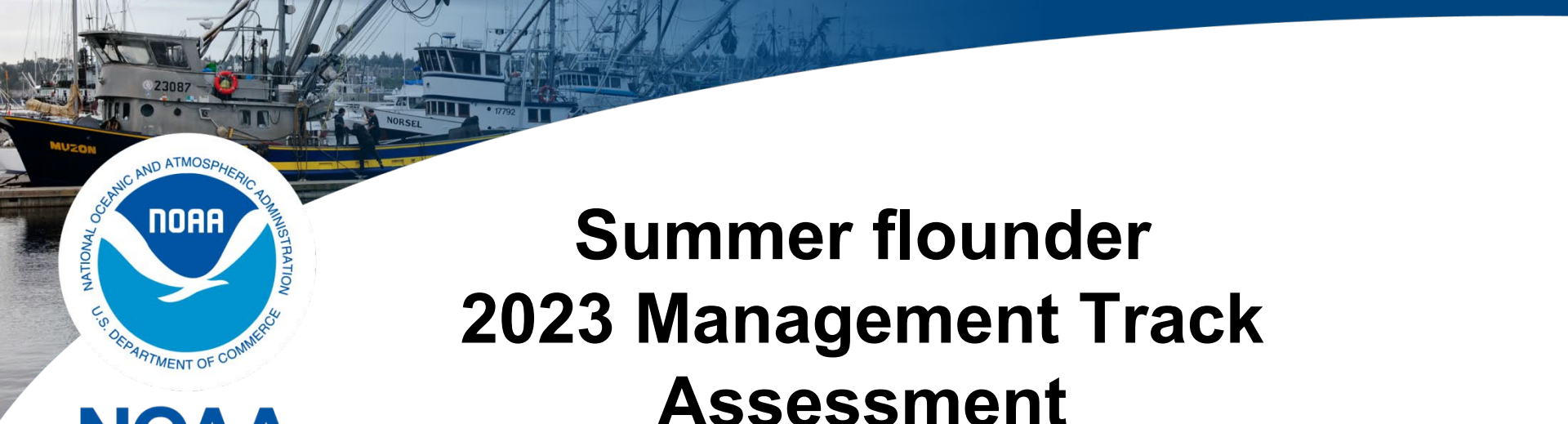


NOAA FISHERIES

- NEFSC

Summer flounder 2023 Management Track Assessment

- ***Paralichthys dentatus***

- **June 2023**

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 Review 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 ('SSQ') took into account trawl efficiency at length.

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.

Recent Updates

Data Updates in 2019 and 2020
All Fishery Catch and Catch-at-age
All Surveys
SSC made no changes to OFLs/ABCs

Management Track Assessment (MTA) in 2021
Analysis: NFT ASAP SCAA, AGEPRO Projection
YPR/SSBR BRP models
Not Overfished and No Overfishing
'Minor' retrospective; no adjustment
Consistent with 2018 SAW 66 Benchmark
SSC accepted projections for
OFLs/ABCs in 2022-2023

2023 Management Track Assessment
Data and modeling overview

- Add 2020-2022 fishery and research survey data to the 2018 SAW 66 / 2021 MTA assessment model
- Update mean weight and maturity averages for BRPs and projections
- Update BRPs
- Evaluate stock status relative to updated BRPs
- Conduct projections for 2024-2025 to determine OFLs
- Level 2 Management Track review
  - CAMS 2020-2022 commercial fishery catch data
  - BIG Indices to 'AS'; minor model setting changes (input CVs, ESSs)
  - Test additional terminal selection block (2008+ to 2016+)
  - Extend last 9 recruitments to last 12 recruitments for projections
- 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
NEFSC Weighout/AA through 2019, GARFO CAMS 2020-2022

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
2019: 4,109 mt (9.1 million lb); 83% of CQ
2020: 4,282 mt (9.1 million lb); 82% of CQ
2021: 4,936 mt (10.9 million lb); 87% of CQ
2022: 5,683 mt (12.5 million lb); 81% of CQ

Commercial Discards

- SBRM Estimator through 2019; CAMS Estimator 2020-2022;
- 80% mortality rate

- During 1993-2017: 1,100 mt = about 20% of comm landings

2018: 979 mt = 35% of comm landings
2019: 783 mt = 19% of comm landings
2020: 1,163 mt = 27% of comm landings
2021: 873 mt = 18% of comm landings
2022: 680 mt = 12% of comm landings

Commercial Discards

	SBRM	CAMS	C-S	%
2018	979	1183	+204	+21%
2019	783	892	+109	+14%
2020	816	1163	+347	+43%
2021	940	873	-67	-7%

Recreational Landings

Uses 'New MRIP'

Avg. ~9,200 mt (20 million lb) for 1981-1992
Under limits, avg. 7,300 mt (16 million lb) for 1993-2017

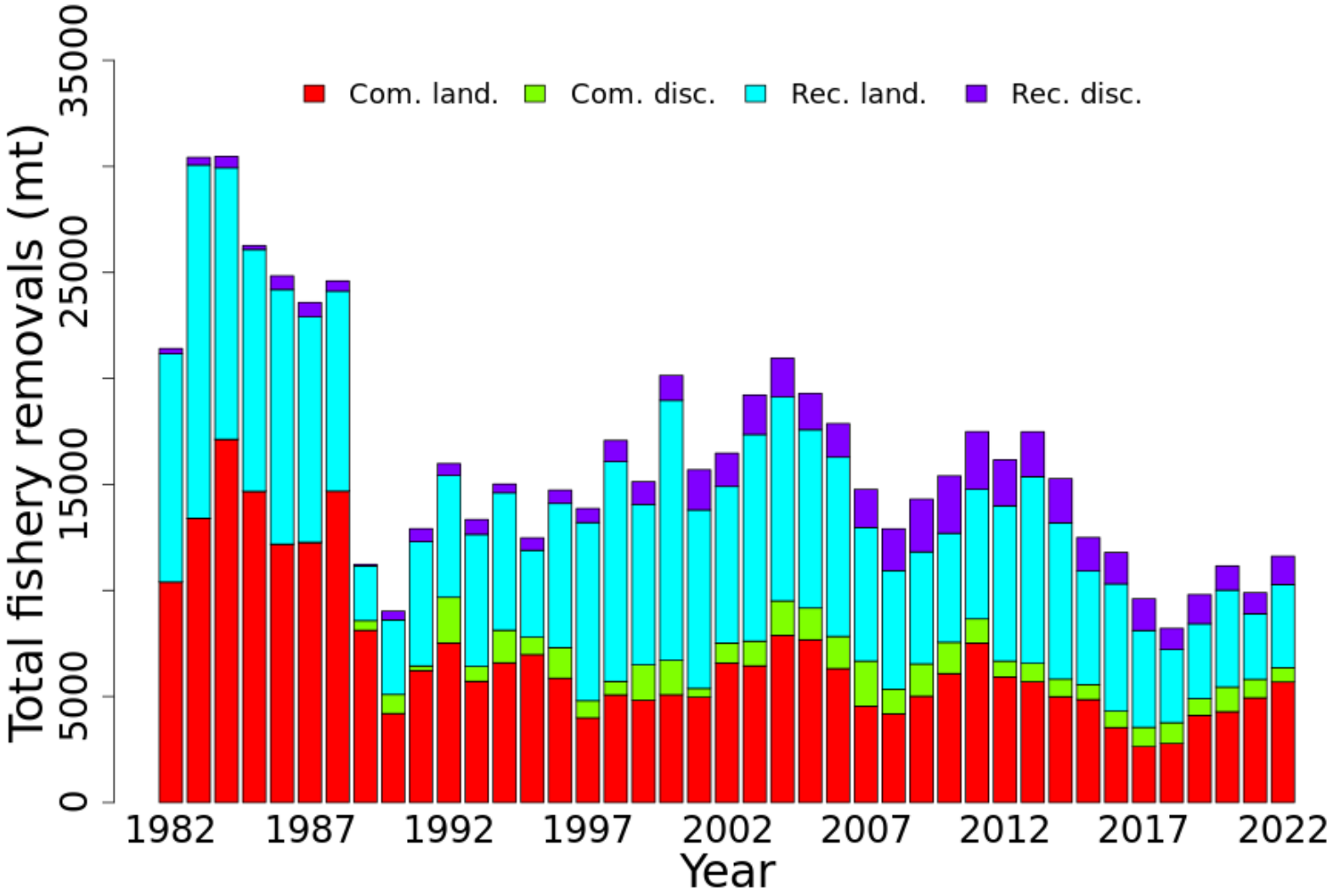
2018: 3,447 mt (6 million lb); 172% of RHL
2019: 3,537 mt (9 million lb); 102% of RHL
2020: 4,571 mt (10 million lb); 131% of RHL
2021: 3,092 mt (7 million lb); 82% of RHL
2022: 3,916 mt (9 million lb); 83% of RHL

Recreational Discards

Uses 'New MRIP'
10% mortality rate

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: 1,141 mt (3 million lb), 25% of recr landings
2021: 997 mt (2 million lb), 32% of recr landings
2022: 1,336 mt (3 million lb), 34% of recr landings

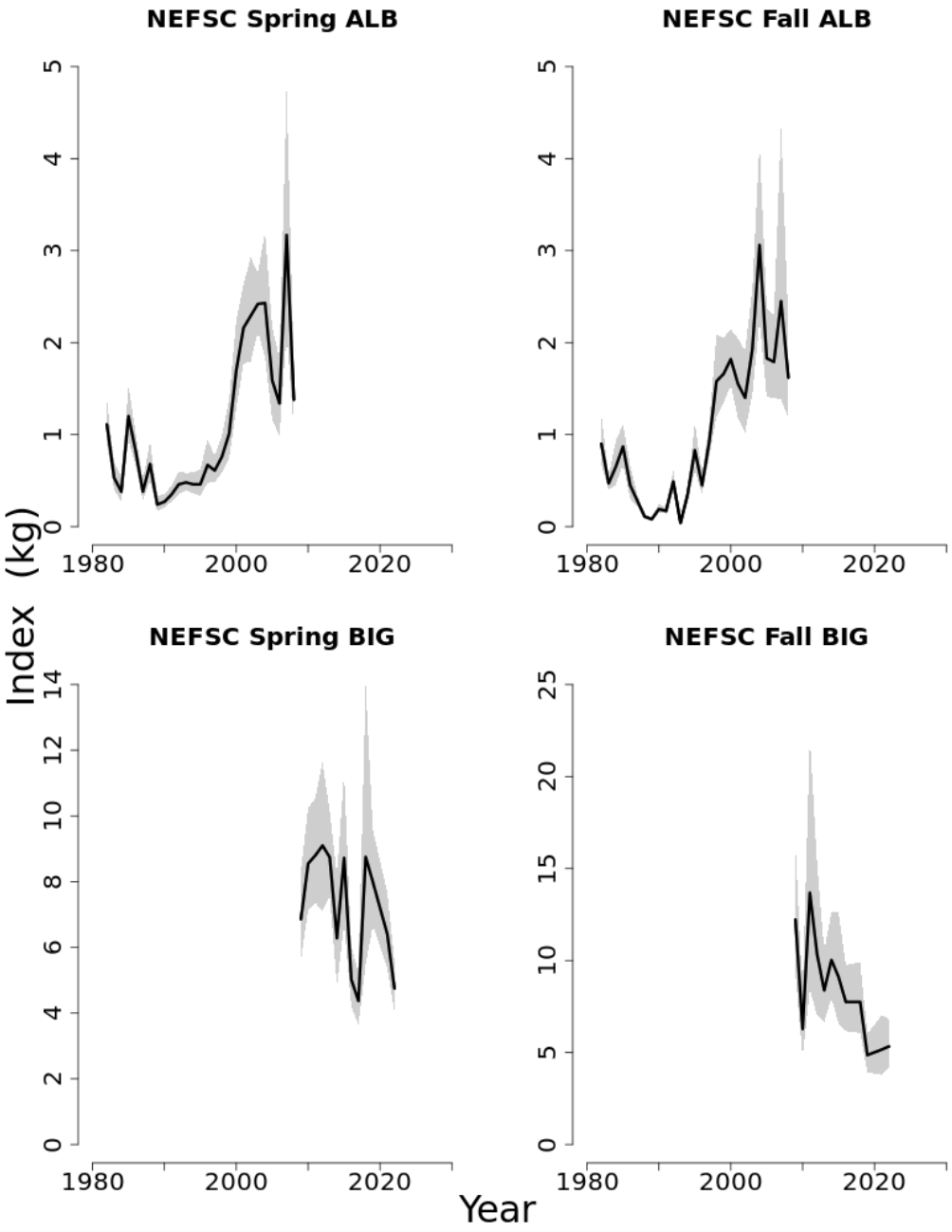

Com. land.
Com. disc.
Rec. land.
Rec. disc.
Total fishery removals (mt)
0
5000
15000
25000
35000
1982
1987
1992
1997
2002
2007
2012
2017
2022
Year

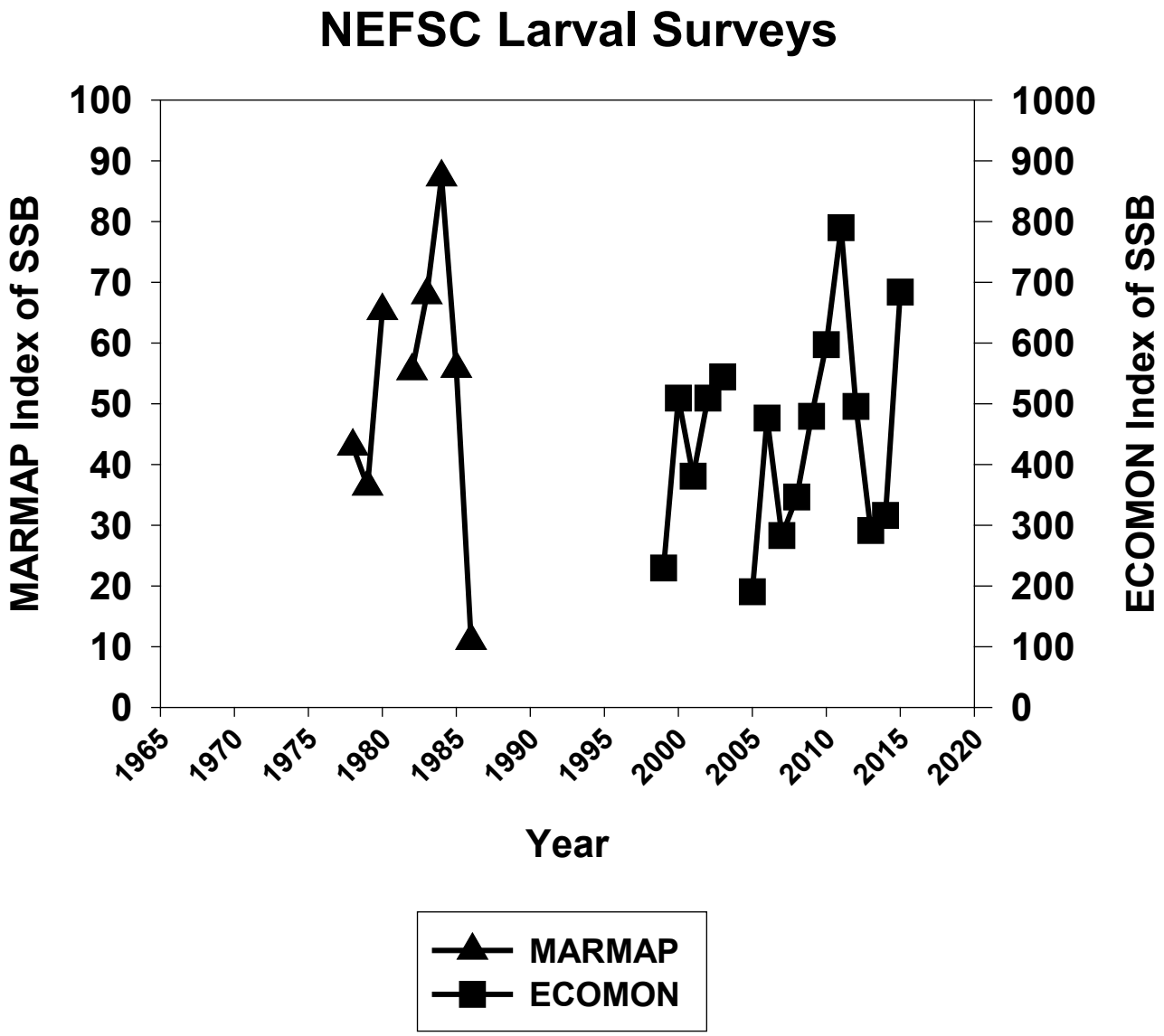
TOR 2: Indices of abundance

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

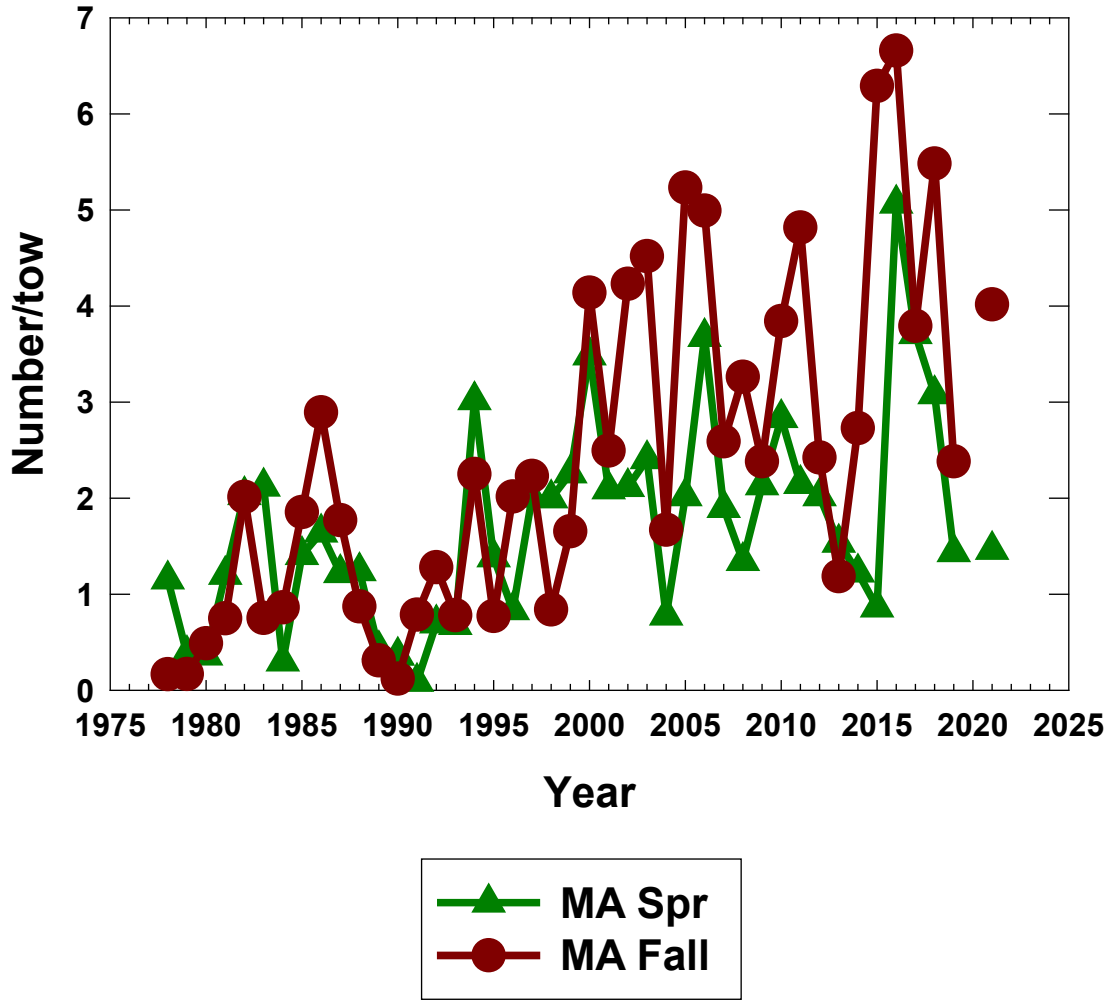
Research Surveys

- NEFSC Winter 1992-2007, Fall and Spring 1967-2022 (no Fall 2017 or 2020)
- MADMF Spring and Fall 1978-2022, Seine YOY 1982-2022
- RIDFW Fall 1981-2022, Monthly Fixed Station 1990-2022
- URIGSO Narragansett Bay/RI Sound 1959-2022
- CTDEP Spring and Fall 1984-2022
- NYDEC Peconic Bay 1987-2022
- NJDFW Apr-Oct 1988-2022
- DEDFW 16 ft Estuary YOY 1980-2022, 16 ft Inland Bays YOY 1986-2022, 30 ft Mainstem Bay Trawl 1991-2022
- MDDNR YOY 1972-2022
- VIMS Juv. Trawl YOY 1955-2022
- VIMS ChesMMAP 2002-2022
- VIMS NEAMAP Fall and Spring 2007-2022
- NCDMF YOY 1987-2022
- NEFSC MARMAP 1978-1986 and ECOMON 1999-2015 Larval indices of SSB

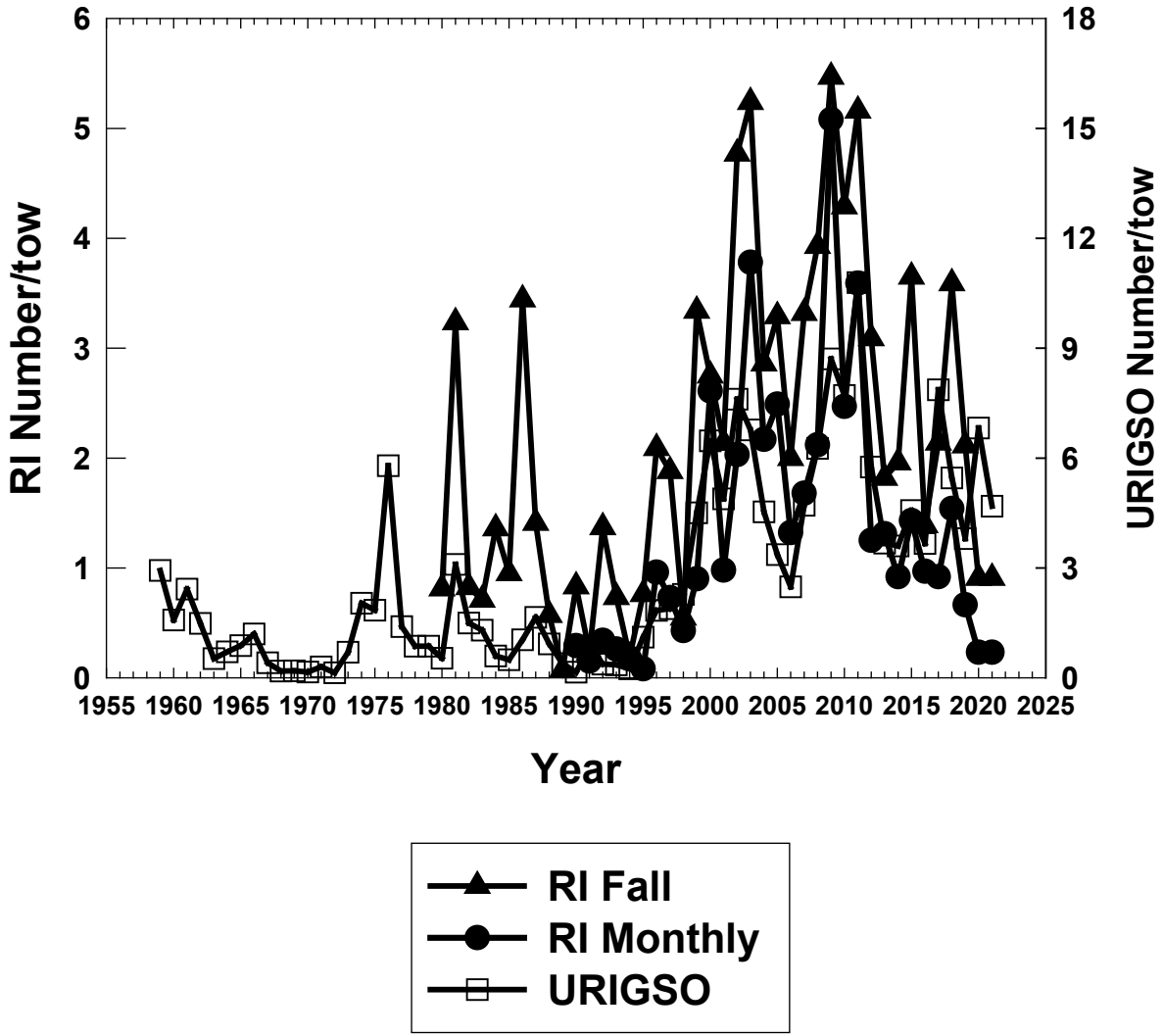

NEFSC Spring ALB
NEFSC Fall ALB
NEFSC Spring BIG
NEFSC Fall BIG
Index (kg)
Year
0
1
2
3
4
5
0
2
4
6
8
10
12
14
0
5
10
15
20
25
1980
2000
2020


NEFSC Larval Surveys
MARMAP Index of SSB
ECOMON Index of SSB
Year
100
90
80
70
60
50
40
30
20
10
0
1000
900
800
700
600
500
400
300
200
100
0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
MARMAP
ECOMON

