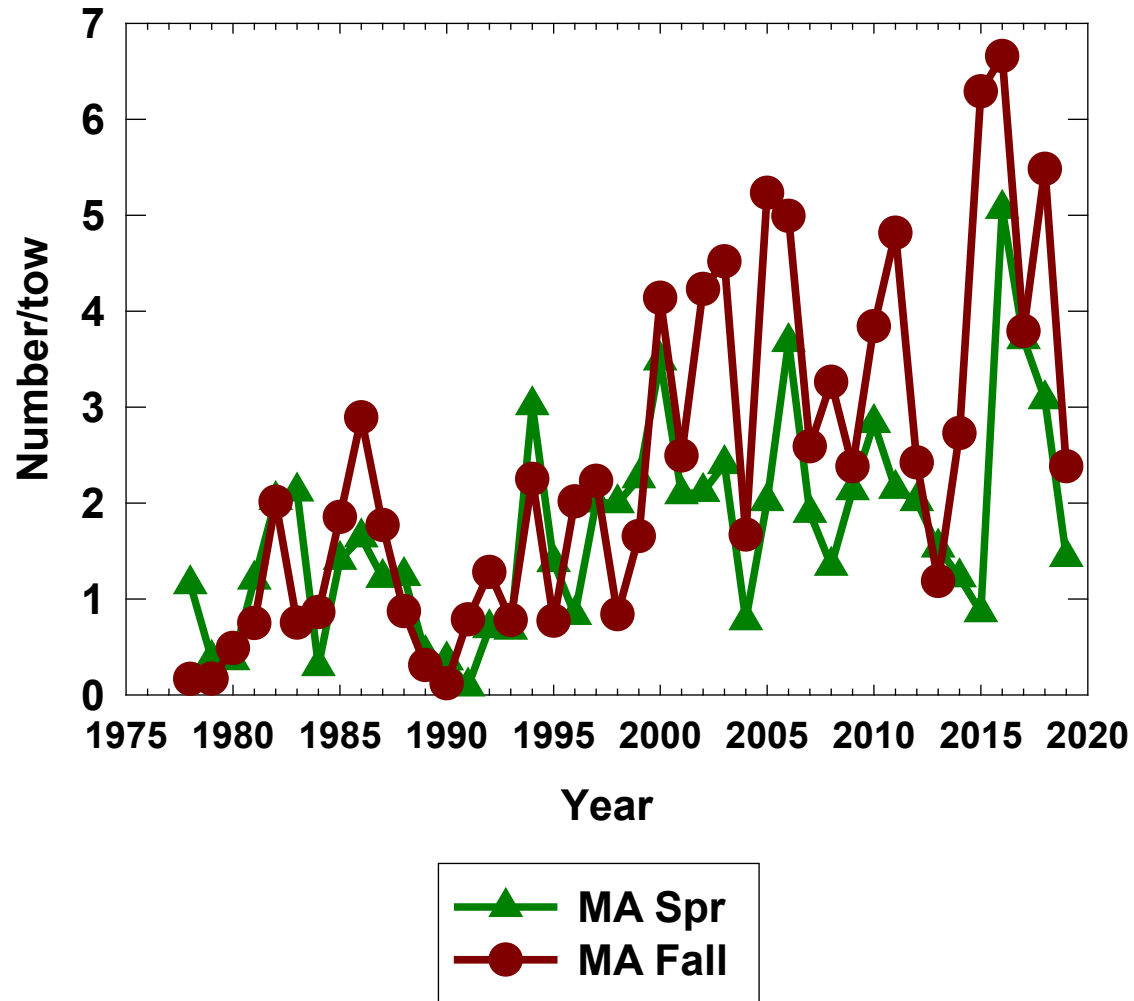
## NEFSC Summer Flounder Biomass Indices: BIG 2009-2019



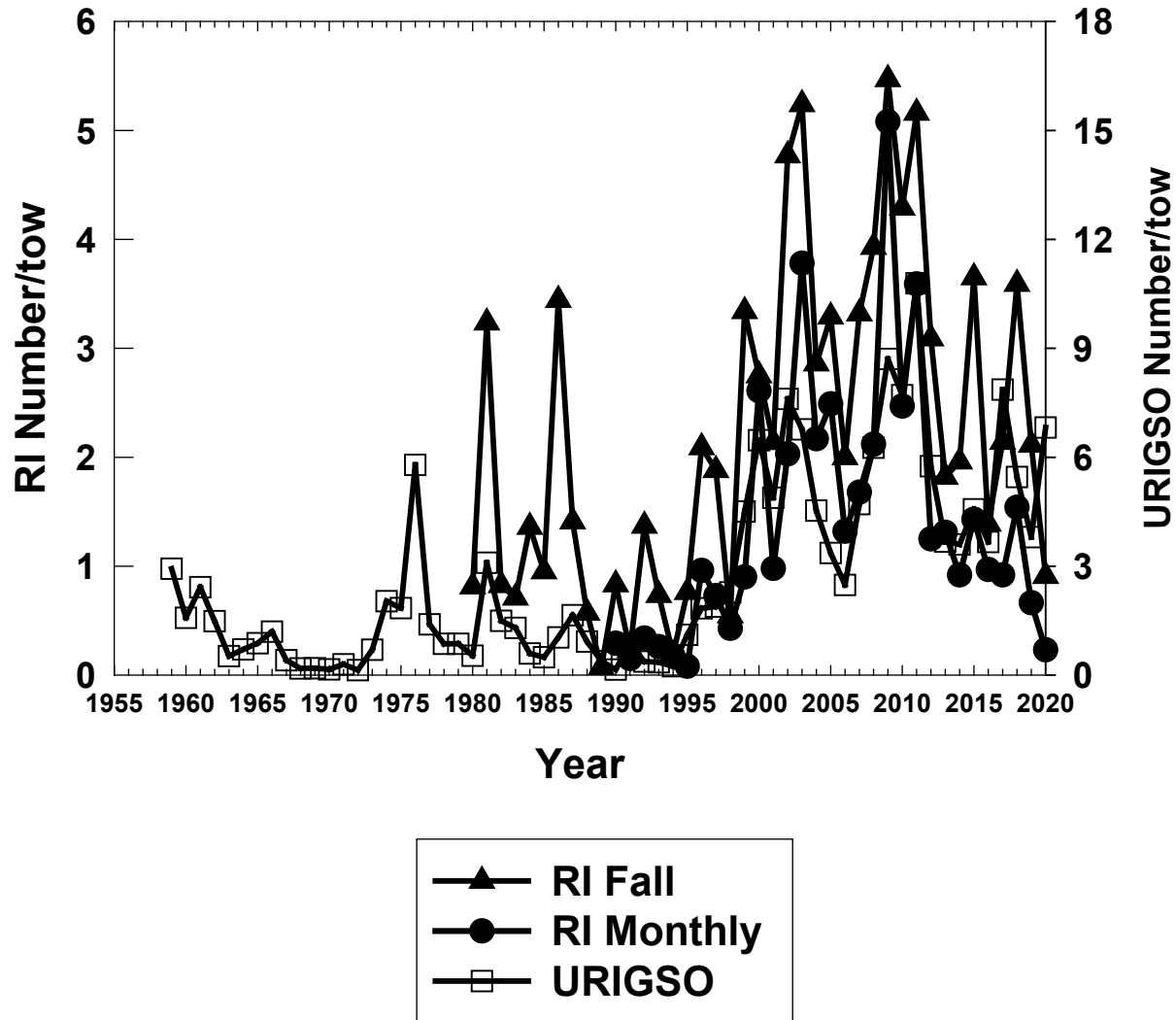
# NEFSC Larval Surveys



# MA Trawl Surveys

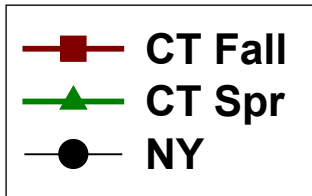
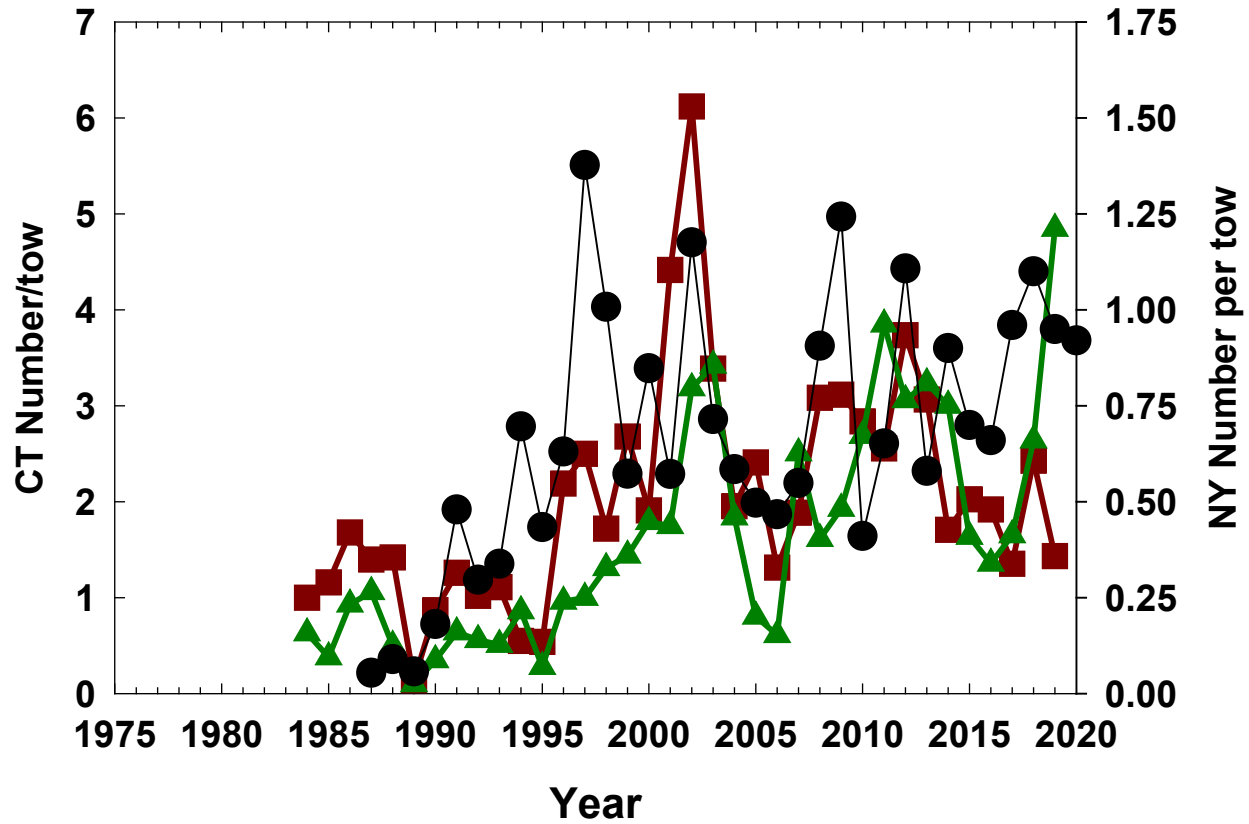


# RI Trawl Surveys

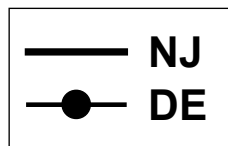
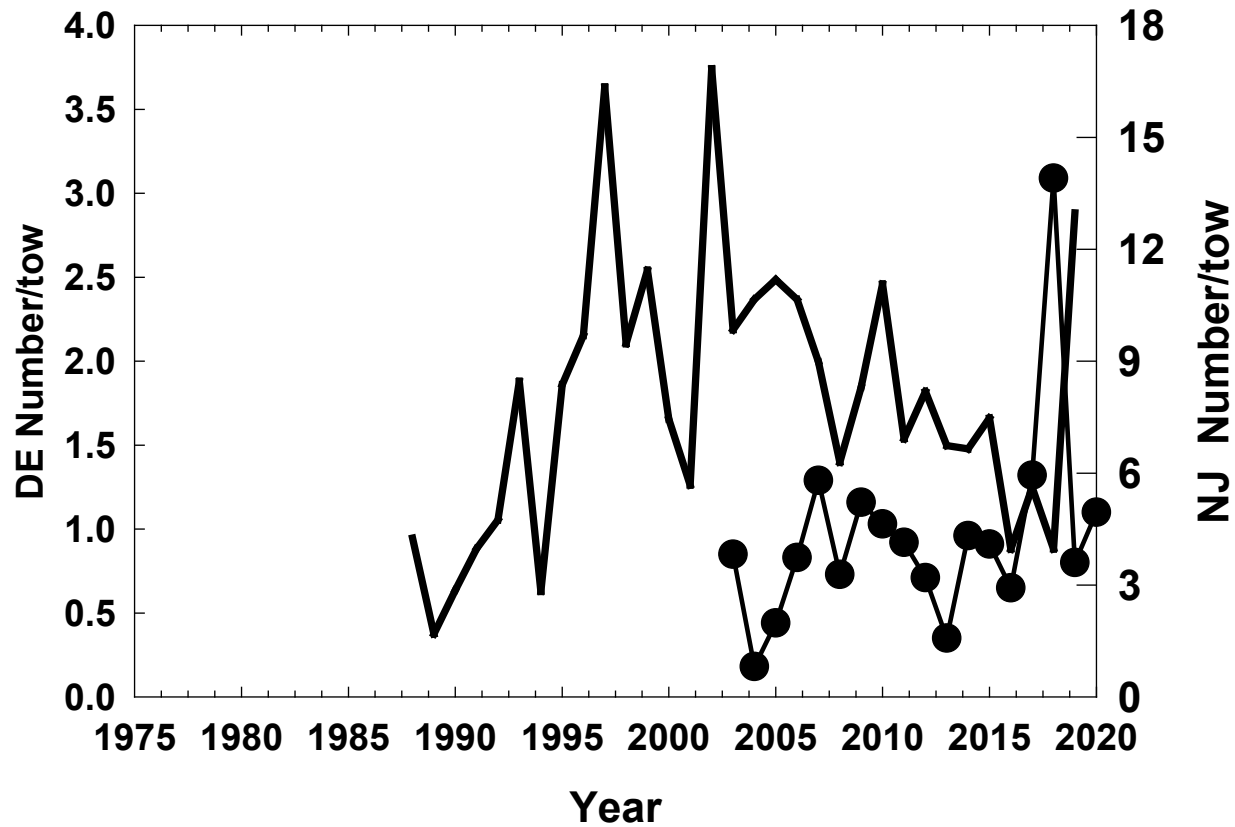




