



**NOAA**  
**FISHERIES**

- NEFSC

# Scup 2021 Management Track Assessment

- *Stenotomus chrysops*
- June 2021

# **Last Benchmark: 2015 SAW 60 Assessment components**

## **Fishery dependent**

- Commercial landings**
- Commercial discards**
- Recreational landings**
- Recreational discards**

## **Fishery independent**

- Three NEFSC trawl surveys**
- Fourteen State agency, University trawl surveys**

**Analysis: NFT ASAP SCAA, AGEPRO Projection  
YPR/SSBR BRP models**

# **Recent Updates**

**Model Update in 2017**

**Analysis: NFT ASAP SCAA, AGEPRO Projection**

**YPR/SSBR BRP models**

**Not Overfished and No Overfishing**

**SSC accepted projections for**

**OFLs/ABCs in 2018-2019**

**Data Updates in 2016 and 2018**

**All Fishery Catch and Catch-at-age**

**All Surveys**

**SSC made no changes to OFLs/ABCs**

# Recent Updates

**Operational Assessment in 2019**

**Analysis: NFT ASAP SCAA, AGEPRO Projection  
YPR/SSBR BRP models**

**Not Overfished and No Overfishing**

**Historically large 2015 year class recruiting**

**SSB about 2X BMSY target**

**F about 60% of FMSY threshold**

**Increasing but still 'minor' internal retrospective  
(SSB -11%; F +26%) no adjustment**

**Consistency between recent assessments**

**SSC accepted projections for  
OFLs/ABCs in 2020-2021**

# **2021 Management Track Assessment**

## **Data and modeling overview**

- **Add 2019 fishery and research survey data to the 2015 SAW 60 / 2017 / 2019 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 2 Management Track review**
  
- **Backup – Examination of aggregate survey trends or PlanBsmooth using NEFSC fall survey trend to project trend of catch**

## Recent Scup TAC/ABCs

- 2012 ABC: 18,543 mt = 40.880 mlb
- 2013 ABC: 17,557 mt = 38.710 mlb
- 2014 ABC: 16,325 mt = 36.990 mlb
- 2015 ABC: 15,320 mt = 33.775 mlb
- 2016 ABC: 14,110 mt = 31.107 mlb
- 2017 ABC: 12,881 mt = 28.398 mlb
- 2018 ABC: 16,525 mt = 36.431 mlb
- 2019 ABC: 16,525 mt = 36.431 mlb
- **2020 ABC: 16,227 mt = 35.774 mlb**
- **2021 ABC: 15,791 mt = 34.813 mlb**

# **Scup (*Stenotomus chrysops*)**

## **TOR 1: Fishery Catch**

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

# Commercial Landings

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

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

**Some hand gear and trap**

**Avg. ~18,000 mt (40 million lbs) for 1948-66**

**Avg. ~ 6,400 mt (14 million lbs) for 1967-96**

**Under quotas, avg. 4,200 mt (9 million lbs) for 1997-2015**

**2016: 7,147 mt (16 million lb), 77% of CQ (9,284 mt)**

**2017: 7,007 mt (15 million lb), 84% of CQ (8,337 mt)**

**2018: 6,064 mt (13 million lb), 56% of CQ (10,858 mt)**

**2019: 6,252 mt (14 million lb), 57% of CQ (10,879 mt)**

**2020: 6,162 mt (14 million lb), 61% of CQ (10,083 mt)**

**During 1997-2015, 46% of total catch in weight**

**2016: 47% of total catch weight**

**2017: 37% of total catch weight**

**2018: 38% of total catch weight**

**2019: 38% of total catch weight**

**2020: 40% of total catch weight**



# Commercial Discards

- **SBRM Estimator (Dobs-scup/Kobs-all)\*Krep-all, stratified by quarter, stat area, and 3 mesh sizes; 100% mortality rate**
  - **During 1997-2015: 1,300 mt = about 30% of comm. land.**
    - 2016: 2,772 mt = 39% of comm. land.**
    - 2017: 4,733 mt = 68% of comm. land.**
    - 2018: 3,293 mt = 54% of comm. land.**
    - 2019: 2,779 mt = 45% of comm. land.**
    - 2020: 2,700 mt = 44% of comm. land. (prelim)**
  - **During 1997-2015, about 26% of total catch in weight**
    - 2016: 18% of total catch in weight**
    - 2017: 25% of total catch in weight**
    - 2018: 21% of total catch in weight**
    - 2019: 17% of total catch in weight**
    - 2020: 18% of total catch in weight**
- **Higher than 'normal' discards during 2015-2018 due to historically large 2015 year class. Year class finished recruiting to the commercial landings at true age 4 with expected reduction in discards in 2019-2020**

# Recreational Landings: 'New' MRIP

Largest catches in NY, CT, MA, and RI state waters

P/R Boat lands ~70%, Shore 20%, P/C Boat 10%

*Note: 2016-2018 RHLs in 'Old' MRIP units and not directly comparable to 'New' MRIP landings; allocations under review*

Under quotas, avg. 3,900 mt (9 million lb) for 1997-2015

2016: 4,536 mt (10 million lb); RHL (2,762 mt)

2017: 6,143 mt (14 million lb); RHL (2,495 mt)

2018: 5,887 mt (13 million lb); RHL (3,342 mt)

2019: 6,403 mt (14 million lb); RHL (3,342 mt)

2020: 5,863 mt (13 million lb); RHL (3,342 mt)

During 1997-2015, 46% of total catch in weight

2016: 30% of total catch weight

2017: 32% of total catch weight

2018: 37% of total catch weight

2019: 40% of total catch weight

2020: 39% of total catch weight

# Recreational Discards: 'New' MRIP

Largest catches in NY, CT, MA, and RI state waters  
P/R Boat discards ~64%, Shore 31%, P/C Boat 5%

Under quotas, avg. 450 mt (1 million lb) for 1997-2015

2016: 862 mt (1.9 million lb)

2017: 1,079 mt (2.3 million lb)

2018: 644 mt (1.4 million lb)