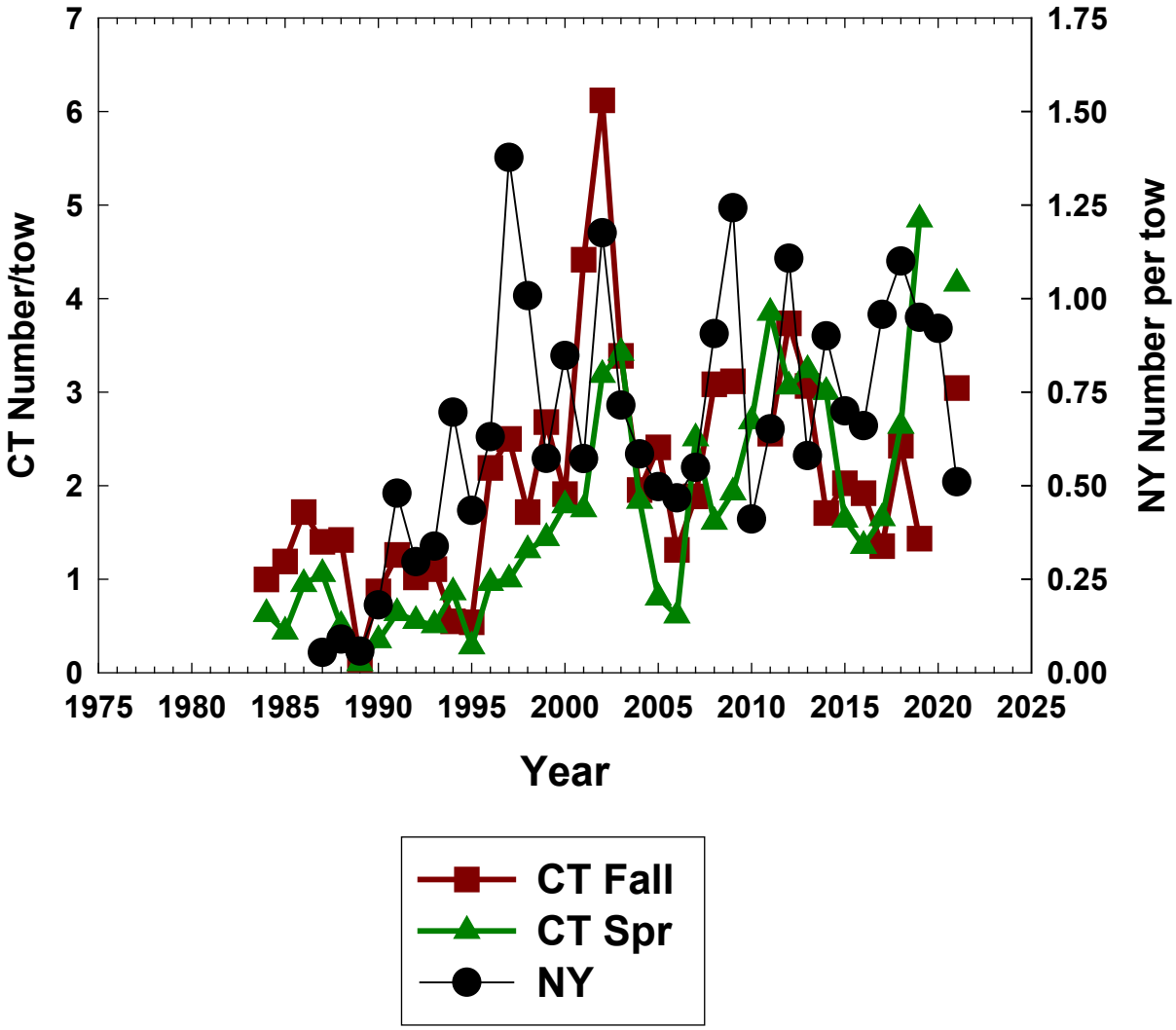
MA Trawl Surveys



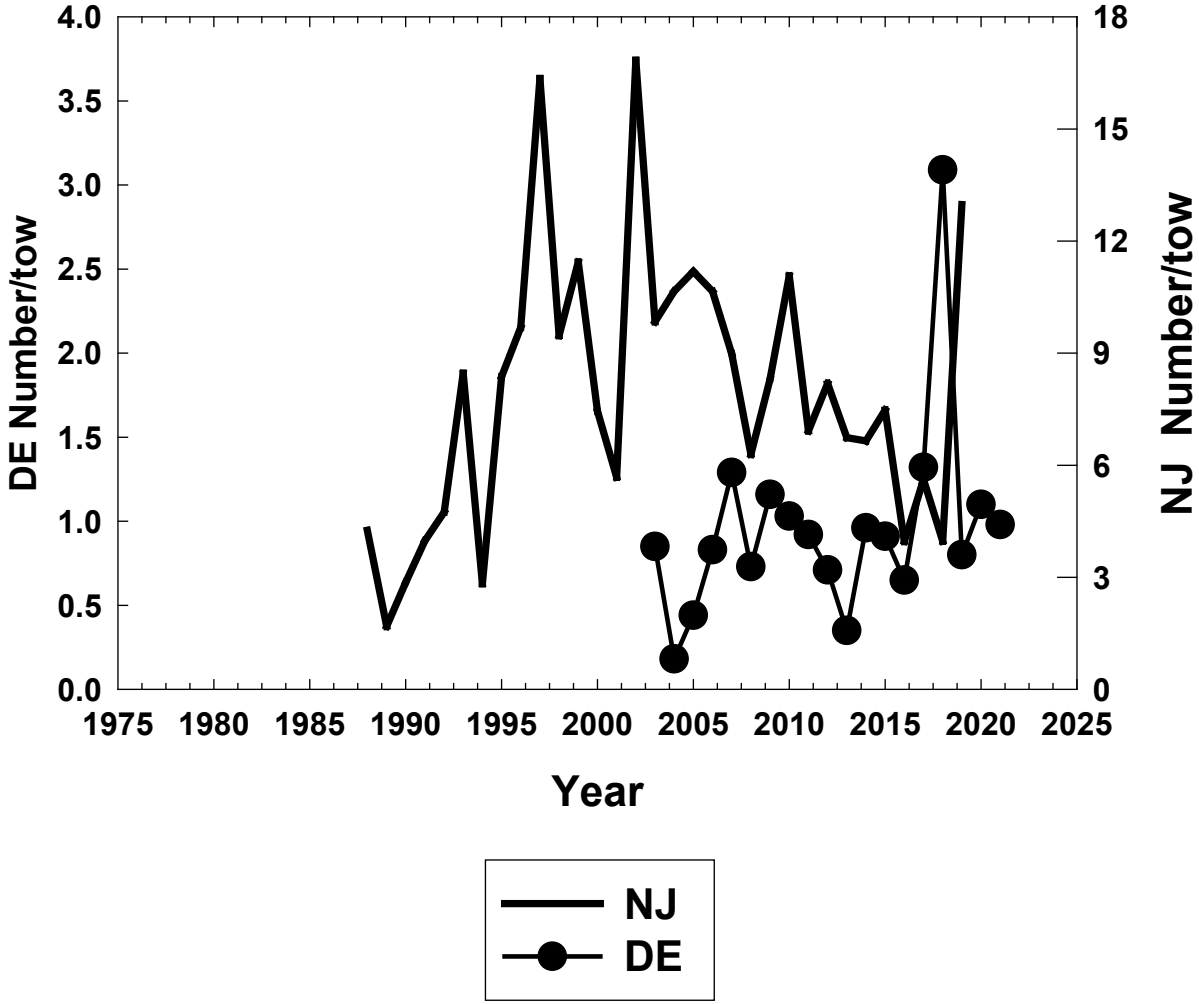
RI Trawl Surveys



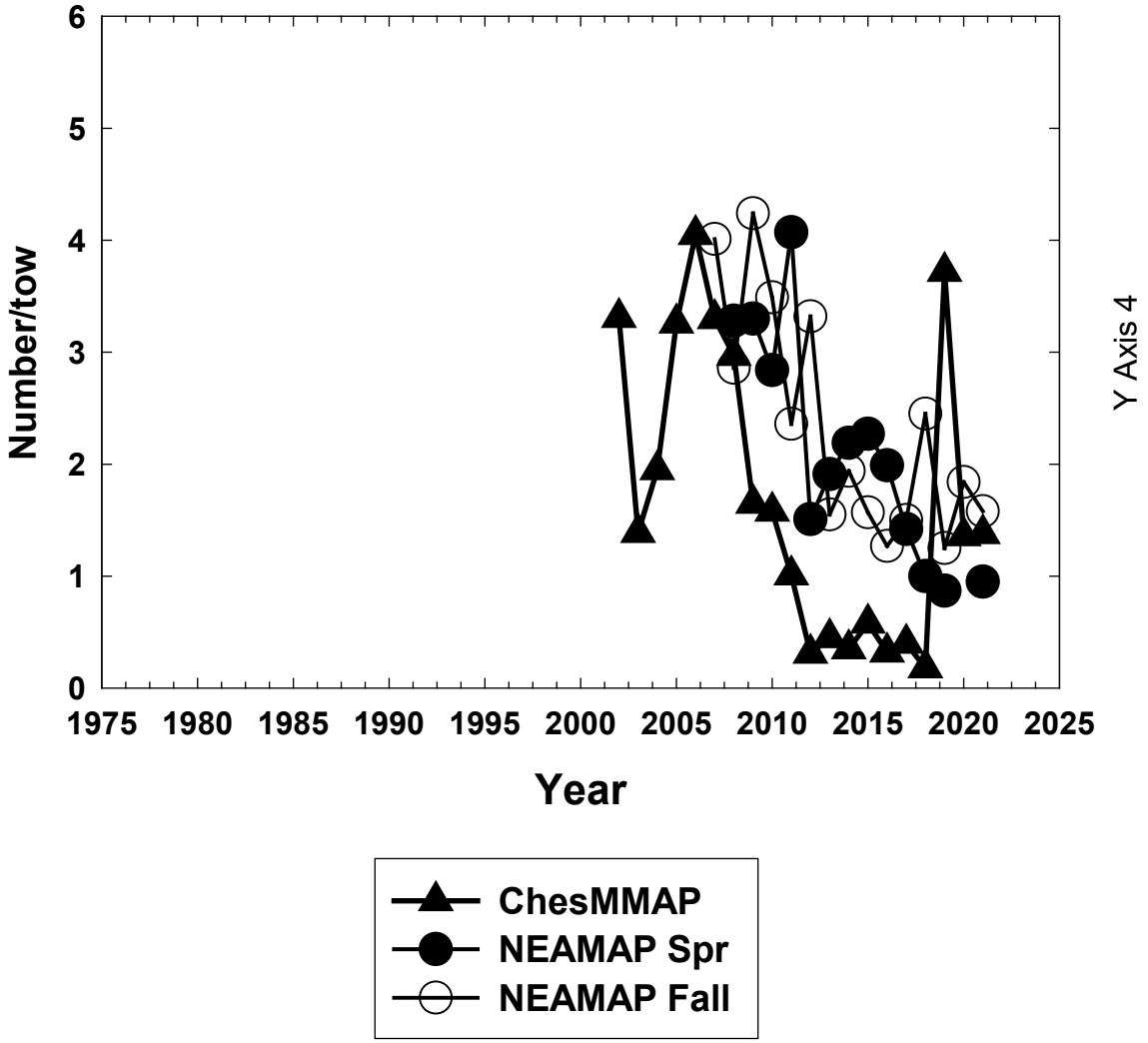
CT and NY Trawl Surveys



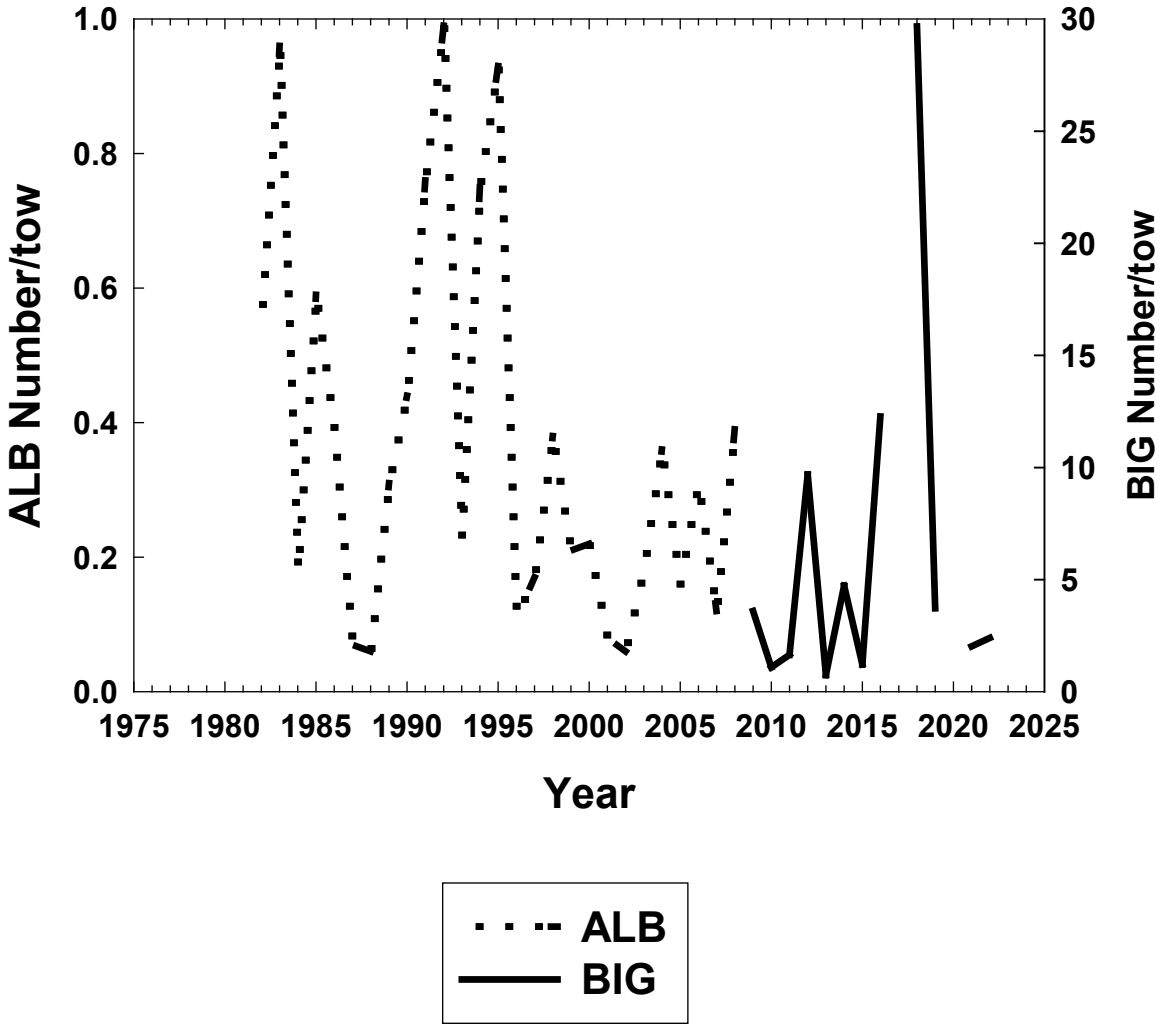
NJ and DE Trawl Surveys



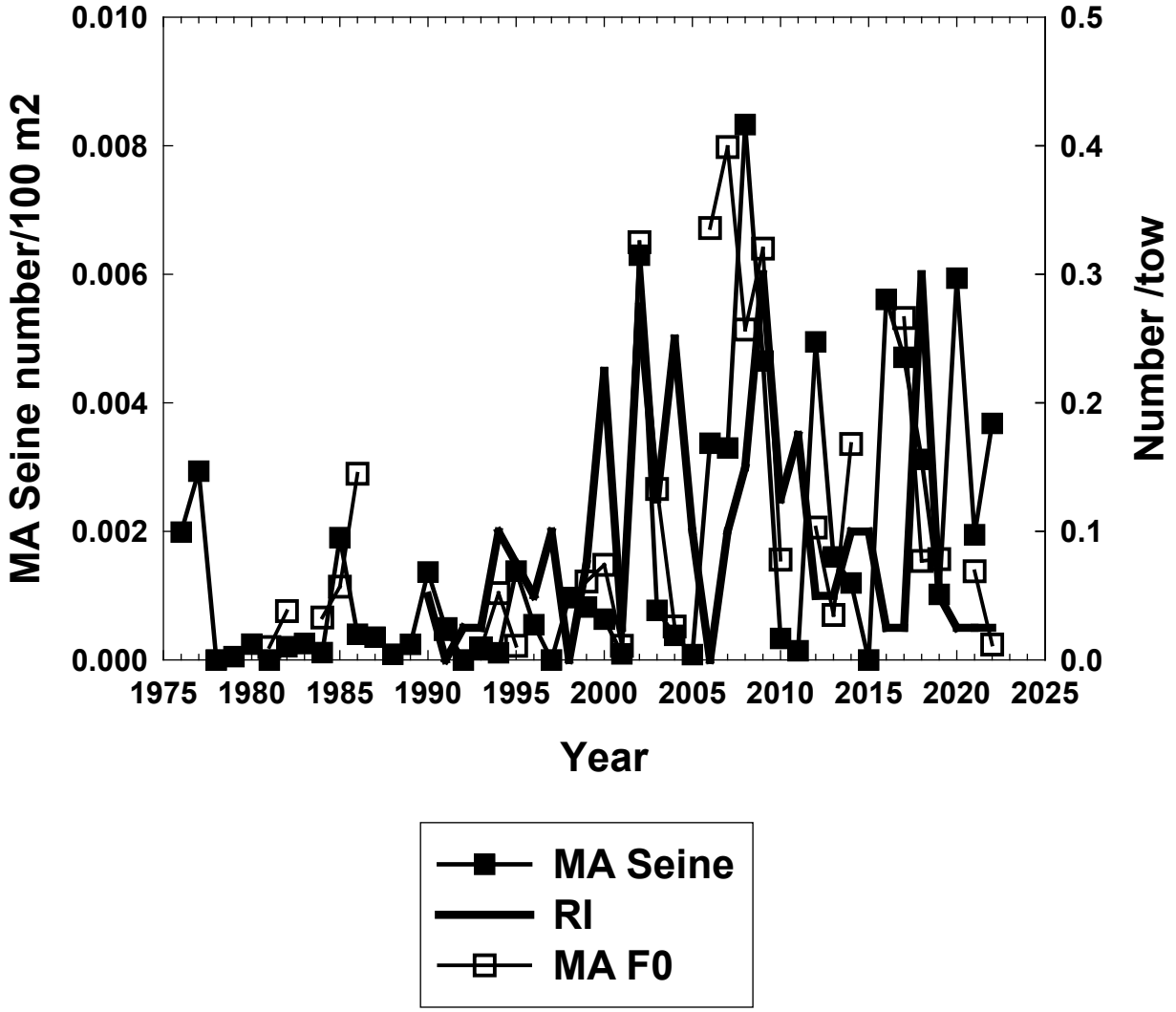
ChesMMAP and NEAMAP Trawl Surveys



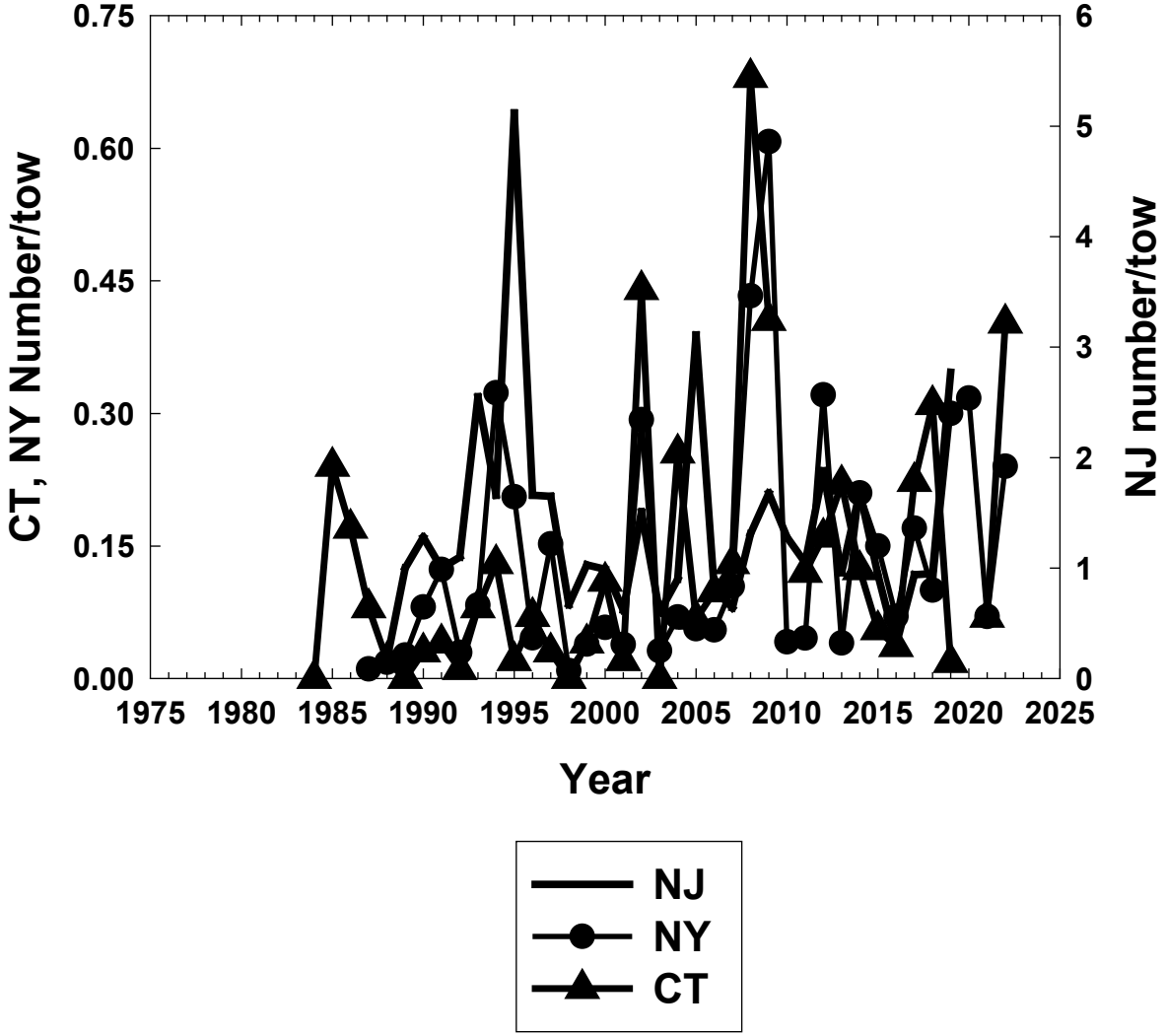
NEFSC Fall Age 0 Indices



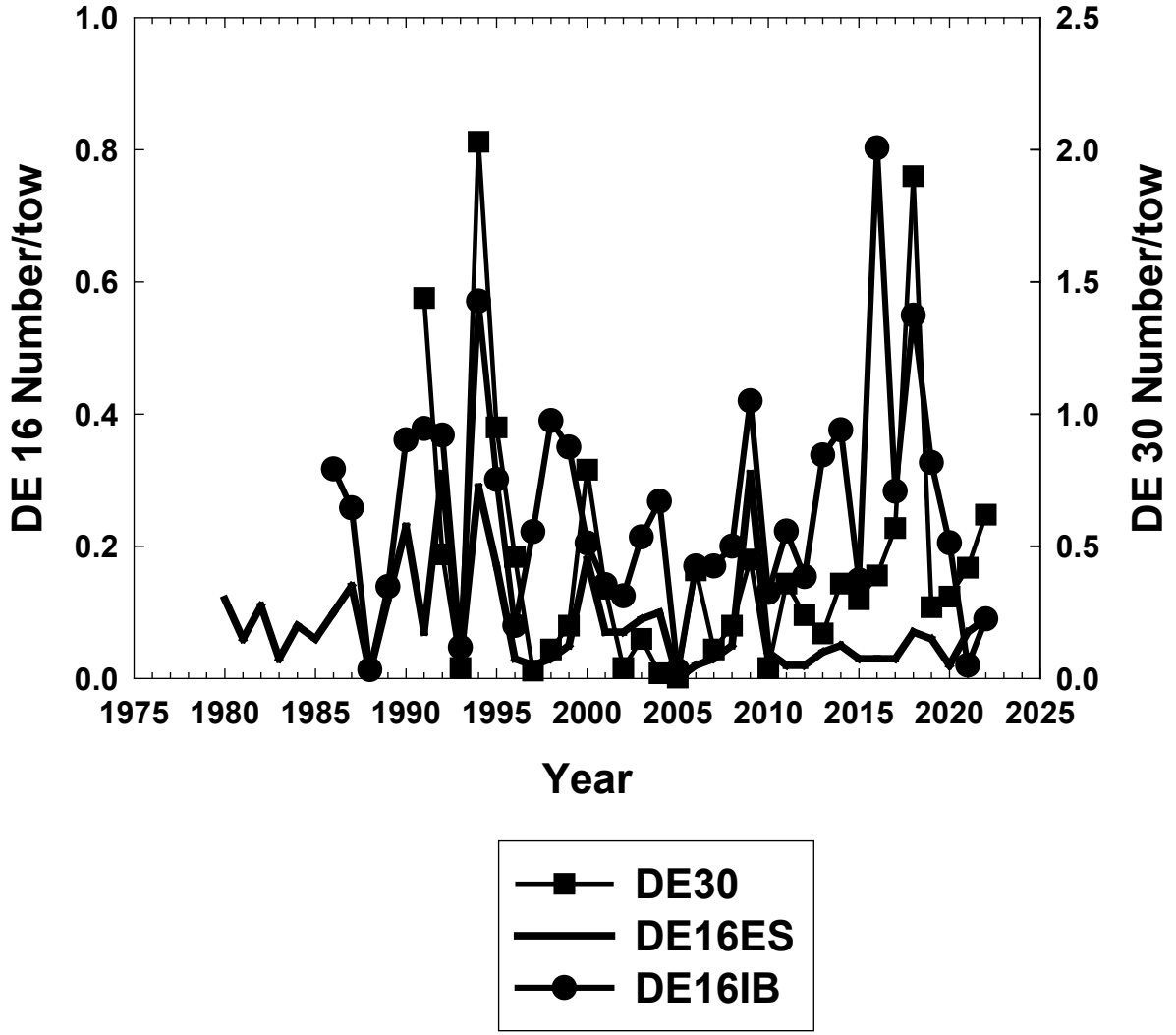
MA and RI Age 0 Indices



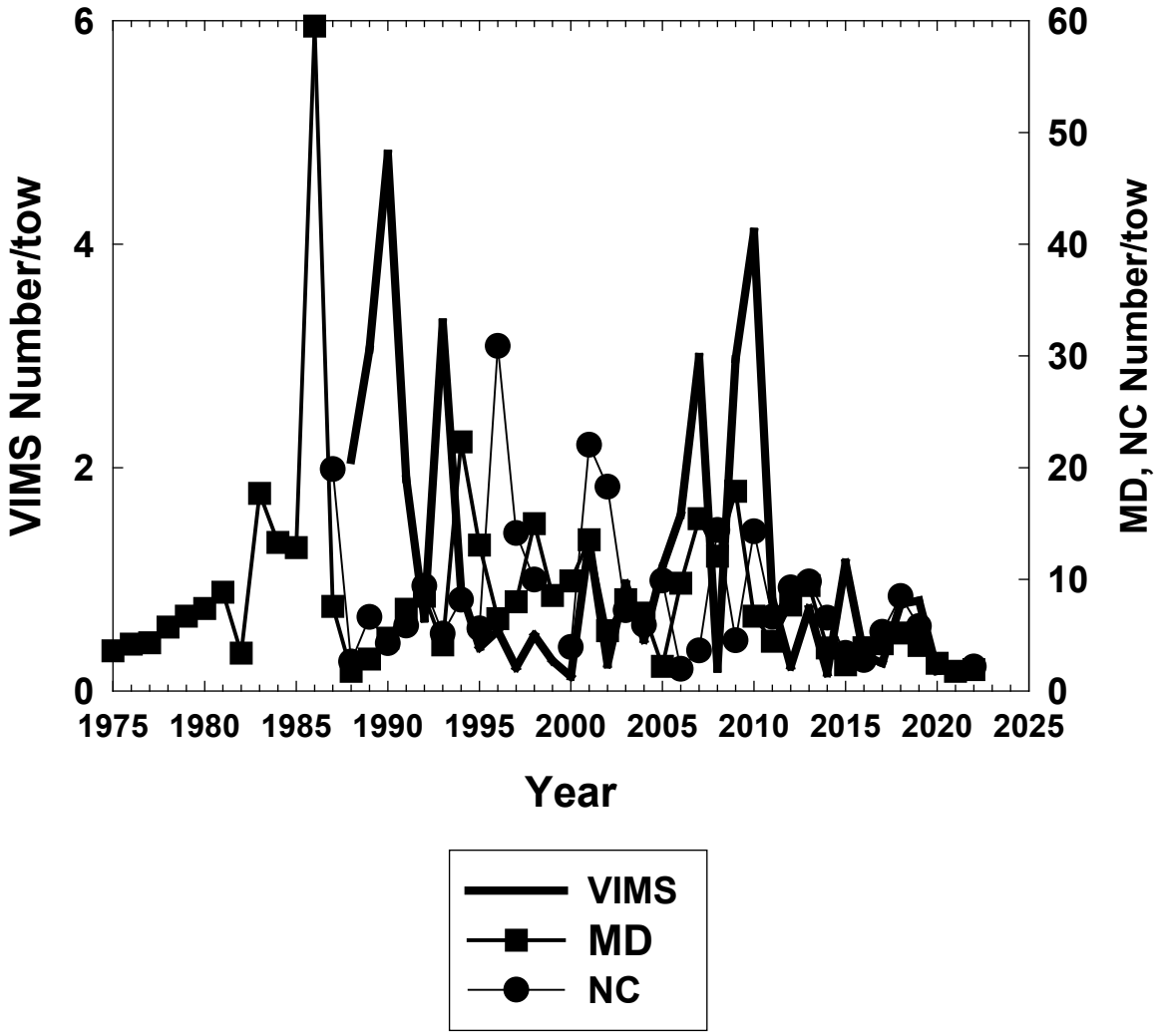
CT, NY and NJ Age 0 Indices



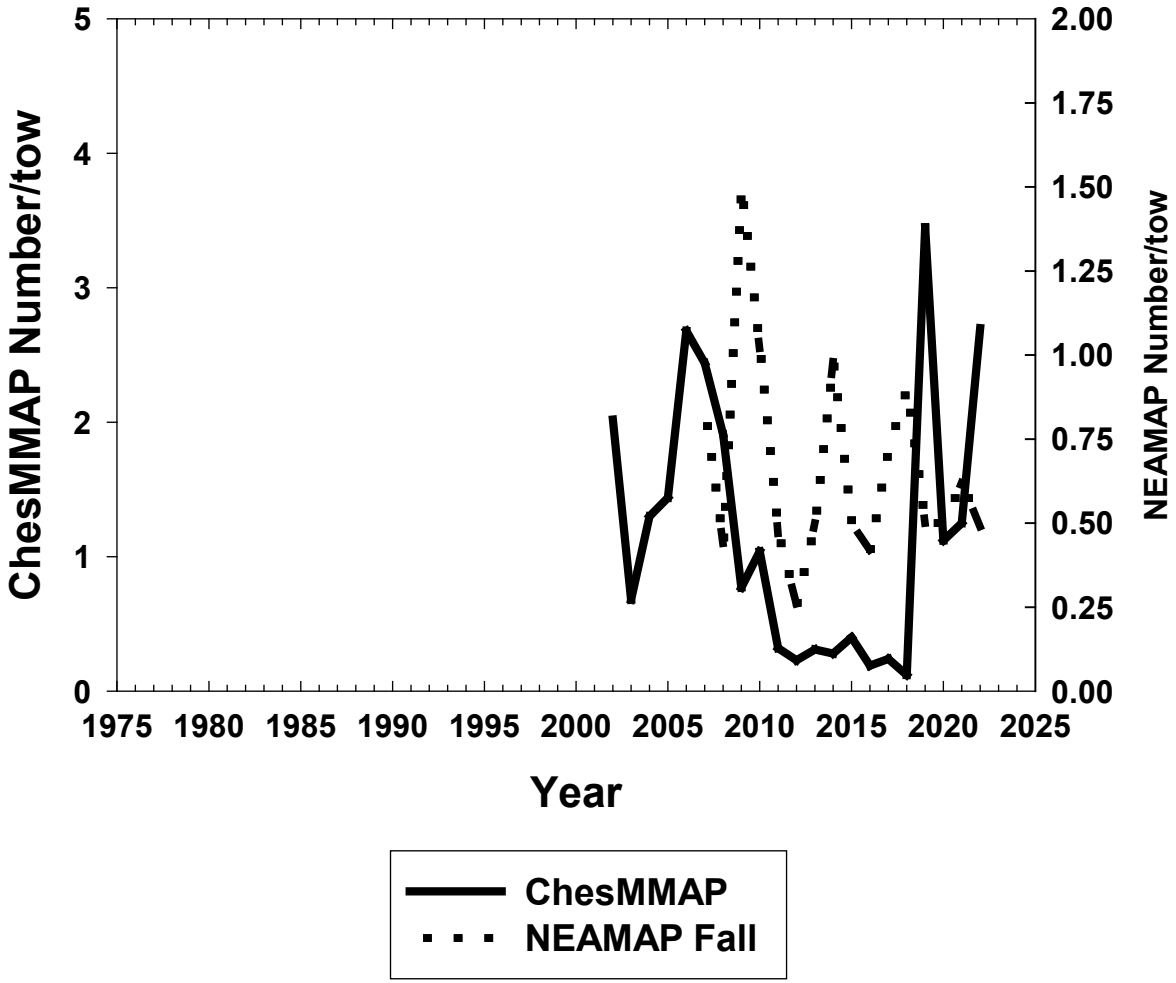
DE Age 0 Indices



MD, VIMS and NC Age 0 Indices

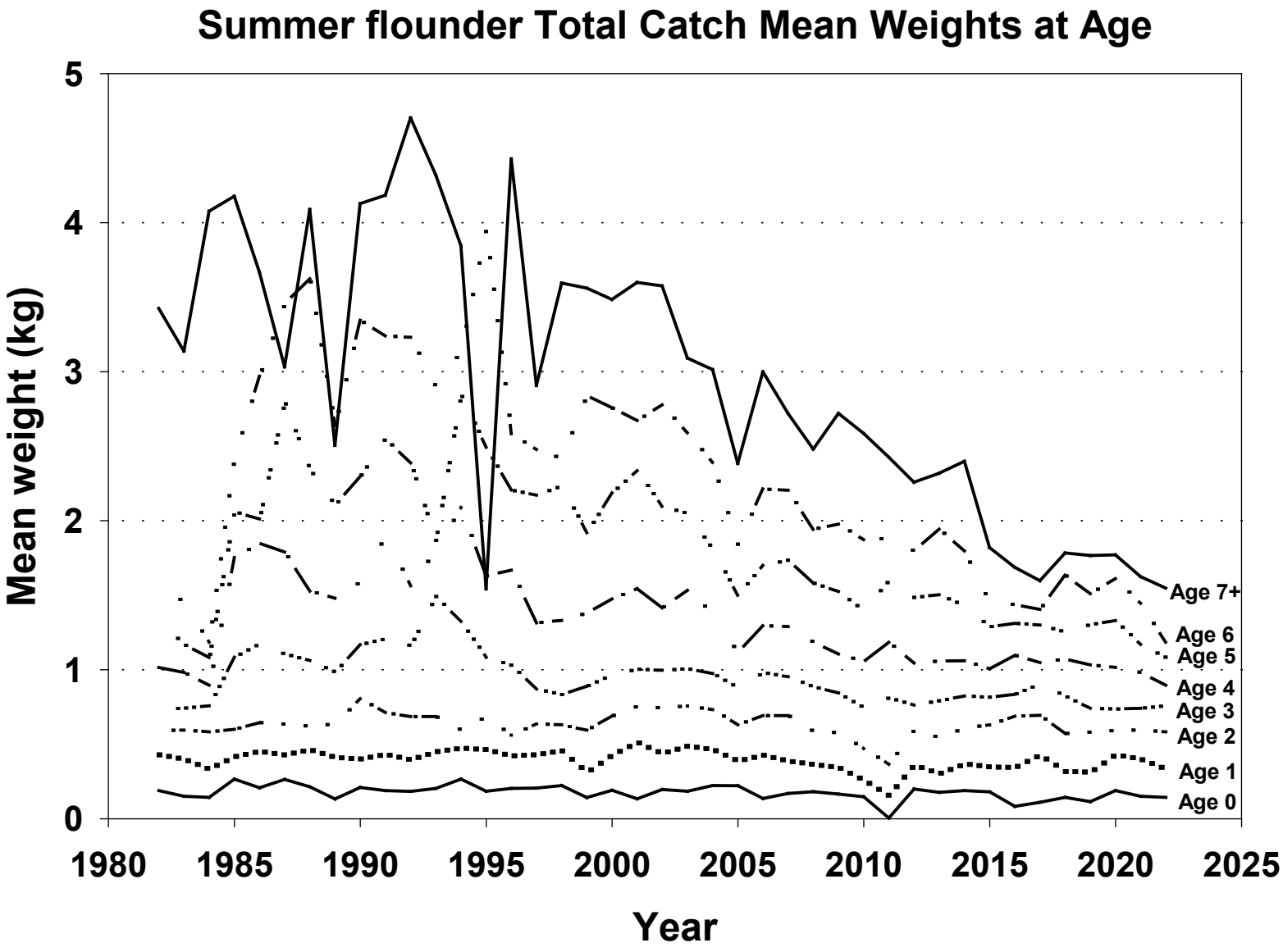


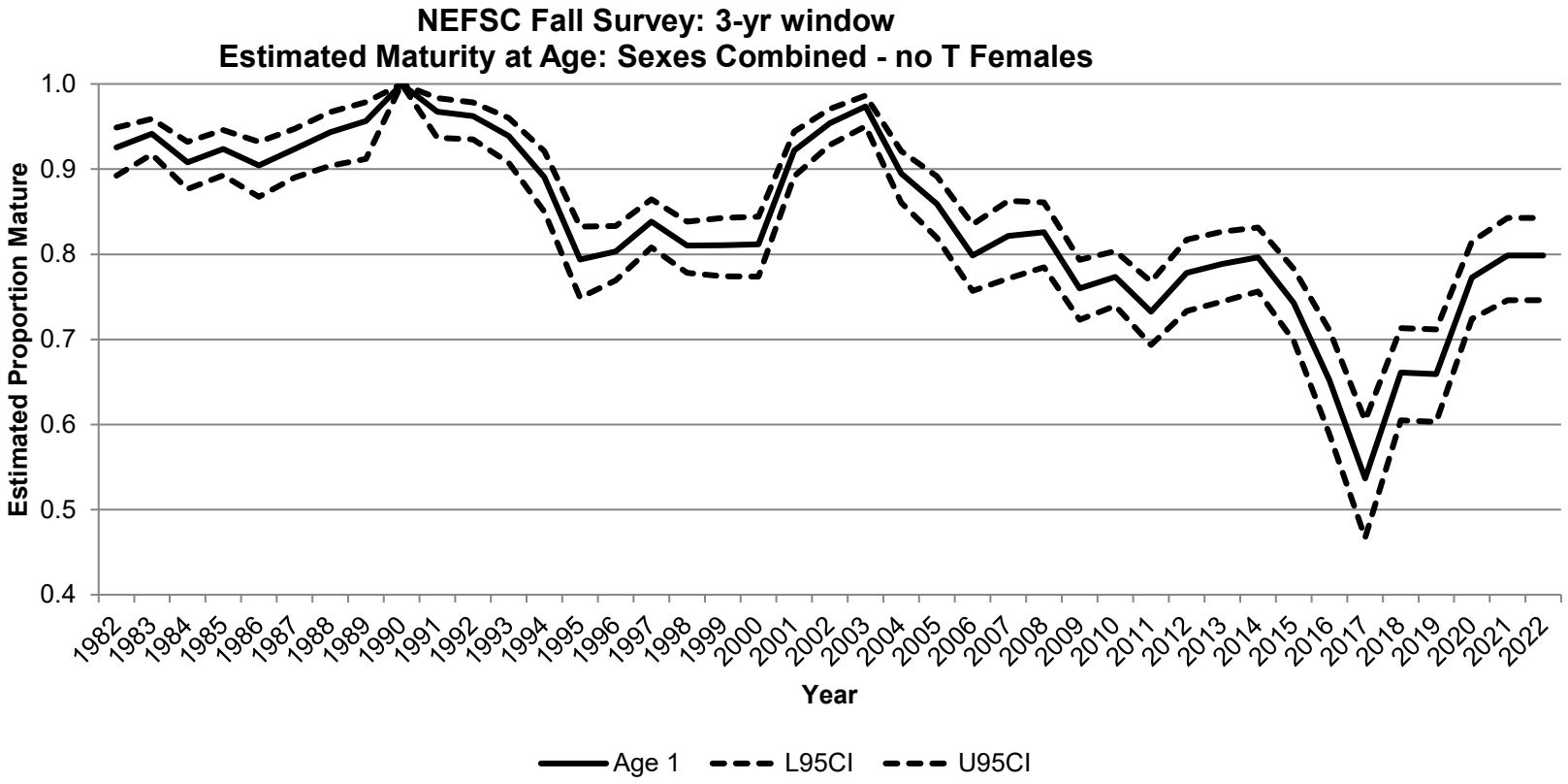
ChesMMAP and NEAMAP Age 0 Indices

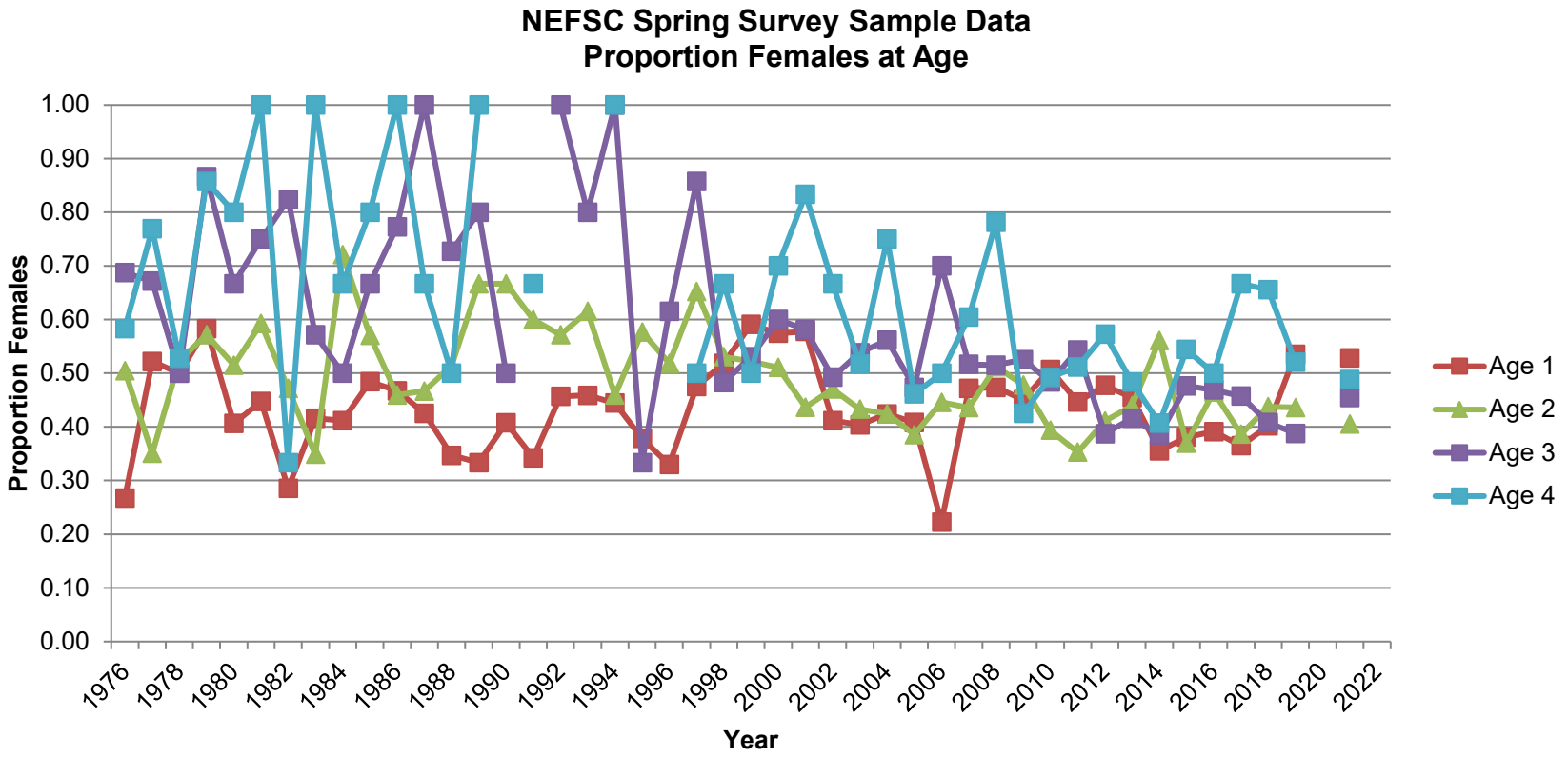


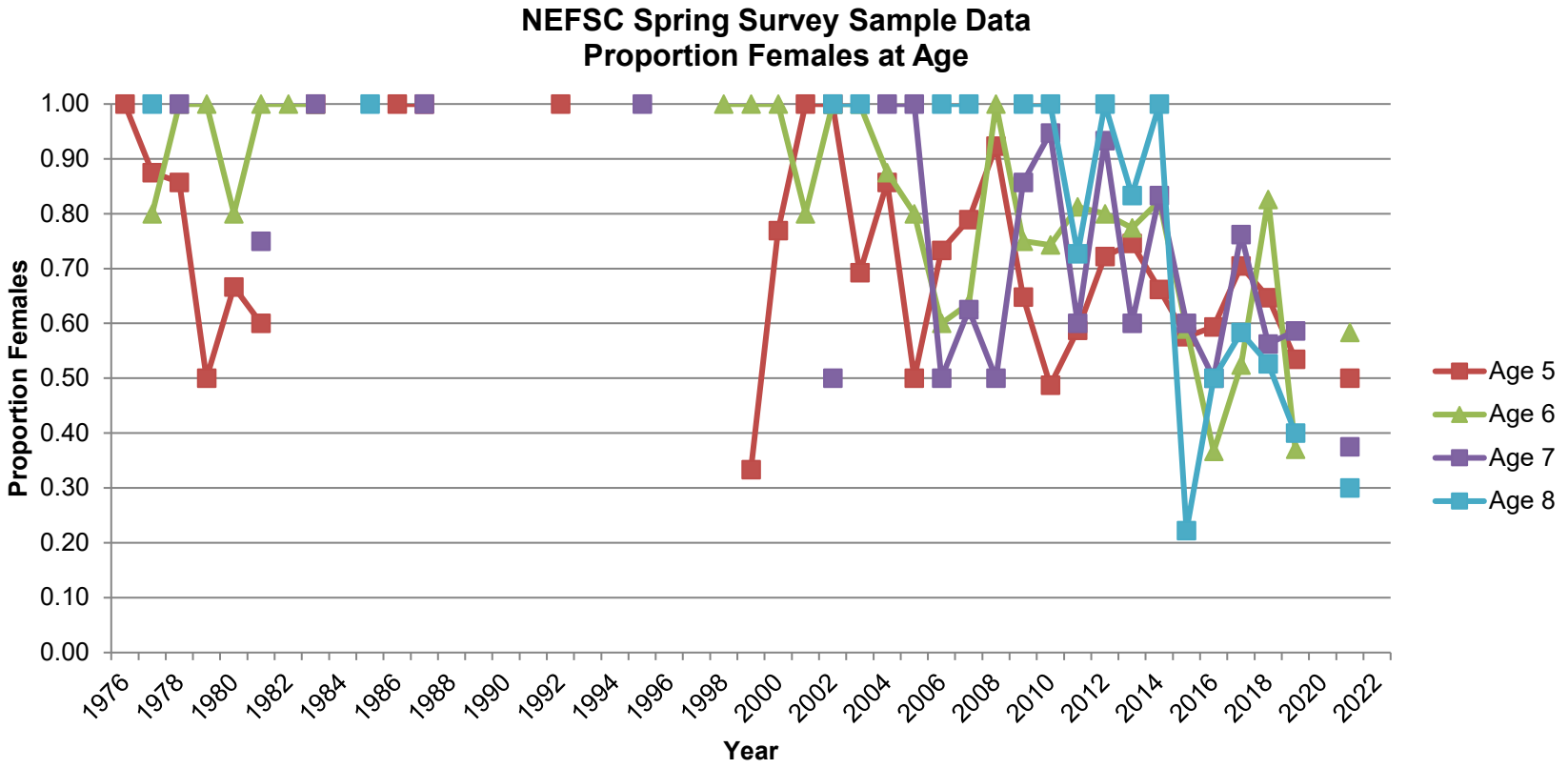
Summer flounder (*Paralichthys dentatus*) Life History

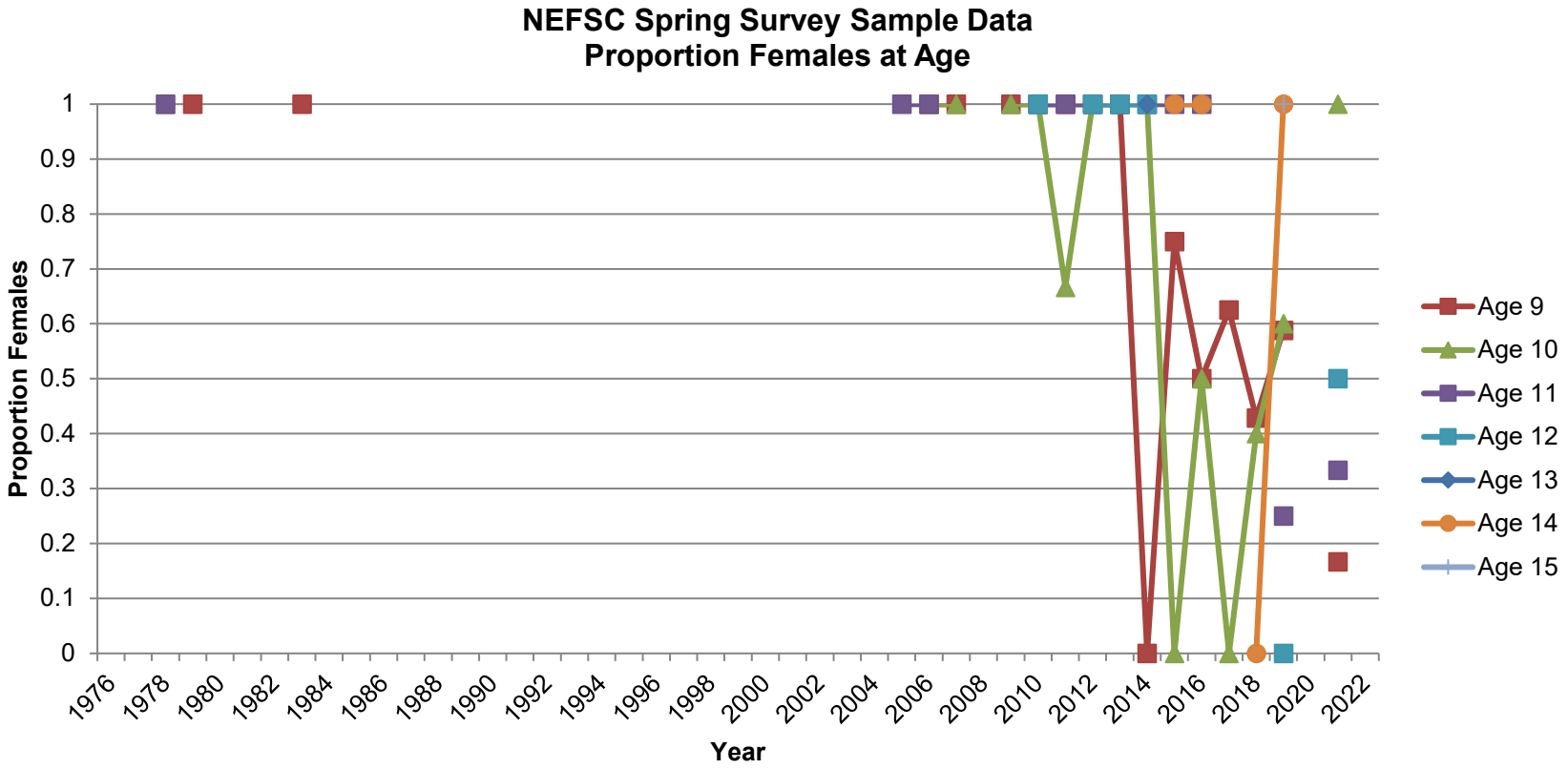
- Biological data from NEFSC survey and fishery samples
- Over last ~decade: more large, old fish
  Transition from scales to otoliths for all aging
  Current maximum ages of 18 and 20 for males (50, 57 cm) and 19 (73, 79 cm) for females
- Over last ~decade:
  - decreasing mean length and weight at age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


Summer flounder Total Catch Mean Weights at Age
Mean weight (kg)
0
1
2
3
4
5
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
Year
Age 7+
Age 6
Age 5
Age 4
Age 3
Age 2
Age 1
Age 0


NEFSC Fall Survey: 3-yr window