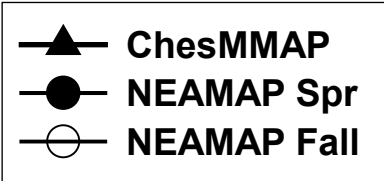
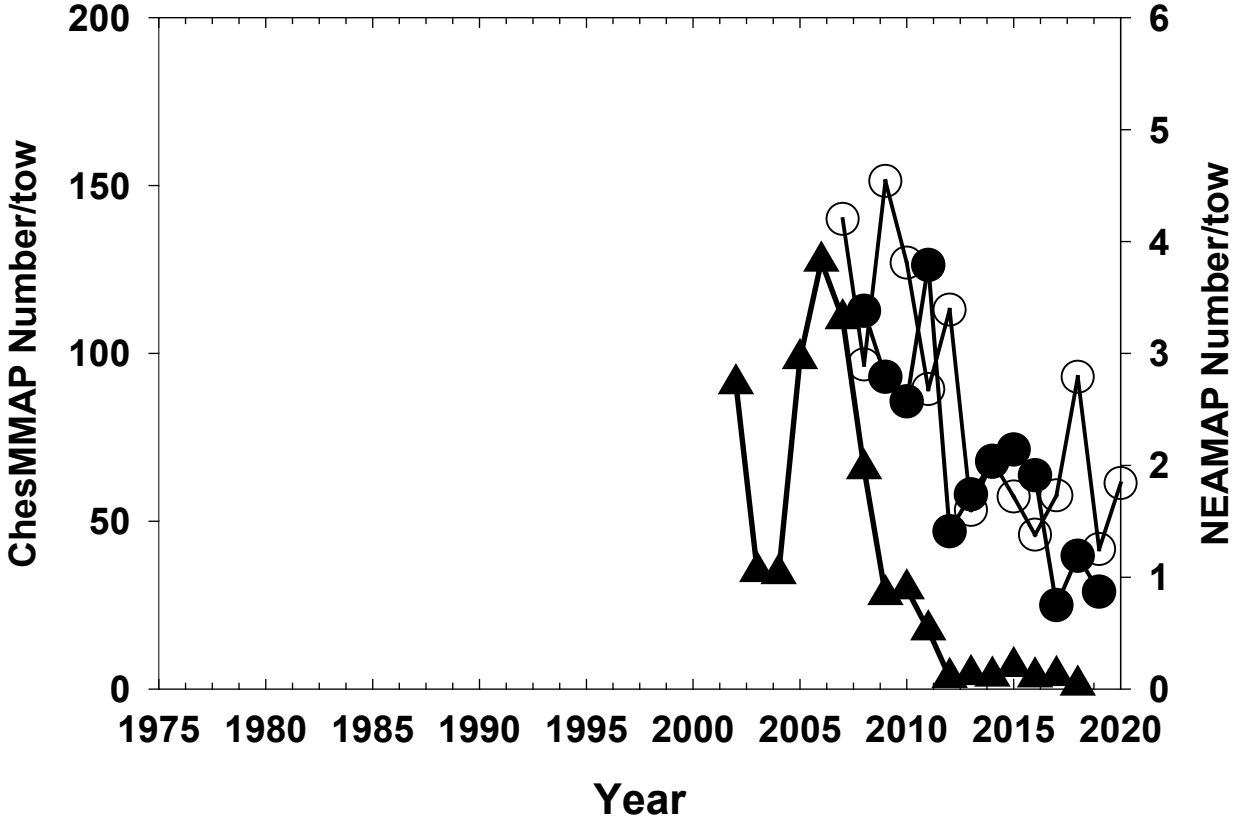
# CT and NY Trawl Surveys