**2019: 560 mt (1.2 million lb)**

**2020: 500 mt (1.1 million lb - prelim)**

During 1997-2015, 5% of total catch in weight

2016: 6% of total catch weight

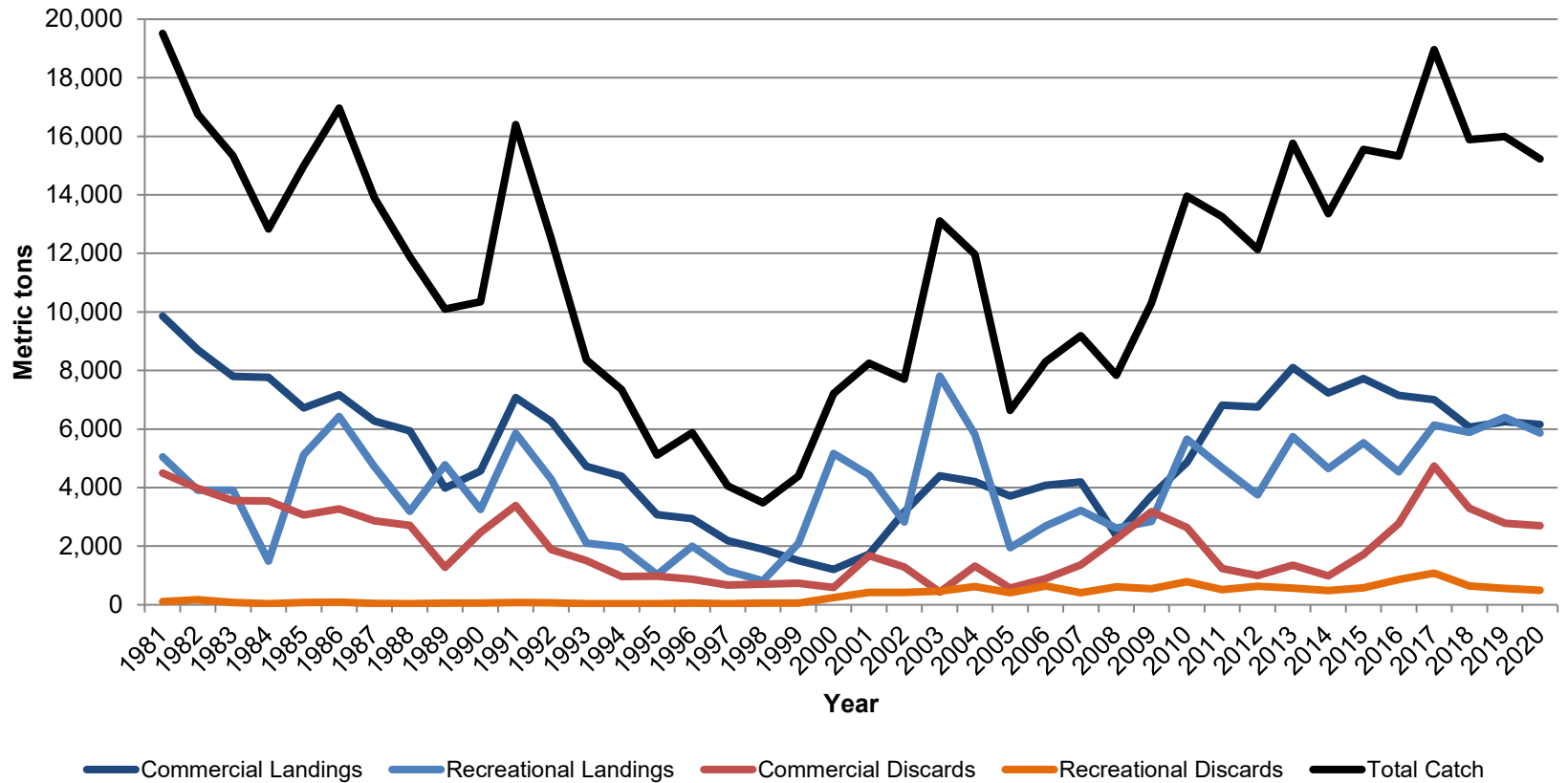
2017: 6% of total catch weight

2018: 4% of total catch weight

**2019: 4% of total catch weight**

**2020: 3% of total catch weight**

## Scup Fishery Total Catch: 1981-2020 with 'New' MRIP



# **Scup (*Stenotomus chrysops*)**

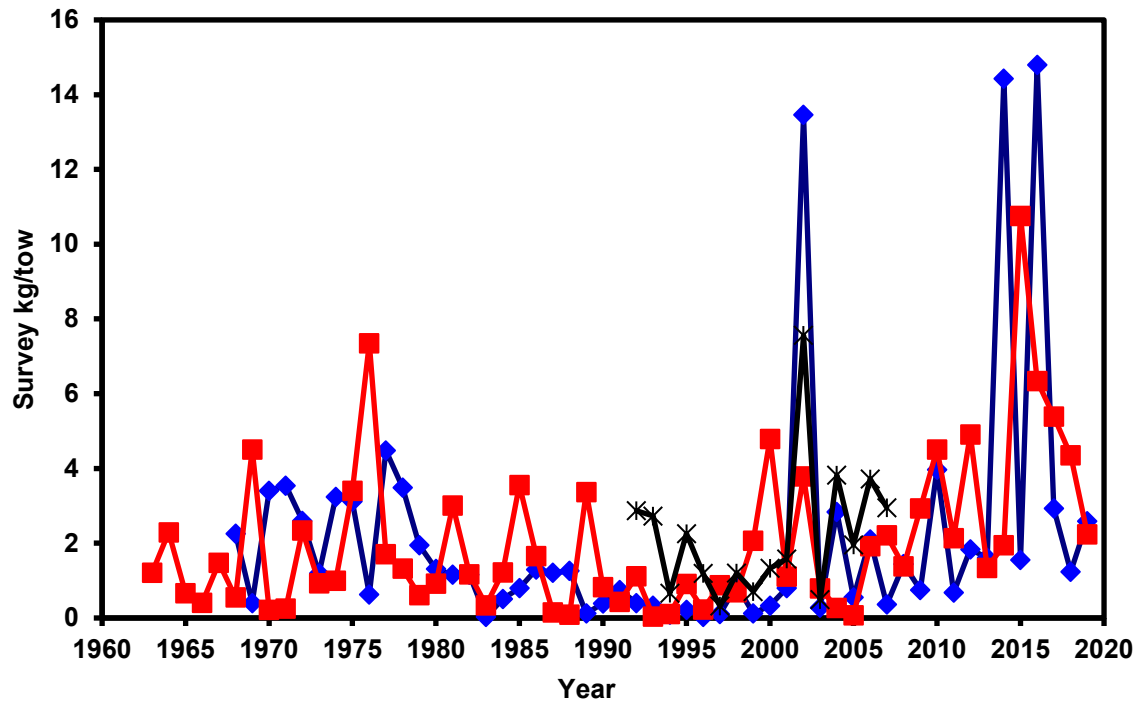
## **TOR 2: Indices of abundance**

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

# Research Surveys

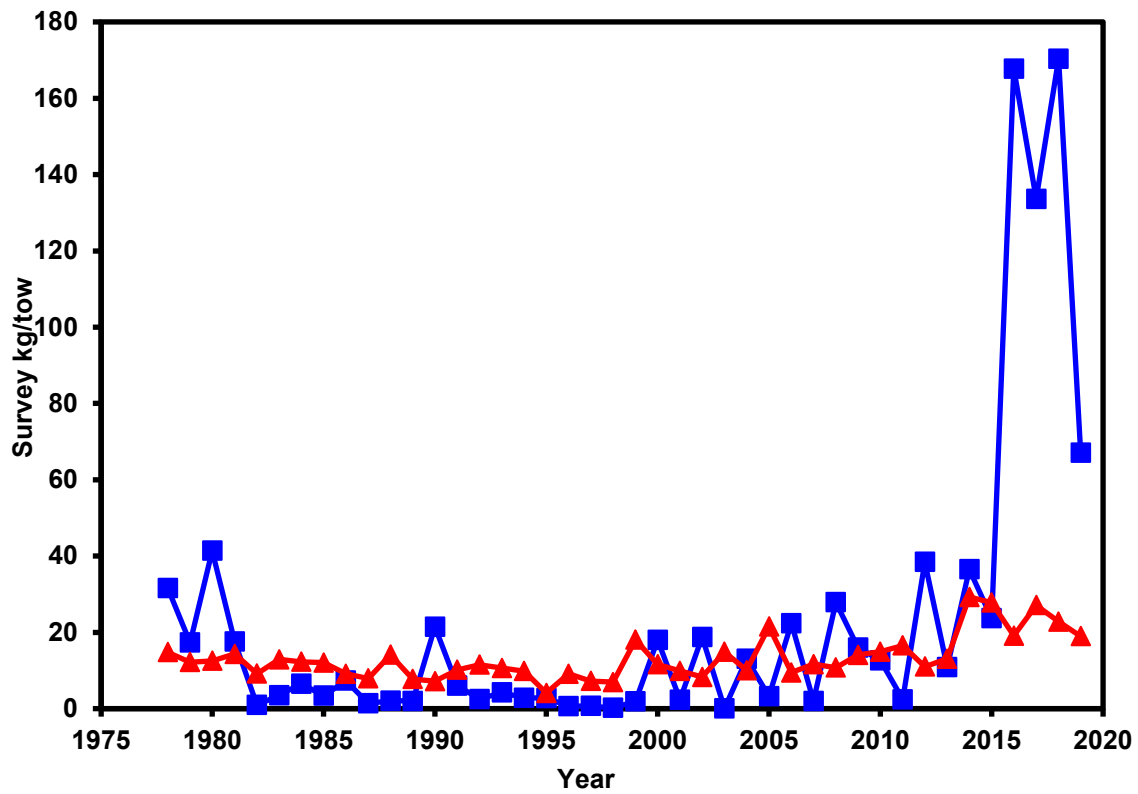
- NEFSC Winter 1992-2007, Fall and Spring 1967-2019
- MADMF Spring and Fall 1978-2019
- RIDFW Spring and Fall 1981-2020
- URIGSO Narragansett Bay, RI Sound 1959-2019
- RI Industry Cooperative Trap 2005-2012
- CTDEEP Spring and Fall 1984-2019
- NYDEC Peconic Bay 1987-2020
- NJDFW Coastal Apr-Oct 1988-2019
- VIMS Juv. Trawl YOY 1955-2020
- VIMS ChesMMAP 2002-2018
- VIMS NEAMAP Fall and Spring 2007-2020