Estimated Maturity at Age: Sexes Combined - no T Females
Estimated Proportion Mature
1.0
0.9
0.8
0.7
0.6
0.5
0.4
1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022
Year
Age 1
L95CI
U95CI


NEFSC Spring Survey Sample Data
Proportion Females at Age
Proportion Females
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
Year
Age 1
Age 2
Age 3
Age 4


NEFSC Spring Survey Sample Data
Proportion Females at Age
Proportion Females
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
Year
Age 5
Age 6
Age 7
Age 8


NEFSC Spring Survey Sample Data
Proportion Females at Age
Proportion Females
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
Year
Age 9
Age 10
Age 11
Age 12
Age 13
Age 14
Age 15

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

2023 Management Track Assessment
ASAP Model thru 2022

- NEFSC NFT ASAP Statistical Catch at Age Model

- M at ages 0-7+ (model ages 1-8+); variable M at age average = 0.25
- Weights at age for Catch and SSB; recent decreases
- Maturity at age: 3 year moving window ~70% age 1, 100% age 2+
- Recently variable from ~50% to ~80% at age 1

- Four fleets - Landings and Discards (Com L, Com D, Rec L, Rec D)

- Several federal and state surveys with age comp indices
- Several stand-alone YOY indices
- A few aggregate indices of abundance
- SV selex modeled with at-age estimation; constant over full time series

- Fishery selex modeled with at-age estimation: 3 time blocks 1982, 1995, 2008; Landings selex with S = 1 at true age 2-4; discards at true age 1-3;