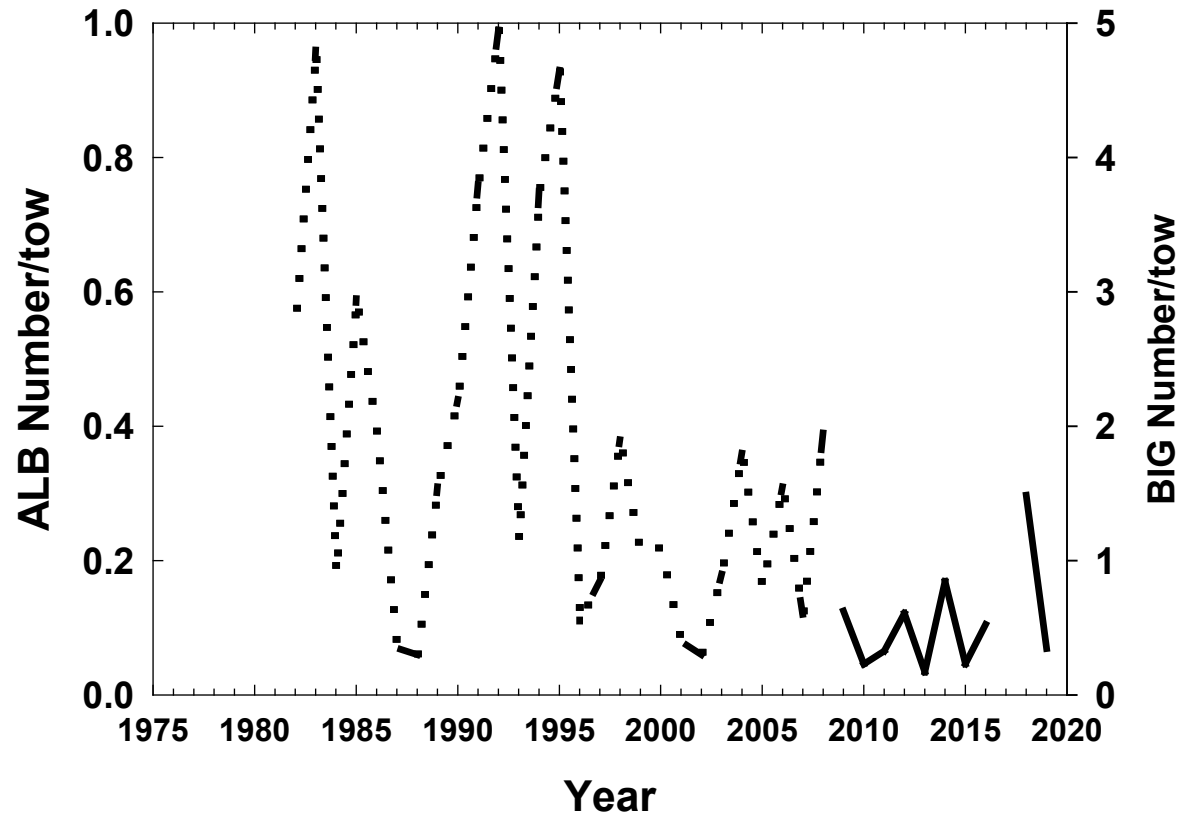
# NJ and DE Trawl Surveys



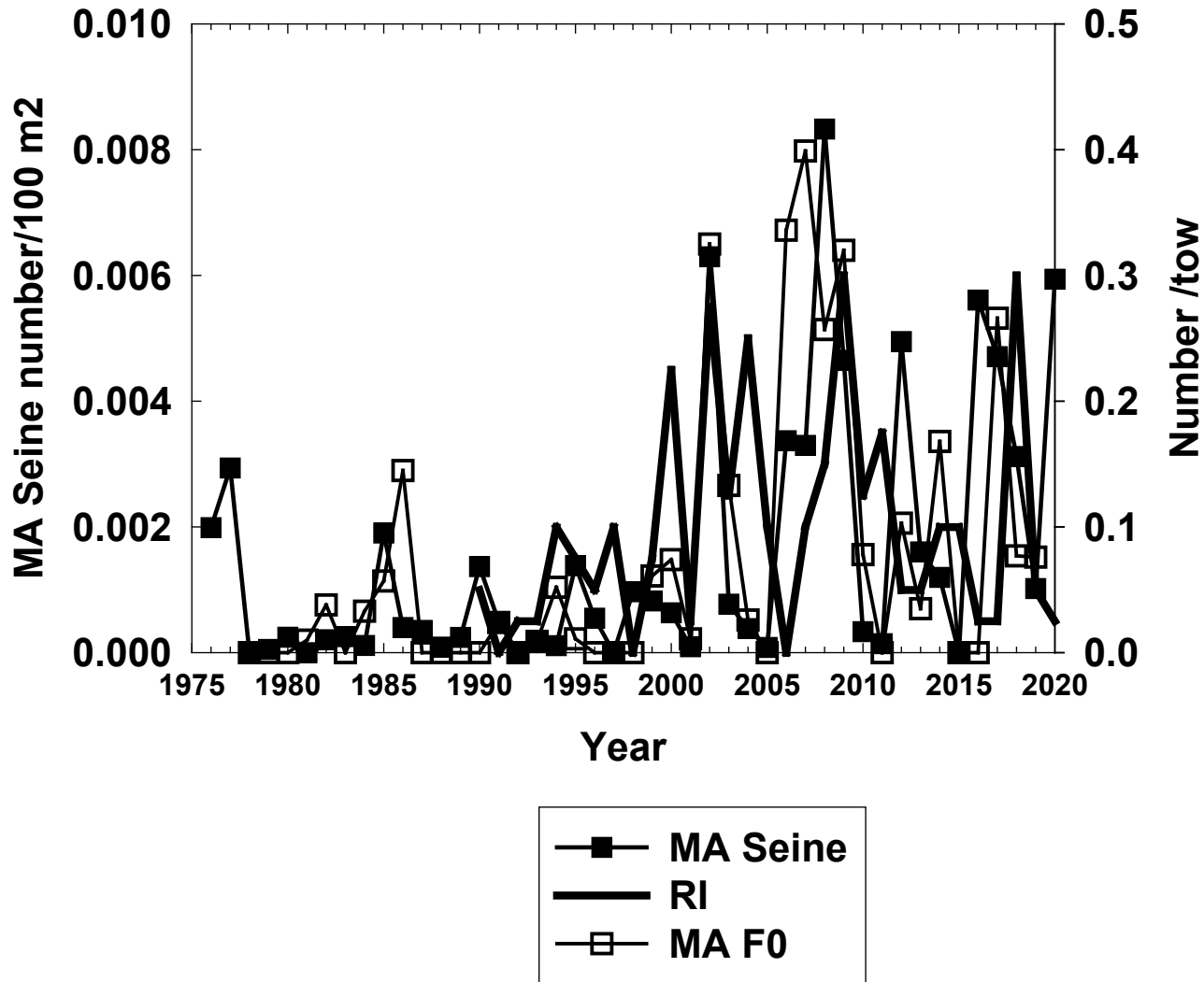
# ChesMMAP and NEAMAP Trawl Surveys



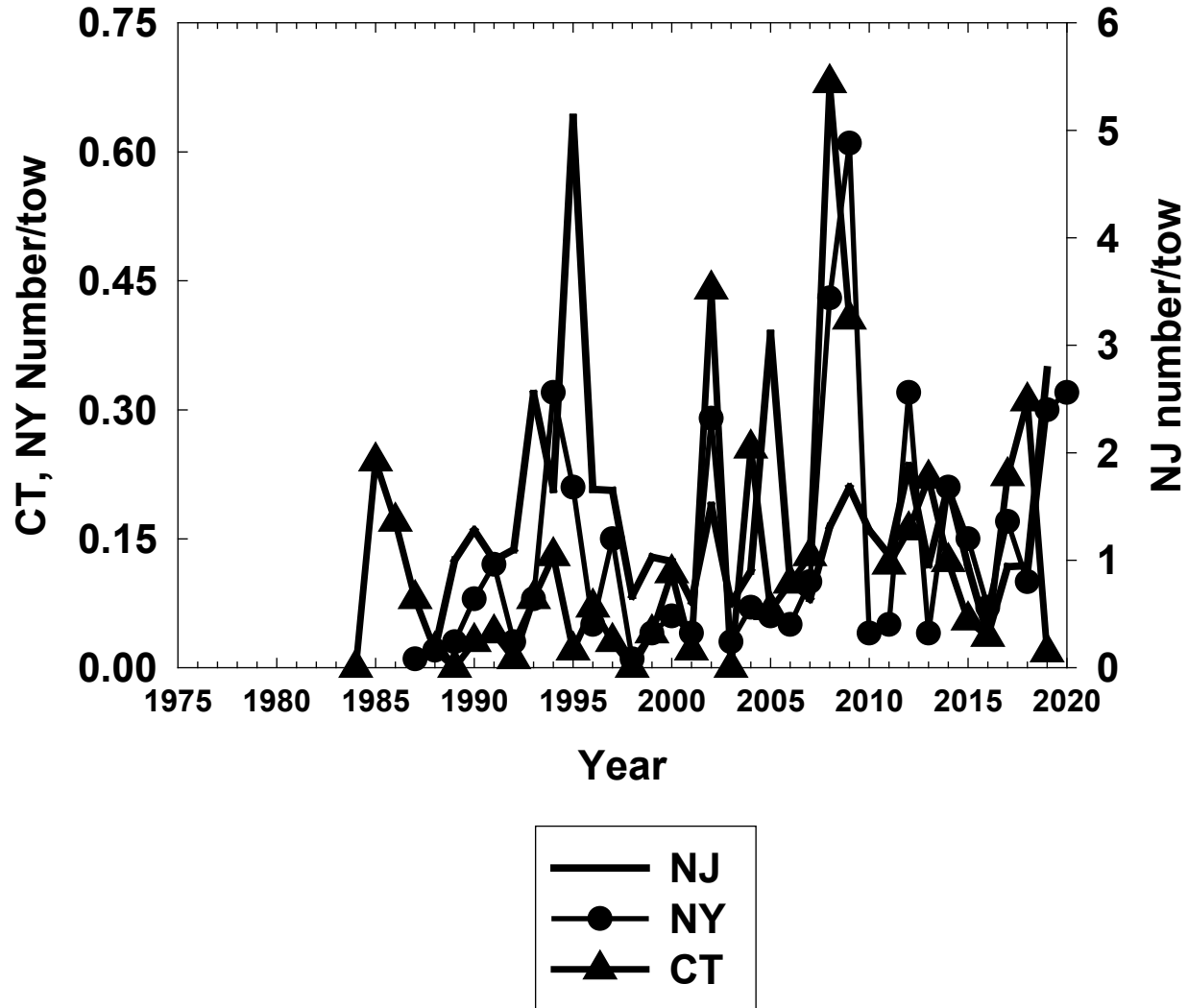
# NEFSC Fall Age 0 Indices



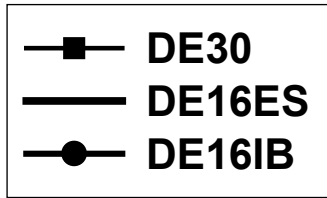
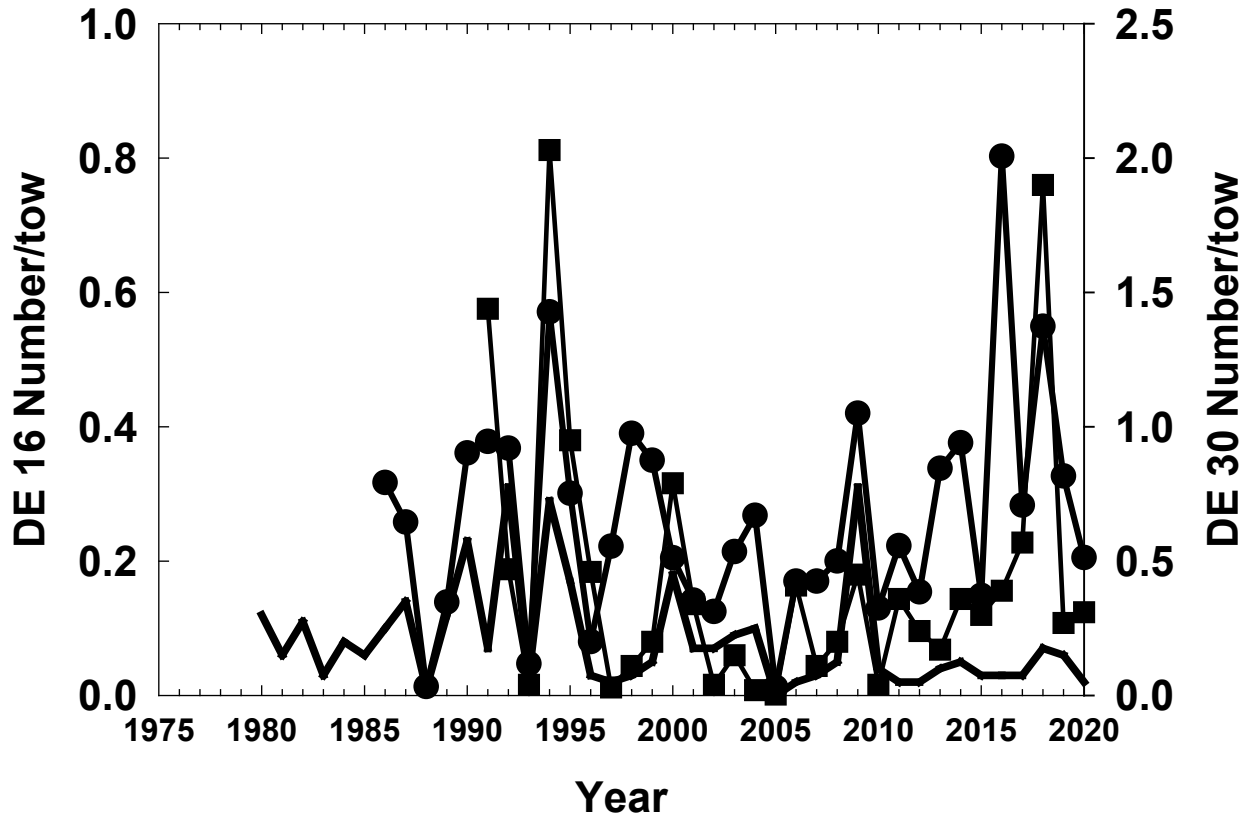
# MA and RI Age 0 Indices