### NEFSC Biomass Indices



Spring Fall Winter

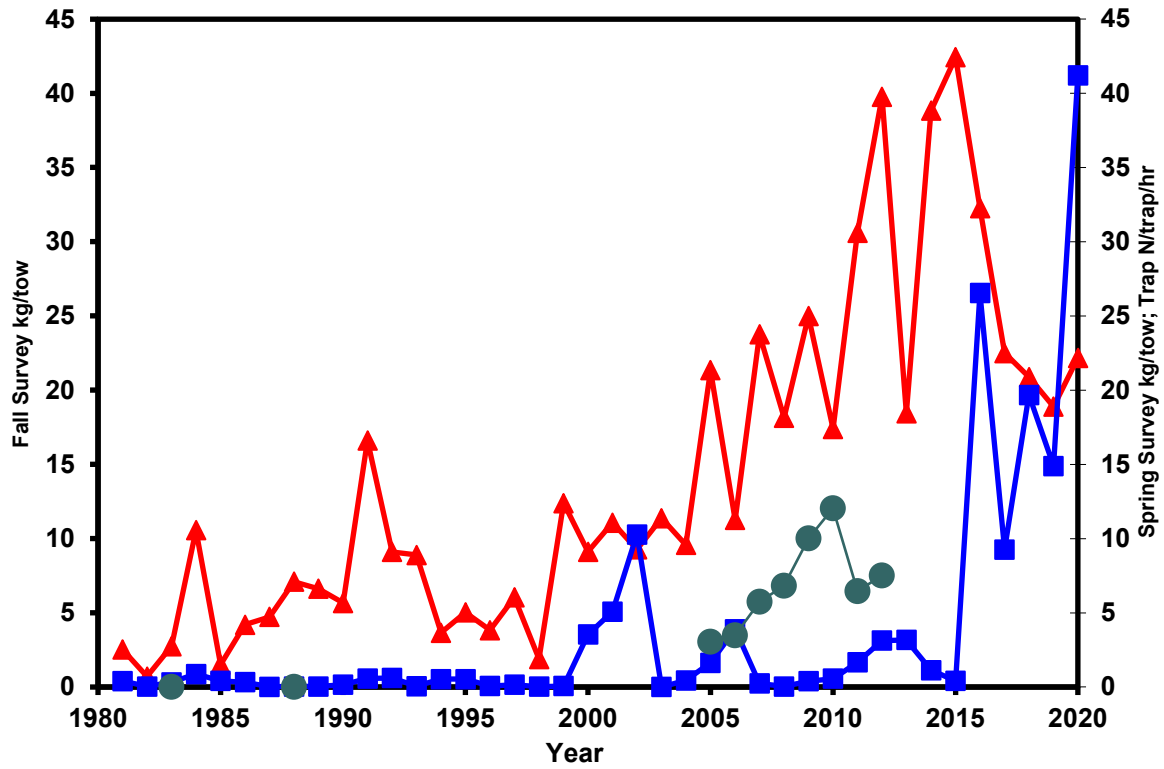
MADMF Biomass Indices



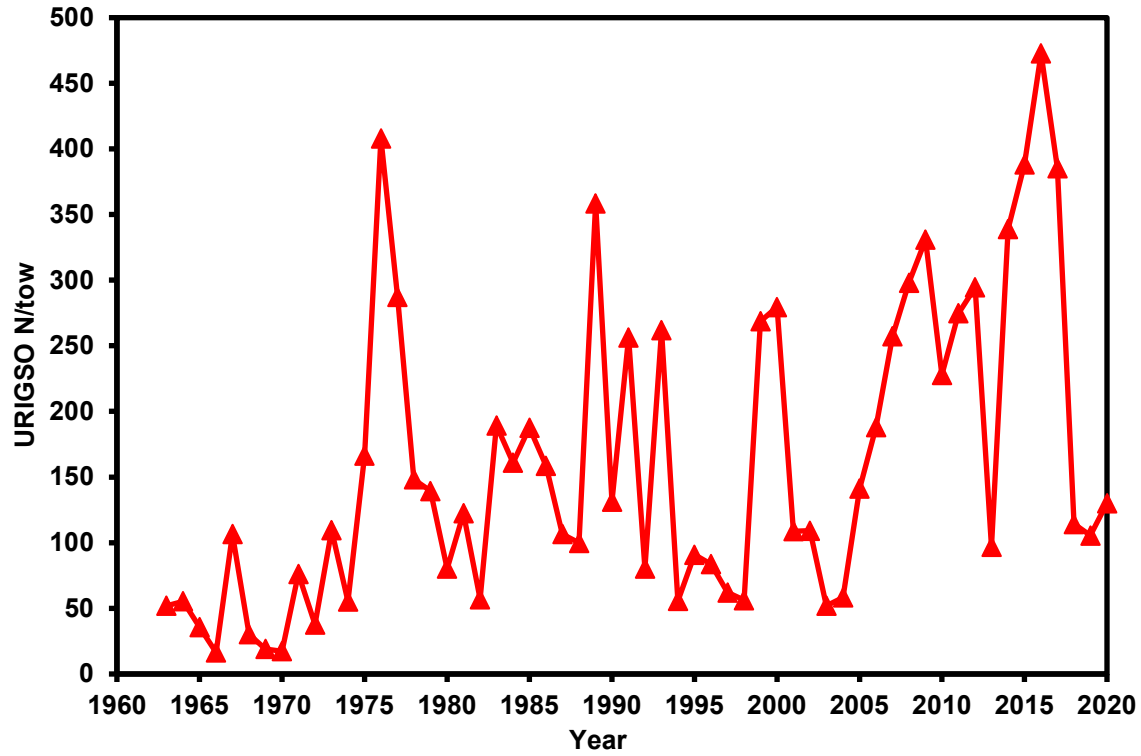
Spring Fall



### RIDFW Indices

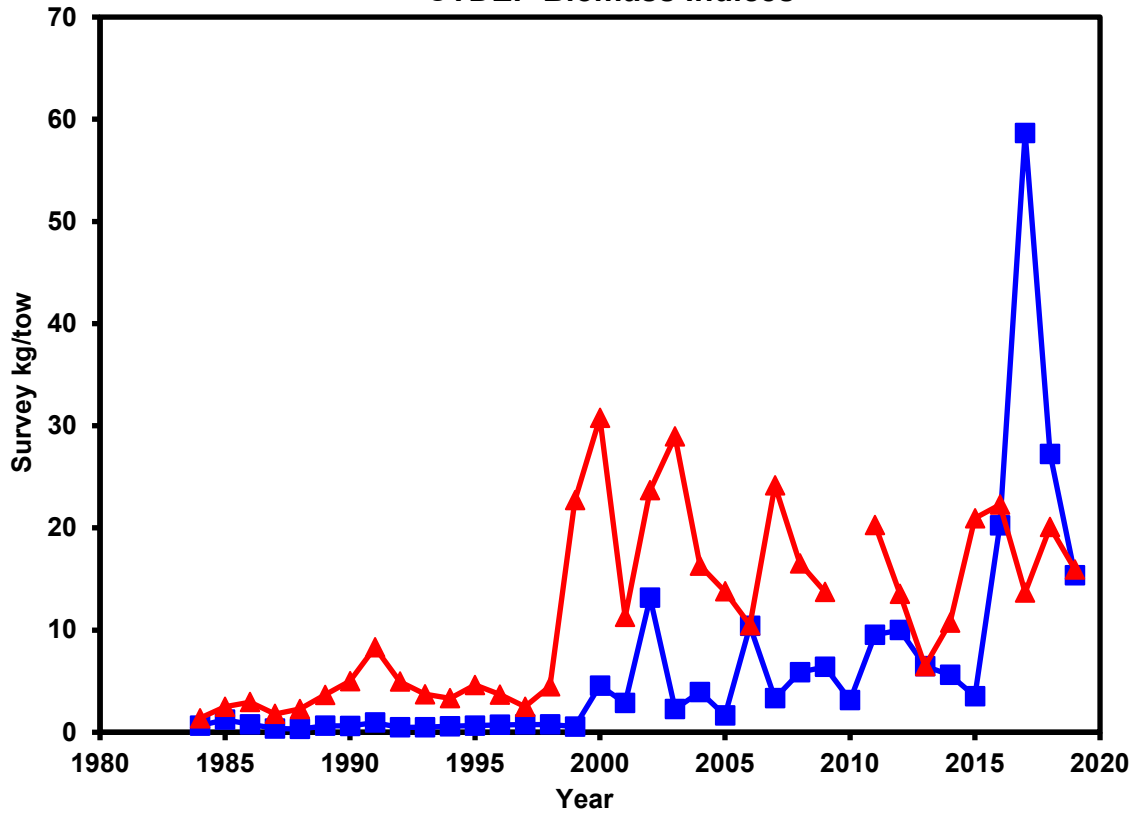


### URIGSO Abundance Indices



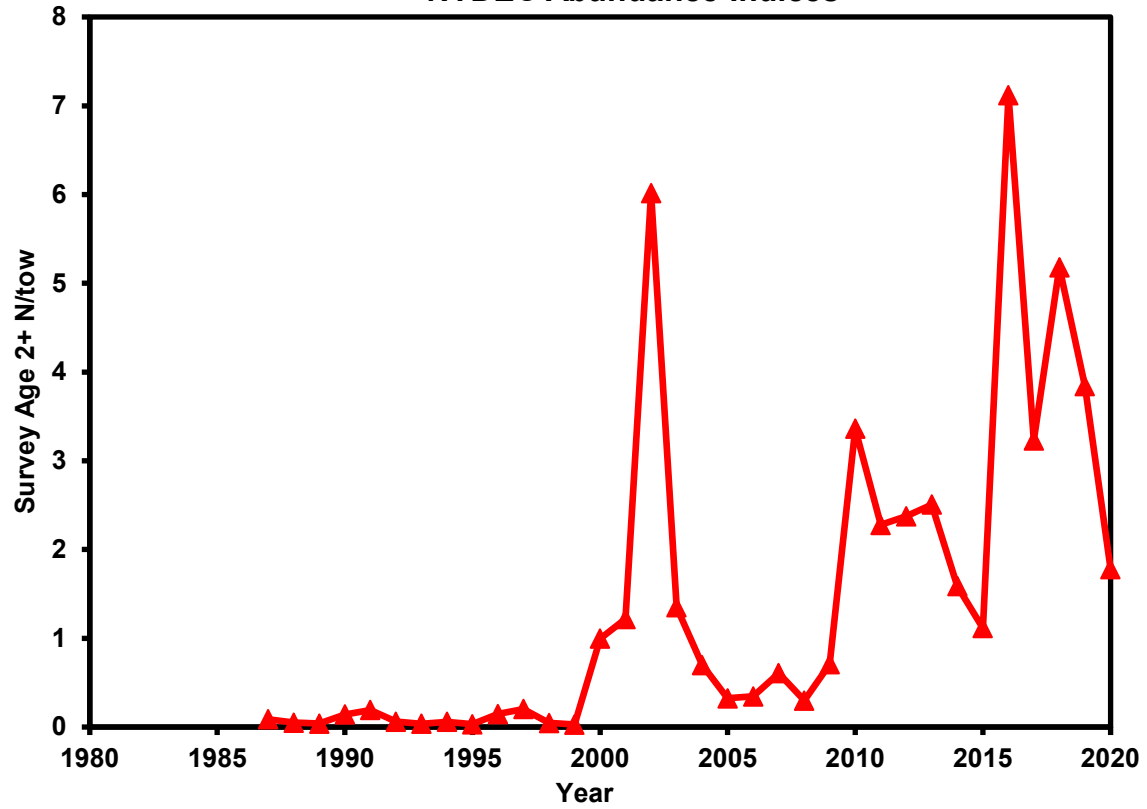
URIGSO

CTDEP Biomass Indices



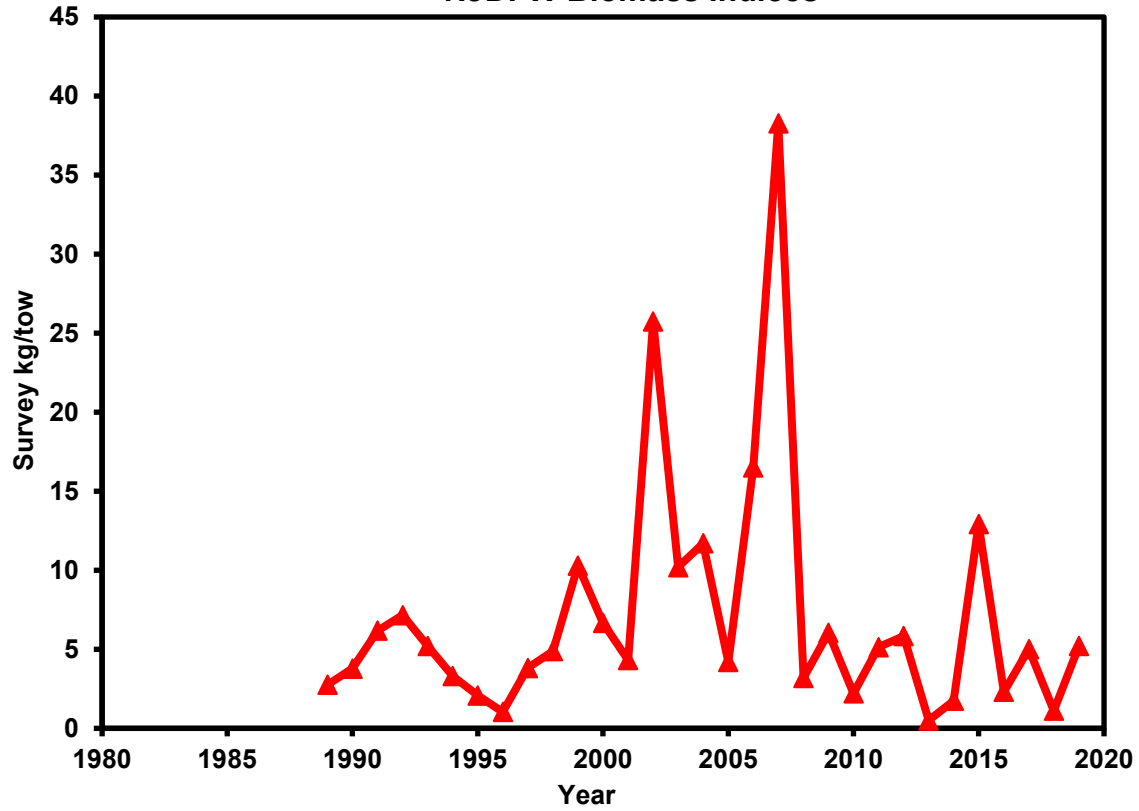
Spring Fall

NYDEC Abundance Indices



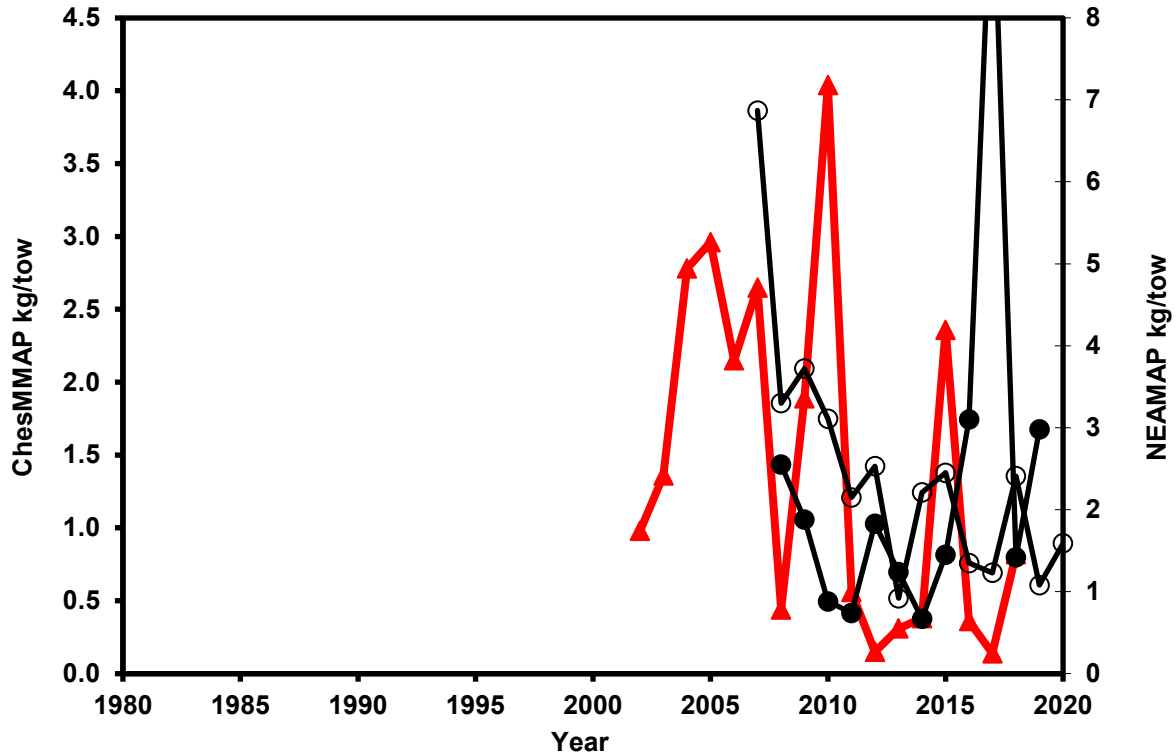
NYDEC

NJDFW Biomass Indices



—▲— NJDFW

### ChesMMAP and NEAMAP Biomass Indices



ChesMMAP NEAMAP Spring NEAMAP Fall

# **Scup (*Stenotomus chrysops*)**

## **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**

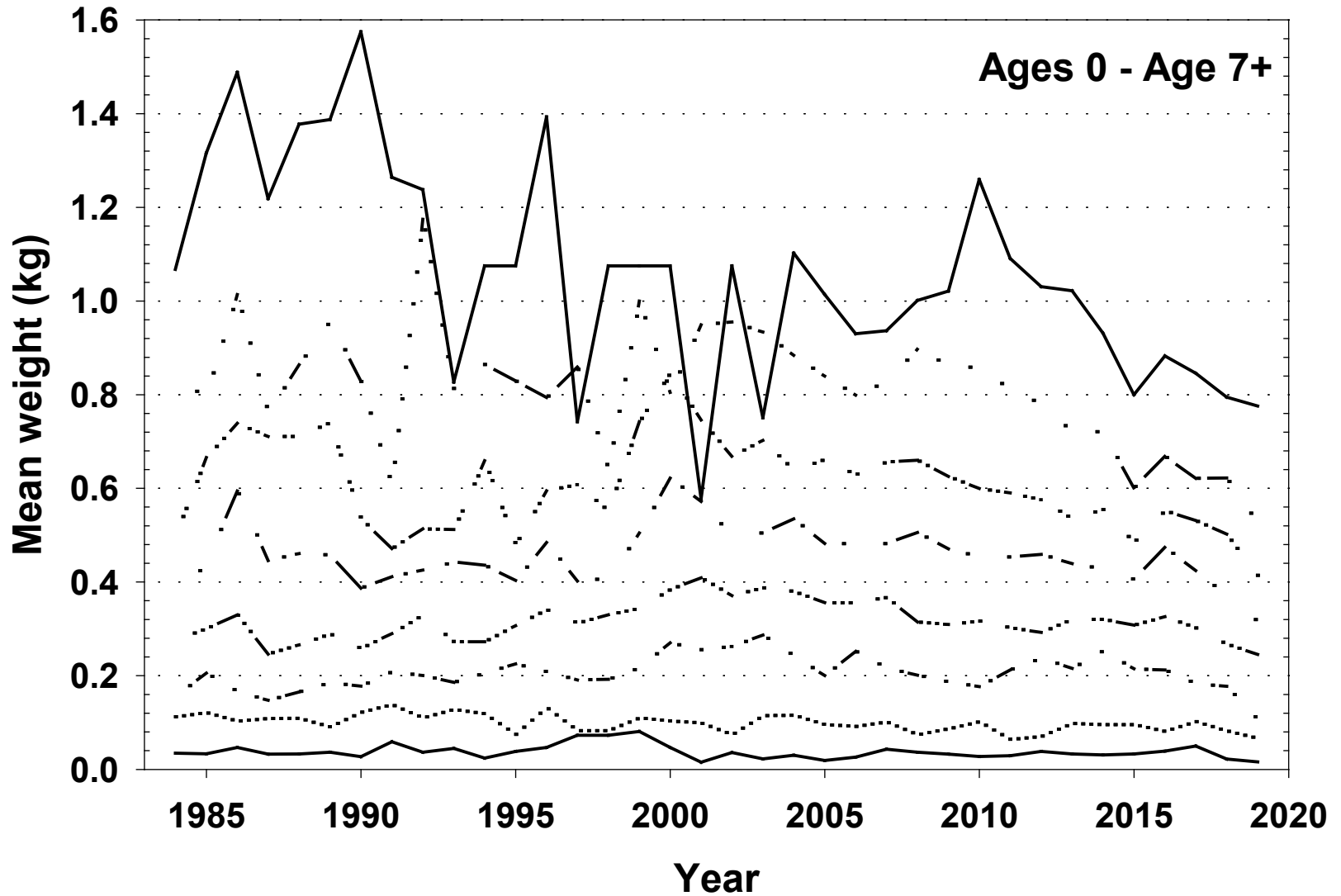
# 2021 Management Track Assessment

## ASAP Model thru 2019

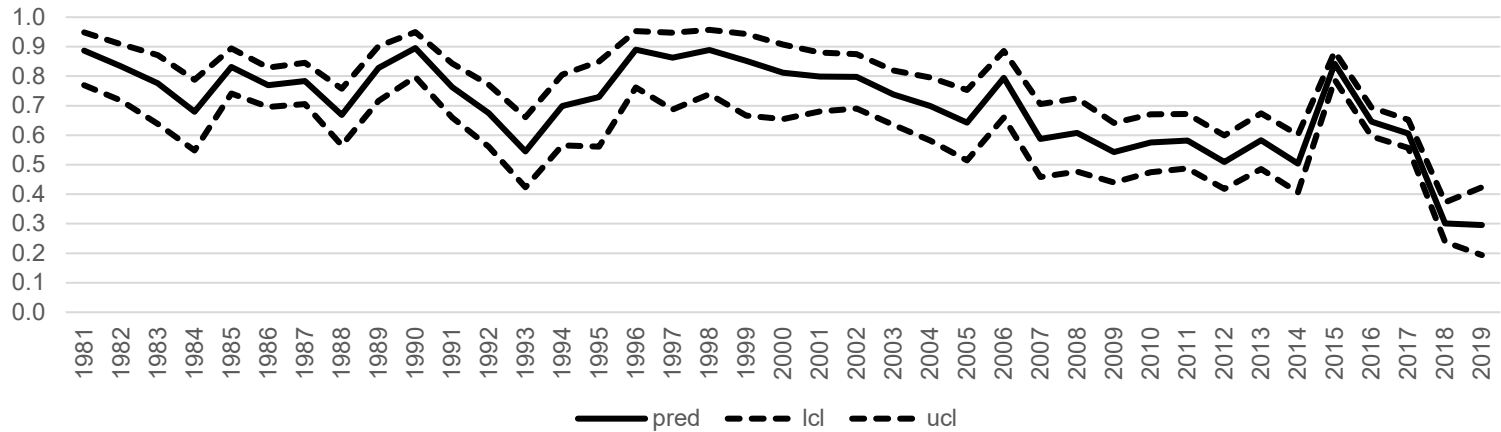
- **NEFSC NFT ASAP Statistical Catch at Age Model**
- **M at ages 0-7+ (model ages 1-8+); constant  $M = 0.20$**
- **Weights at age for Catch and SSB; recent decreases**
- **Maturity at age: 3 year moving window ~60-80% age 2, 100% age 3+**
- **Recent decreases to ~30% age 2, ~80% age 3**
  
- **Four fleets - Landings and Discards (Com L, Com D, Rec L, Rec D)**
  
- **Several surveys with age comps and one stand-alone YOY index**
- **Several aggregate indices of biomass**
- **SV selex modeled with at-age estimation; constant over full time series**
  
- **Fishery selex modeled with at-age estimation: 4 time blocks 1963, 1997, 2006,2013; Land selex with  $S = 1$  at true age 3 or 4; discards at true age 1 or 2;**
  
- **Full F ( $F_{mult} = F_{report} = \text{Average F}$ ) in 2013+ block for true age 4 (model age 5)**