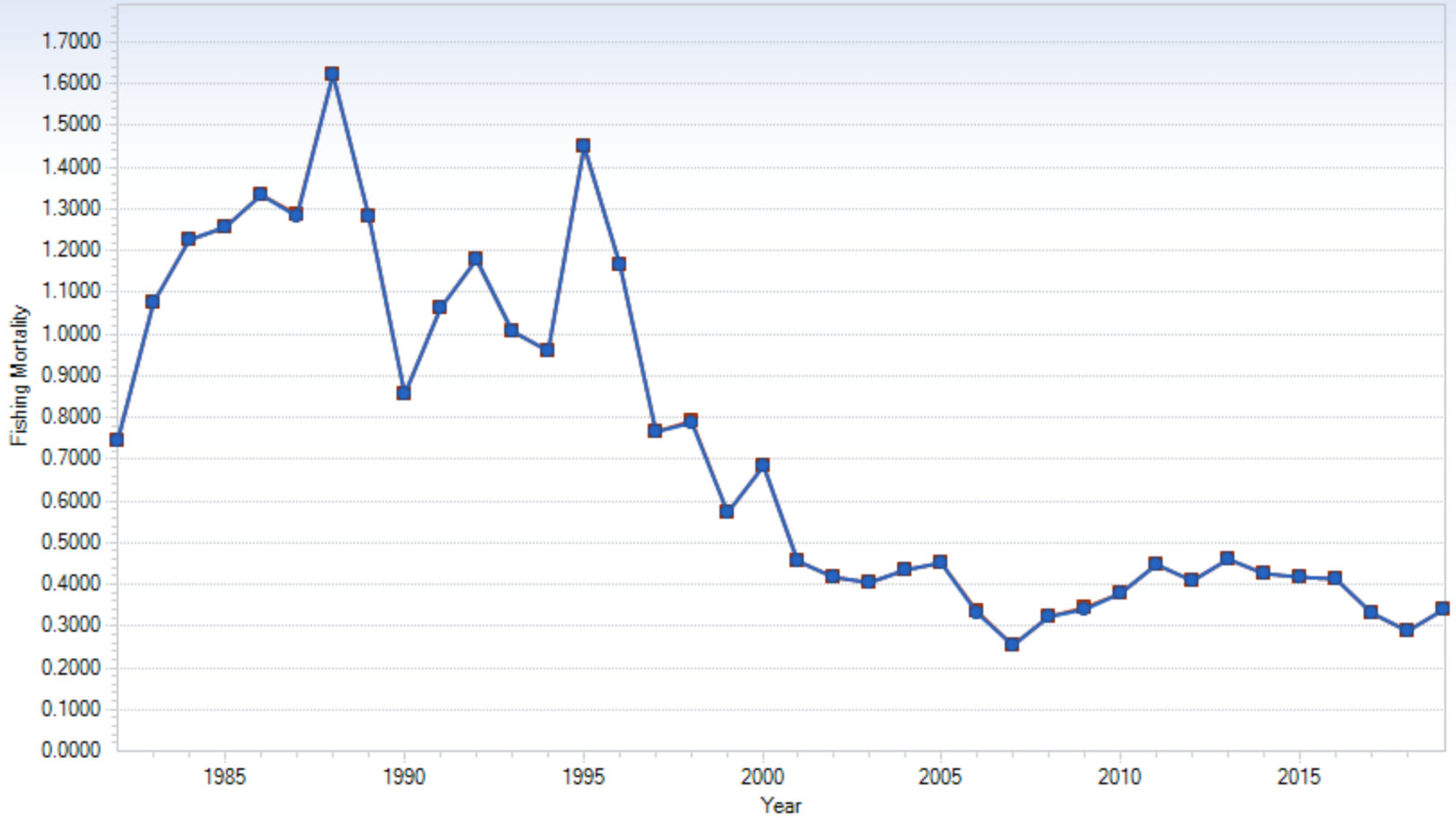
Summer flounder 2023 MTA
ASAP Model Development

- **1) Comparison of 2021 MTA model using BIG sweep-study efficiency and average tow swept area (SSQ) to BIG efficiency and individual tow area swept (AS): very minor effect on indices and model**

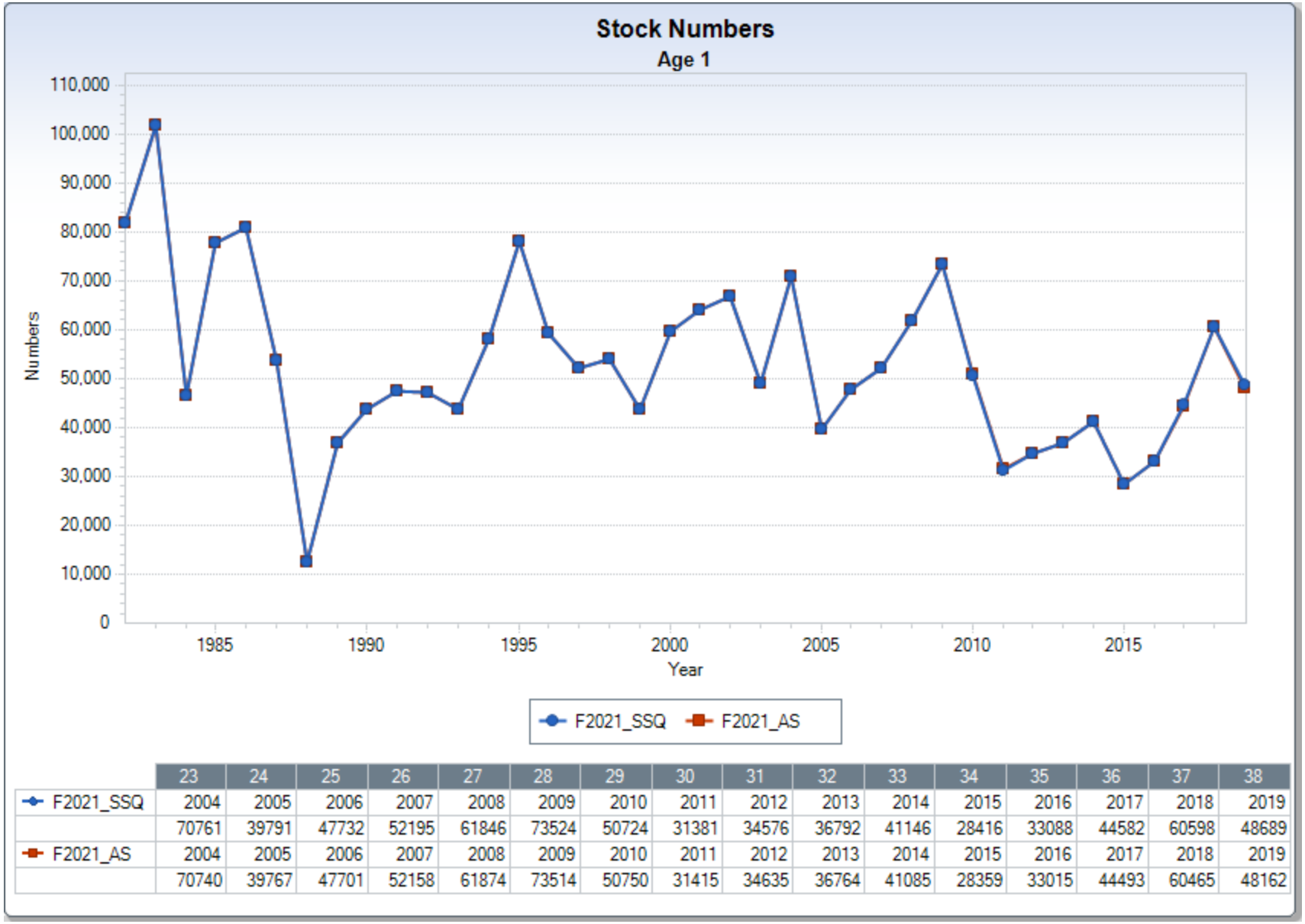
Spawning Stock Biomass

	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
F2021_SSQ	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	51708	60095	67498	62534	58923	62295	61370	61847	63421	62137	56467	60957	53700	49600	44212	41313	39516	41403	47397
F2021_AS	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	51693	60075	67471	62504	58889	62251	61319	61790	63368	62094	56439	60953	53692	49589	44189	41270	39453	41318	47265

Average F



	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
F2021_SSQ	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	0.4194	0.4038	0.4327	0.4521	0.3334	0.2542	0.3208	0.3419	0.3778	0.4457	0.4092	0.4610	0.4241	0.4191	0.4143	0.3309	0.2863	0.3399
F2021_AS	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	0.4195	0.4039	0.4329	0.4524	0.3336	0.2543	0.3211	0.3423	0.3781	0.4458	0.4093	0.4617	0.4245	0.4195	0.4148	0.3313	0.2869	0.3410

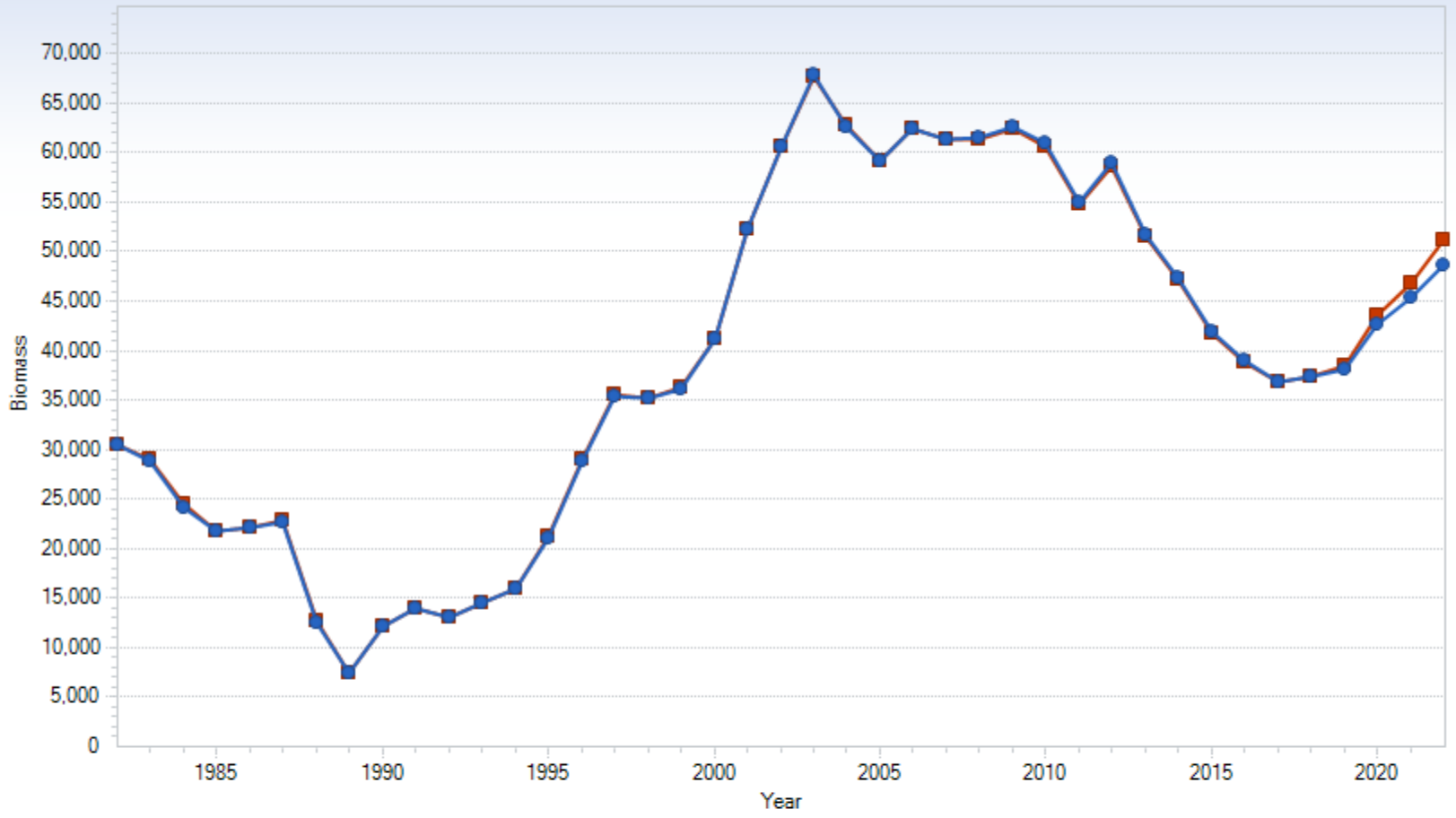


	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
F2021_SSQ	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	70761	39791	47732	52195	61846	73524	50724	31381	34576	36792	41146	28416	33088	44582	60598	48689
F2021_AS	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	70740	39767	47701	52158	61874	73514	50750	31415	34635	36764	41085	28359	33015	44493	60465	48162

Summer flounder 2023 MTA
ASAP Model Development

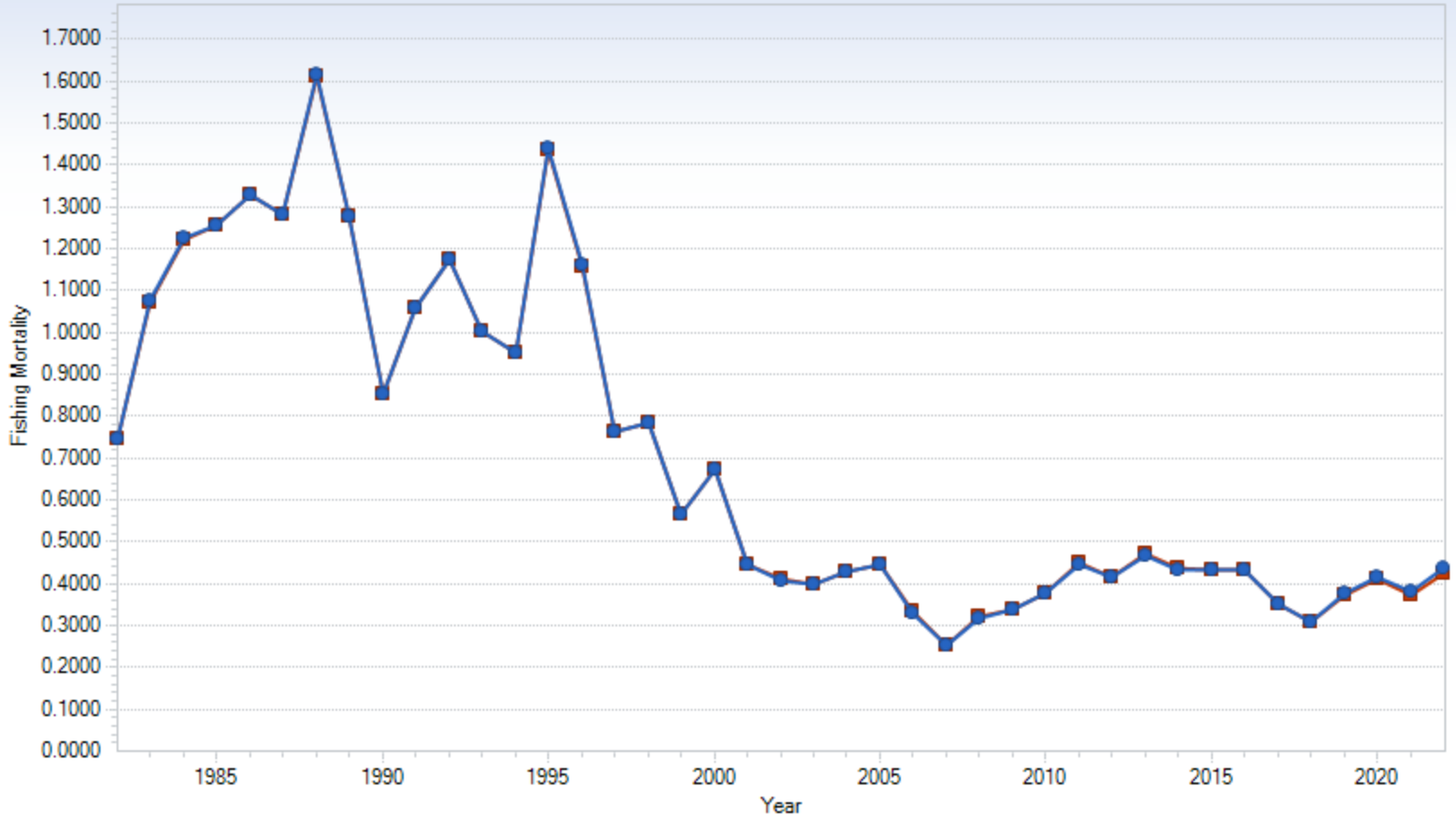
- **2) Comparison of 2023 MTA model using 2021 input SV CVs to updated SV CVs based on diagnostics (OLDSET vs NEWSET)**
  - **Inflate input CVs of a few survey indices (CT spring, NM fall, BIG fall; minor improvement in diagnostics and minor estimation effect in terminal years)**

Spawning Stock Biomass

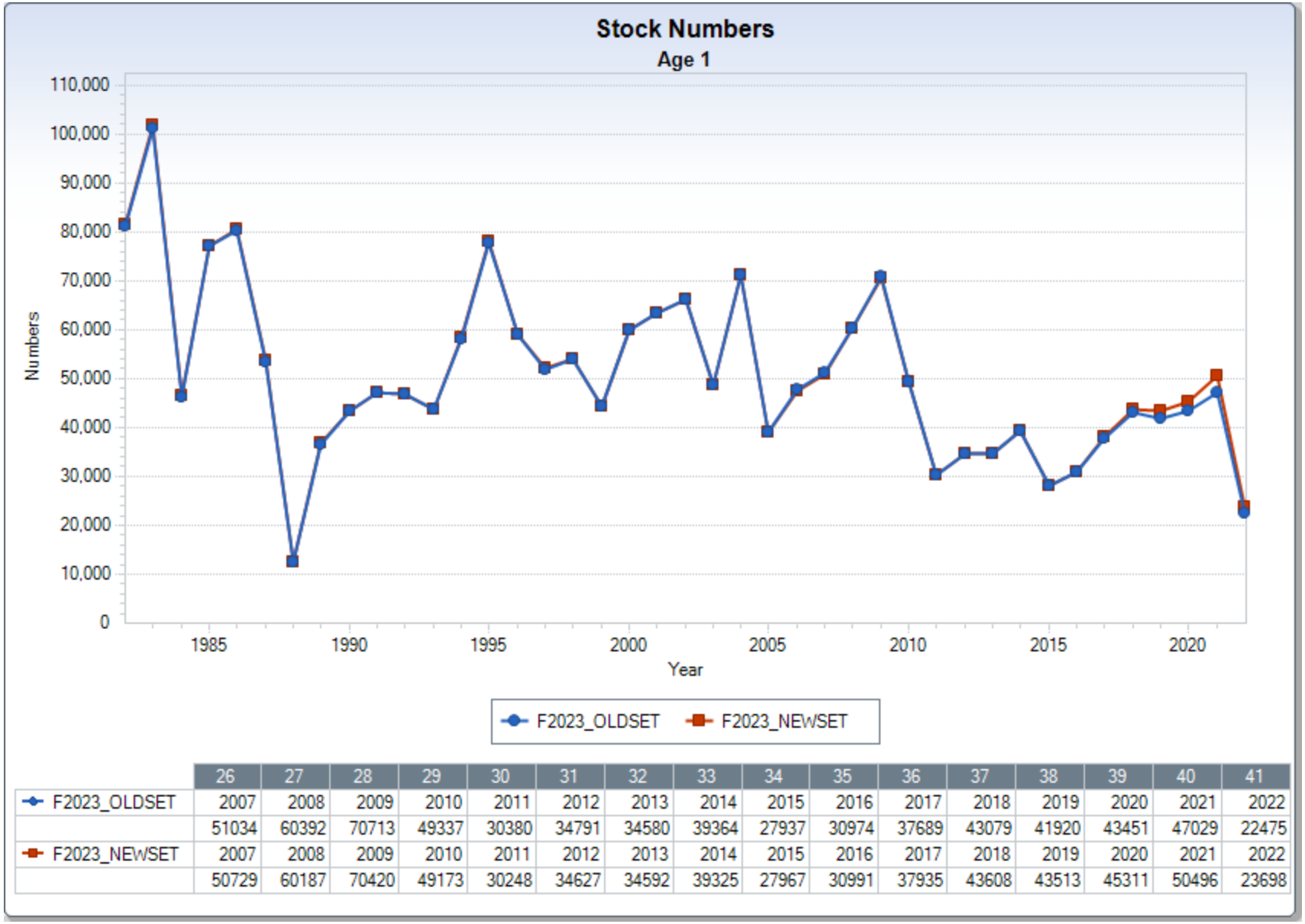


	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
F2023_OLDSET	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	59131	62383	61342	61485	62629	60922	55006	59008	51752	47451	41961	38929	36914	37317	38174	42697	45381	48638
F2023_NEWSET	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	59191	62390	61256	61307	62398	60664	54717	58666	51464	47215	41803	38821	36850	37331	38402	43482	46833	51202

Average F



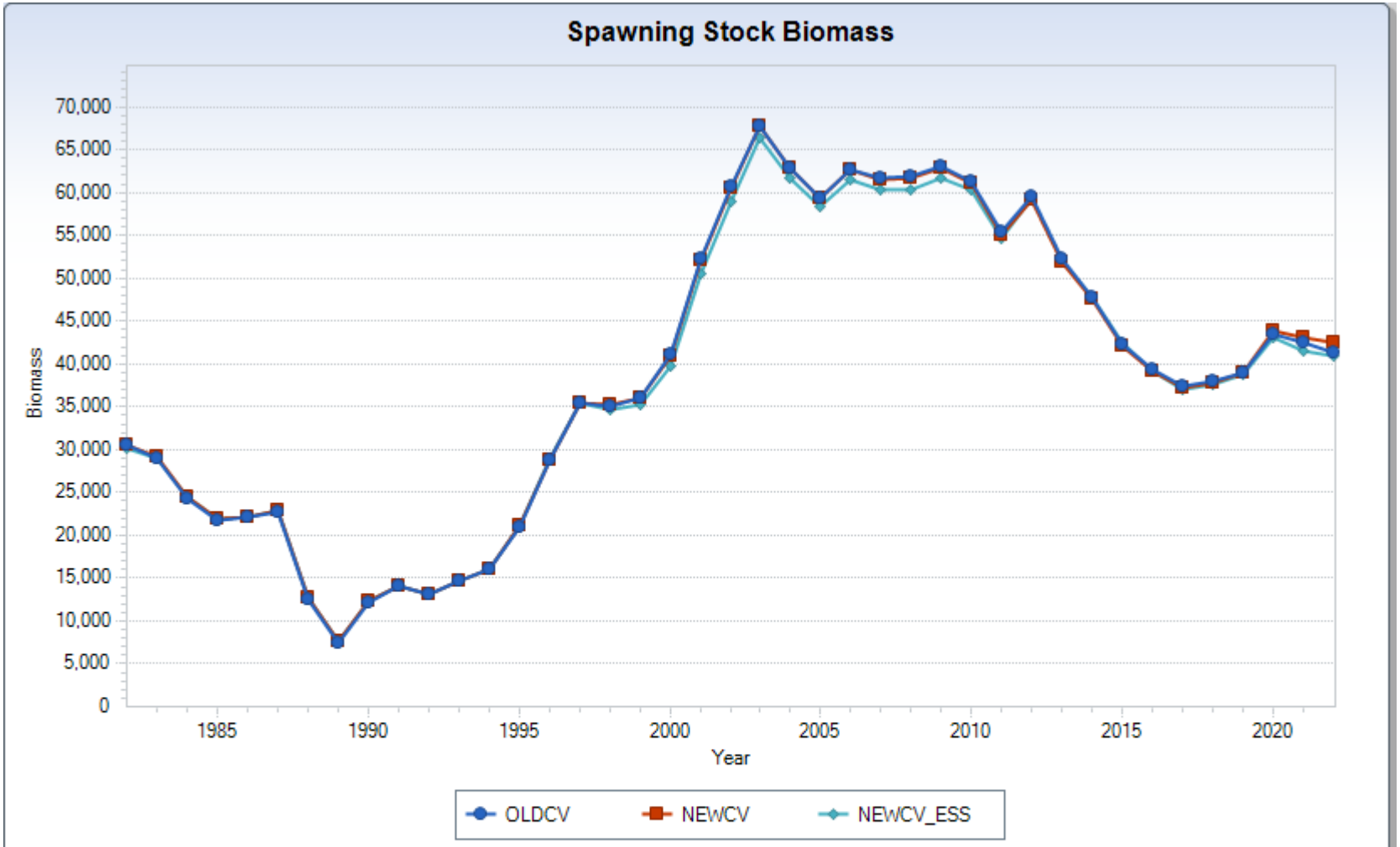
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
F2023_OLDSET	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	0.3316	0.2529	0.3189	0.3395	0.3767	0.4470	0.4154	0.4689	0.4342	0.4328	0.4328	0.3503	0.3079	0.3756	0.4159	0.3814	0.4377
F2023_NEWSET	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	0.3326	0.2537	0.3196	0.3404	0.3777	0.4492	0.4176	0.4695	0.4356	0.4339	0.4339	0.3509	0.3079	0.3722	0.4098	0.3722	0.4222



	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
F2023_OLDSET	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	51034	60392	70713	49337	30380	34791	34580	39364	27937	30974	37689	43079	41920	43451	47029	22475
F2023_NEWSET	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	50729	60187	70420	49173	30248	34627	34592	39325	27967	30991	37935	43608	43513	45311	50496	23698

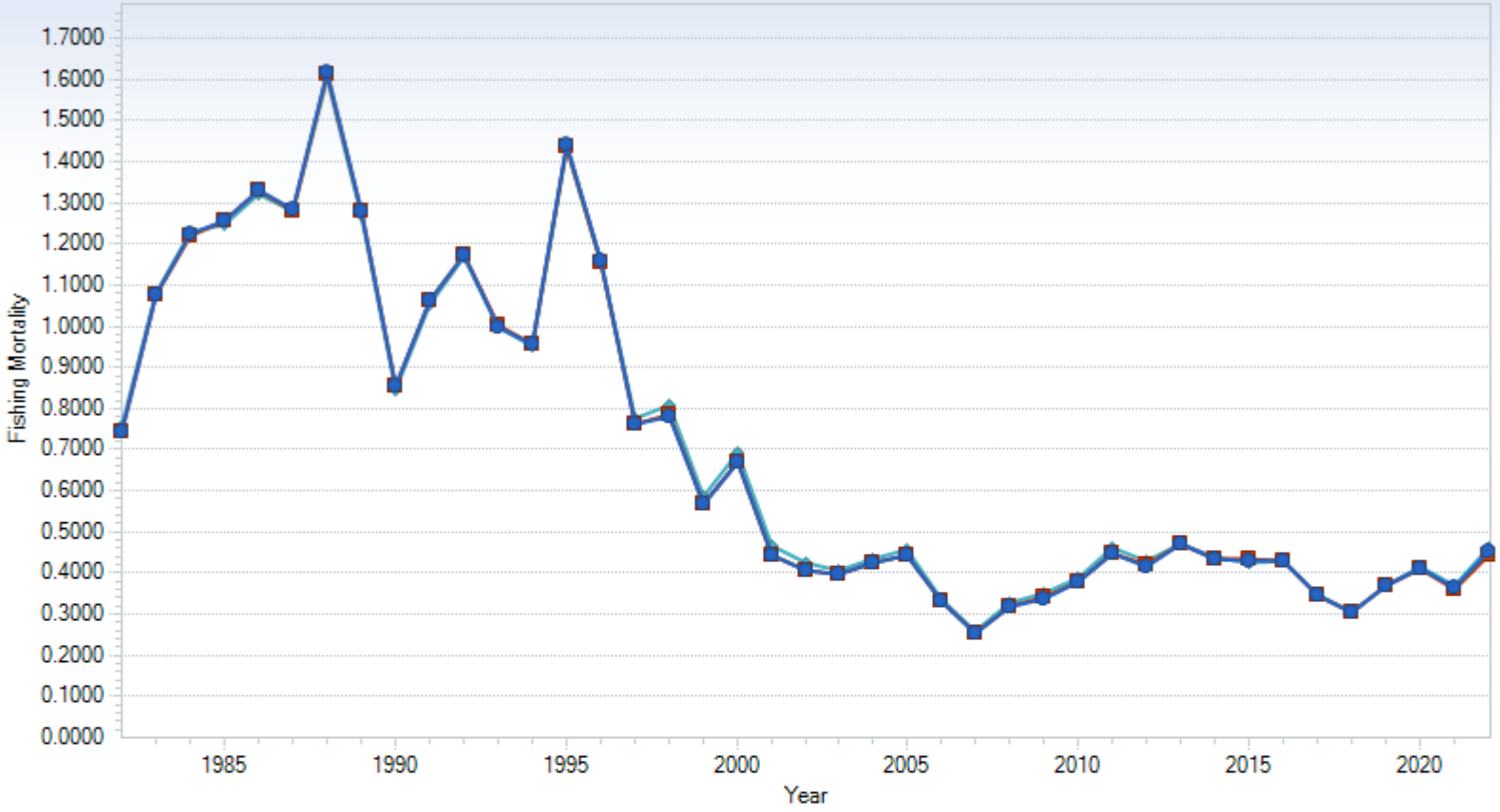
Summer flounder 2023 MTA ASAP Model Development