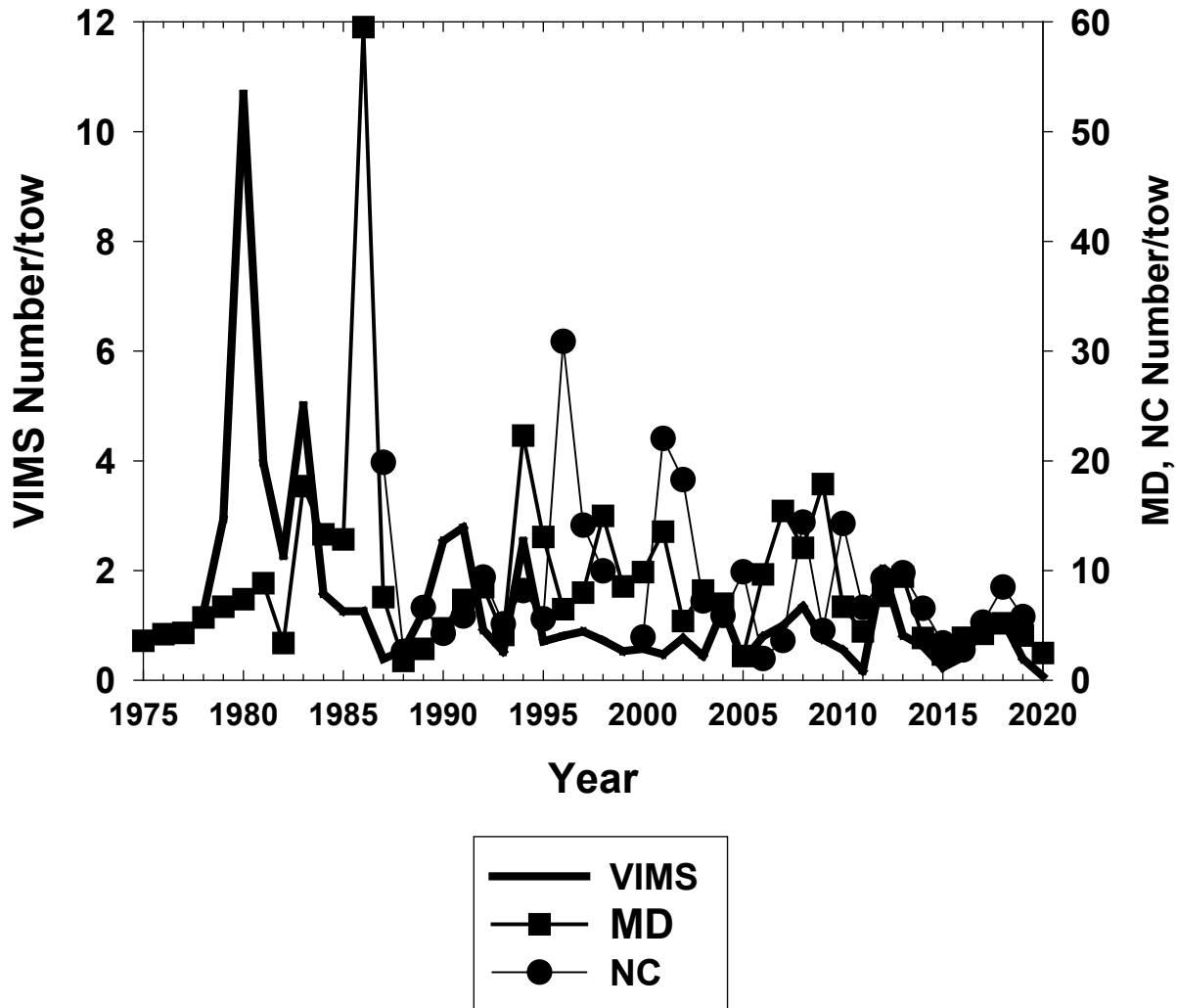
# CT, NY and NJ Age 0 Indices



# DE Age 0 Indices

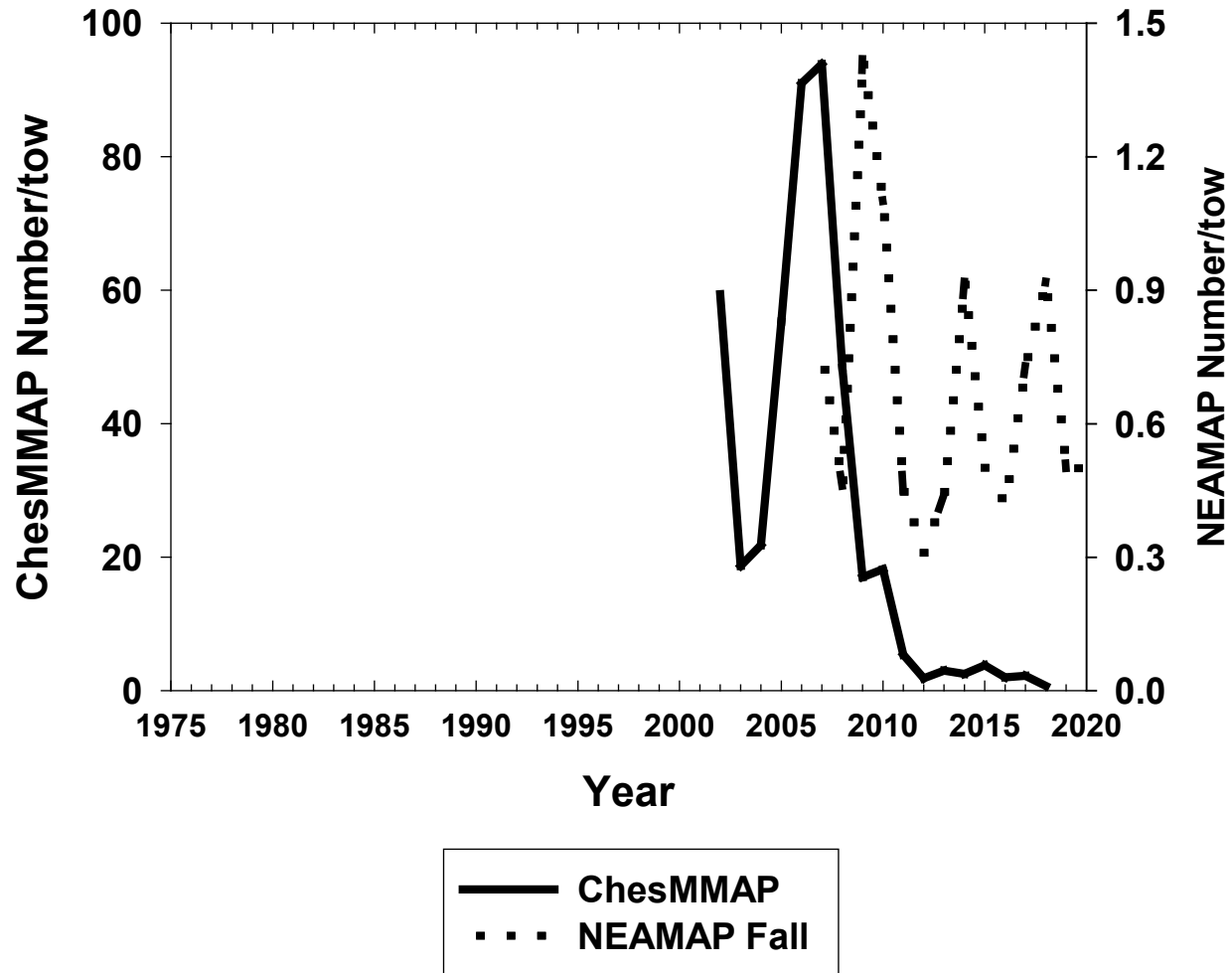


# MD, VIMS and NC Age 0 Indices





## ChesMMAP and NEAMAP Age 0 Indices



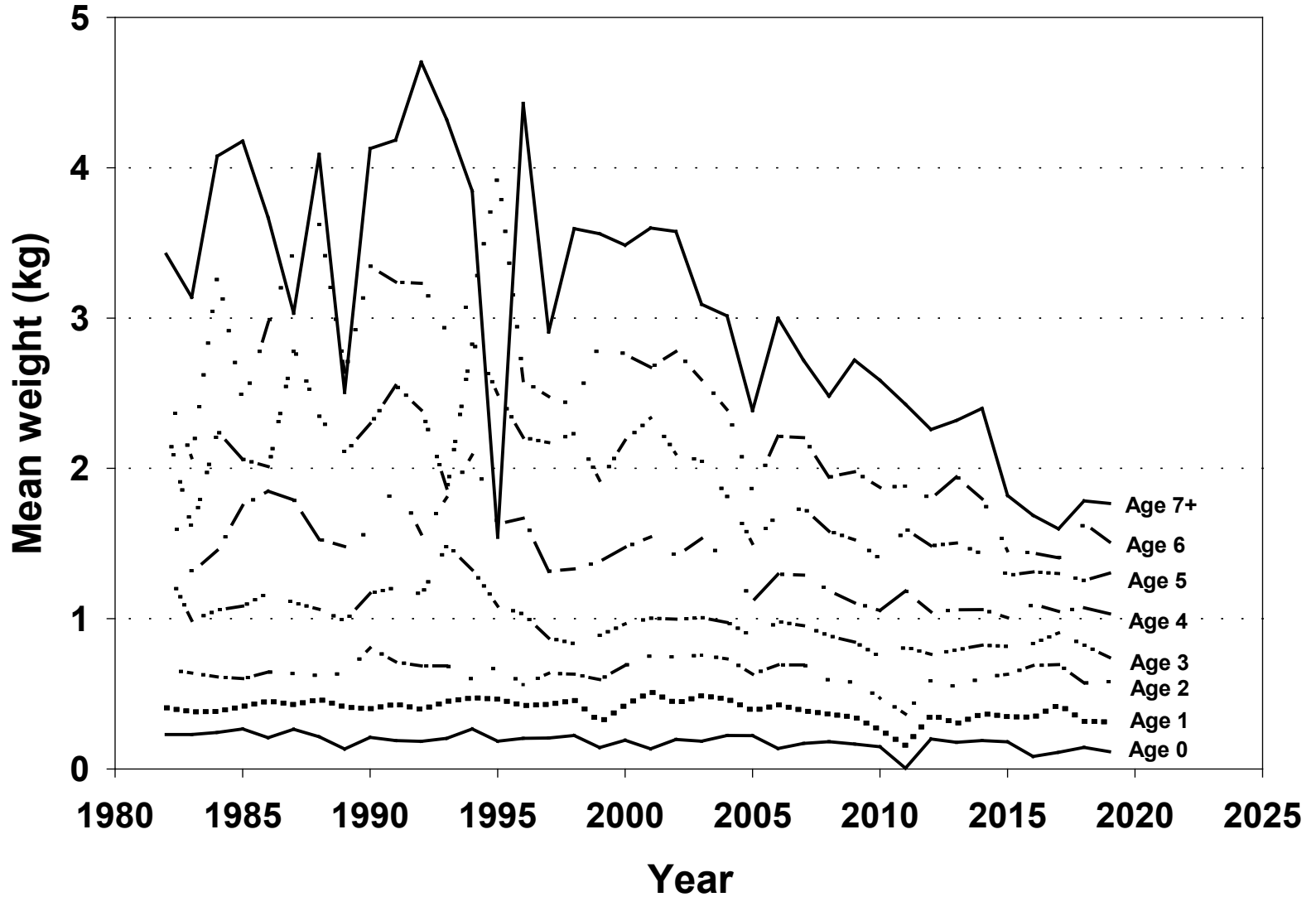
# Research Surveys Summary

- Nearly all ongoing surveys (expressed as aggregate N) have **decreased** since their most recent peak (generally since 2005-2010) to 2019-2020; CTDEEP Spring and NJDFW indices are the exception;
- NEFSC Spring **-29%**; NEFSC Fall **-73%** (**BIG Indices**)
- MADMF Spring **-72%**; MADMF Fall **-64%**
- RIDFW Fall **-83%**; RIDFW Monthly **-95%**; URIGSO **-37%**
- CTDEEP Spring **+26%**; CTDEEP Fall **-8%**
- NYDEC **-26%**
- NJDFW **+17%**
- DEDFW **-64%**
- VIMS ChesMMAAP **-99%** (undergoing calibration to new vessel)
- NEAMAP Spring **-79%**; NEAMAP Fall **-57%**
- YOY indices suggest above average recruitment in 2008-2009; average to below average recruitment during 2010-2017; 2018 above average and largest since 2009; 2019 below average; 2020 about average

# Summer flounder

- Life history (biological) data in NEFSC survey and fishery samples
- Over last decade, more large, old fish  
Transition from scales to otoliths for all aging  
Current maximum ages of 18 and 20 for males (50, 57 cm) and 19 (73, 79 cm) for females
- Over last decade, decreasing mean length and weight at age for both sexes
- Over last decade, decreasing maturity, largest impact for age 1
- Over last decade, changing sex ratio at age as F has decreased and stabilized: convergence to 1:1 even for larger/older (>60 cm/5+) fish
- Over last decade, indications of expansion/shift of range to the northeast

# Summer flounder Total Catch Mean Weights at Age



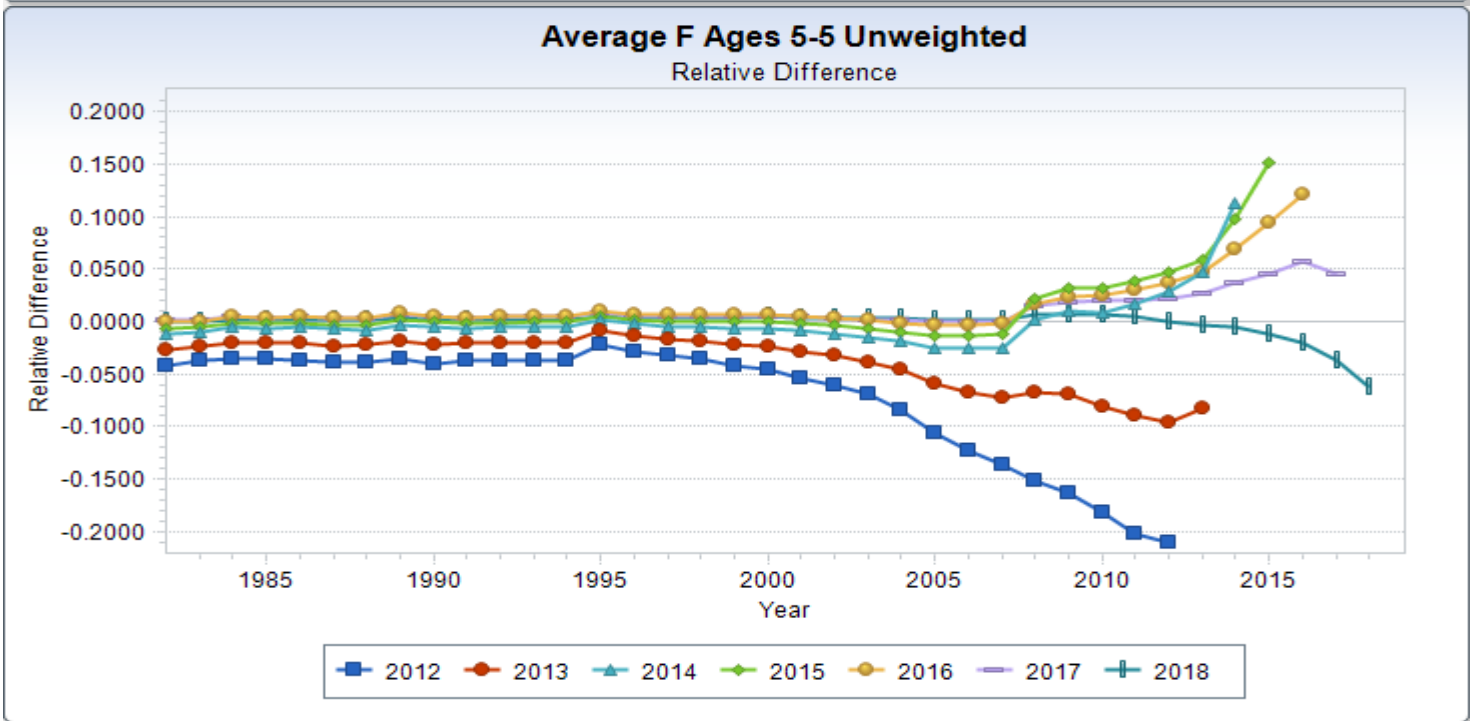
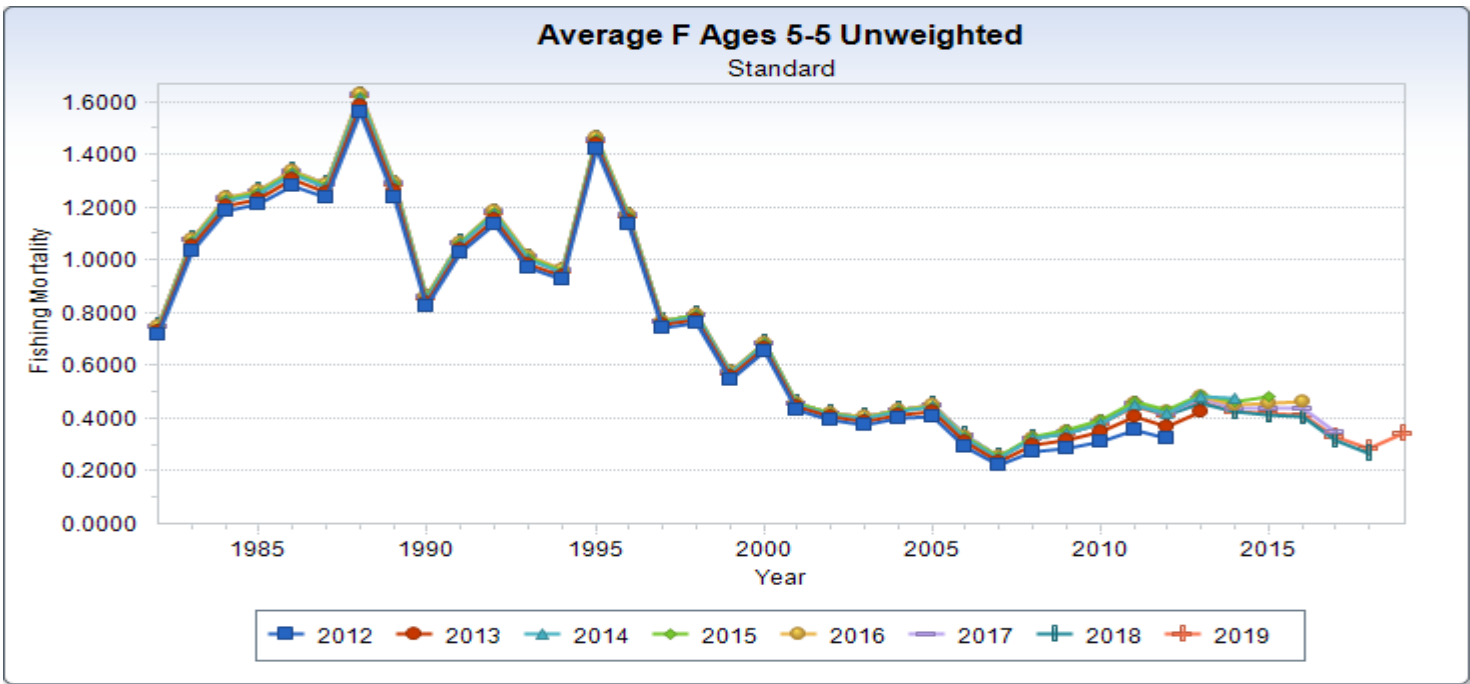
## **TOR 3: Estimate F, R, and SSB**