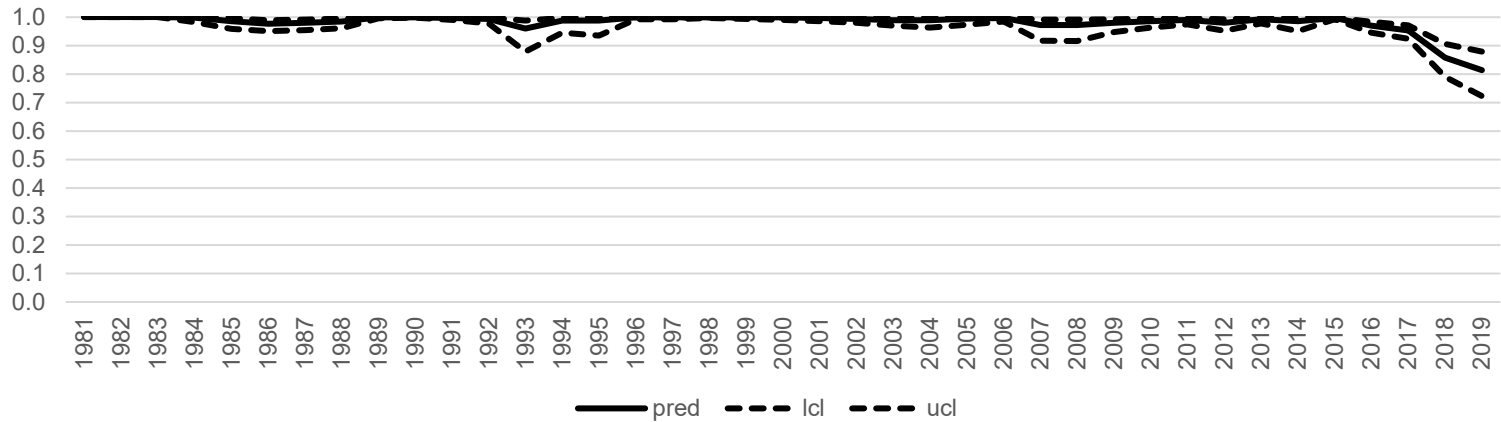
# Scup Total Catch Mean Weights at Age



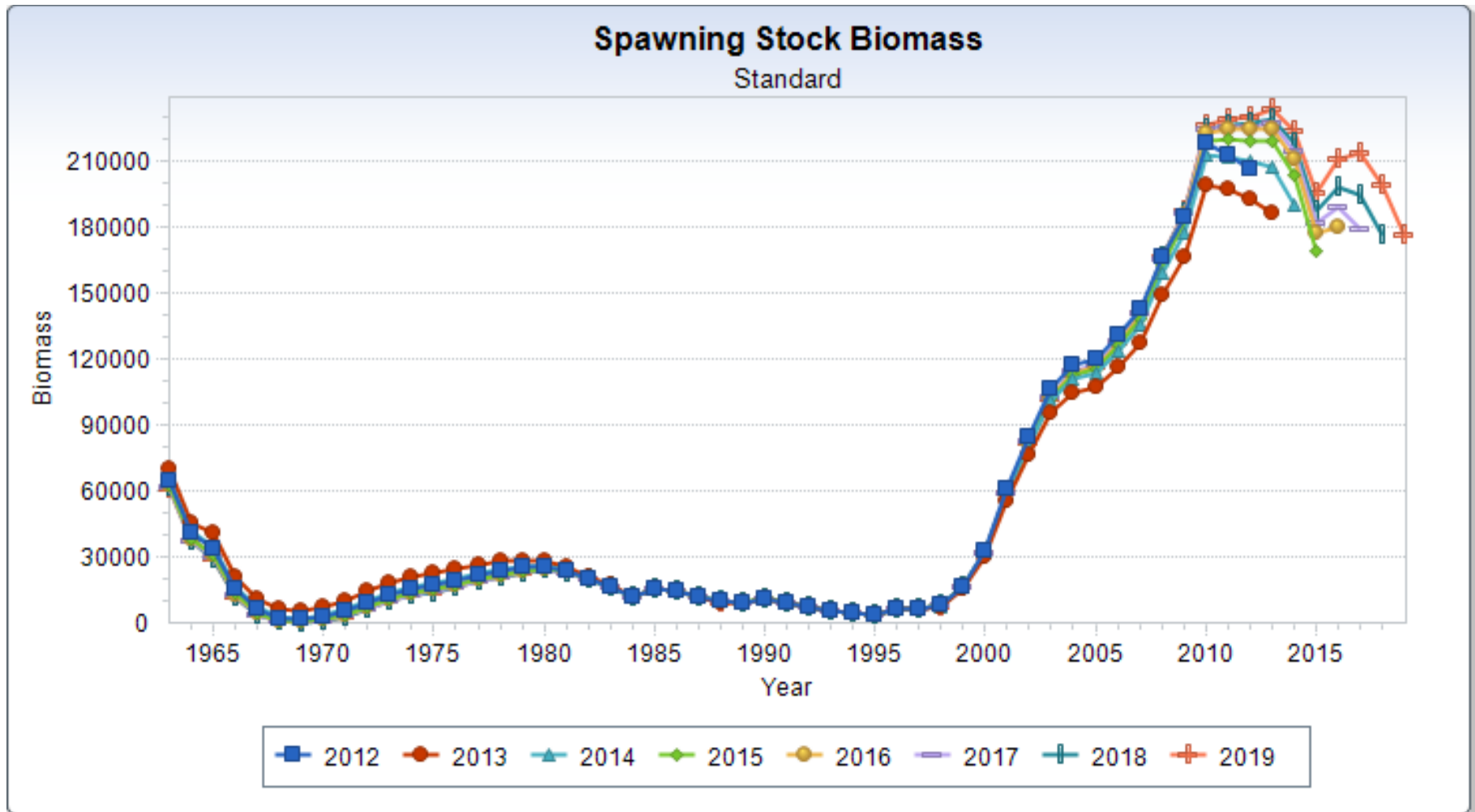
NEFSC Spring Survey: 3-yr window (last = 2018-2019)  
Estimated Proportion Mature: Sexes Combined age 2



NEFSC Spring Survey: 3-yr window (last = 2018-2019)  
Estimated Proportion Mature: Sexes Combined age 3



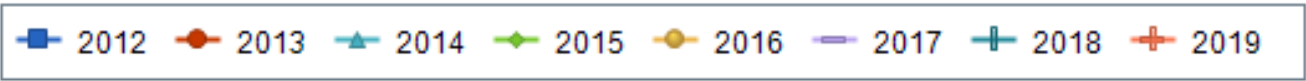
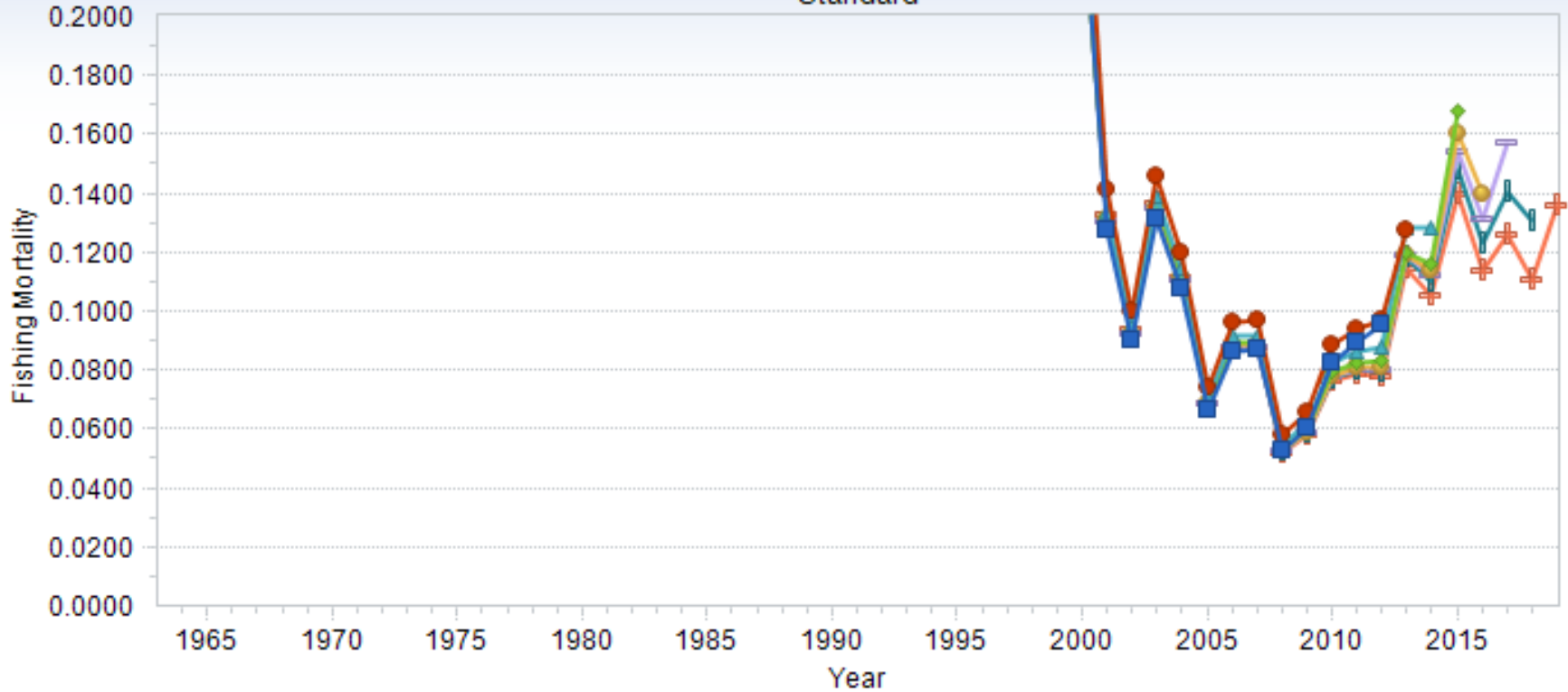
# 'Internal' Retrospective