- **3) From 2023 MTA model NEWSET, re-center input catch and survey input ESSs (NEWSET_ESS): minor improvement in diagnostics, minor estimation effect in terminal years, moved forward with NEWSET_ESS**

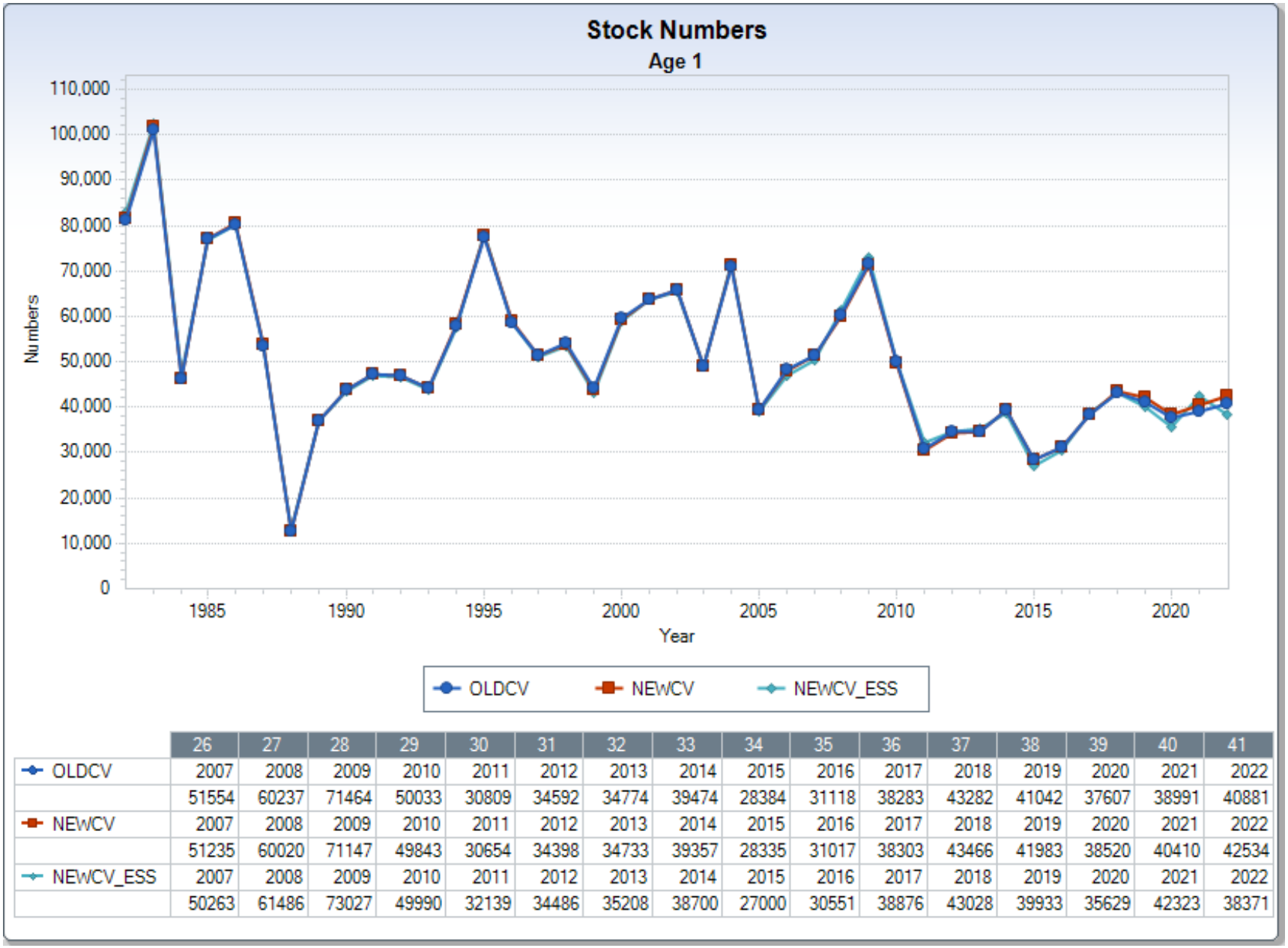


	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
OLDCV	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	59270	62621	61699	61931	63083	61320	55395	59587	52219	47839	42343	39361	37407	37903	39041	43511	42424	41414
NEWCV	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	59291	62583	61569	61709	62805	61015	55058	59185	51862	47520	42093	39141	37208	37731	38999	43815	43065	42471
NEWCV_ESS	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	58287	61500	60366	60320	61694	60353	54677	59252	52155	47841	42424	39209	37040	37599	38846	43024	41615	40994

Average F



	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
OLDCV	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	0.3307	0.2520	0.3187	0.3392	0.3792	0.4476	0.4159	0.4697	0.4333	0.4307	0.4298	0.3472	0.3041	0.3700	0.4132	0.3635	0.4542
NEWCV	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	0.3318	0.2529	0.3194	0.3399	0.3802	0.4497	0.4182	0.4705	0.4350	0.4322	0.4316	0.3486	0.3050	0.3685	0.4103	0.3590	0.4456
NEWCV_ESS	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	0.3371	0.2565	0.3293	0.3490	0.3890	0.4598	0.4286	0.4731	0.4392	0.4272	0.4278	0.3451	0.3044	0.3705	0.4170	0.3706	0.4641



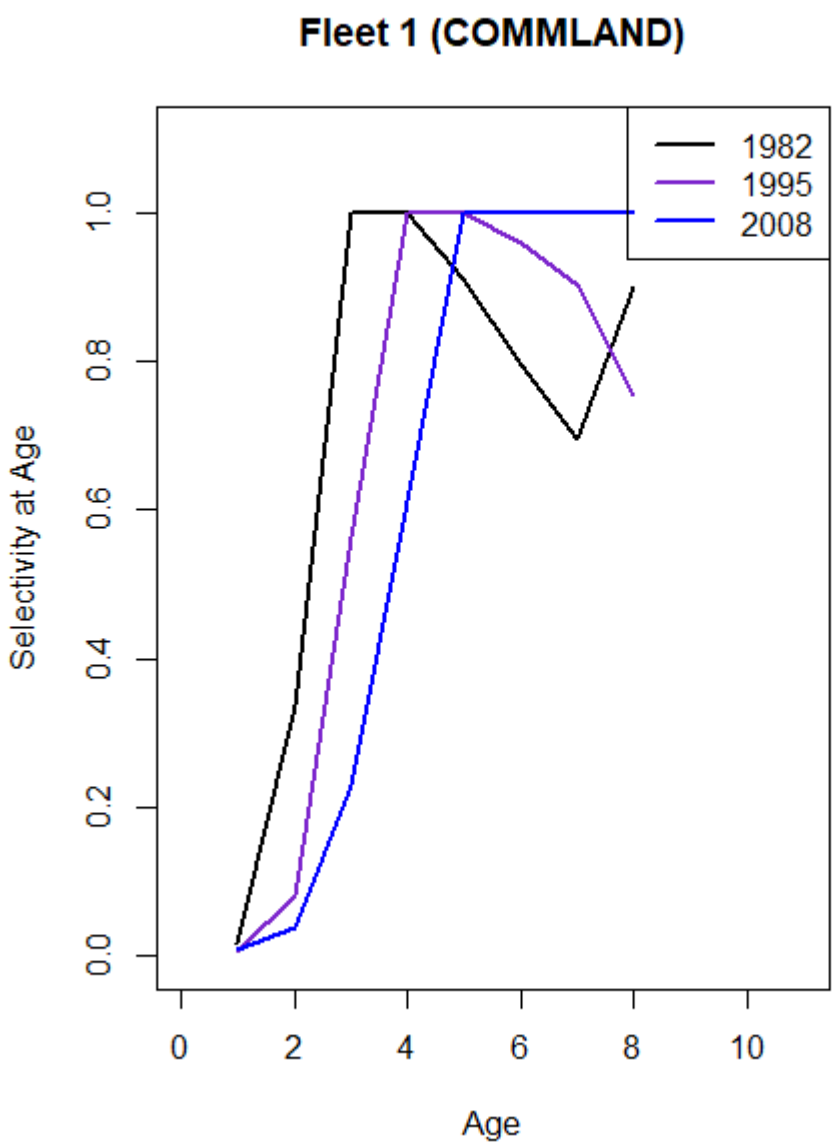
	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
OLDCV	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	51554	60237	71464	50033	30809	34592	34774	39474	28384	31118	38283	43282	41042	37607	38991	40881
NEWCV	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	51235	60020	71147	49843	30654	34398	34733	39357	28335	31017	38303	43466	41983	38520	40410	42534
NEWCV_ESS	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
	50263	61486	73027	49990	32139	34486	35208	38700	27000	30551	38876	43028	39933	35629	42323	38371

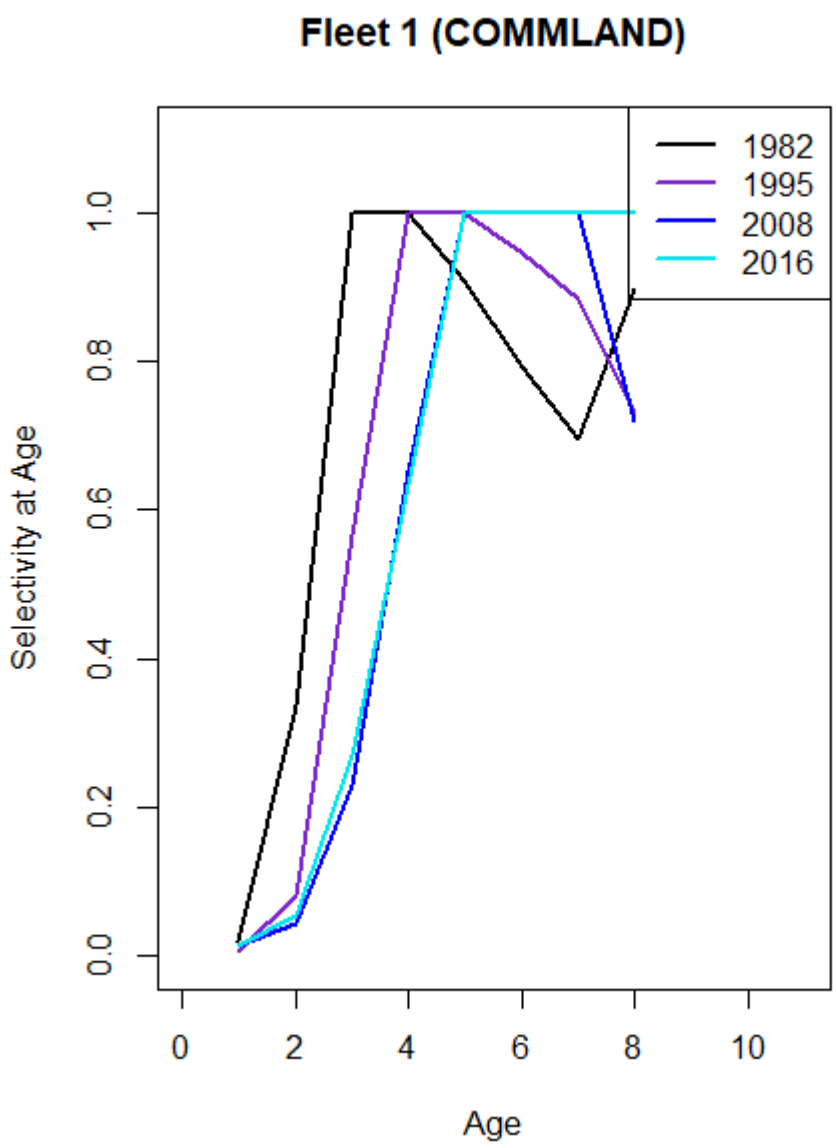
Summer flounder 2023 MTA ASAP Model Development

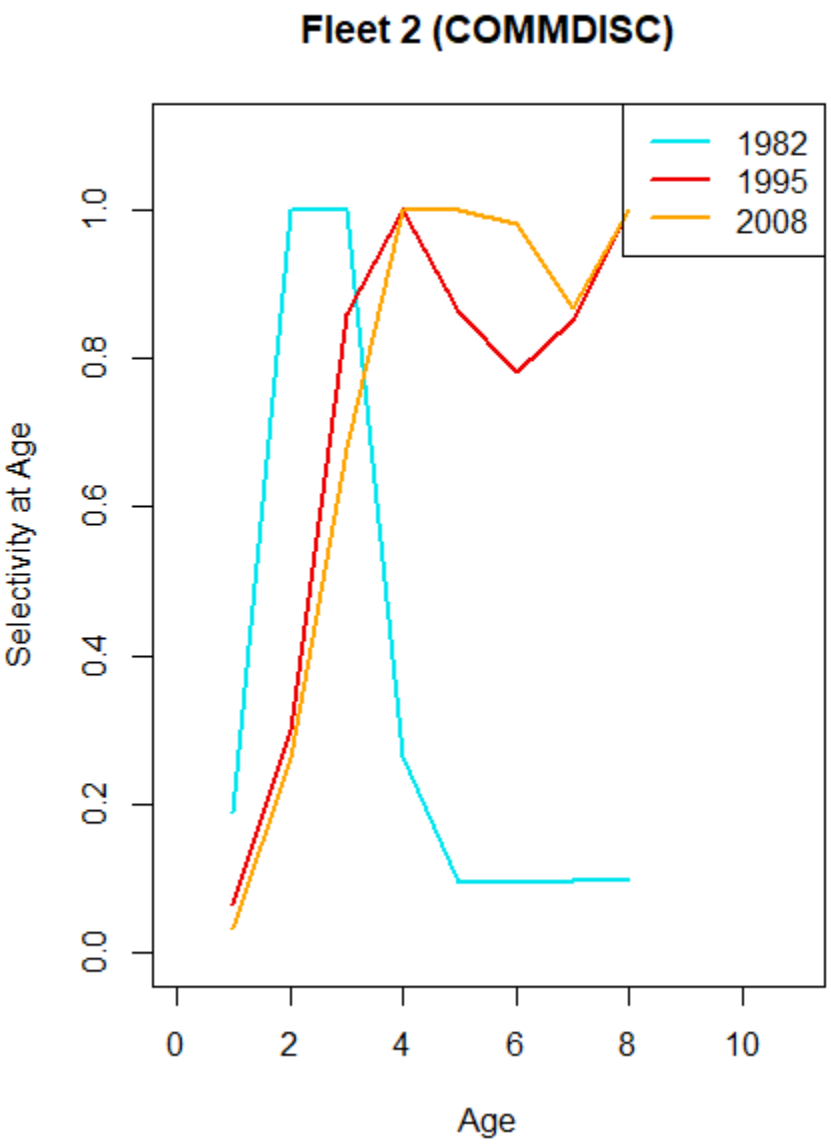
4) From 2023 MTA model NEWSET_ESS, test split of terminal fishery selectivity block from 2008-2022 to 2008-2015, 2016-2022

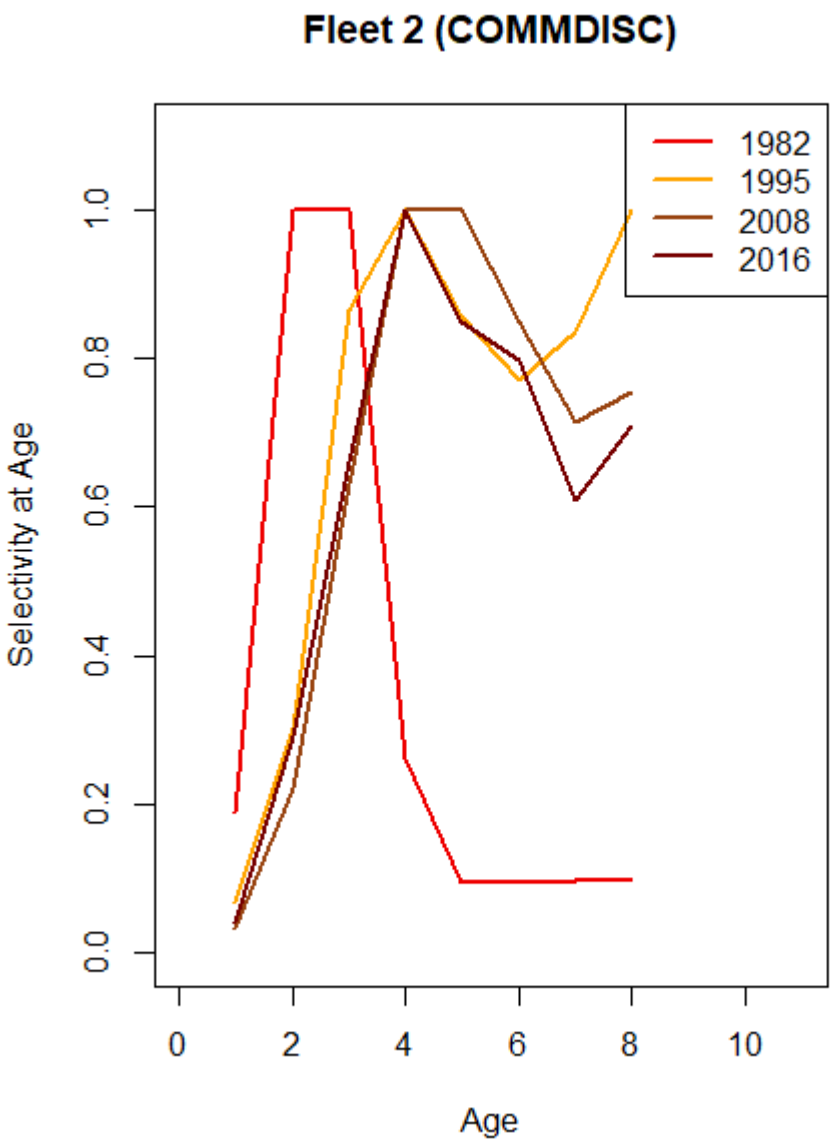
- Resulted in larger maximum gradient (i.e., less robust model fit)
  - 0.004 increased to 0.012
- Did not result in obviously changed/improved fishery catch at age residuals
- Shifted/create some 'doming' in selex back into the 2008-2015 time block; terminal block still relatively flat
- Minimal change in SSB and F
- Largest selex effects occurred for true ages 6, 7+
- Retrospective pattern changes were variable:
  - F: +3% to -8%; 'worse'
  - SSB: +6% to +4%; 'better'
  - R: +28% to +17%; 'better'
  - Total N: +16% to +9%: 'better'

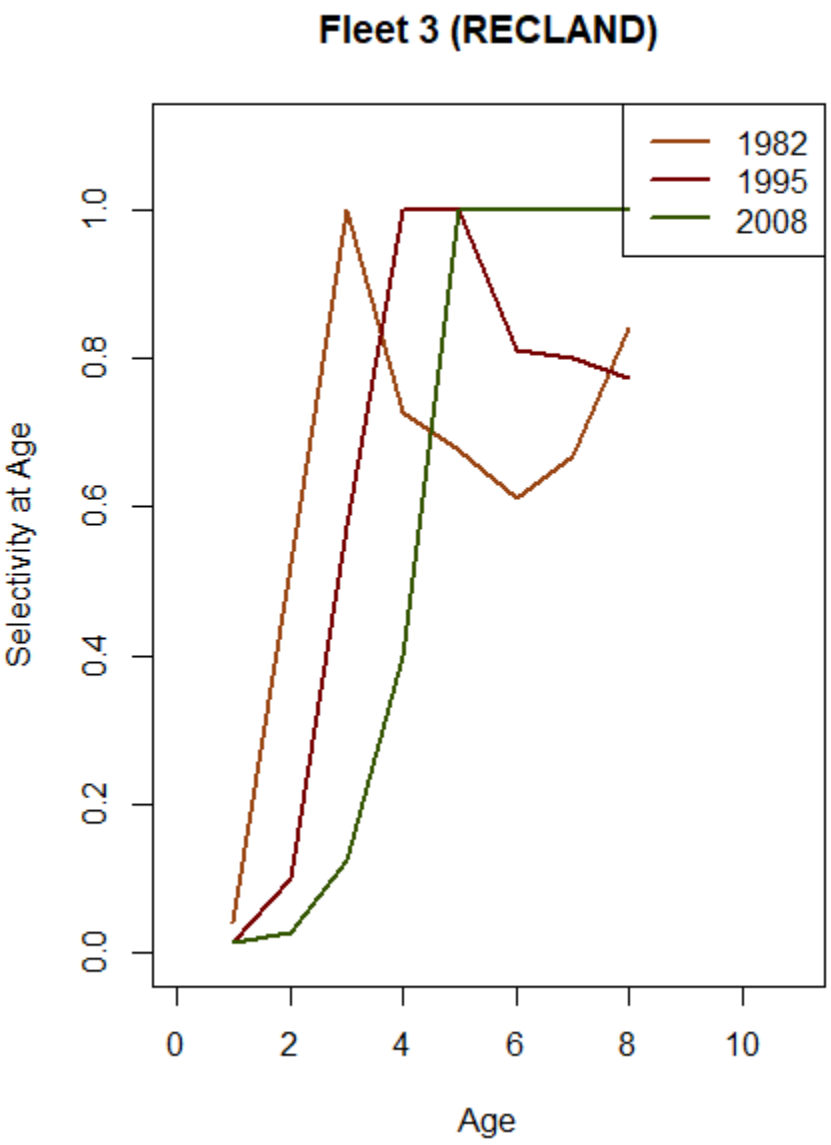
Ultimately did not change, retaining one longer time block (15 years), versus two borderline 'too short' blocks (8 years, 7 years), for this model with 8 age classes

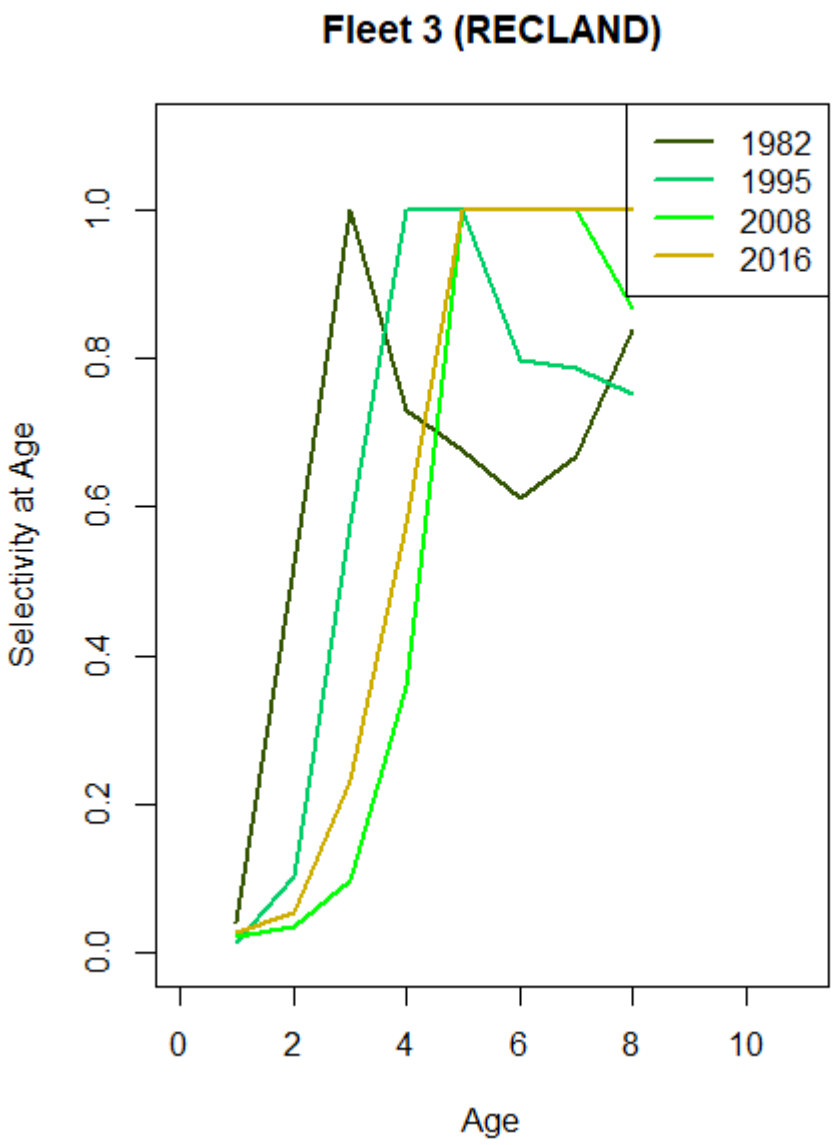

Fleet 1 (COMMLAND)
Selectivity at Age
Age
1982
1995
2008
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10

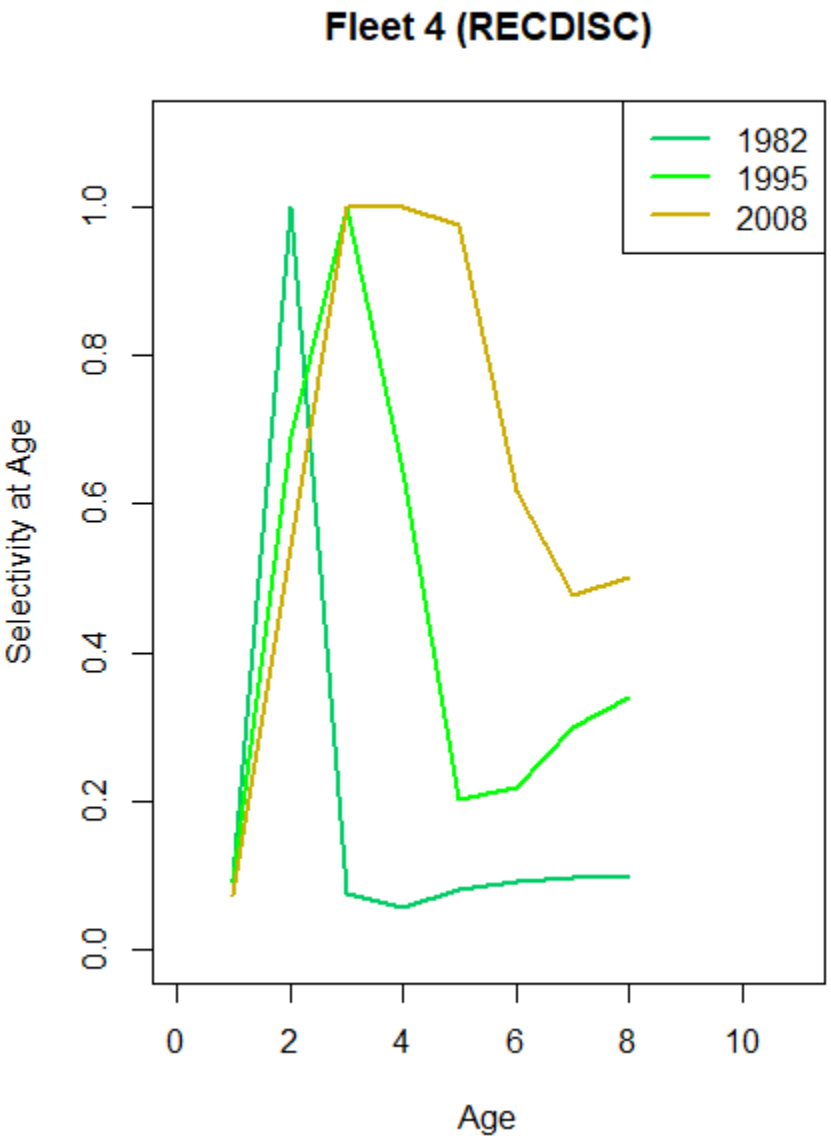

Fleet 1 (COMMLAND)
Selectivity at Age
Age
1982
1995
2008
2016
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10