- **3. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) as possible (depending on the assessment method) for the time series using the approved assessment method and estimate their uncertainty. Include retrospective analyses if possible (both historical and within-model) to allow a comparison with previous assessment results and projections, and to examine model fit.**
  - a. Include bridge runs to sequentially document each change from the previously accepted model to the updated model proposed for this peer review.**
  - b. Prepare a backup assessment approach that would serve as an alternative for providing scientific advice to management if the analytical assessment were to not pass review**

# Summer flounder 2021 MTA ASAP Model Development

- Included 4 fishery fleets (comm landings, comm discards, recr landings, recr discards)
- Included all candidate research surveys, including stand-alone YOY and larval SSB indices
- 'Internal' Retrospective: minor at +3% for SSB and +1% for F
- MCMC: no convergence problems or high correlations, relatively precise estimates (terminal year CVs=15%)
- Internal Estimation of BRPs not sufficient: estimated steepness ( $h$ ) = 1, used proxies instead ( $F_{35\%} = F_{MSY}$ )

Rho = +1%

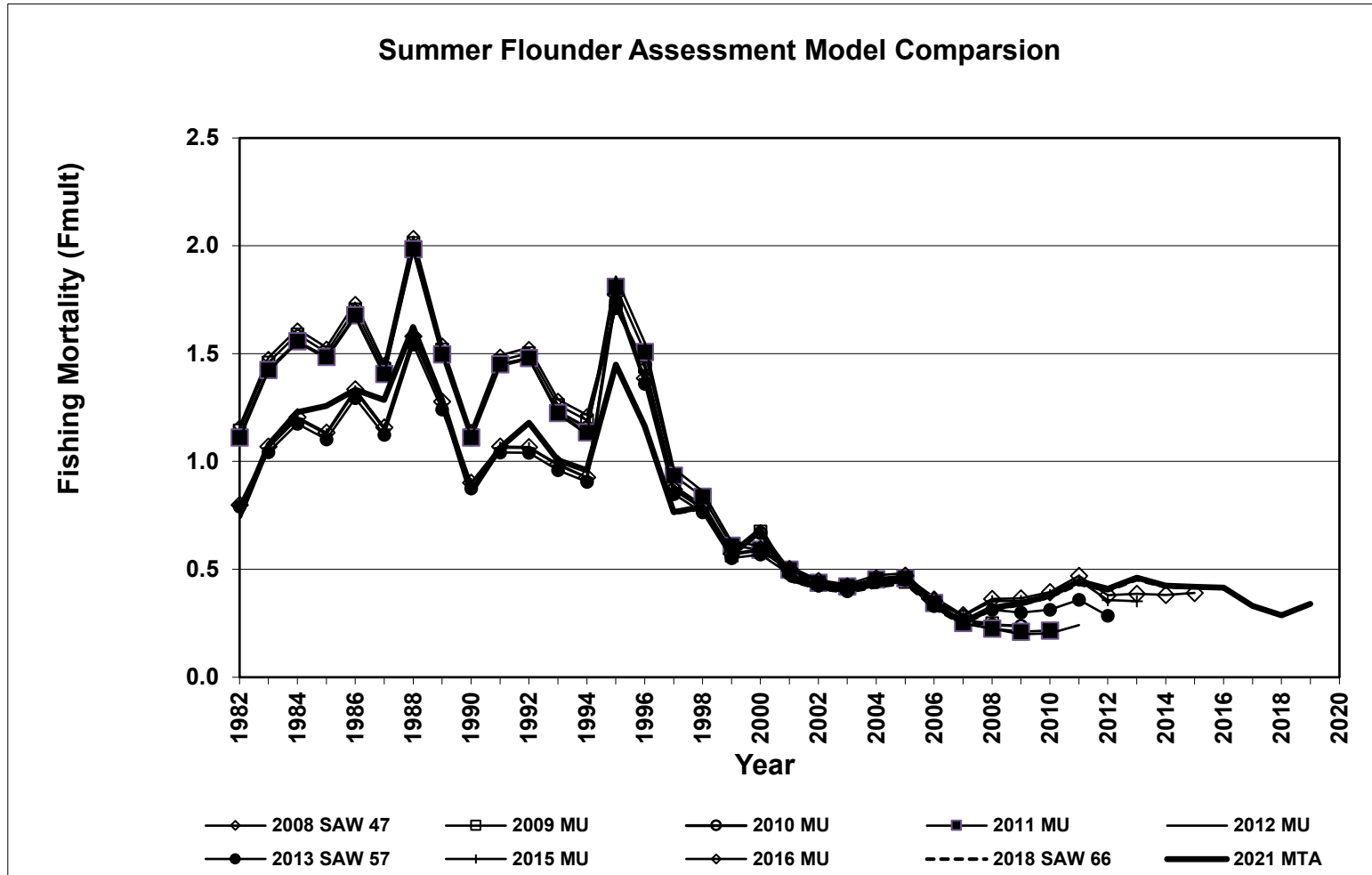






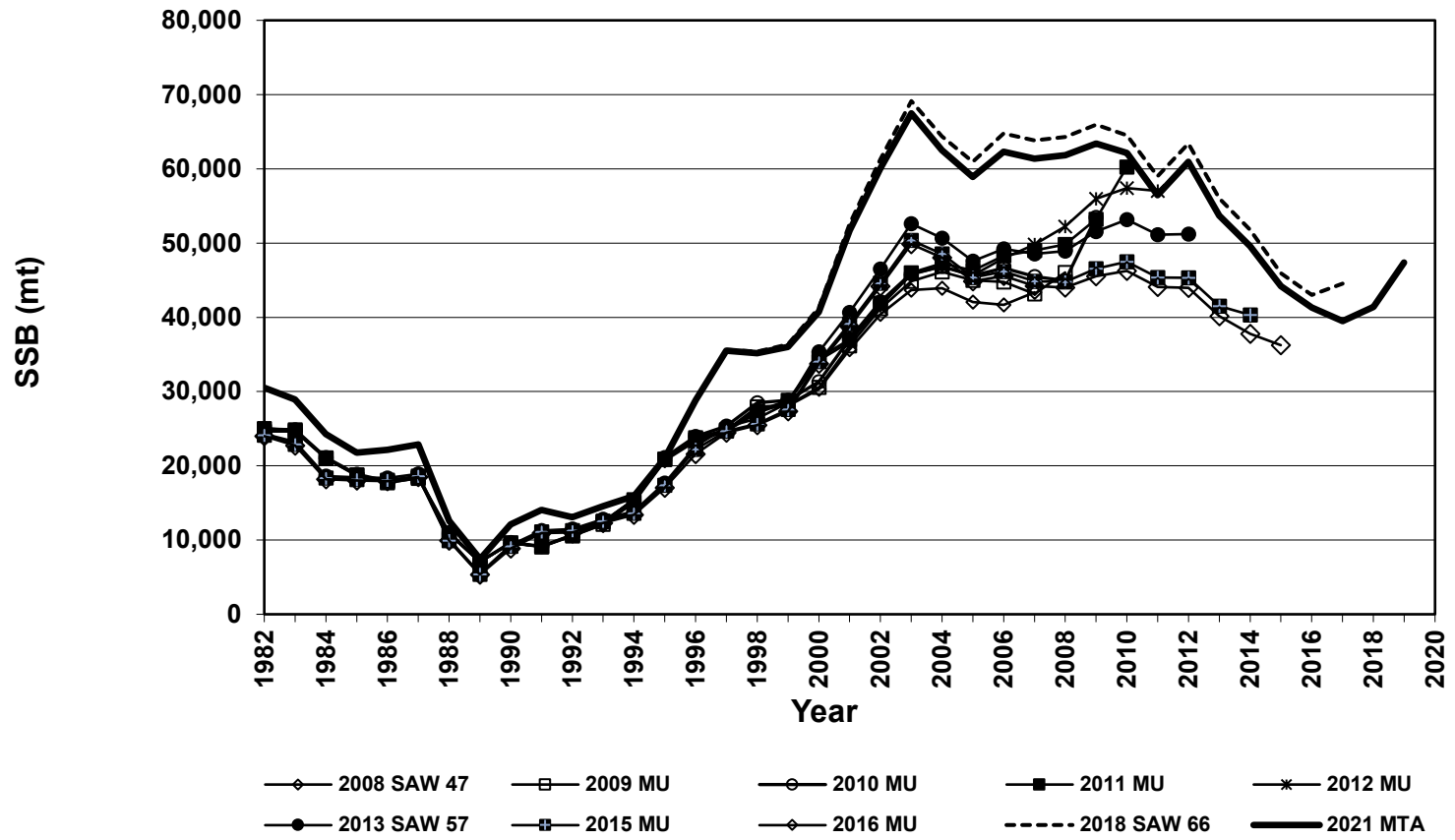


# ASAP Assessments 2008-2021

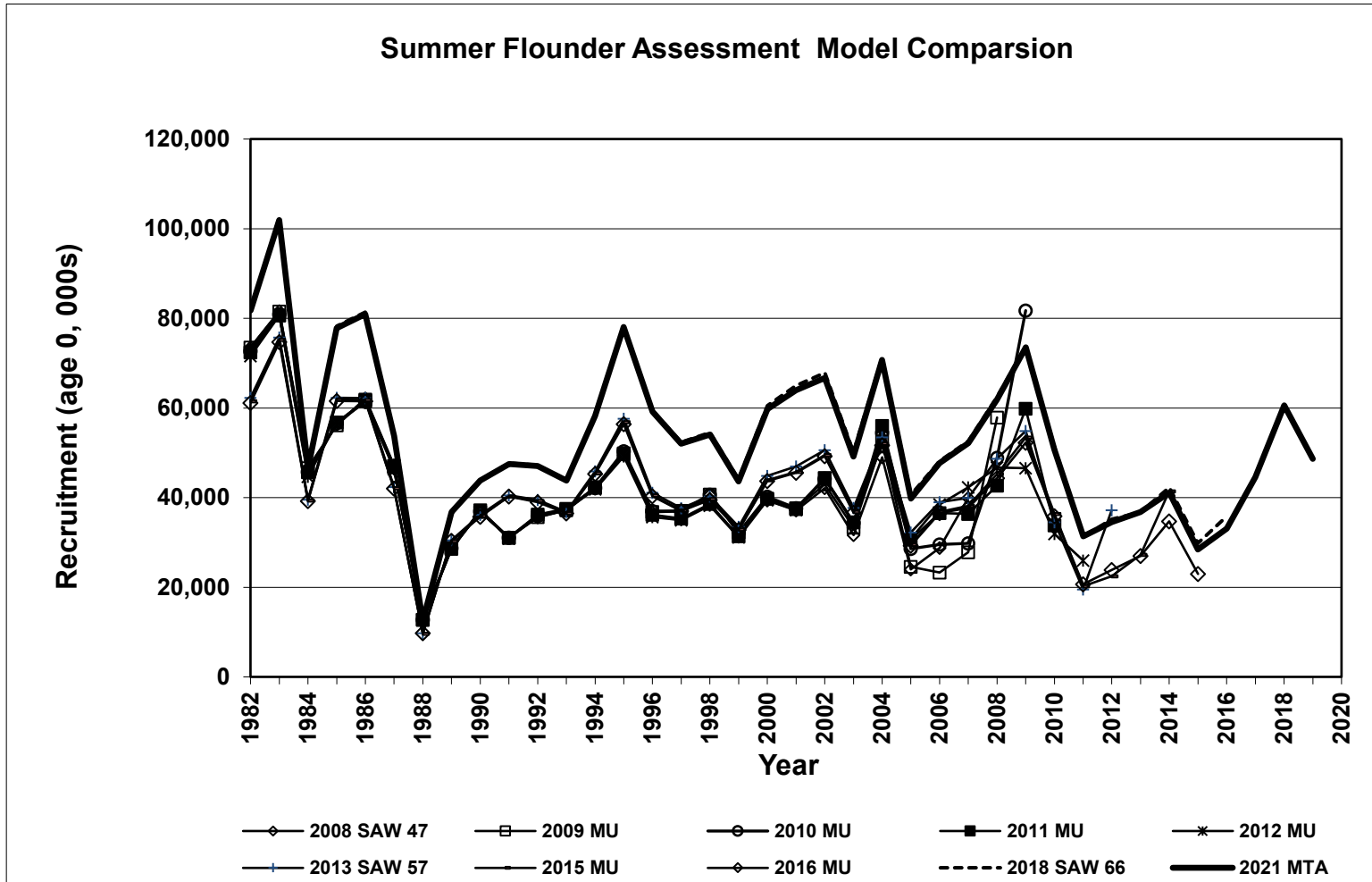


# ASAP Assessments 2008-2021

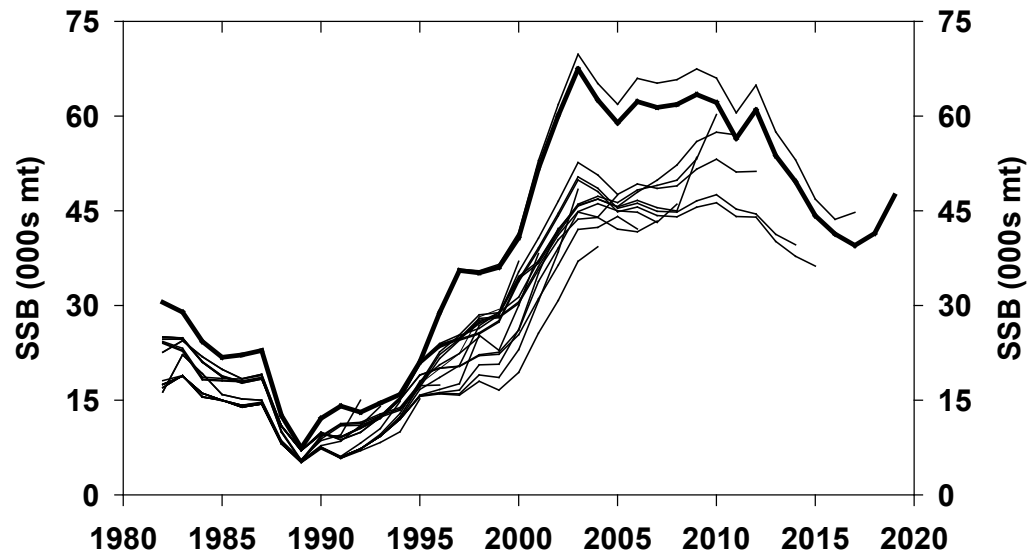
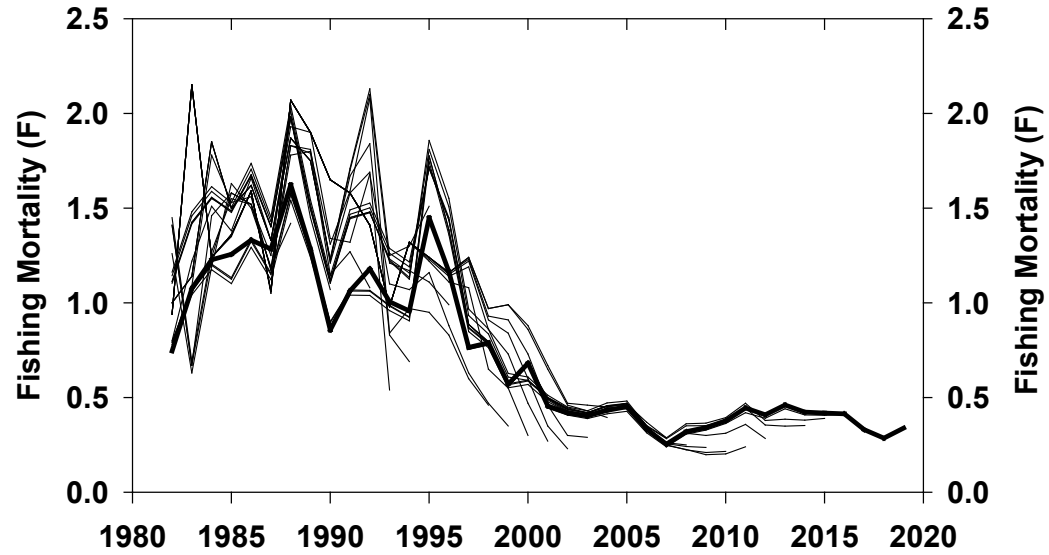
## Summer Flounder Assessment Model Comparison



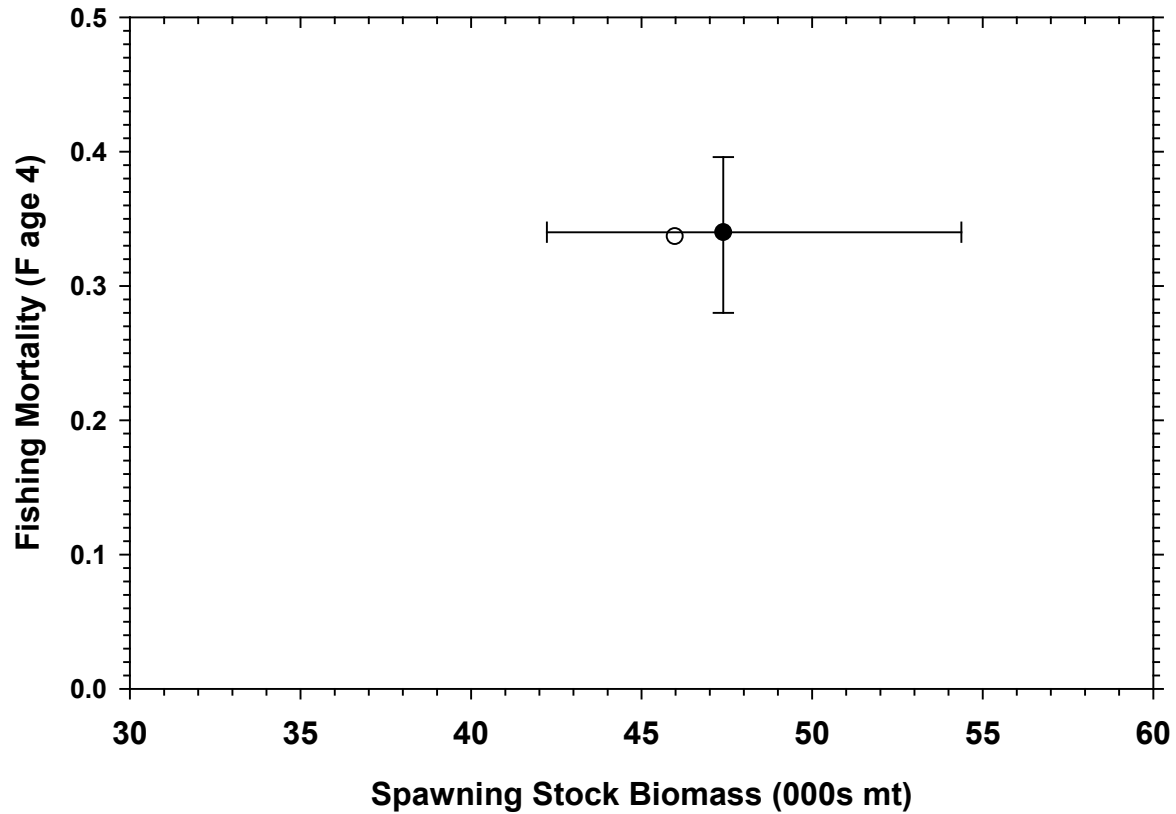
# ASAP Assessments 2008-2021



### Summer Flounder Historical Retrospective 1990-2021 Stock Assessments



2021 MTA: Model estimates with 90% CI  
and retrospective adjusted estimates



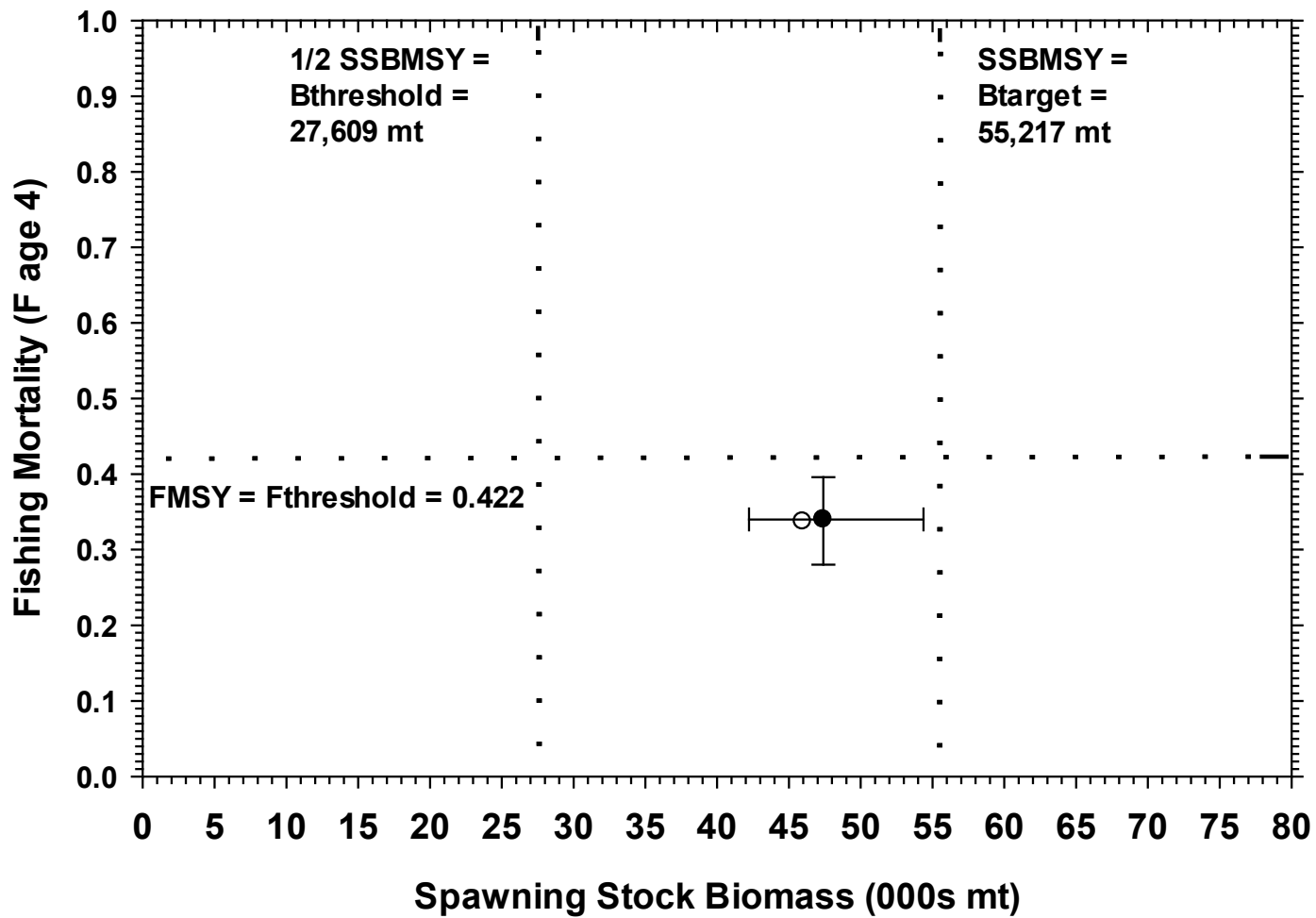
## **TOR 4: BRPs and Status**

**4. Re-estimate or update the BRP's as defined by the management track level and recommend stock status. Also, provide qualitative descriptions of stock status based on simple indicators/metrics (e.g., age- and size-structure, temporal trends in population size or recruitment indices, etc.).**

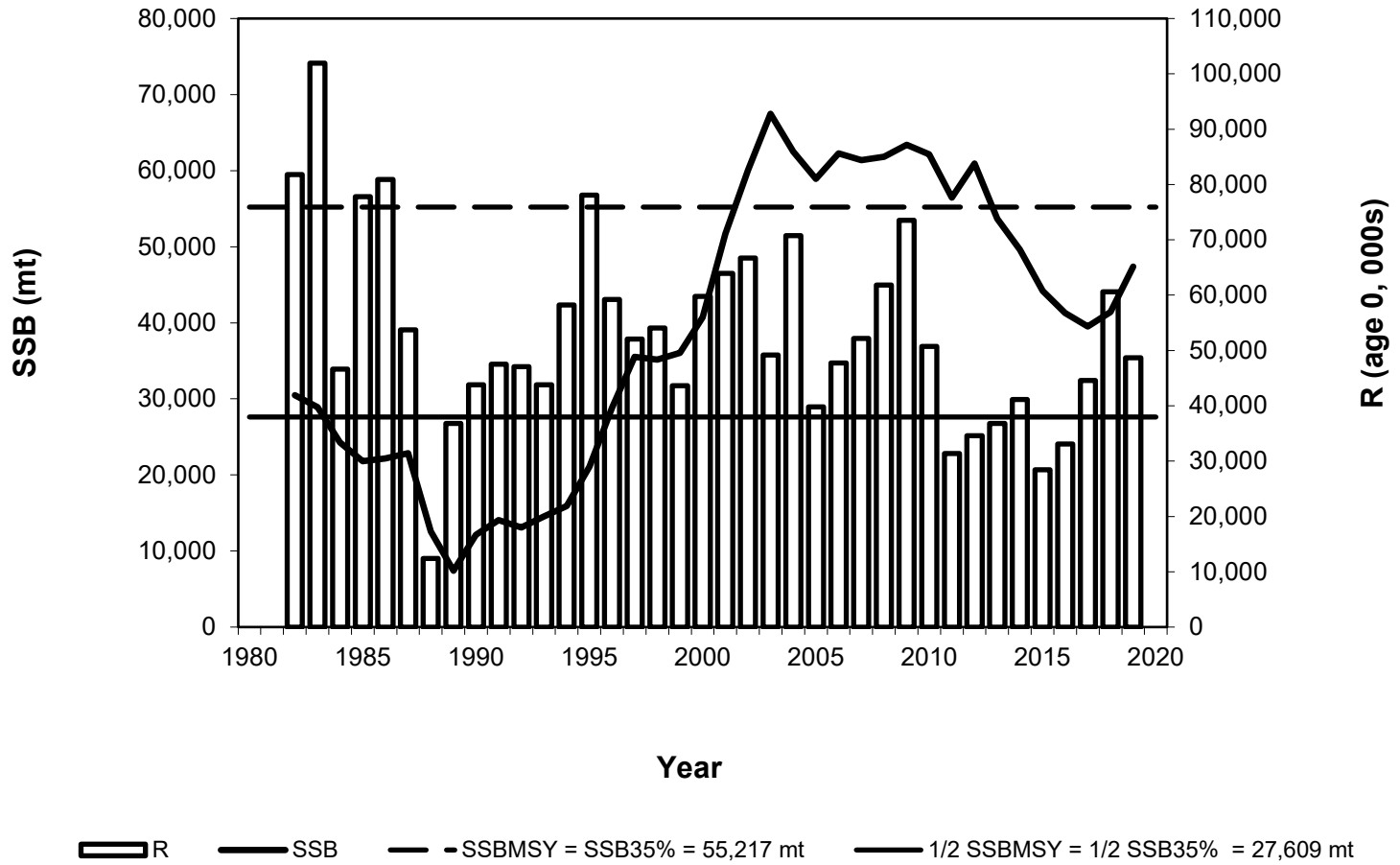
- **2018 SAW 66: through 2017**
- **BMSY = SSB35% = 57,159 mt**
- **FMSY = F35% = 0.448**
- **MSY = 15,973 mt = 35.214 mlb**
- **Not Overfished: SSB2017 = 44,552 mt, 78% of BMSY**
- **Not Overfishing: F2017 = 0.334, 75% of FMSY**
  