**7-year 'peel'**  
**Mohn's rho =**  
**-21% to -11%, -14%**  
**(underestimate SSB)**

### Average F Ages 5-5 Unweighted

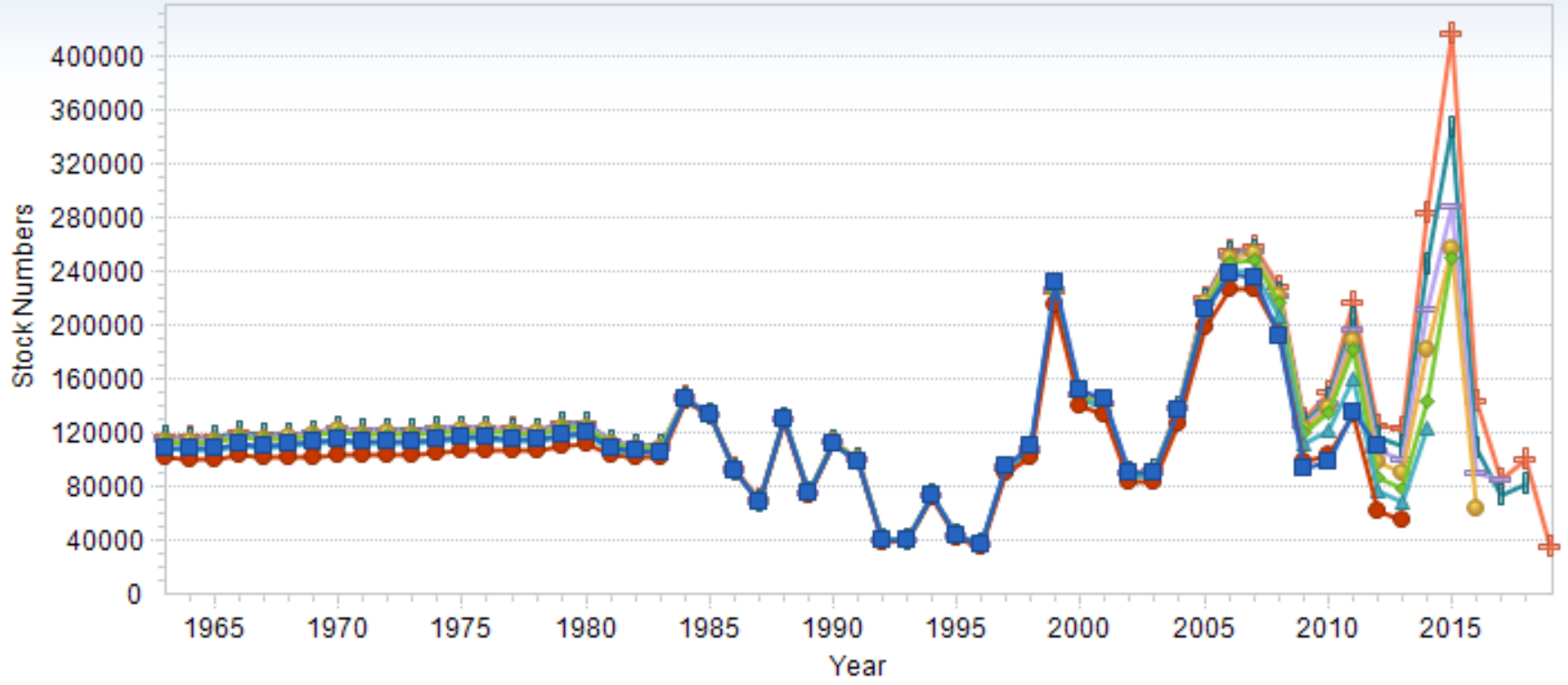
Standard



**7-year 'peel'**  
**Mohn's rho =**  
**+13% to +25%, +20%**  
**(overestimate F)**

# Stock Numbers Age 1

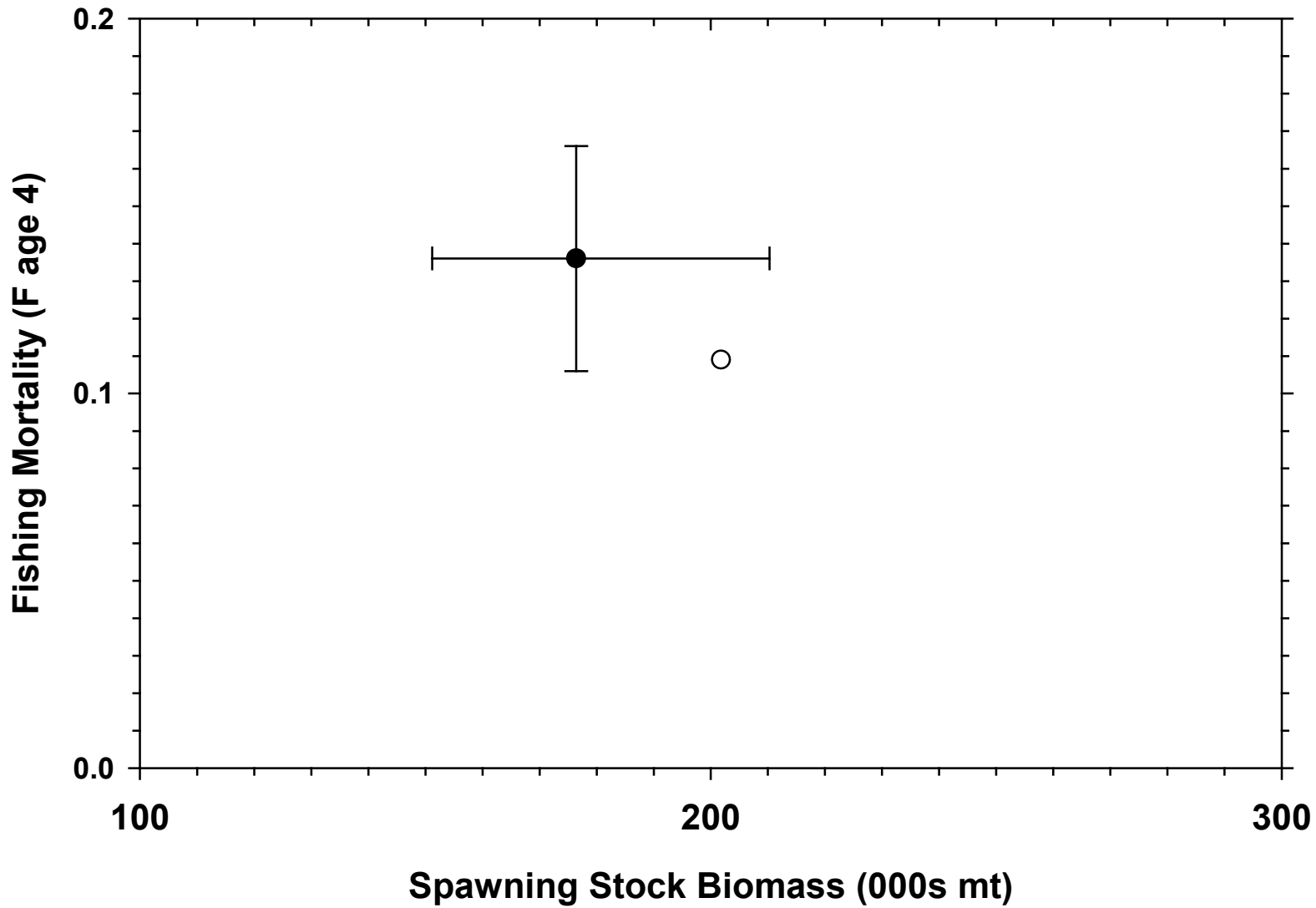
Standard



2012 2013 2014 2015 2016 2017 2018 2019

**7-year 'peel'**  
**Mohn's rho =**  
**-60% to +10%, -33%**  
**(underestimate N)**

- The model estimate of SSB in 2019 adjusted for internal retrospective error (-14.4%) is within the model estimate 90% confidence interval
- The model estimate of F in 2019 adjusted for internal retrospective error (+20.2%) is within the model estimate 90% confidence interval
- Therefore, no adjustment of these terminal year estimates has been made for stock status determination or projections

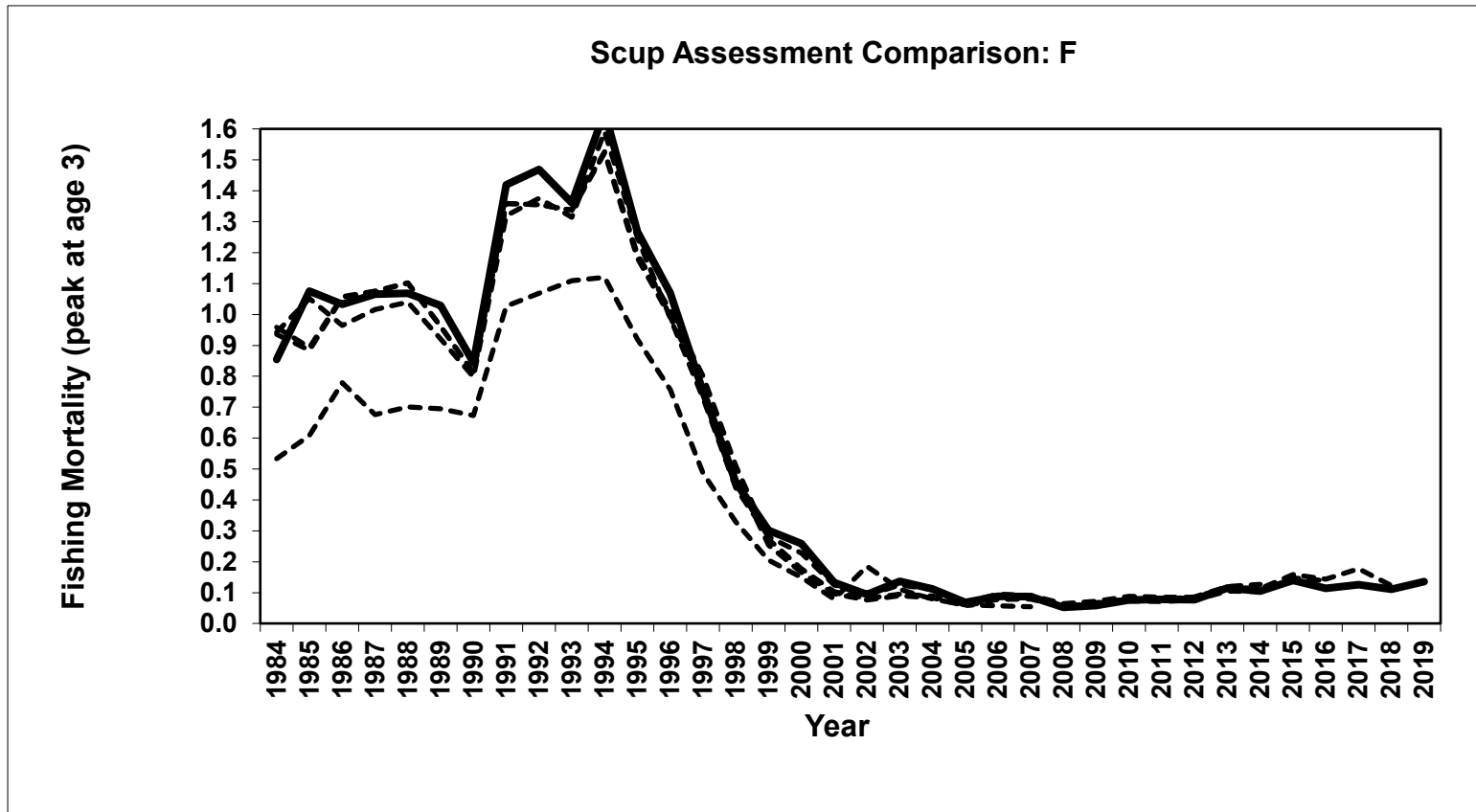


# **2021 Management Track Assessment ASAP Model**

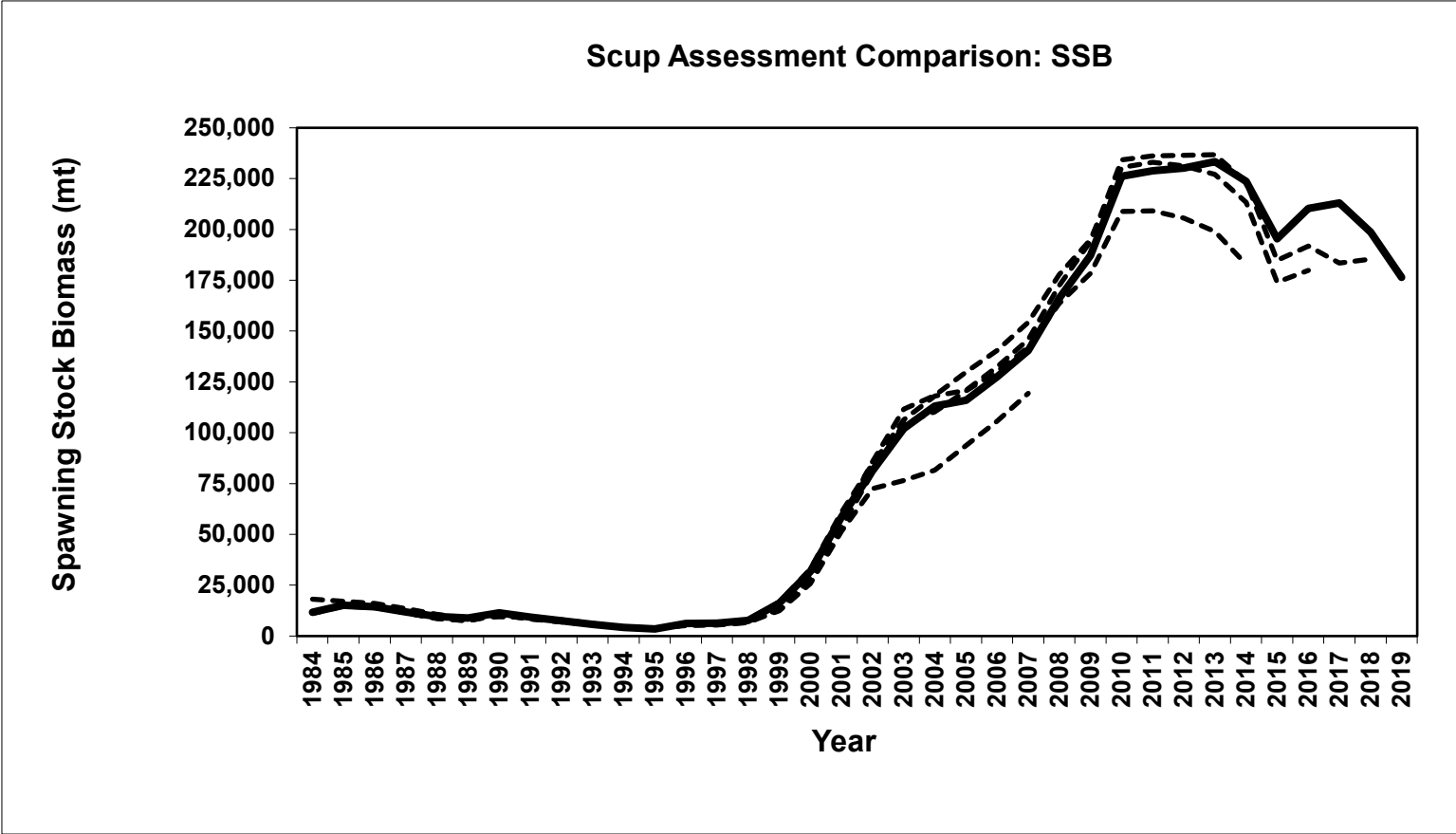
**Comparative results 2015 to 2021 models**