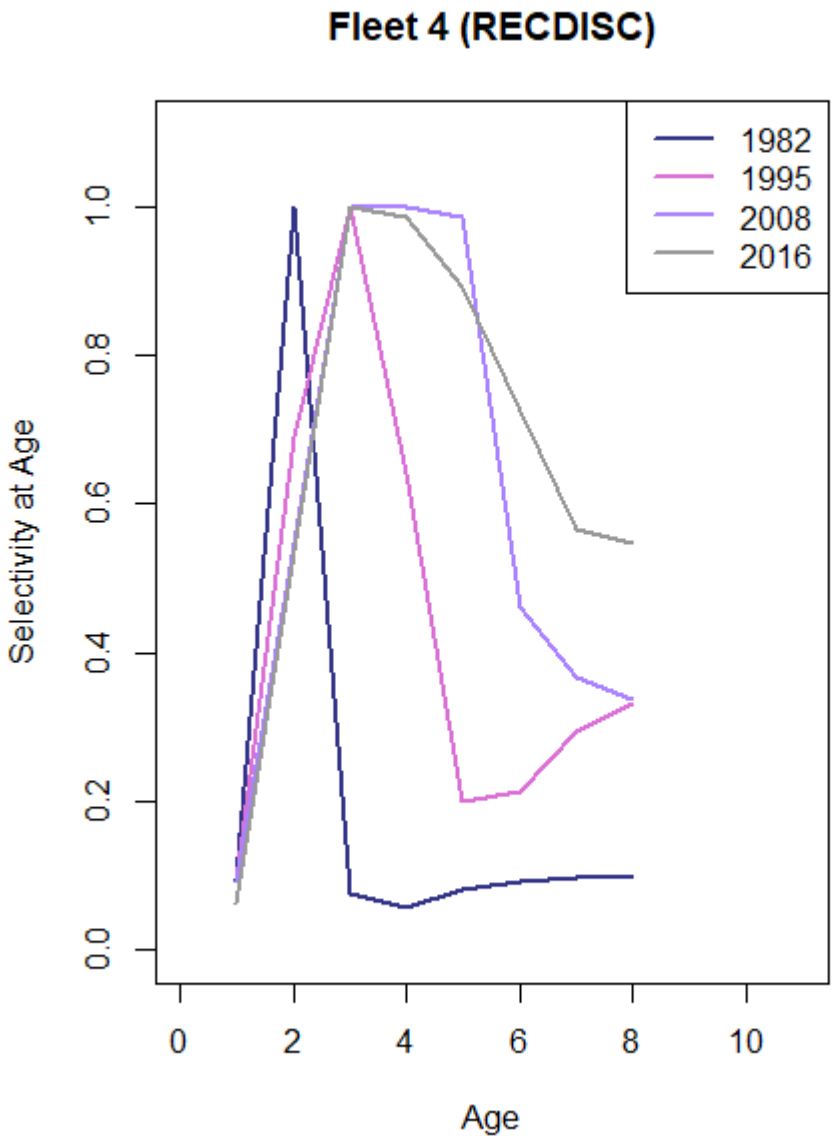

Fleet 2 (COMMDISC)
1982
1995
2008
Selectivity at Age
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
Age

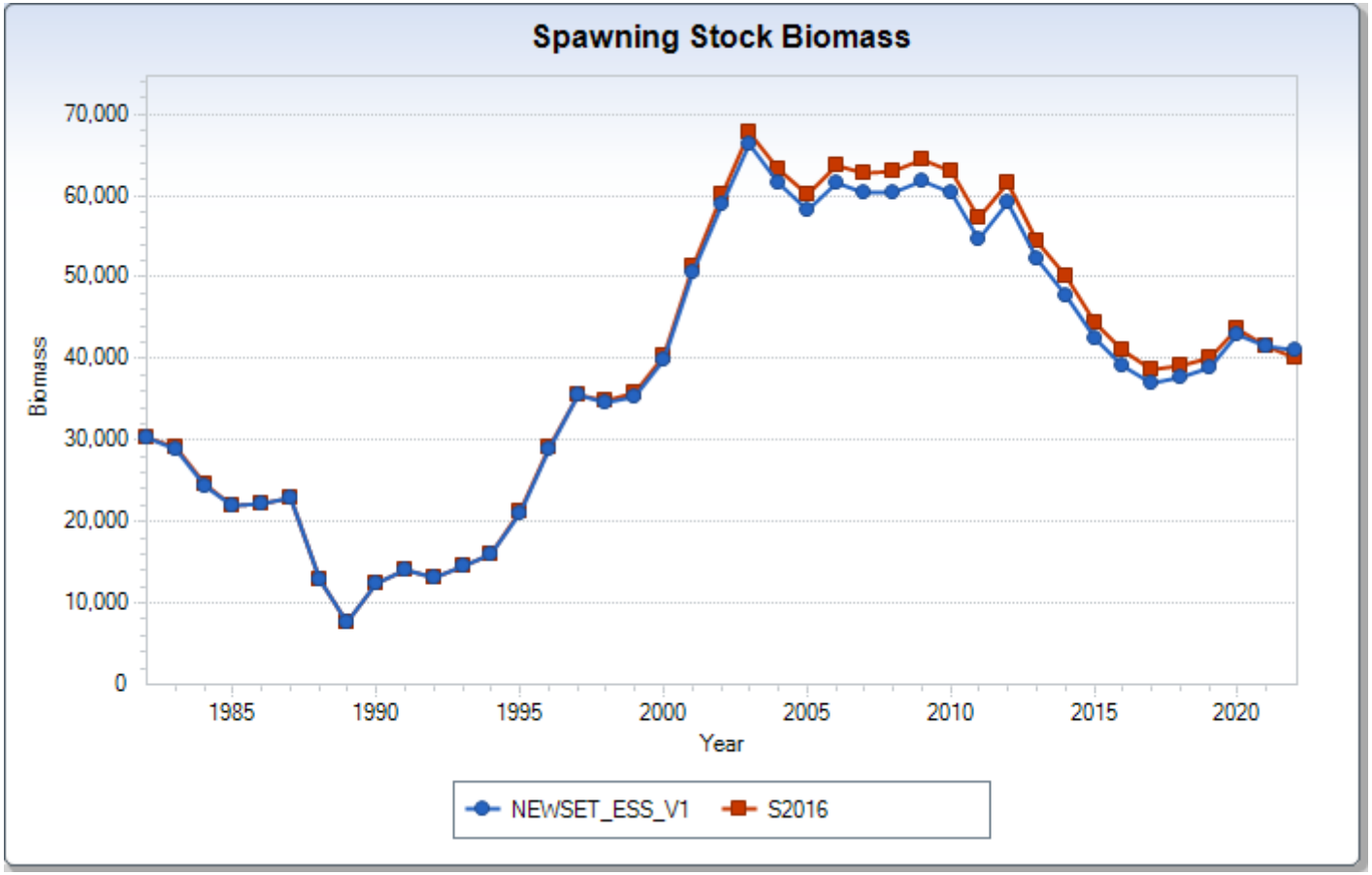

Fleet 2 (COMMDISC)
1982
1995
2008
2016
Selectivity at Age
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
Age

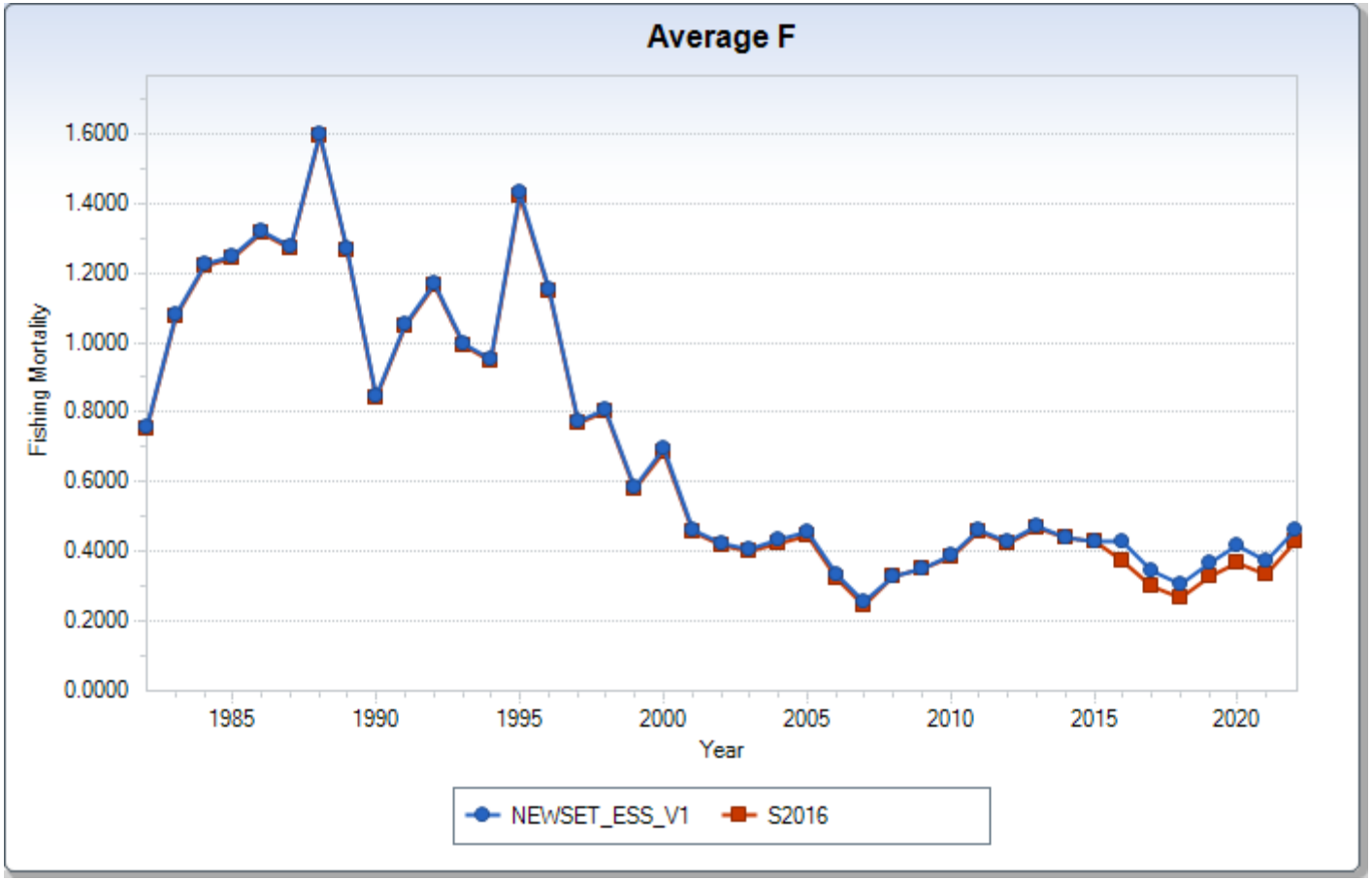

Fleet 3 (RECLAND)
1982
1995
2008
Selectivity at Age
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
Age

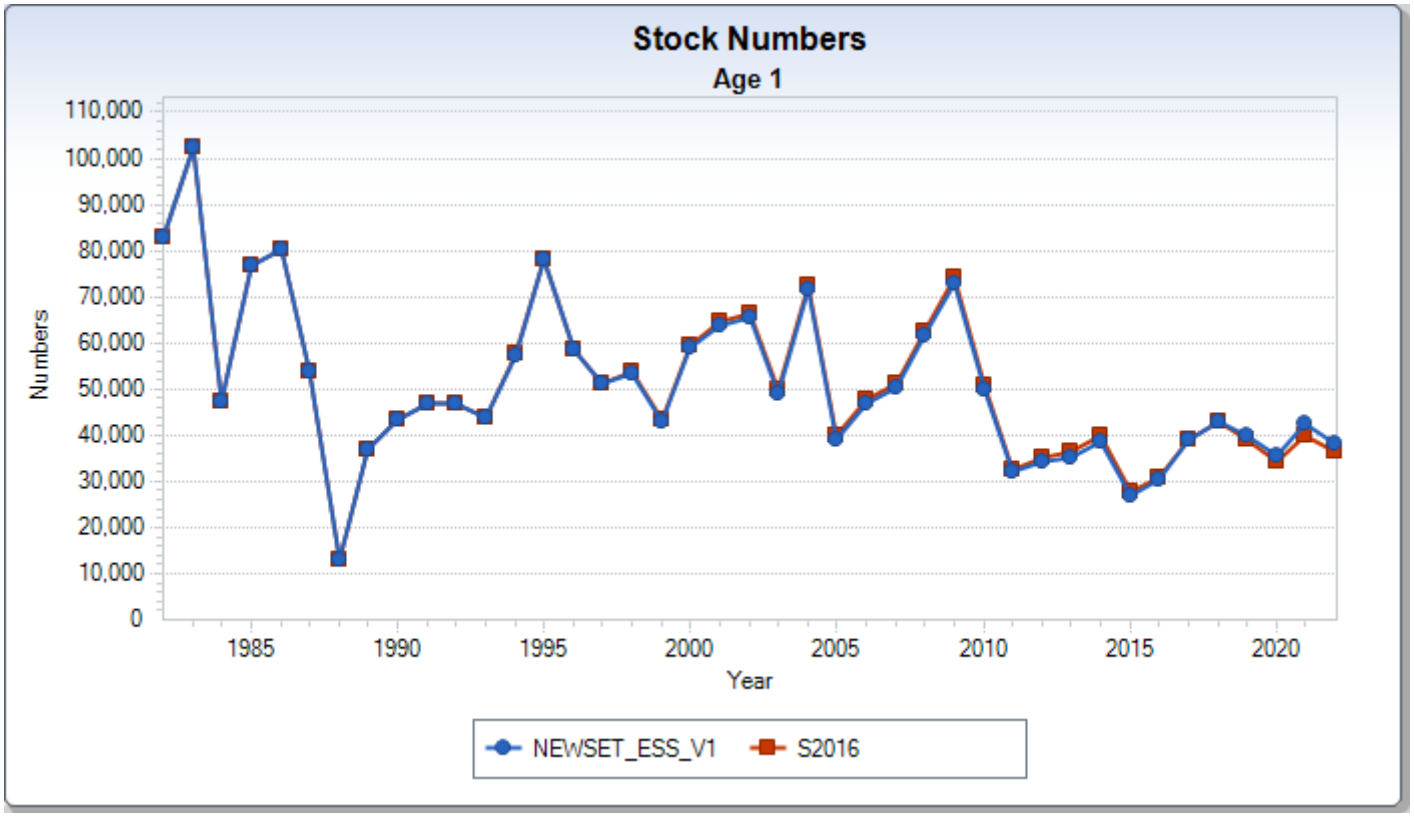

Fleet 3 (RECLAND)
1982
1995
2008
2016
Selectivity at Age
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
Age

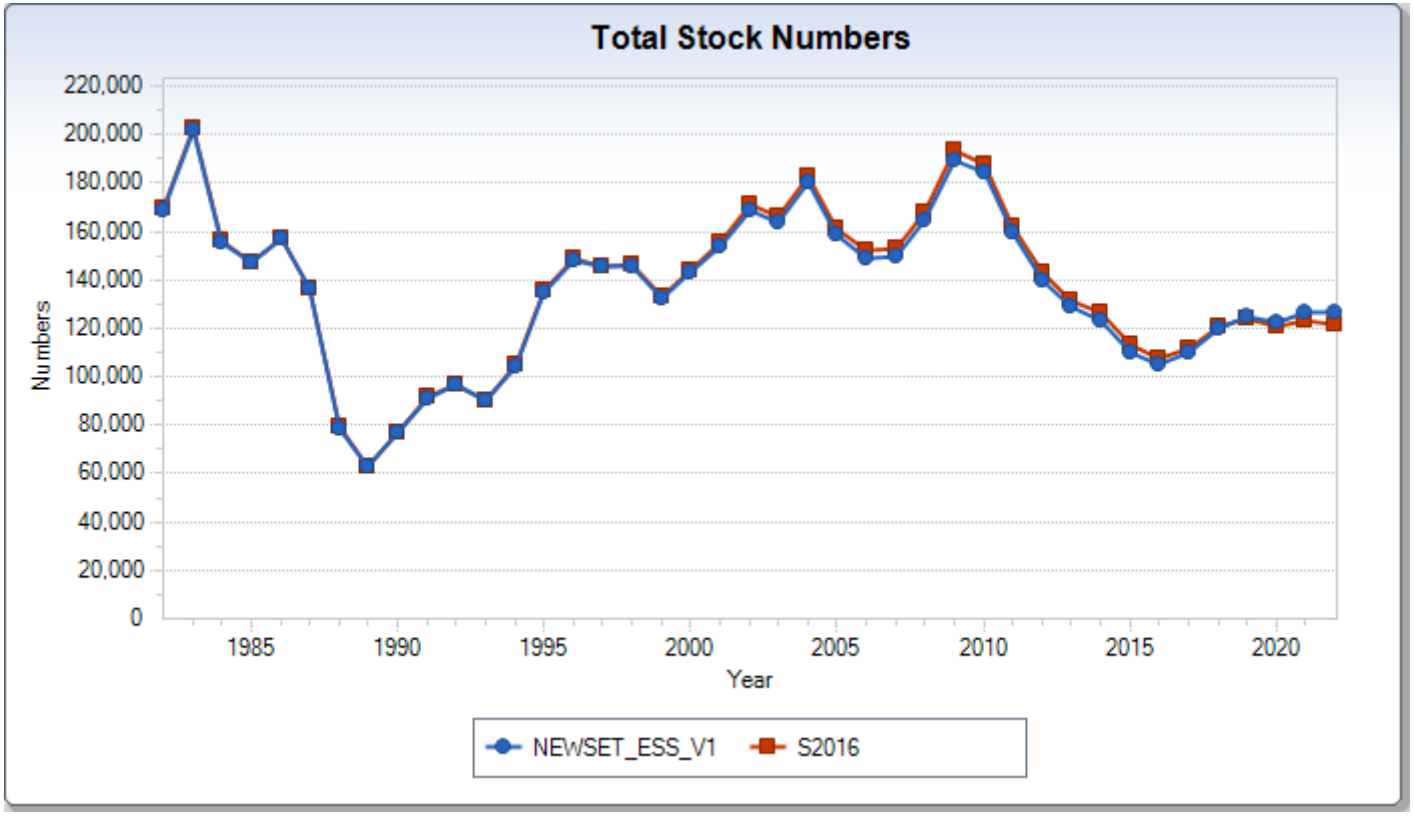

Fleet 4 (RECDISC)
1982
1995
2008
Selectivity at Age
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
Age


Fleet 4 (RECDISC)
1982
1995
2008
2016
Selectivity at Age
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
Age


Spawning Stock Biomass
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Biomass
1985
1990
1995
2000
2005
2010
2015
2020
Year
NEWSET_ESS_V1
S2016

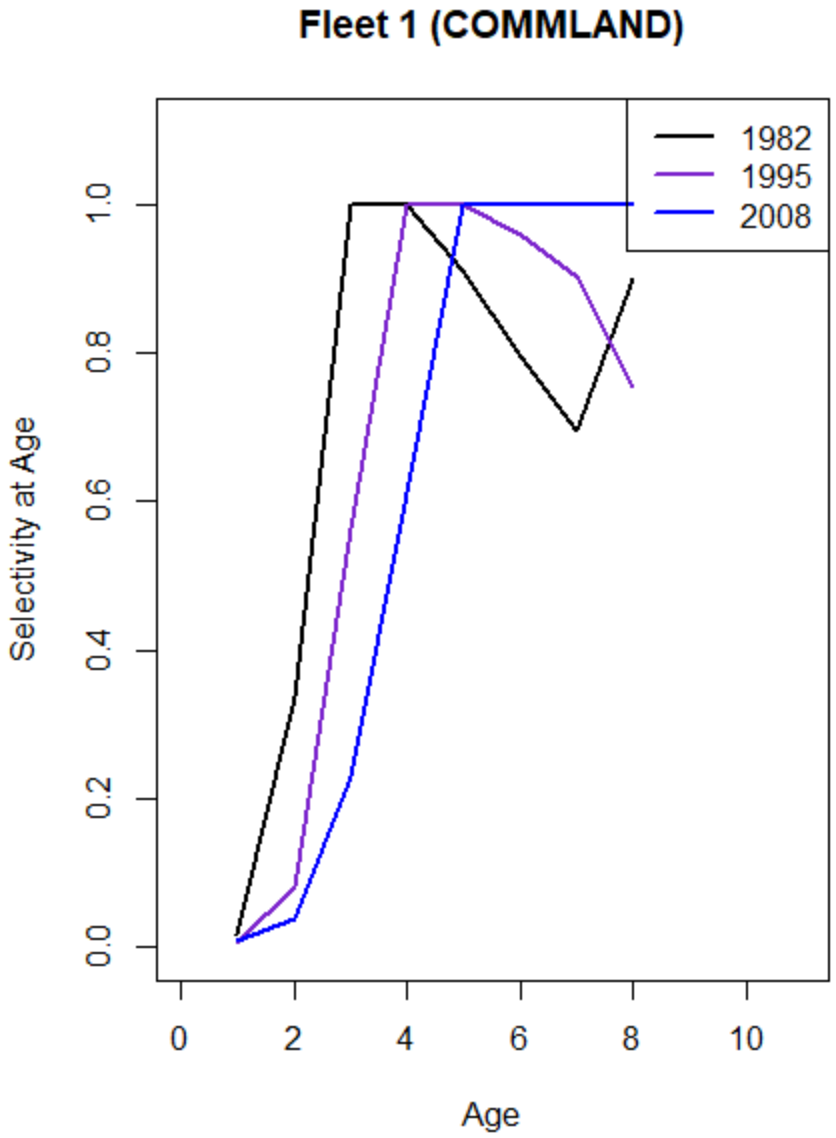

Average F
Fishing Mortality
1.6000
1.4000
1.2000
1.0000
0.8000
0.6000
0.4000
0.2000
0.0000
1985
1990
1995
2000
2005
2010
2015
2020
Year
NEWSET_ESS_V1
S2016

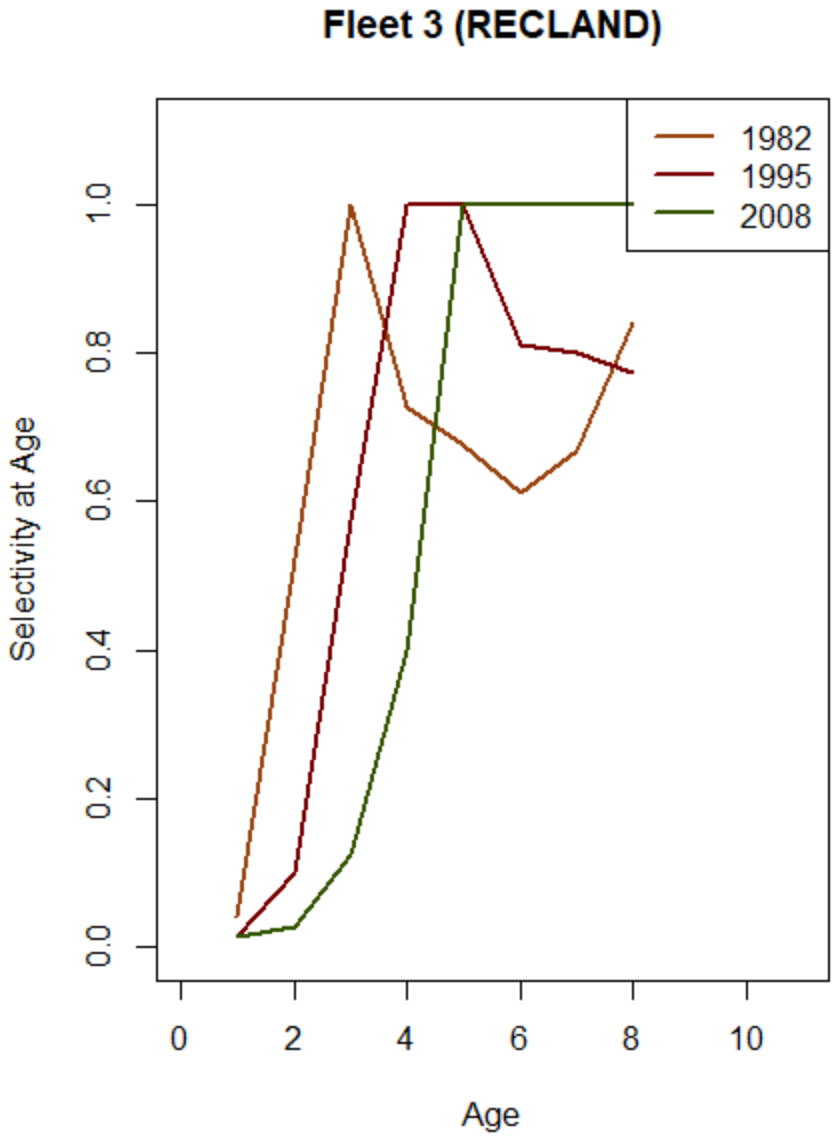

Stock Numbers
Age 1
110,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Numbers
1985
1990
1995
2000
2005
2010
2015
2020
Year
NEWSET_ESS_V1
S2016