- **2021 Management Track Assessment: through 2019**
- **BMSY = SSB35% = 55,217 mt**
- **FMSY = F35% = 0.422**
- **MSY = 15,872 mt = 34.992 mlb**
- **Not Overfished: SSB2019 = 47,397 mt, 86% of BMSY**
- **Not Overfishing: F2019 = 0.340, 81% of FMSY**



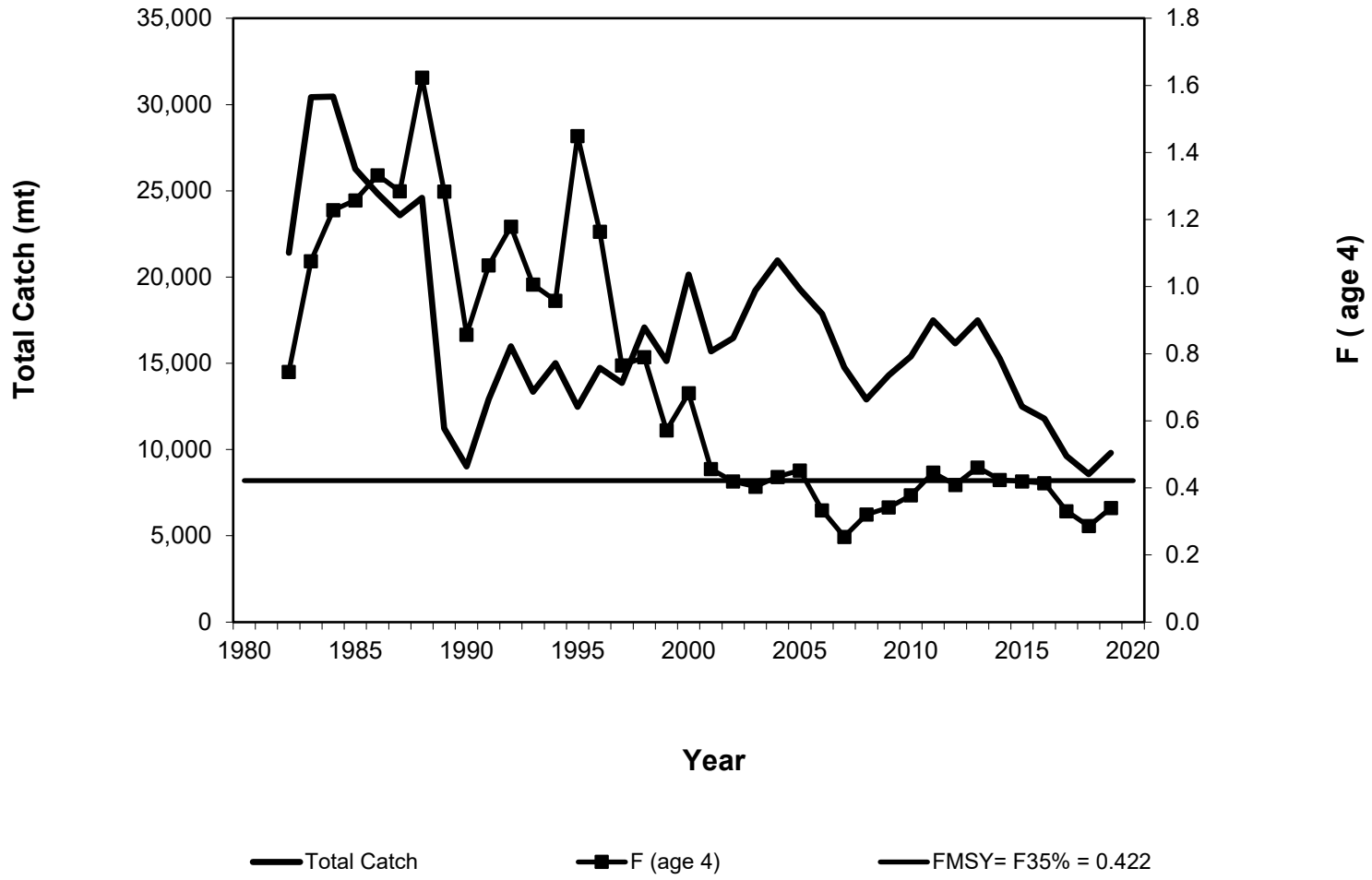
# 2021 MTA Recommended Stock Status

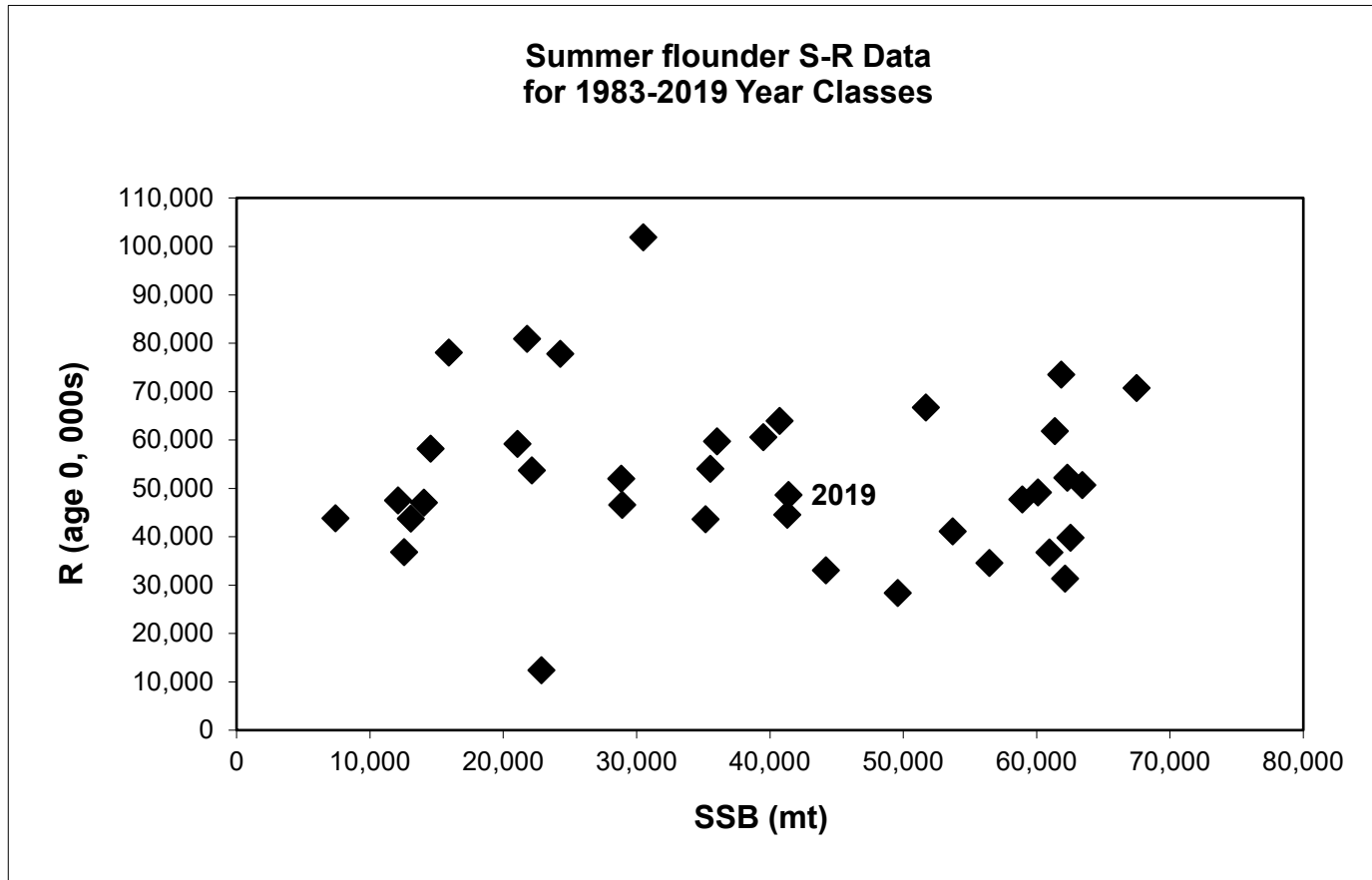


### Spawning Stock Biomass (SSB) and Recruitment (R)



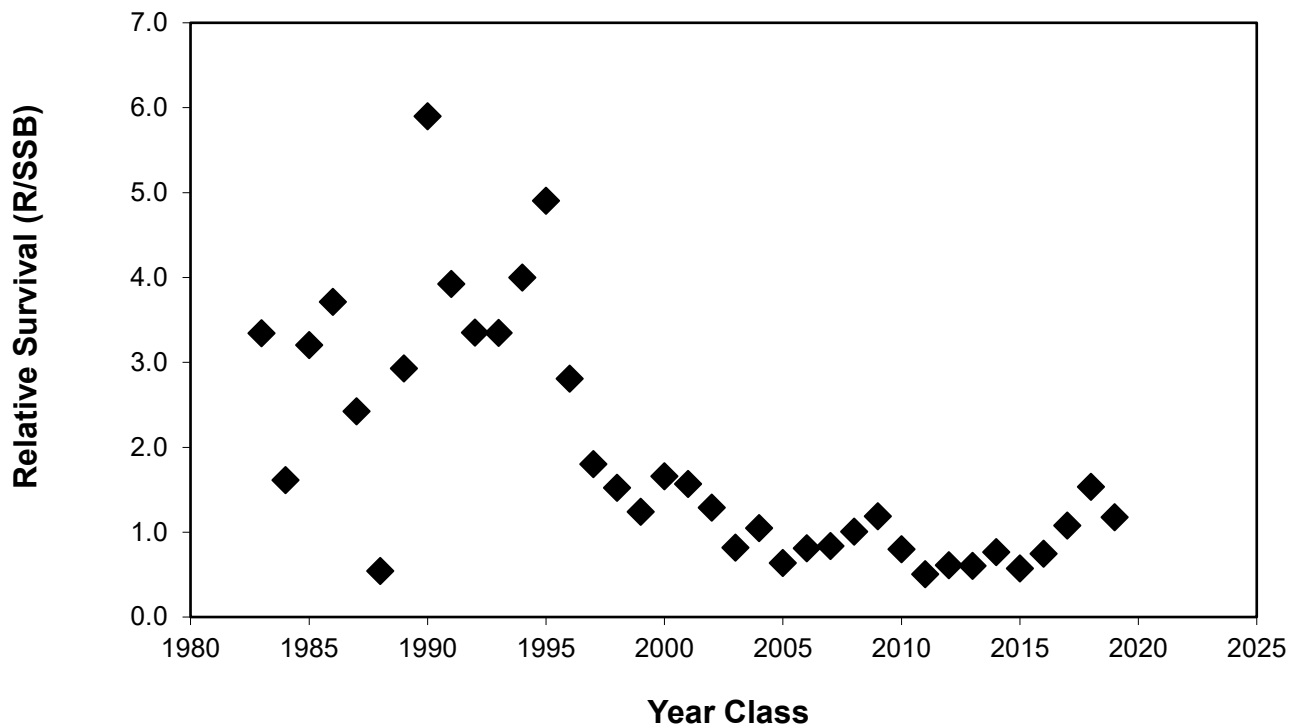
### Total Catch and Fishing Mortality (F)





Stock-recruitment (SSB-R) scatter plot for the summer flounder 1983-2019 year classes. The largest recruitment (R) point is for the 1983 year class (R = 102 million, SSB = 30,495 mt). The lowest recruitment point is for the 1988 year class (R = 12 million, SSB = 22,859 mt). The 2018 year class is at R = 61 million, SSB = 39,516 mt; the 2019 year class is at R = 48 million, SSB = 41,403 mt.