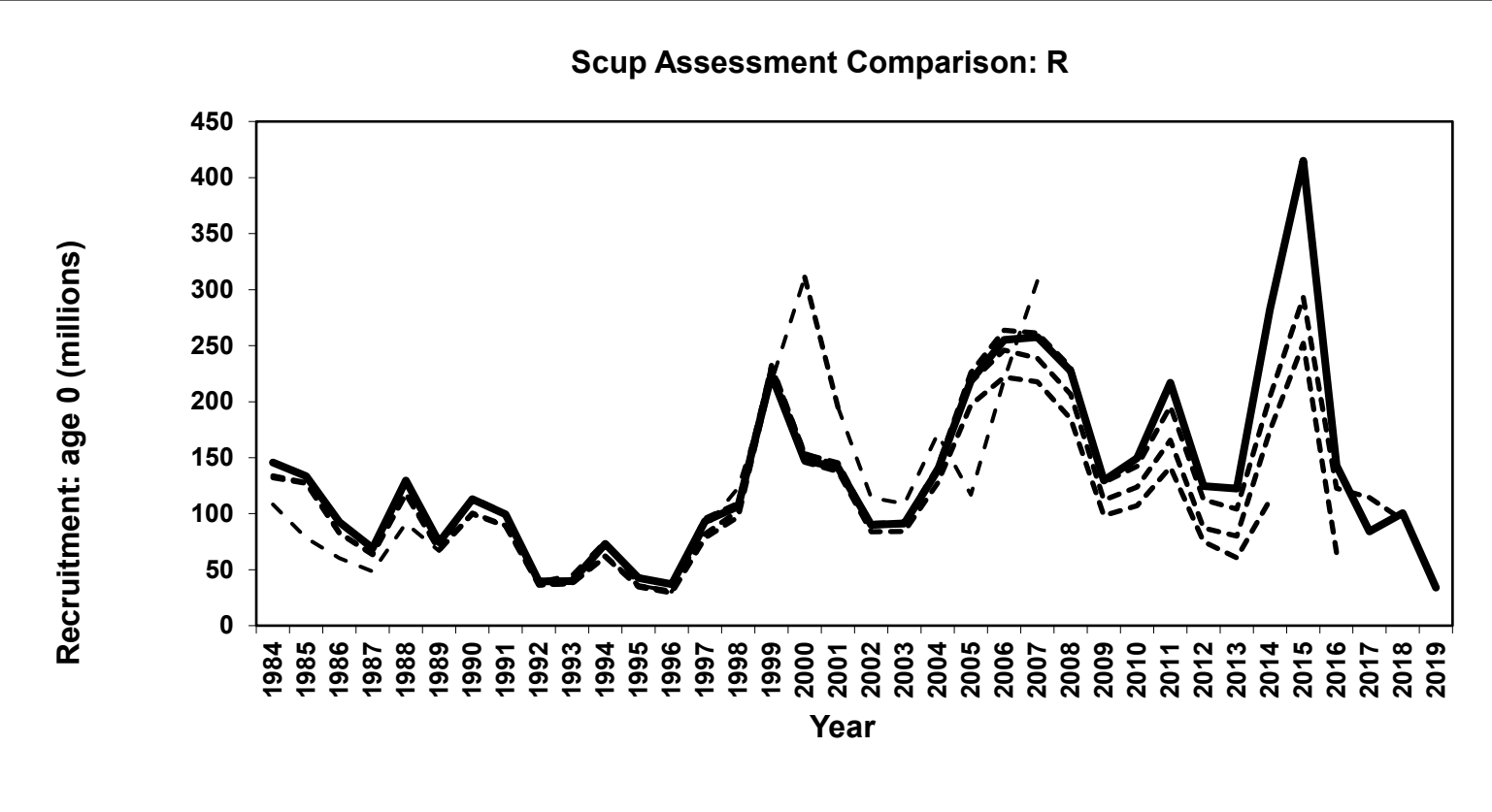
# Comparison across assessments 2008, 2015, 2017, 2019, 2021



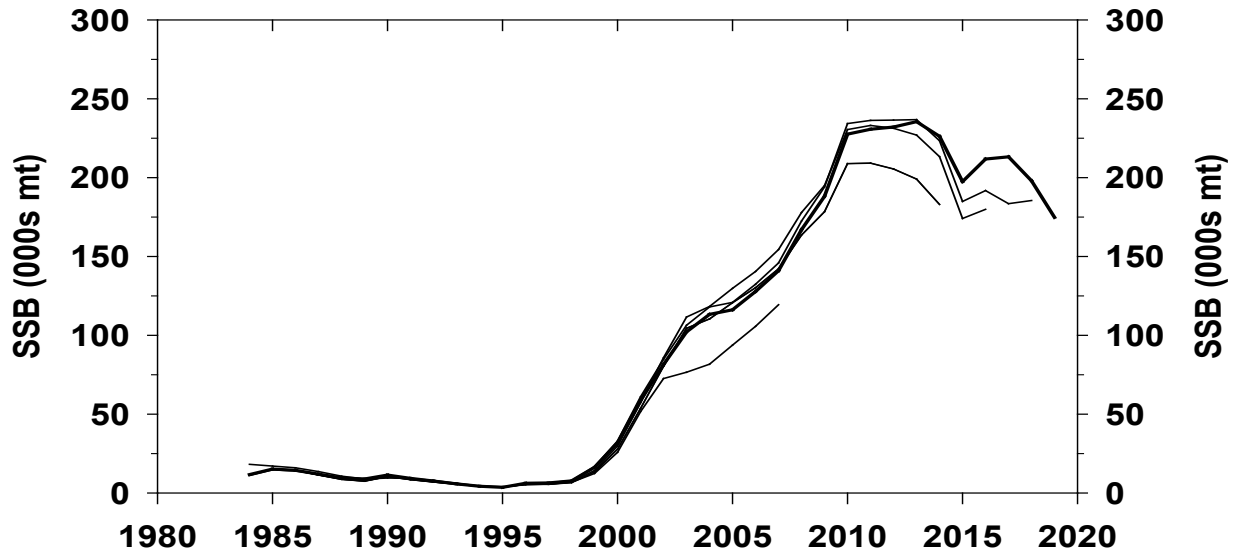
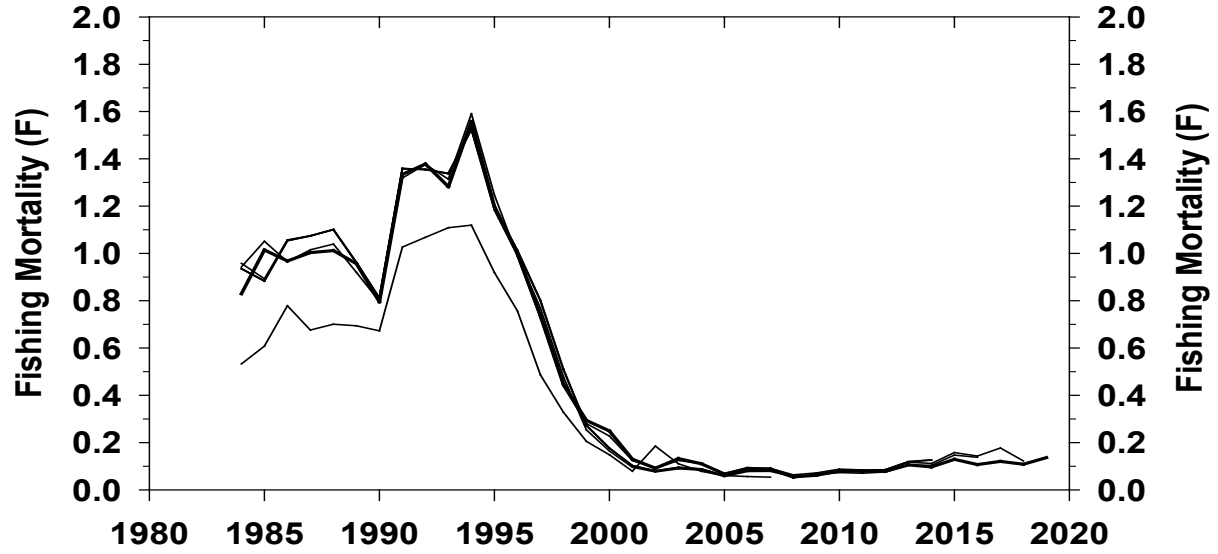
# Comparison across assessments 2008, 2015, 2017, 2019, 2021



# Comparison across assessments 2008, 2015, 2017, 2019, 2021



# Scup Historical Retrospective 2008-2021 Stock Assessments

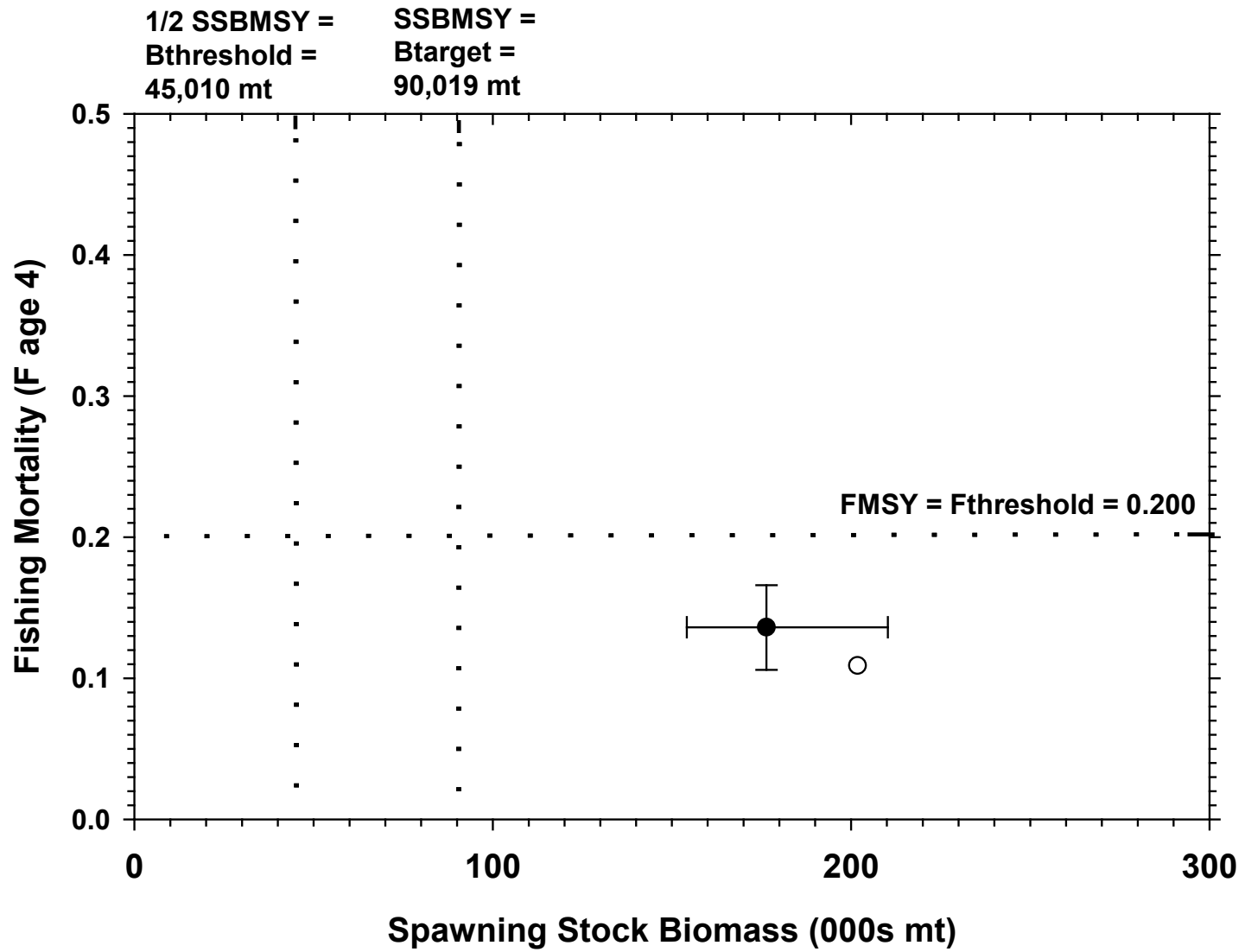


# **Scup (*Stenotomus chrysops*)**

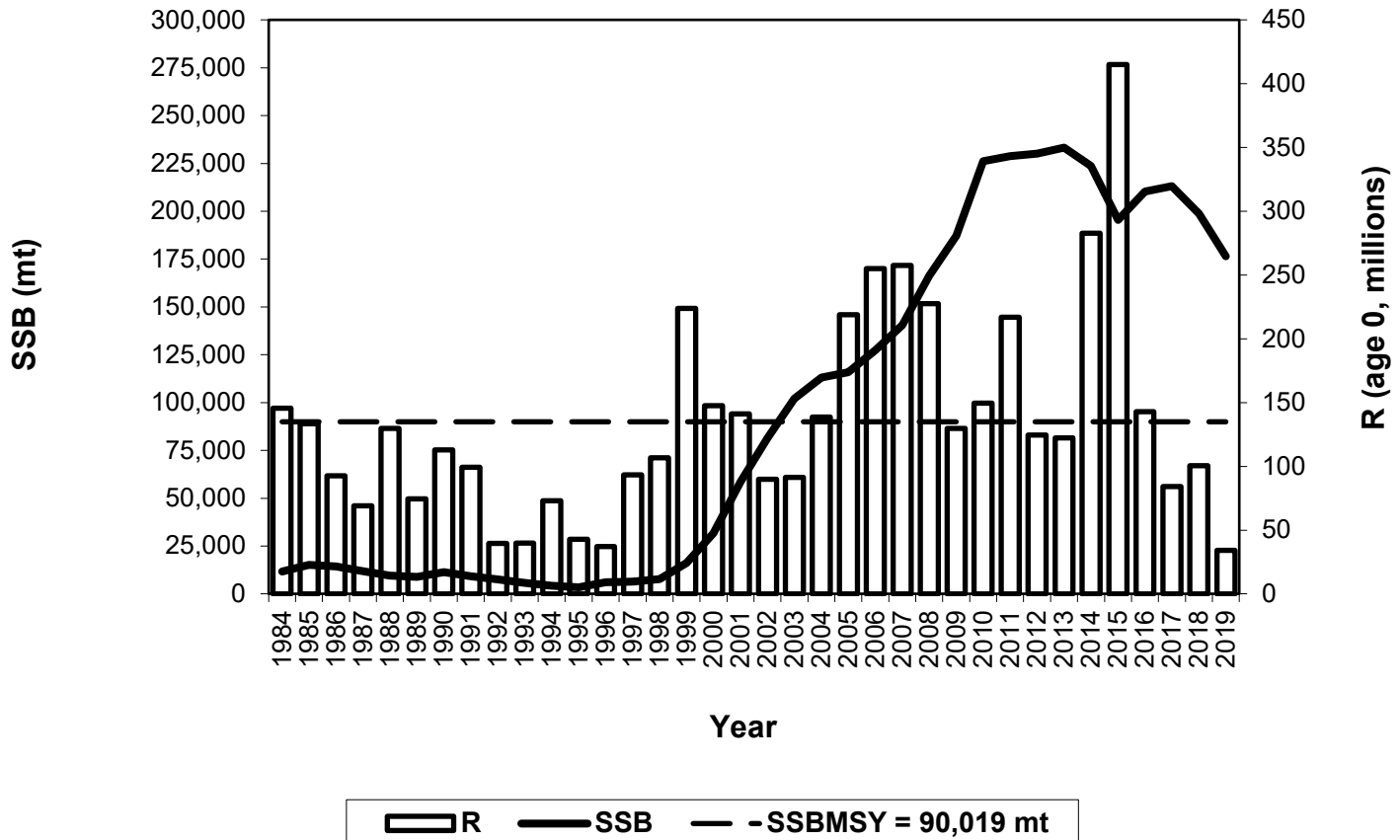
## **TOR 4: BRPs and Status**

**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.).**

- **2019 Operational Assessment: through 2018**
- **BMSY = SSB40% = 94,020 mt**
- **FMSY = F40% = 0.215**
- **MSY = 12,927 mt**
- **Not Overfished: SSB2018 = 186,578 mt, 1.98 x BMSY**
- **Not Overfishing: F2018 = 0.158, 73% of FMSY**
  