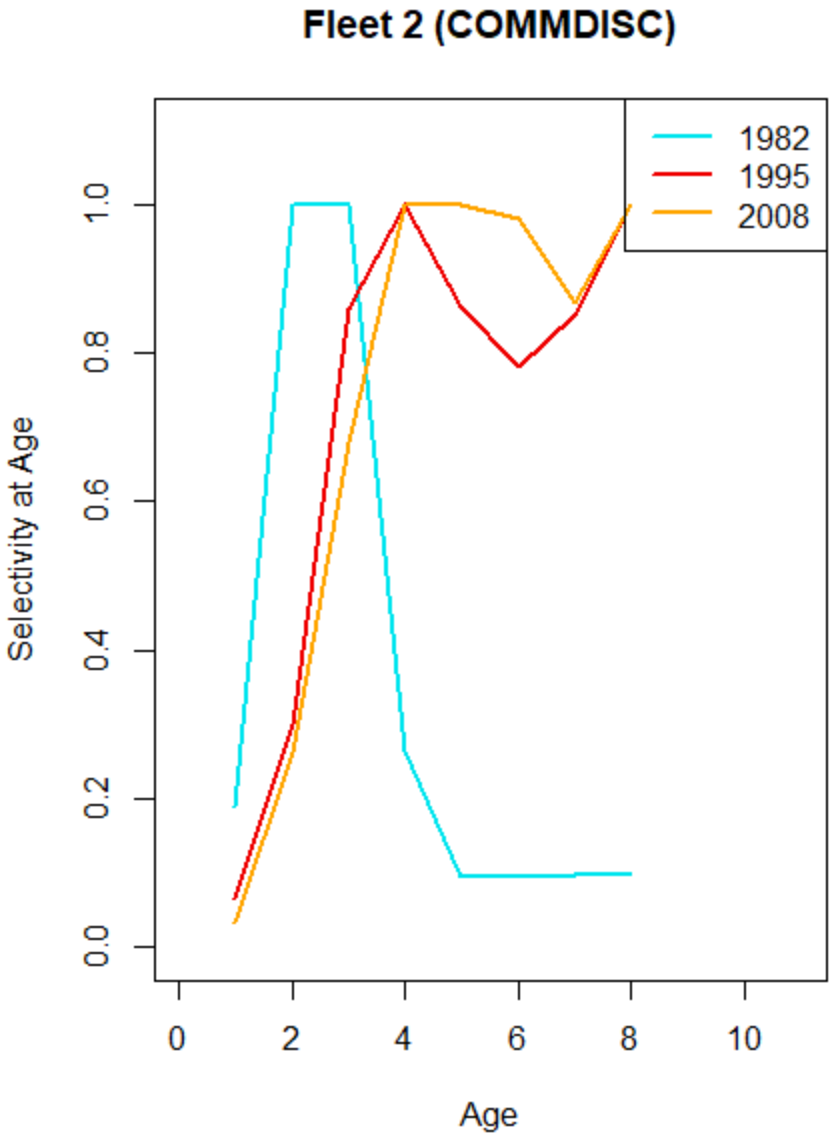

Total Stock Numbers
220,000
200,000
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Numbers
1985
1990
1995
2000
2005
2010
2015
2020
Year
NEWSET_ESS_V1
S2016

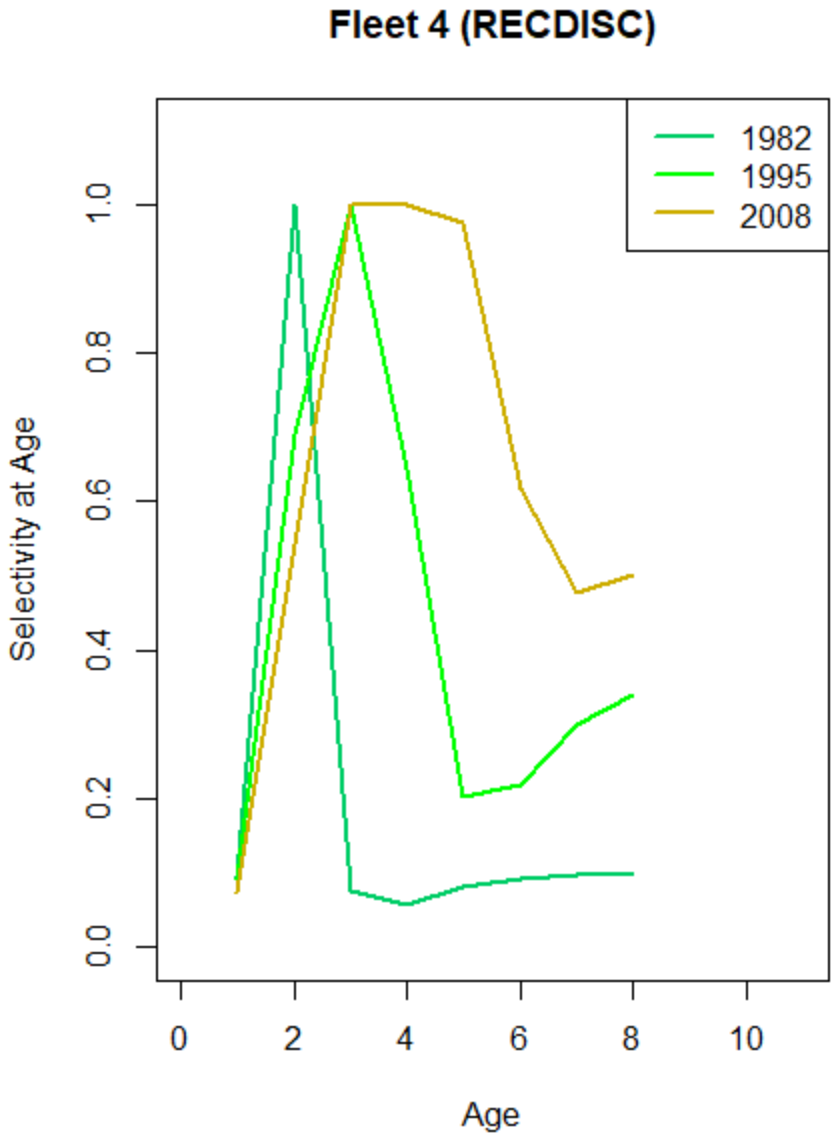
Summer flounder 2023 MTA
Final ASAP Model

- 'Internal' Retrospective: minor at +6% for SSB and +3% for F
- Jitter: 98 of 100 converged, all at same Objective Function value
- MCMC: no convergence problems or unusual high correlations, relatively precise estimates (terminal year CVs = ~15%)
- Internal Estimation of BRPs not sufficient: estimated steepness (h) = 1, used proxies instead (F35% = FMSY)
- Final model: F2023_NEWSET_ESS_V1

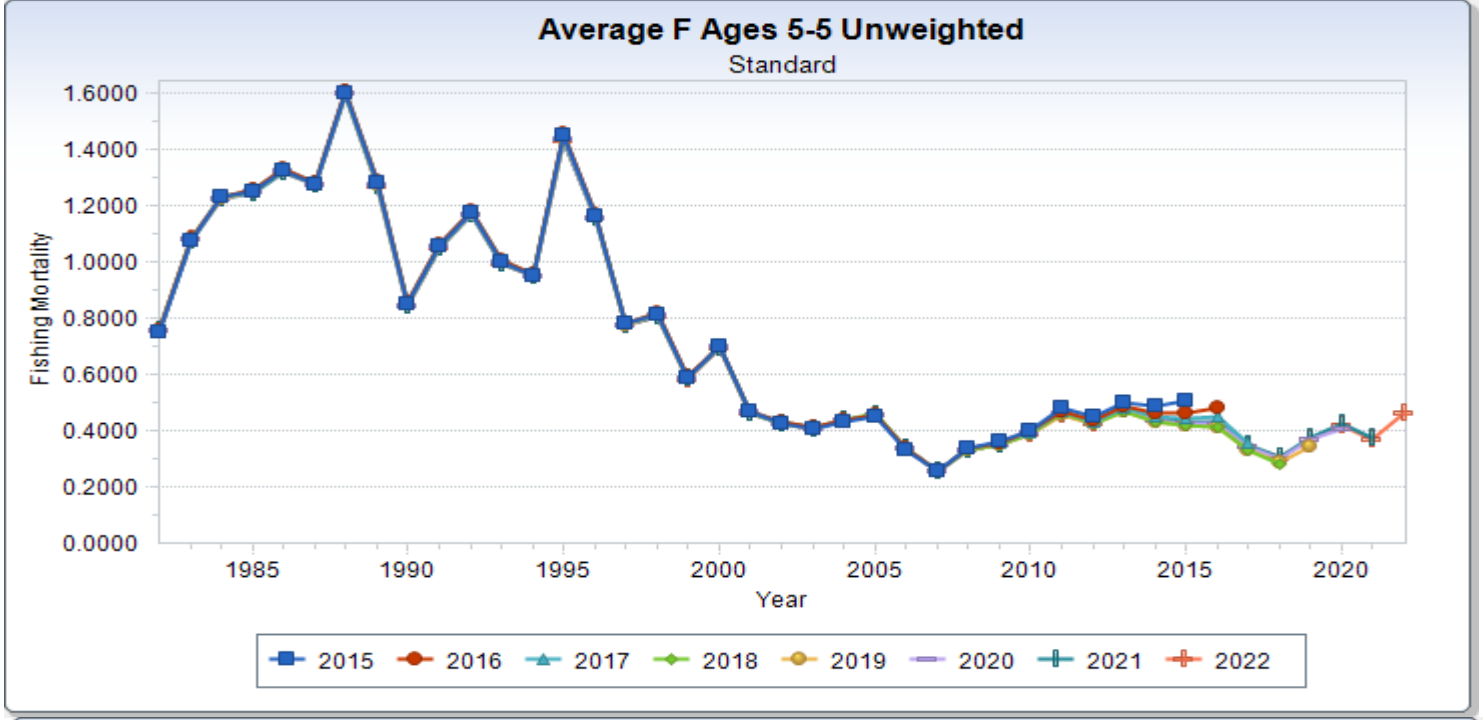

Fleet 1 (COMMLAND)
1982
1995
2008
Selectivity at Age
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
Age

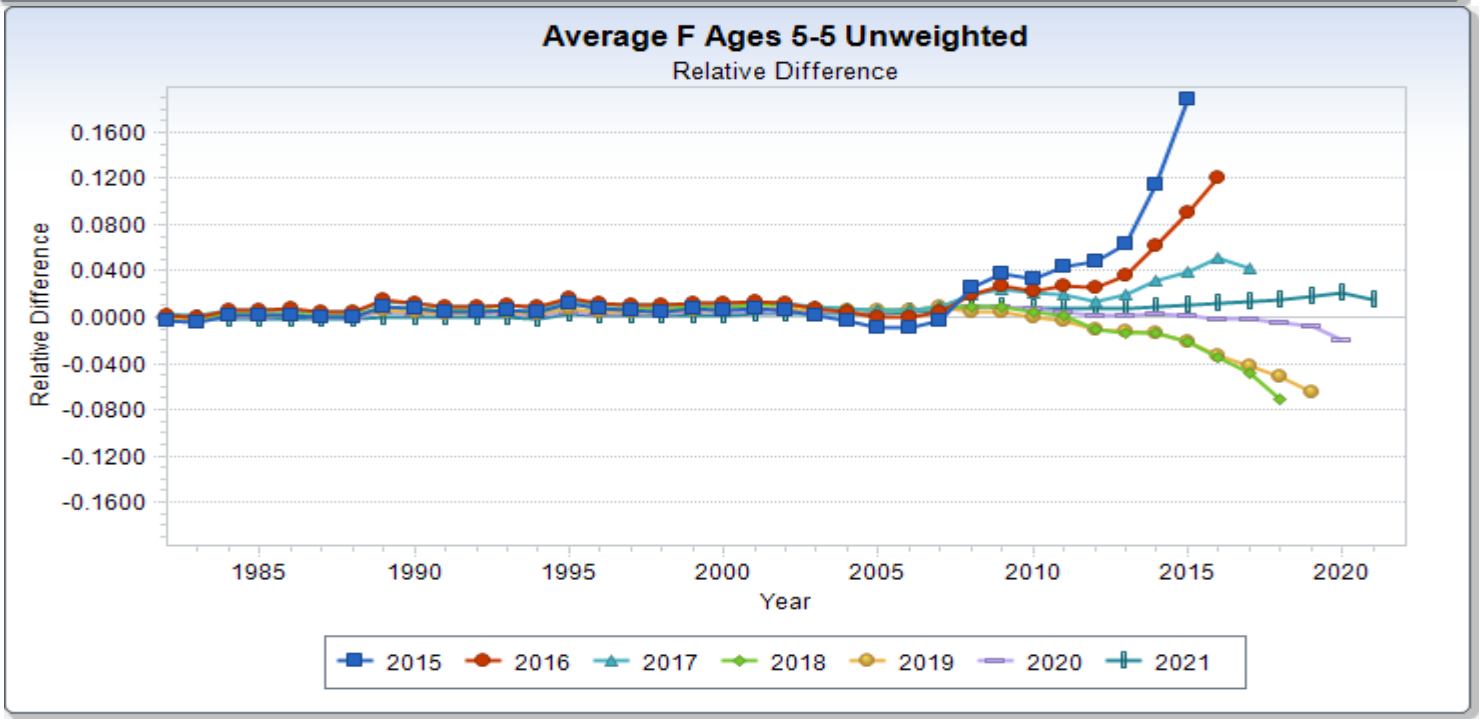

Fleet 3 (RECLAND)
1982
1995
2008
Selectivity at Age
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
Age


Fleet 2 (COMMDISC)
1982
1995
2008
Selectivity at Age
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
Age

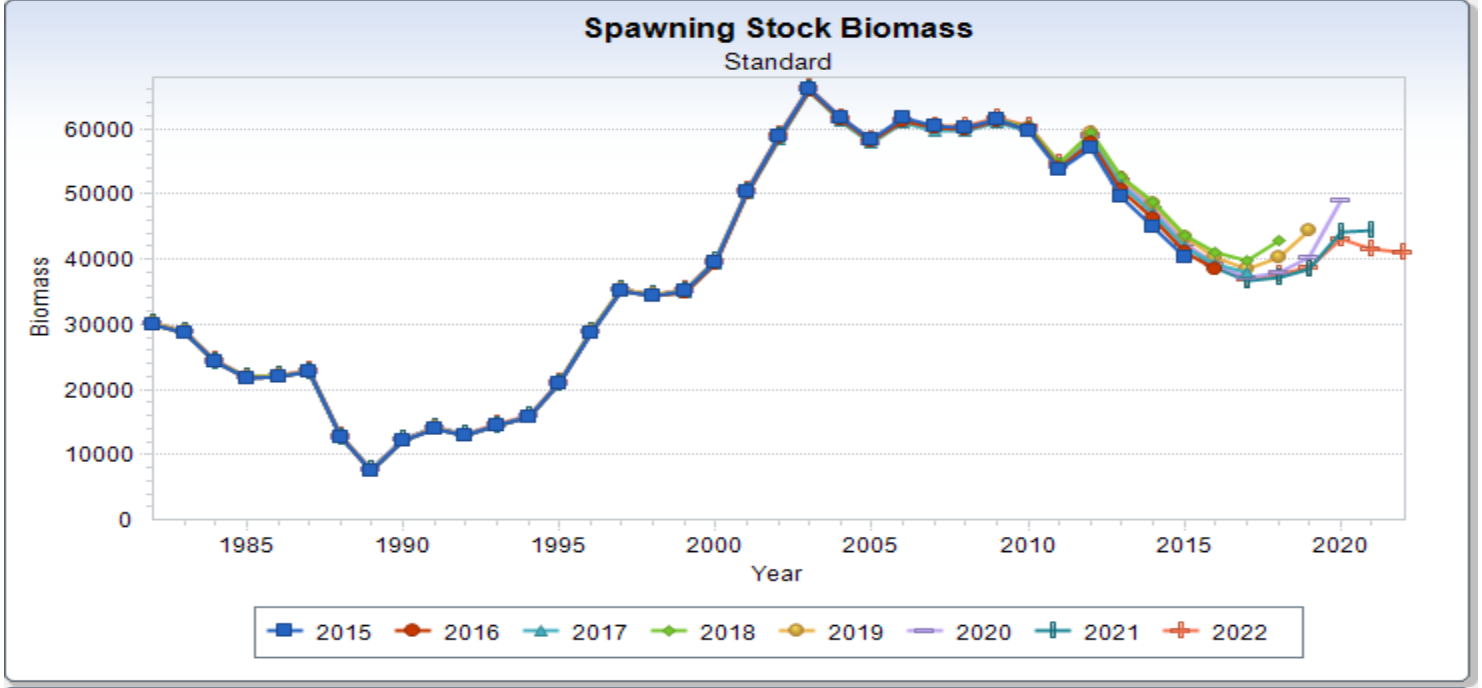

Fleet 4 (RECDISC)
1982
1995
2008
Selectivity at Age
0.0
0.2
0.4
0.6
0.8
1.0
0
2
4
6
8
10
Age

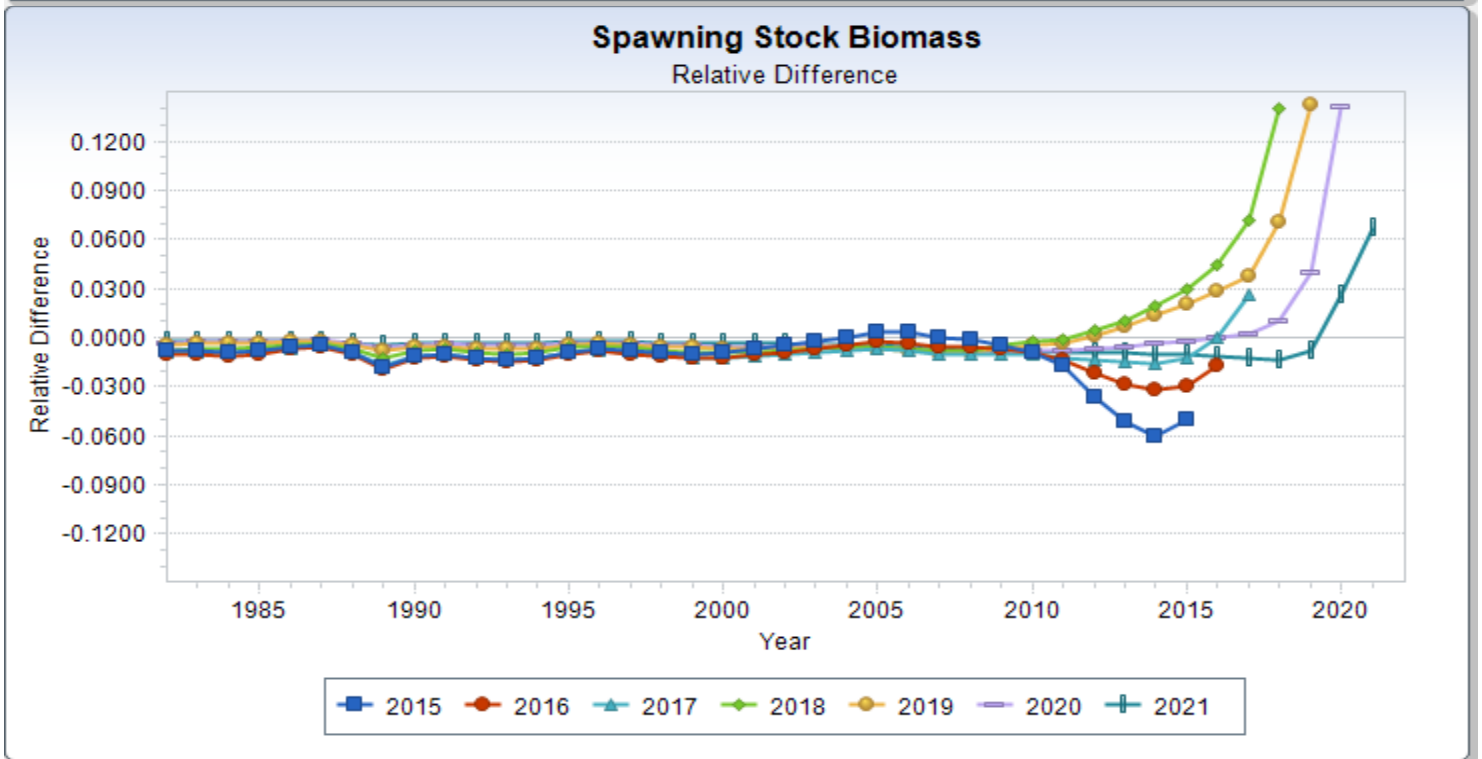
Rho = +3%


Average F Ages 5-5 Unweighted
Standard
Fishing Mortality
1.6000
1.4000
1.2000
1.0000
0.8000
0.6000
0.4000
0.2000
0.0000
1985
1990
1995
2000
2005
2010
2015
2020
Year
2015
2016
2017
2018
2019
2020
2021
2022

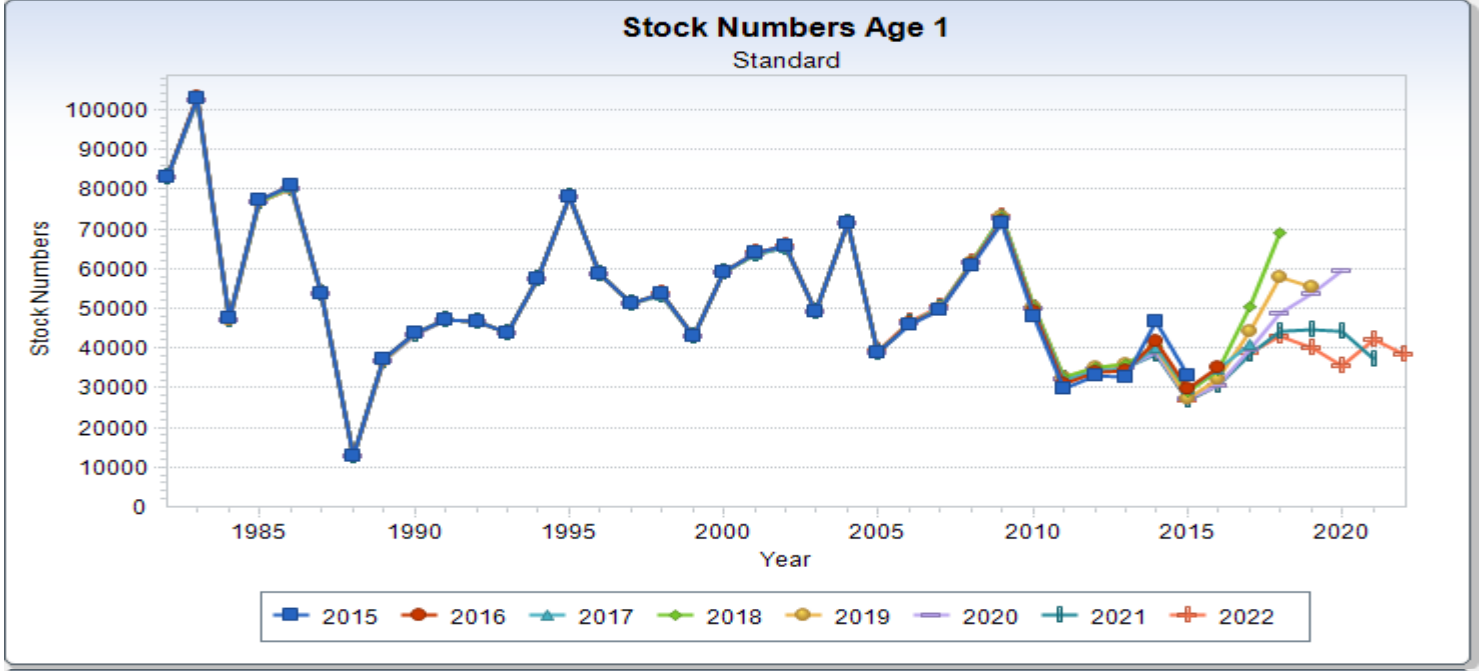

Average F Ages 5-5 Unweighted
Relative Difference
Relative Difference
0.1600
0.1200
0.0800
0.0400
0.0000
-0.0400
-0.0800
-0.1200
-0.1600
1985
1990
1995
2000
2005
2010
2015
2020
Year
2015
2016
2017
2018
2019
2020
2021

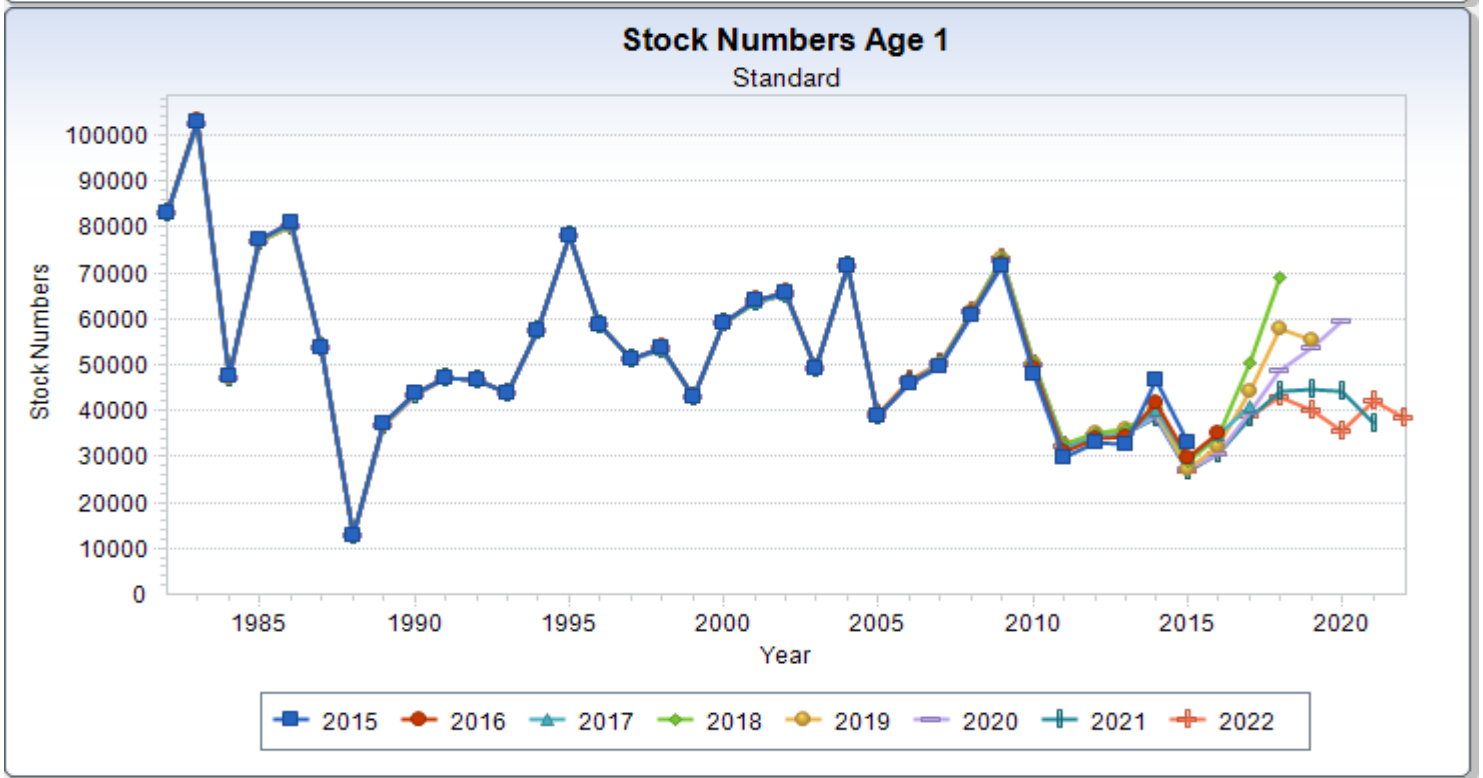
Rho = +6%

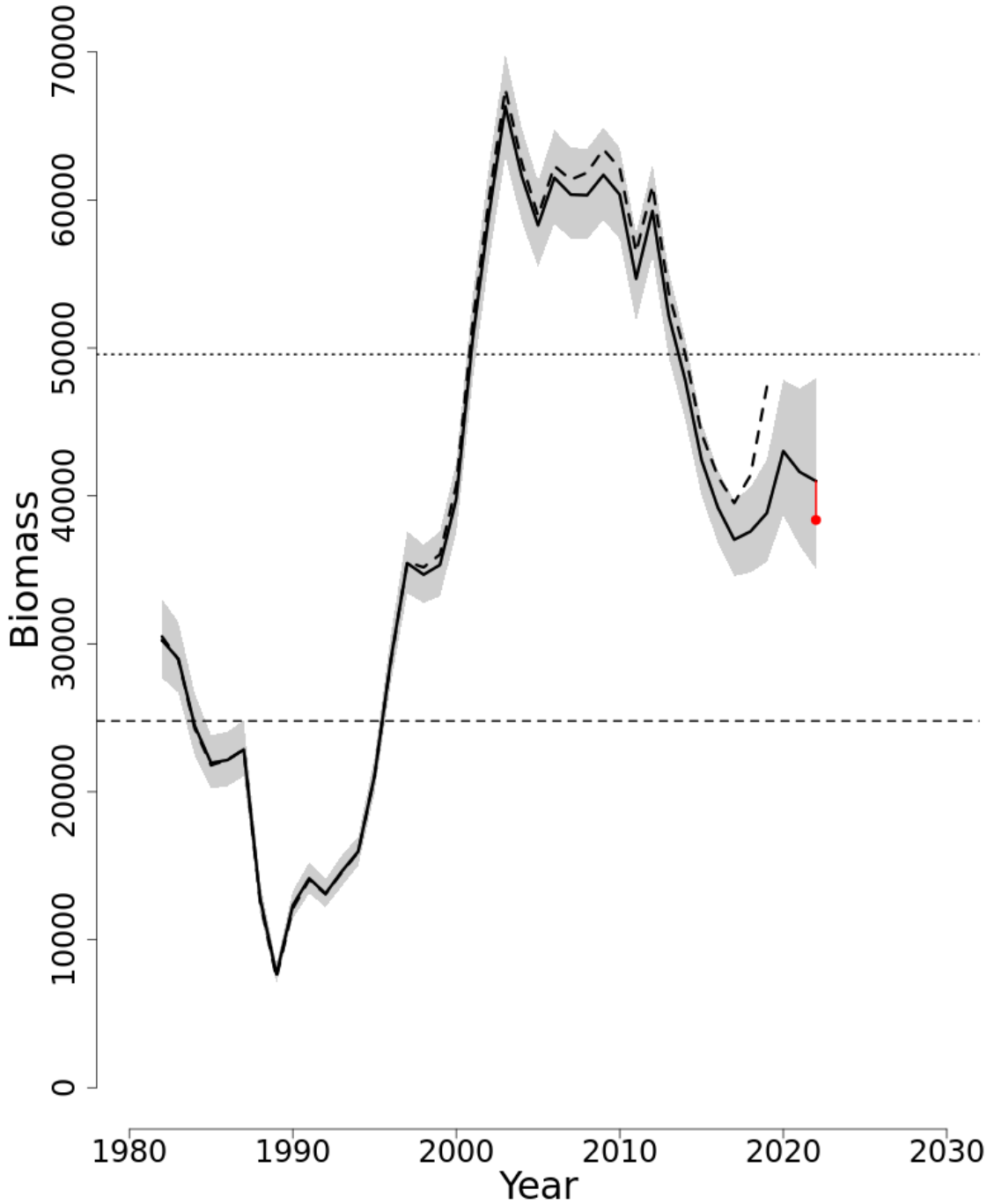

Spawning Stock Biomass
Standard
Biomass
60000
50000
40000
30000
20000
10000
0
1985
1990
1995
2000
2005
2010
2015
2020
Year
2015
2016
2017
2018
2019
2020
2021
2022