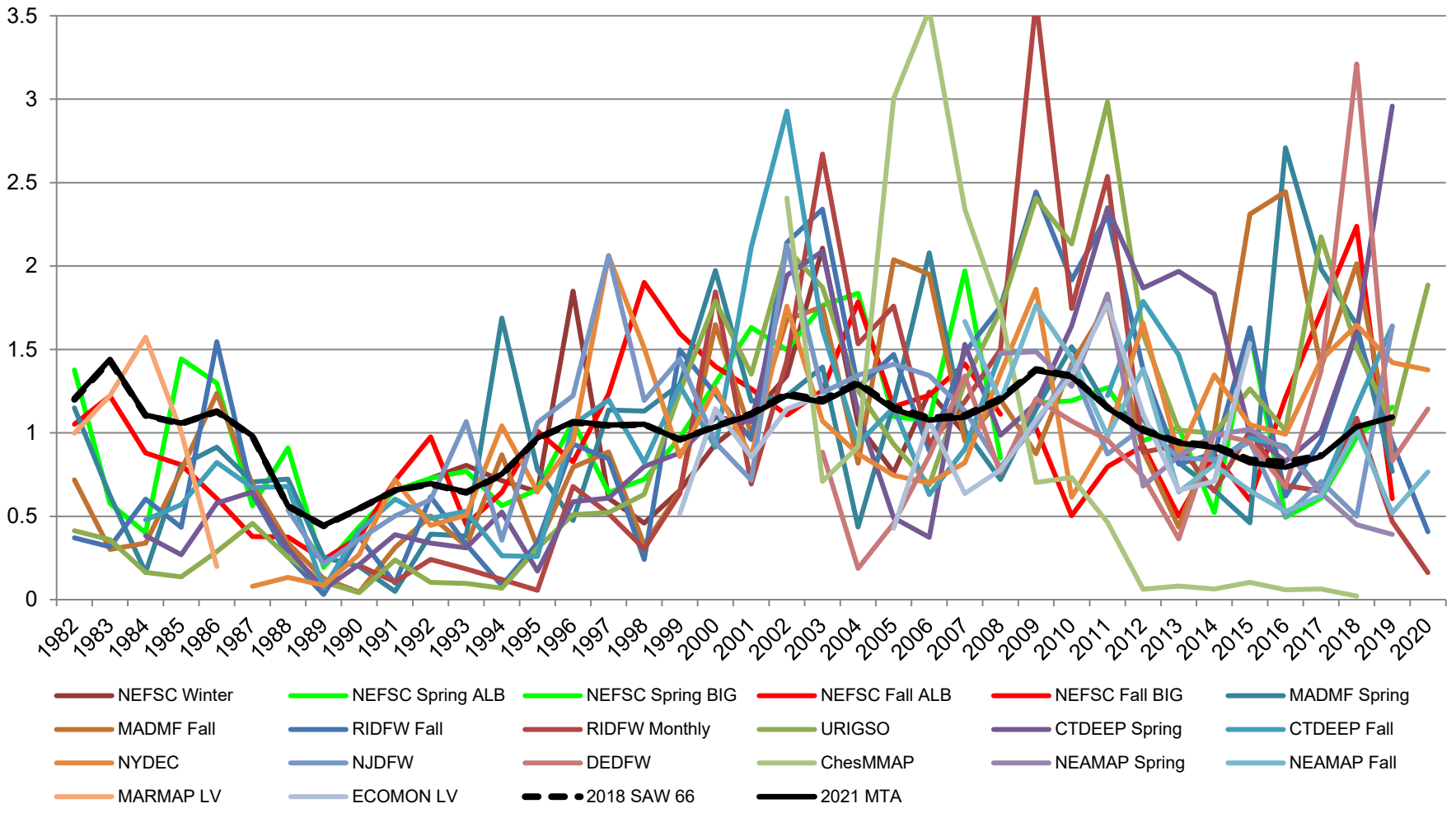
Summer flounder relative survival (R/SSB)  
for 1983-2019 Year Classes



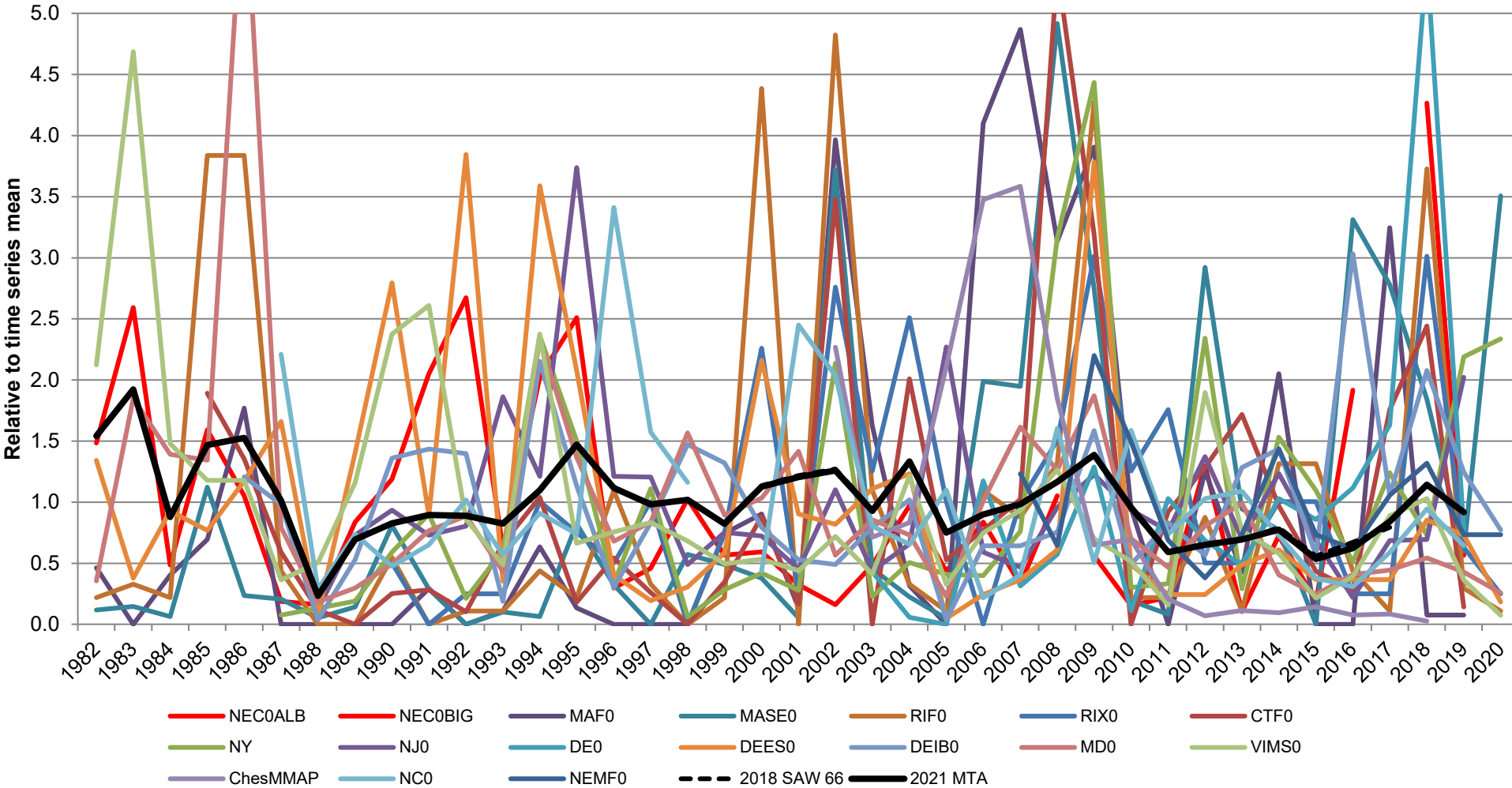
## **TOR 4: Qualitative status**

- The age structure in current fishery and survey catches is greatly expanded compared to the truncated distribution observed in the late 1980s to early 1990s - indicates mortality has been sufficiently low to allow rebuilding of age structure (2018 SAW 66)**
- Most aggregate SV indices have declined since mid-2000s**
- Although survey indices and model estimates of recruitment have generally been below average in recent years, the driver of this pattern has not been identified and it is not clear if this pattern will persist in the future (2018 SAW 66)**
- Survey indices indicate the recent 2018 year class is above average and the largest to recruit to the stock since 2009, while the 2019 year class is below average and the 2020 year class about average**

## Summer flounder Aggregate Numeric Indices Scaled to time series means



### Summer flounder age 0 recruitment indices Scaled to time series means





## **TOR 5: Projections**

**5. Conduct short-term stock projections when appropriate.**

***(PDB/AOP Assumptions for 2020-2021 catch, OFLs for 2022-2023)***

# OFL Projections 2022-2023

- **Projections for 2022-2023 OFLs at FMSY = 0.422**  
**Assume 2020-2021 ABCs caught; 11,354 (prelim = 11,203; 99%)**  
**and 12,297 mt**  
**Recruitment sampled from 2011-2019**
- **OFL 2022 = 16,458 mt (CV = 14%)**
- **OFL 2023 = 15,464 mt (CV = 12%)**
- ***Subsequent MAFMC Staff and SSC recommendations will determine OFLs/ABCs under the risk policy and other options***

# 2021 Management Track Assessment

OFL for 2022-2023  
Catches and SSB in metric tons

Year	Catch	Landing	Discards	F	SSB
2020	11,354	8,604	2,750	0.328	54,352
2021	12,297	9,468	2,829	0.320	56,920
2022	16,458	12,798	3,620	0.422	54,053
2023	15,464	12,072	3,392	0.422	49,933

## 2021 Management Track Assessment

**TOR 6: Respond to any review panel comments or SSC concerns from the most recent prior research or management track assessment.**

### 2018 SAW 66

- Continue to explore changes in the distribution of recruitment. Develop studies, sampling programs, or analyses to better understand how and why these changes are occurring, and the implications to stock productivity: no new research progress; ongoing monitoring through assessment, note that recruitment improved in 2018-2019
- The reference points are internally consistent with the current assessment. It may be useful to carry uncertainty estimates through all the components of the assessment, BRPs, and projections: no new research progress, both 'internal' and 'external' models of S-R data continue to indicate that steepness is very close to 1
- Explore the potential mechanisms for recent slower growth that is observed in both sexes: no new research progress ongoing monitoring through assessment; some literature on climate effects on distribution, growth, and M (O'Leary et al. 2019 a,b)

## 2021 Management Track Assessment

**TOR 6: Respond to any review panel comments or SSC concerns from the most recent prior research or management track assessment.**

### MAFMC SSC 2019-2020

- Evaluate the causes of decreased recruitment and changes in the recruit per spawner relationship in recent years: **no new research progress, however, note that R/SSB ratio has stabilized as the stock has varied near BMSY**
- Evaluate uncertainties in biomass to determine potential modifications to the OFL CV employed: **SSC has developed new procedures for establishing the OFL CV**
- Evaluate fully the sex and size distributions of landed and discarded fish in the Summer Flounder fisheries: **no progress in implementing by-sex fishery sampling**
- Evaluate the effects of past and possible future changes to size regulations on retention and selectivity in stock assessments and projections: **ongoing monitoring in assessment**
- Incorporate sex-specific differences in size-at-age into the stock assessment through model structures as well as data streams: **no new data streams; however ASAP by-sex model updated through 2018 and NEFSC WHAM state-space by-sex model in development**

## 2021 Management Track Assessment

**TOR 6: Respond to any review panel comments or SSC concerns from the most recent prior research or management track assessment.**

### **MAFMC SSC 2019-2020**

- **Validate the otolith-based age determination: no explicit validation, however, going aging method exchanges have insured consistency among the major aging labs (NEFSC, NCDMF, VIMS, ODU, CTDEEP, and NYDEC)**
- **Further develop understanding of effects of ecosystem changes (e.g., temperature, trophic structure changes) on population dynamics: new publications in the primary literature (O'Leary et al. 2019, a,b; Gulf Stream Index and exploitation influences on growth and natural mortality).**
- **The MAMFC SSC expressed some concern in 2020 that the rebuilding of the stock does appear to be rapid. It was noted that rebuilding was predicted to be slow under the harvest policy adopted: updated projections through 2023 in the 2021 MTA**

## 2021 Management Track Assessment

**TOR 6: Respond to any review panel comments or SSC concerns from the most recent prior research or management track assessment.**

### **MAFMC SSC 2019-2020**

- The above average 2018 year class will not fully recruit to the fishery for 3 or 4 years (2021-2022). There are concerns about increasing discards during this transition. Quantify the size, magnitude, and uncertainty of the discards: **updated estimates of discards through 2019 in the 2021 MTA**
- Verifying the strength of the 2018 year class based on a synthesis of the various surveys included in the assessment. (3 years of data on this year class will be available): **only 1 complete year of surveys available (2019) due to survey cancellations and limited fishery sample data in 2020**