- **2021 Management Track Assessment: through 2019**
- **BMSY = SSB40% = 90,019 mt**
- **FMSY = F40% = 0.200**
- **MSY = 12,671 mt**
- **Not Overfished: SSB2019 = 176,404 mt, 1.96 x BMSY**
- **Not Overfishing: F2019 = 0.136, 68% of FMSY**

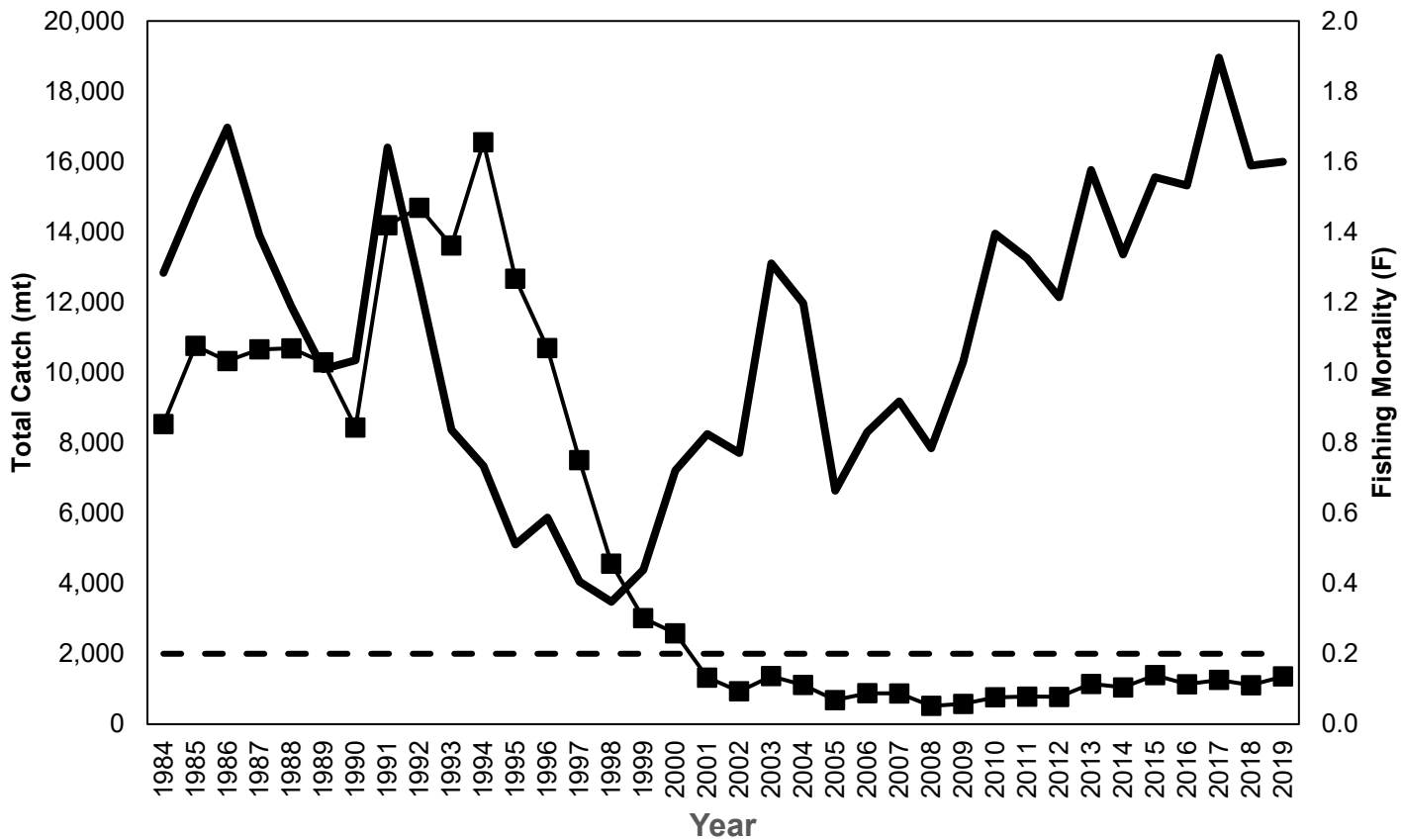


### Spawning Stock Biomass (SSB) and Recruitment (R)



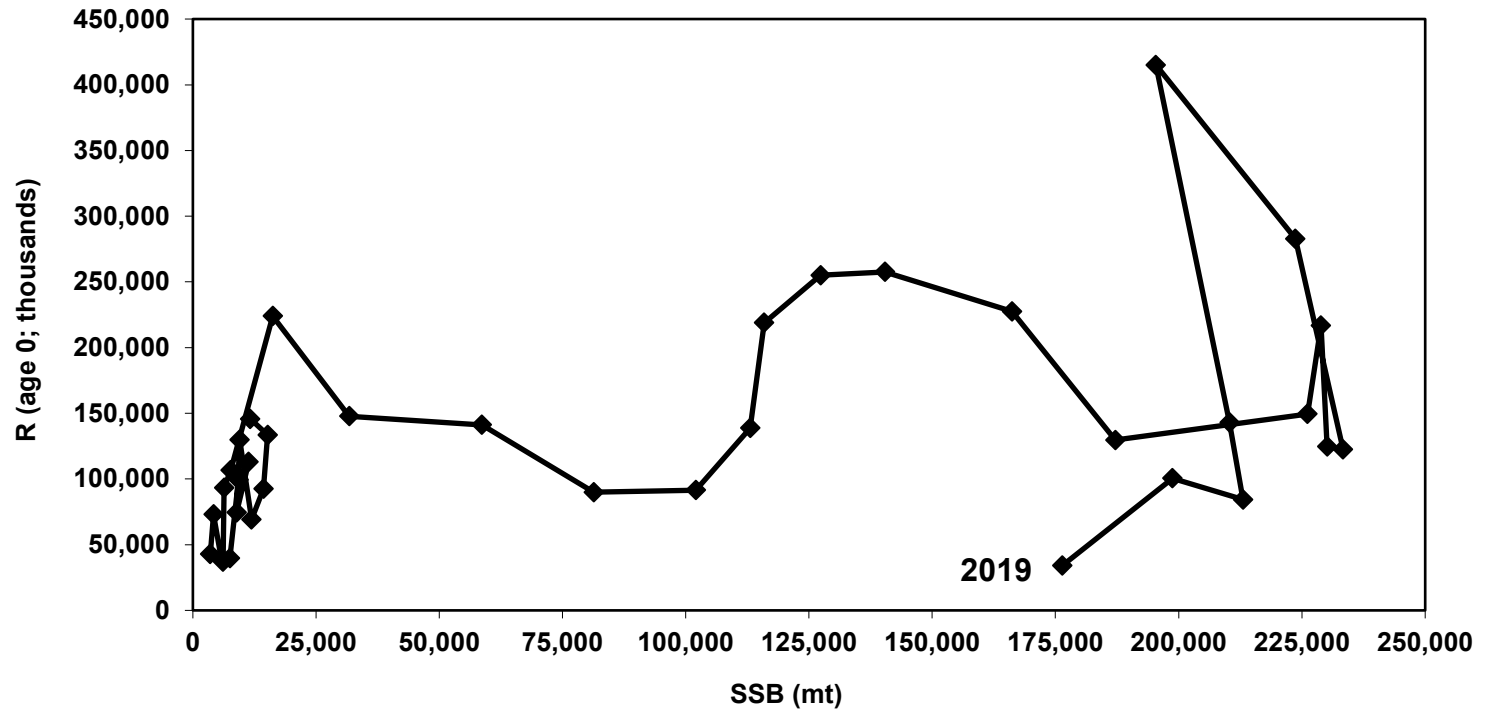


### Total Catch and Fishing Mortality

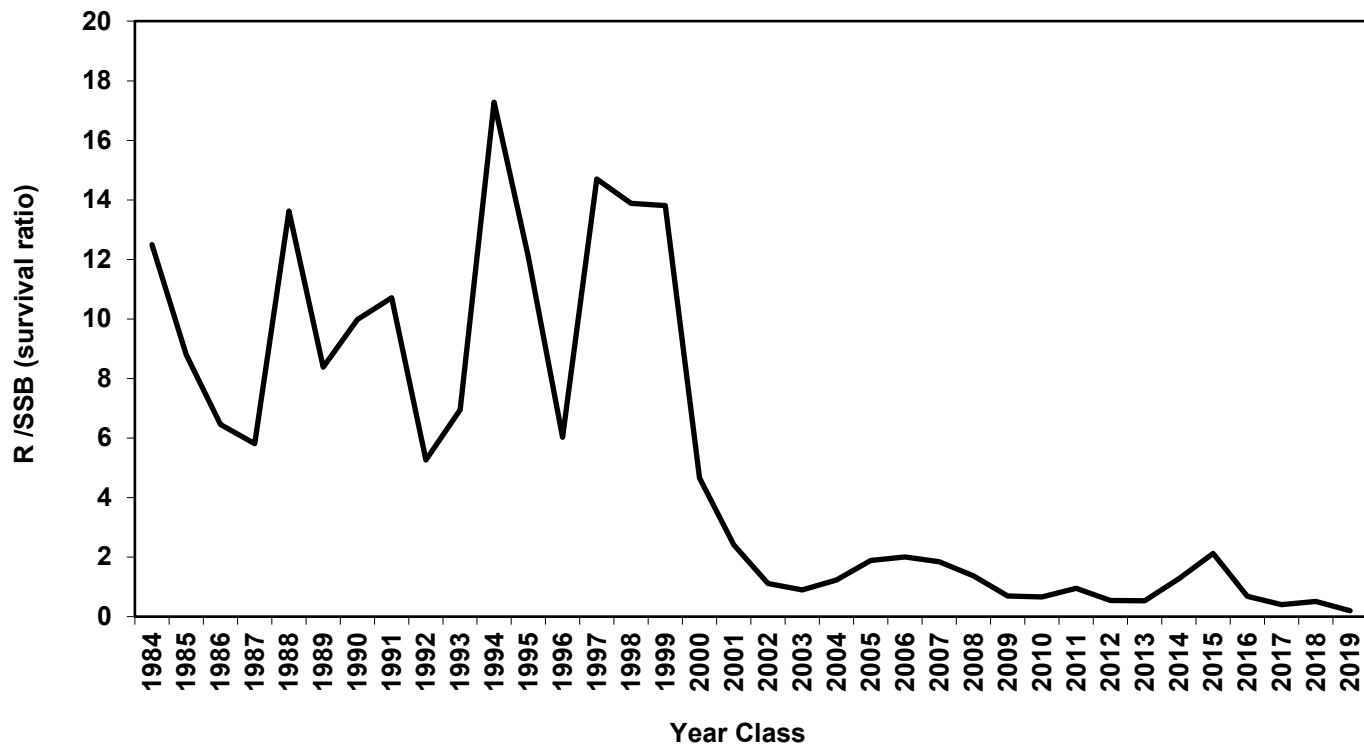


— Total Catch    ■ F    - - FMSY = 0.200

**Scup S-R Data  
for 1984-2019 Year Classes**



**Scup R/SSB ratios  
for 1984-2019 Year Classes**

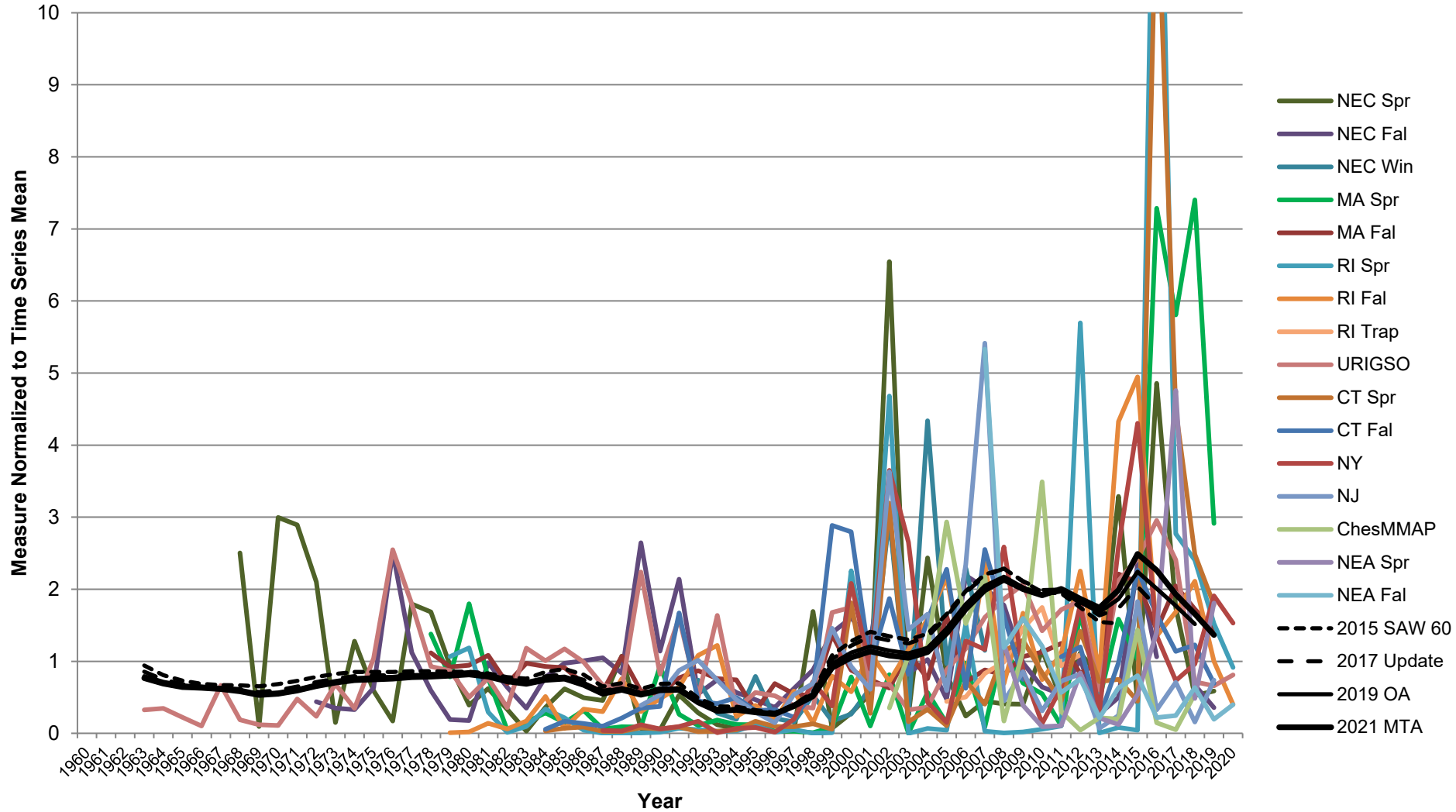


# **2021 Management Track Assessment**

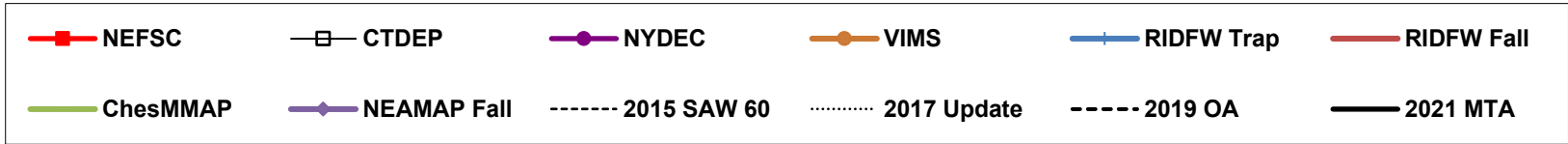
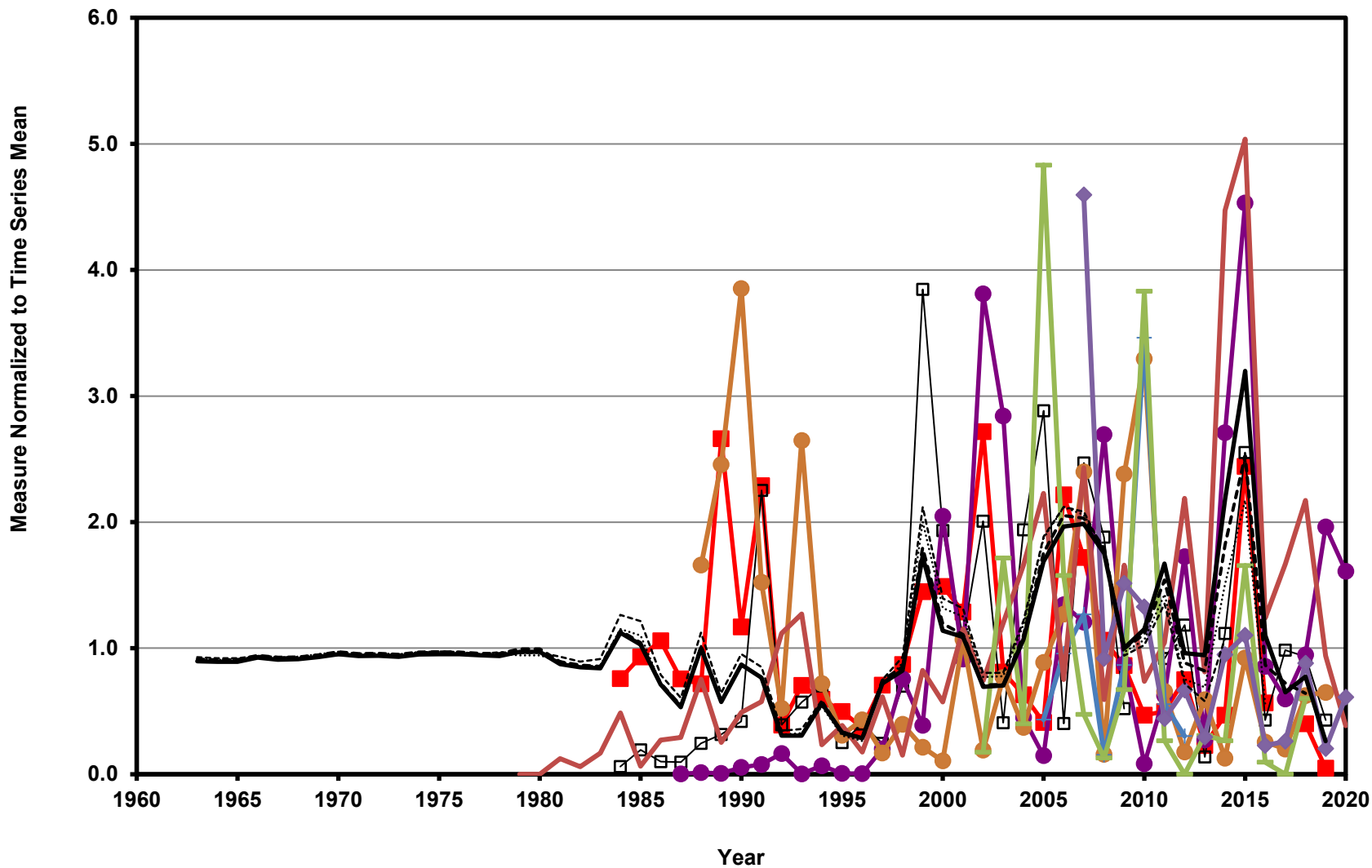
## **TOR 4: Qualitative status**

- **Expanded age structure in current catch and surveys, relative to early 1990s**
- **Most survey aggregate biomass indices near time series high**
- **Survey indices suggest recruitment of several large year classes during 2000-2015**
- **Simple metrics indicate that mortality from all sources was lower than recruitment inputs to the stock since about 2000, which has resulted in SSB that is well above the target**
- **The high stock biomass sustained catches greater than MSY during 2013-2019**
- **Most recent indices, however, suggest the 2017-2019 year classes are the smallest since the late 1990s**
- **Stock biomass is projected to decrease toward the target unless more above average year classes recruit to the stock in the short term**

# Scup Total Stock N Measures of Abundance: All Available Indices



### Scup Age 0 Measures of Abundance



# **Scup (*Stenotomus chrysops*)**

## **TOR 5: Projections**

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

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

# 2021 Management Track Assessment OFL Projections 2022-2023

- Projections for 2022-2023 OFLs at FMSY = 0.200
- Assume 2020-2021 ABCs caught; 16,227 (**prelim = 15,226; 94%**) and 15,791 mt
- Recruitment sampled from 1984-2019
- OFL 2022 = 14,770 mt (CV = 18%)
- OFL 2023 = 13,626 mt (CV = 18%)
- *Subsequent MAFMC Staff and SSC recommendations will determine OFLs/ABCs under the risk policy and other options*



## 2021 Management Track Assessment

<b>OFL for 2022-2023</b>					
<b>Catches and SSB in metric tons</b>					
Year	Catch	Landings	Discards	F	SSB
2020	16,227	14,300	1,927	0.137	191,096
2021	15,791	13,799	1,992	0.166	173,993
2022	14,770	12,112	2,658	0.200	156,850
2023	13,626	10,596	3,030	0.200	139,337

## 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.

#### 2015 SAW 60

- A standardized fishery dependent CPUE of scup targeted tows, from either NEFOP observer samples or the commercial study fleet, might be considered as an additional index of abundance to complement survey indices in future benchmark assessments: **completed for 2015 SAW 60, CPUE indices not included model calibration**
- Explore additional sources of length/age data from fisheries and surveys in the early parts of the time series to provide additional context for model results: **no success, likely alternative is to begin model in 1984 in next RTA**
- Explore experiments to estimate the catchability of scup in NEFSC and other research trawl surveys (side-by-side, camera, gear mensuration, acoustics, etc.): **no progress**
- Refine and update the Manderson et al. availability analysis when/if a new ocean model is available (need additional support). Explore alternative niche model parameterizations including laboratory experiments on thermal preference and tolerance: **no progress**

## 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.**

### 2015 SAW 60

- Explore the Study fleet data in general for information that could provide additional context and/or input for the assessment: **completed for 2015 SAW 60, CPUE indices not included model calibration**
- A scientifically designed survey to sample larger and older scup would likely prove useful in improving knowledge of the relative abundance of these large fish: **no progress**

## 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.**

### 2019 OA

- The recent recruitment of the largest year class in the assessment time series (the 2015 year class) has contributed to recent high commercial fishery discards. The exploration of management actions to reduce discarding in the event of future high recruitment events might include modification of the commercial fishery Gear Restricted Areas and modified commercial mesh sizes: **considered annually as part of the specifications process**
- There is evidence of a decreasing trend in mean weights at age and maturity, perhaps indicative of density dependent effects. Potential effects on reference points and projected fishery yield should continue to be closely monitored: **ongoing monitoring in assessment**

## 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

- Characterize the pattern of selectivity for older ages of Scup in both surveys and Fisheries: **ongoing estimation in assessment**
- Explore the applicability of the pattern of fishery selectivity in the model to the most recent catch data to determine whether a new selectivity block in the model is warranted: **updated in 2021 MTA – new 2013+ selectivity block added to model**
- Mean weights-at-age have declined and age-at-maturity has increased slightly (the proportion mature at age 2 has decreased) in recent years. Continued monitoring of both is warranted: **ongoing monitoring in assessment**
- It was conjectured that the increase in stock biomass since 2000 resulted from increased recruitments due to the imposition of gear restriction areas (GRAs), to minimize interactions between Scup and squid fisheries, and from increases in commercial mesh sizes. Long-term climate variation is a potential alternative explanation for increased recruitments from 2000 to 2015. Research to explore the validity of both hypotheses is warranted: **no new research progress**

## 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

- Improve estimates of discards and discard mortality for commercial and recreational fisheries: **no progress, but no concerns expected if current levels of sampling are maintained**
- Evaluate the degree of bias in the catch, particularly the commercial catch: **no stock-specific progress, but GARFO/NEFSC CAMS proposed for 2020+ data**
- Conduct experiments to estimate catchability of Scup in NEFSC surveys: **no progress**
- Explore the utility of incorporating ecological relationships, predation, and oceanic events that influence Scup population size on the continental shelf and its availability to resource surveys used in the stock assessment model: **no new research progress**
- Explore additional source of age-length data from historical surveys to inform the early part of the time series, providing additional context for model results: **no success, likely alternative is to begin model in 1984 in next RTA**

## 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

- An MSE could evaluate the effectiveness of Scup management procedures: **no progress**
- The Scup Statistical Catch at Age assessment model uses multiple selectivity blocks. The final selectivity block (2006-2018) is the longest in the model. The applicability of the most recent selectivity block to the current fishery condition is uncertain. If the fishery selectivity implied in this block changes, estimates of stock number, spawning stock biomass, and fishing mortality become less reliable: **updated in 2021 MTA – new 2013+ selectivity block added to model**
- Recruitment indices for Scup have been declining in recent years. The 2021 management track assessment should consider the implications on stock biomass projections should this trend continue: **evaluated in the 2021 MTA assessment model and associated projections**

## 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

- Most of the fishery-independent indices used in the model provide estimates of the abundance of Scup < age 3. One consequence is that much of the information on the dynamics of Scup of older ages arises largely from the fishery catch-at-age and from assumptions of the model, and are not conditioned on fishery-independent observations. As a result, the dynamics of these older fish remain uncertain. Knowledge of the dynamics of these older age classes will become more important as the age structure continues to expand: **no new research progress, but assessment indicated the abundance of older fish is increasing in fishery and survey catches, and there is evidence of possible density dependent effects on growth and maturity**
- The projection on which the ABC was determined assumes that the quotas would be landed in 2019, 2020, and 2021; however, landings in recent years have been below the quotas and perhaps a more realistic assumption should be used in future projections: **given the uncertainty of fishery dynamics and catch estimated for 2020, the 2021 MTA projections assumed the ABCs would be caught in 2020-2021; prelim 2020 catch is 94% of 2020 ABC**
- Uncertainty exists with respect to the estimate of natural mortality used in the assessment: **no new research progress**



## 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

- Uncertainty exists as to whether the MSY proxies (SSB40%, F40%) selected and their precisions are appropriate for this stock: **no new research progress**
- Survey indices are particularly sensitive to Scup availability, which results in high inter-annual variability. Efforts were made to address this question in the Stock Assessment Workshop and Stock Assessment Review Committee (SAW/SARC) in 2017 that should be continued in the 2021 management track assessment: **no new research progress**