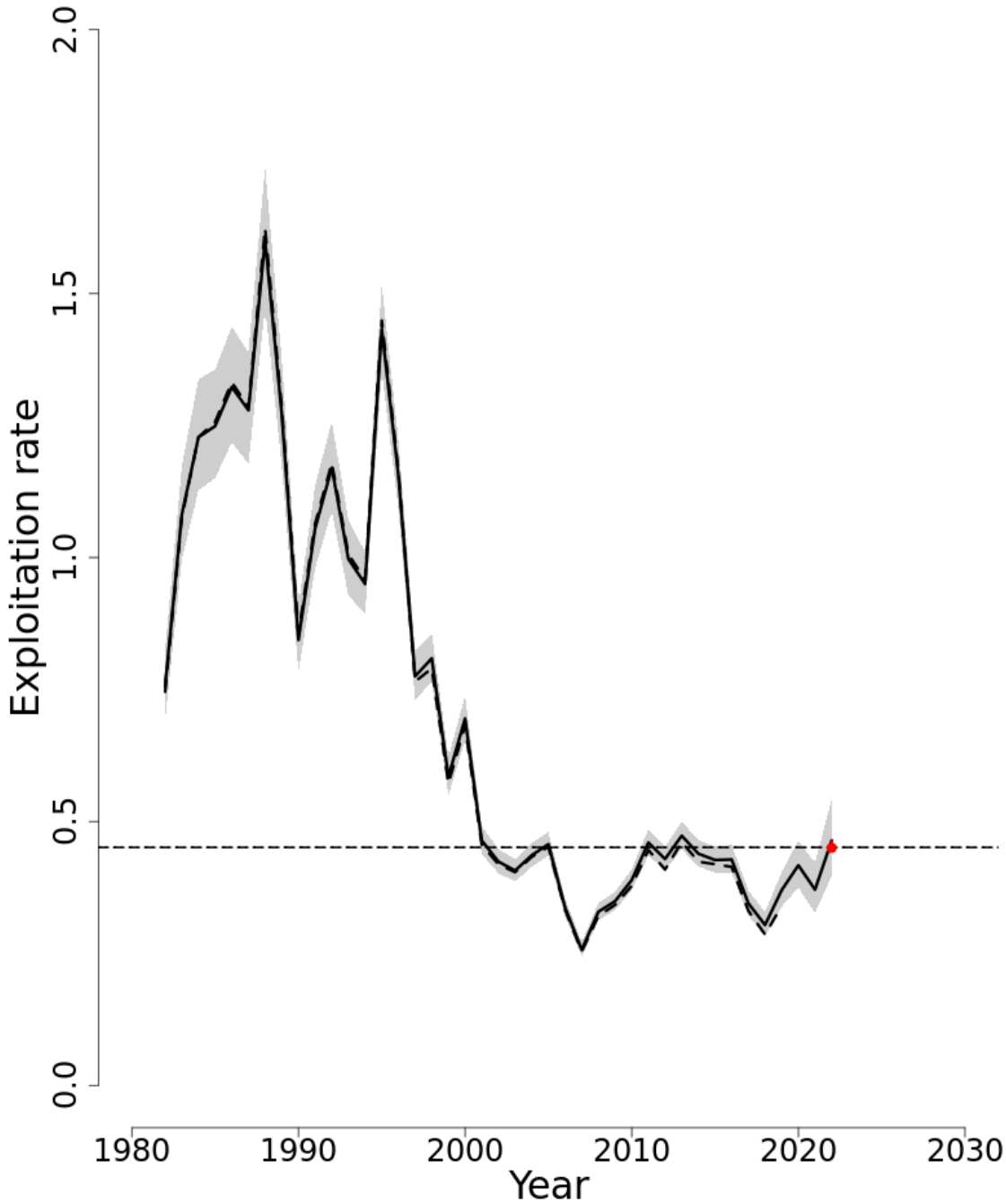

Spawning Stock Biomass
Relative Difference
Relative Difference
0.1200
0.0900
0.0600
0.0300
0.0000
-0.0300
-0.0600
-0.0900
-0.1200
1985
1990
1995
2000
2005
2010
2015
2020
Year
2015
2016
2017
2018
2019
2020
2021

Rho = +28%


Stock Numbers Age 1
Standard
Stock Numbers
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
1985
1990
1995
2000
2005
2010
2015
2020
Year
2015
2016
2017
2018
2019
2020
2021
2022


Stock Numbers Age 1
Standard
Stock Numbers
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
1985
1990
1995
2000
2005
2010
2015
2020
Year
2015
2016
2017
2018
2019
2020
2021
2022

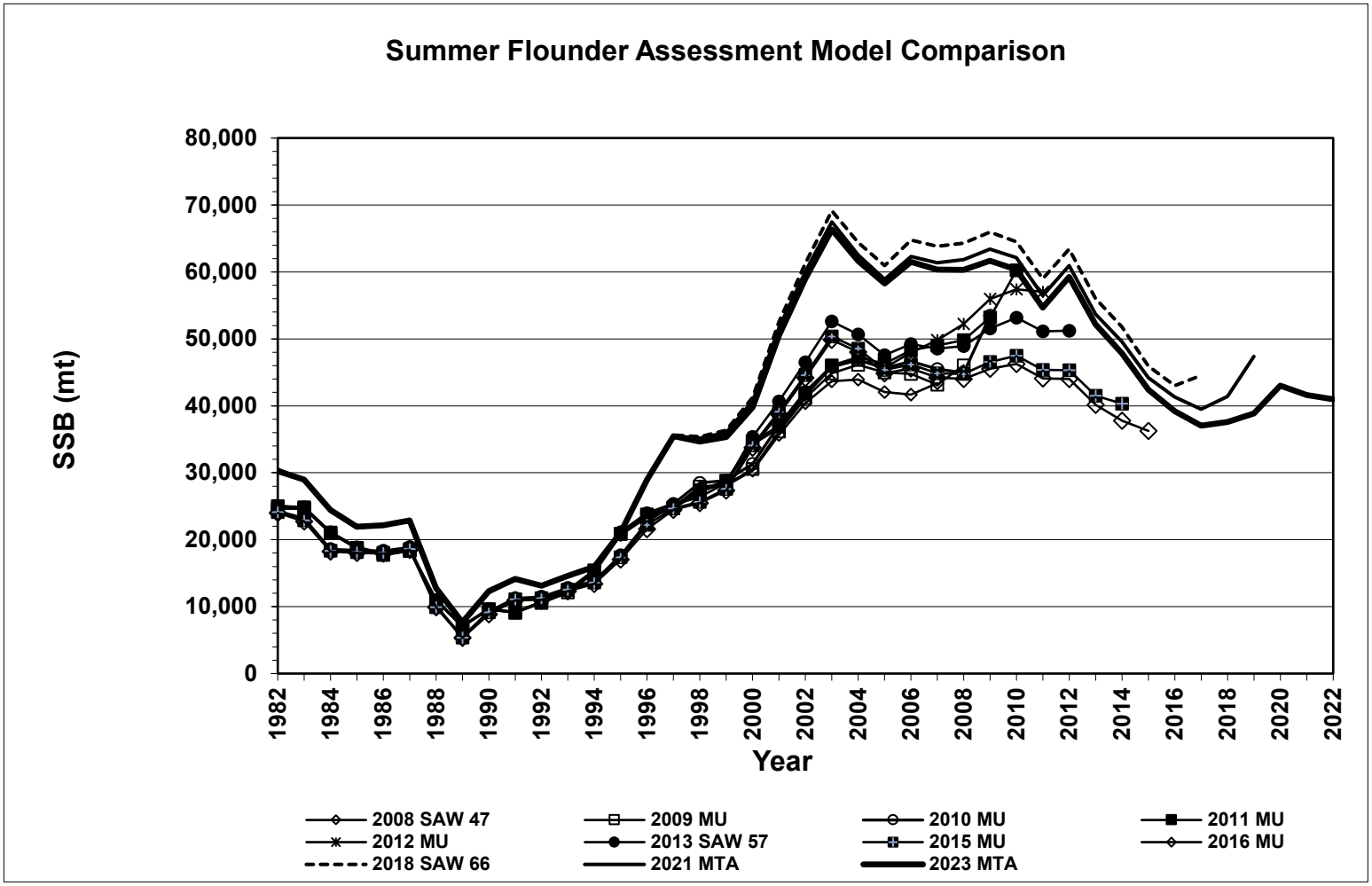

Biomass
0
10000
20000
30000
40000
50000
60000
70000
1980
1990
2000
2010
2020
2030
Year


Exploitation rate
0.0
0.5
1.0
1.5
2.0
1980
1990
2000
2010
2020
2030
Year

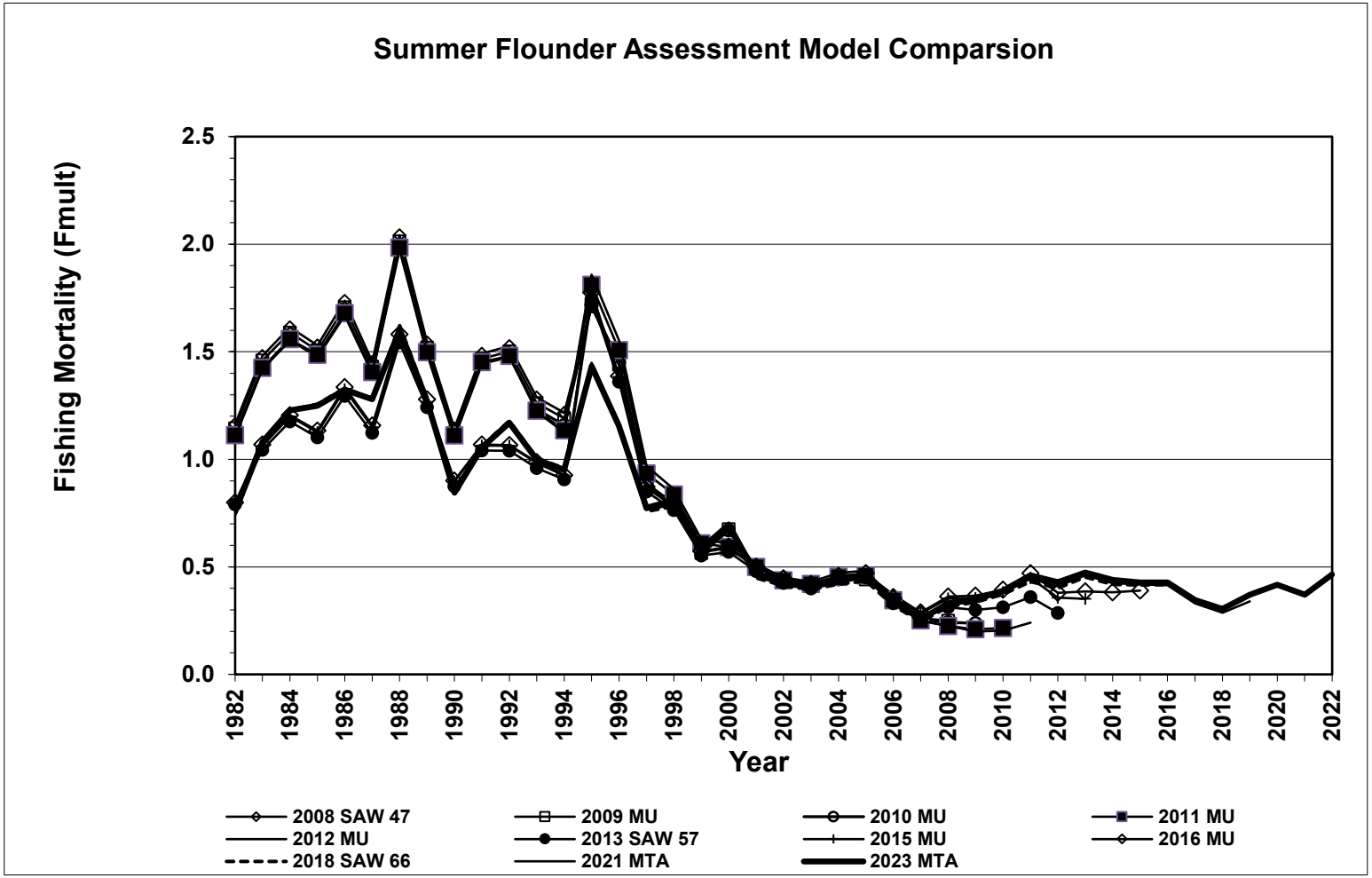
2023 Management Track Assessment
ASAP Model

Comparative results 2008 to 2023 models

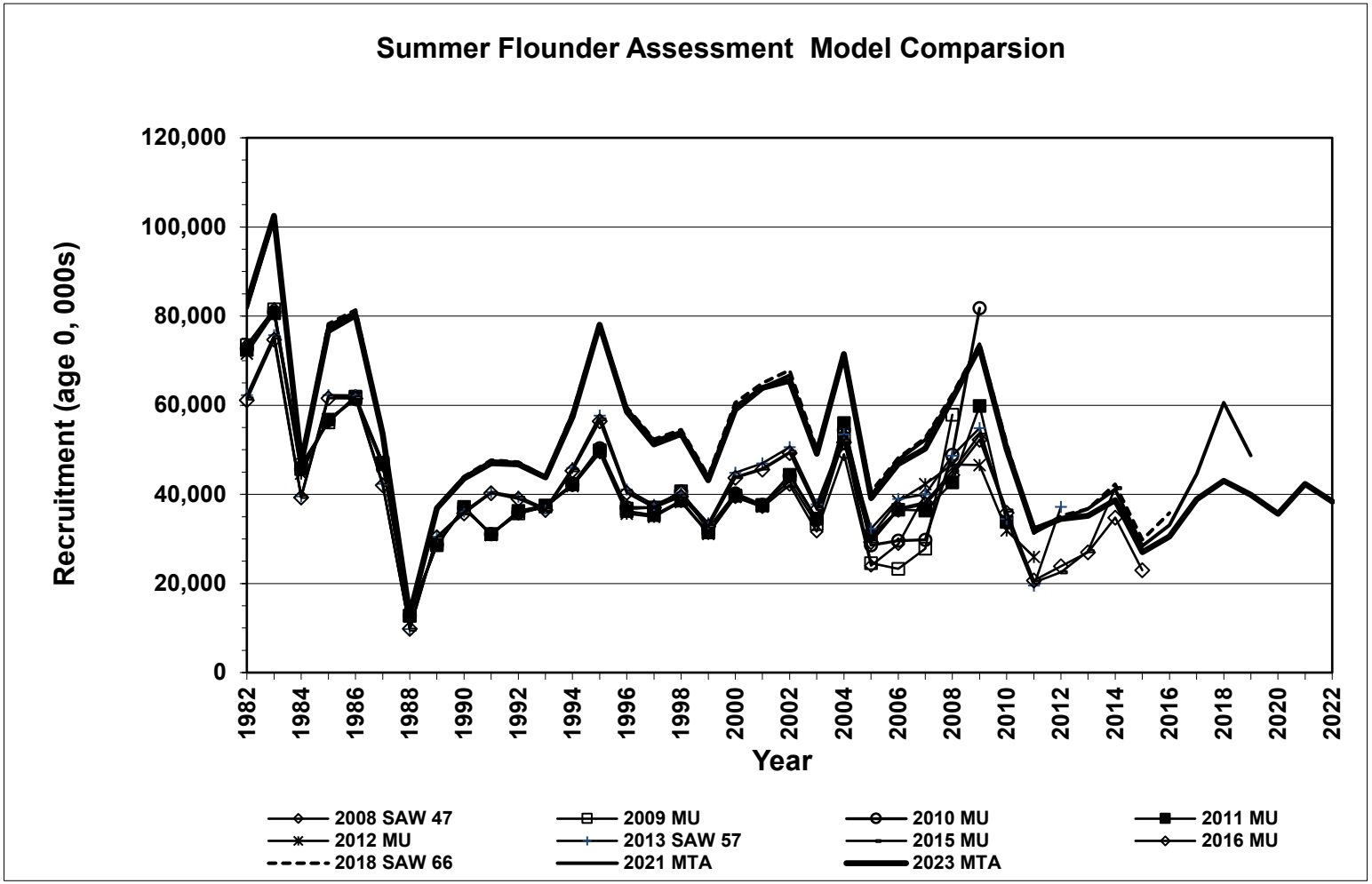
ASAP Assessments 2008-2023



ASAP Assessments 2008-2023



ASAP Assessments 2008-2023

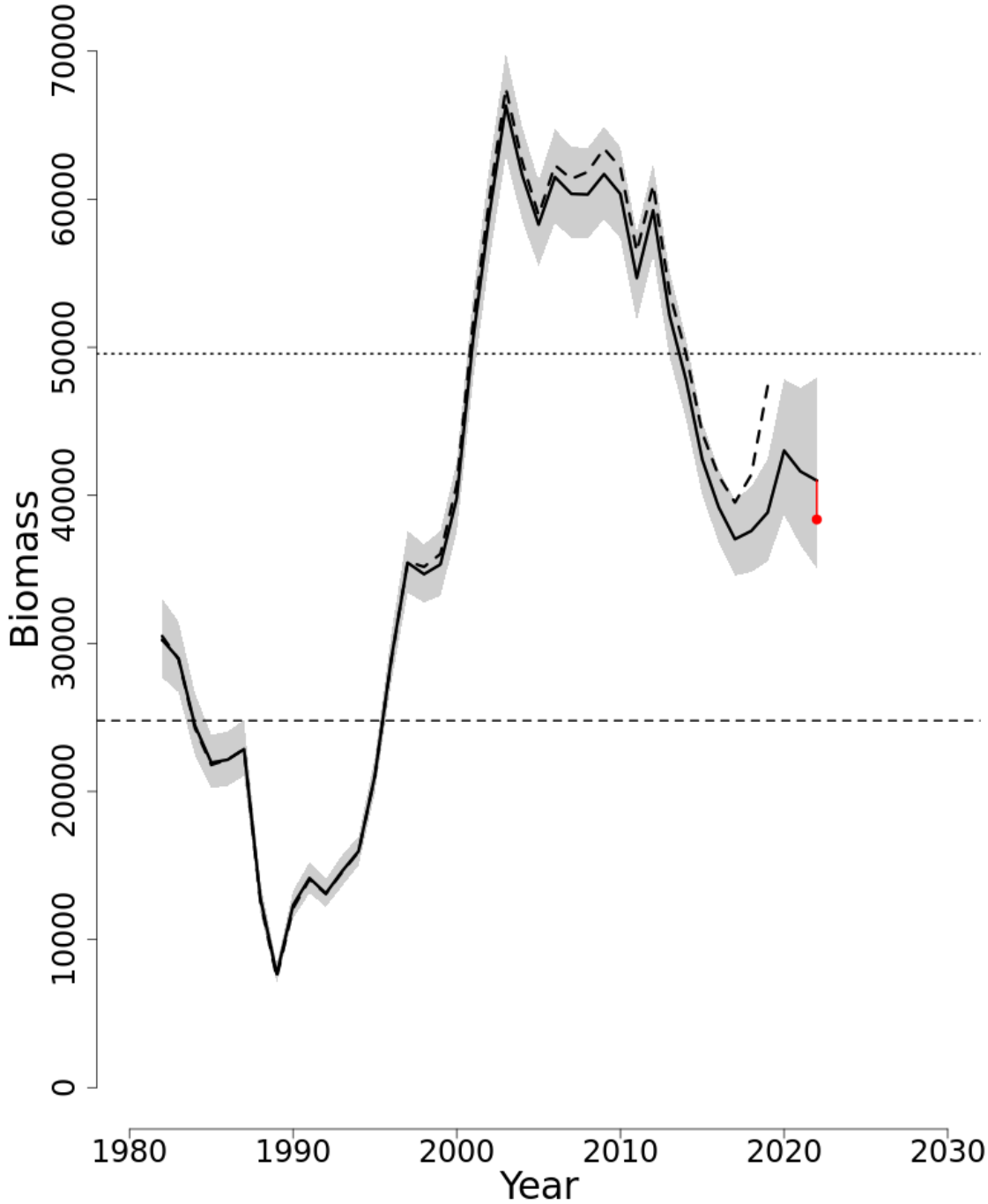


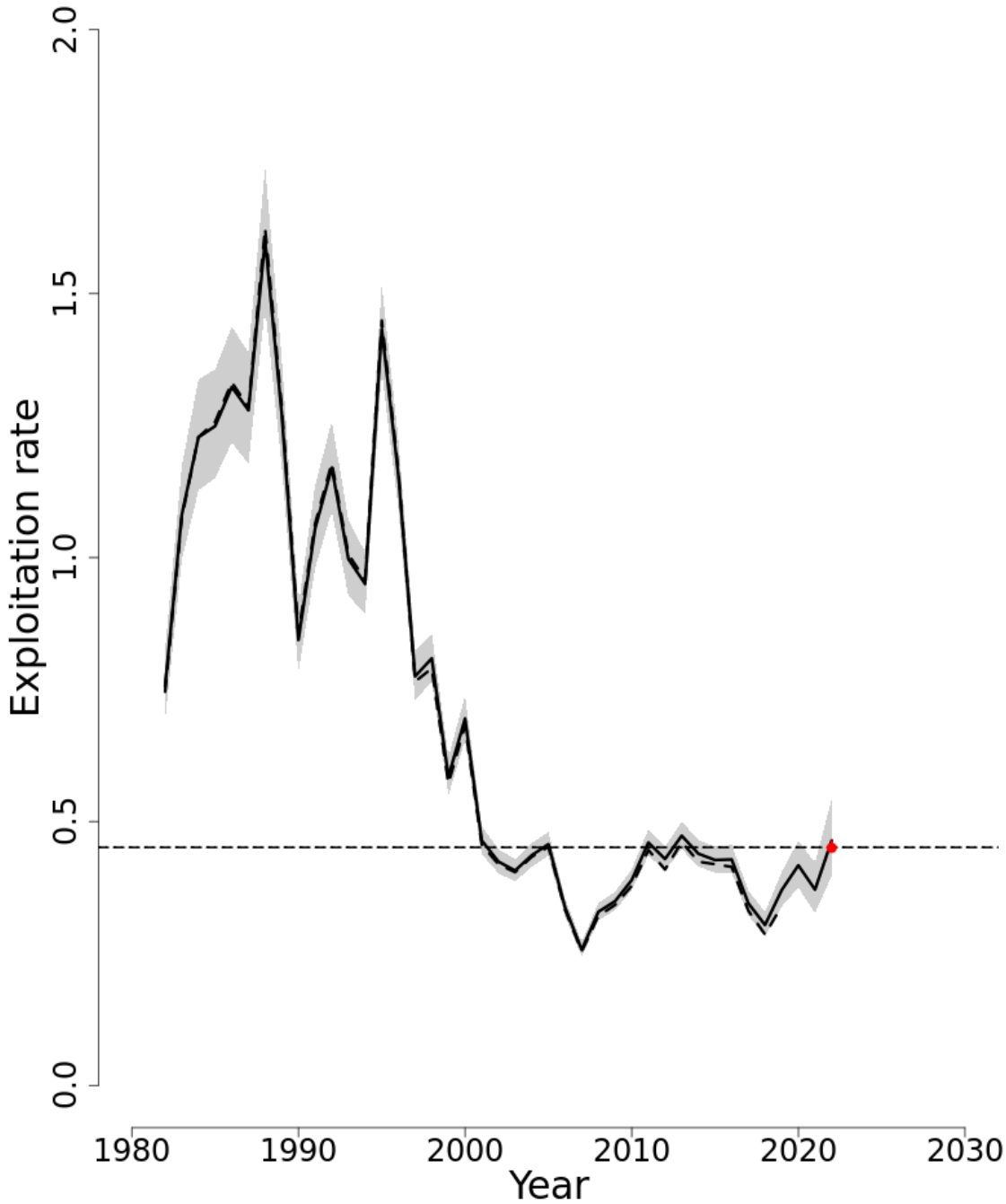
TOR 4: BRPs and Status

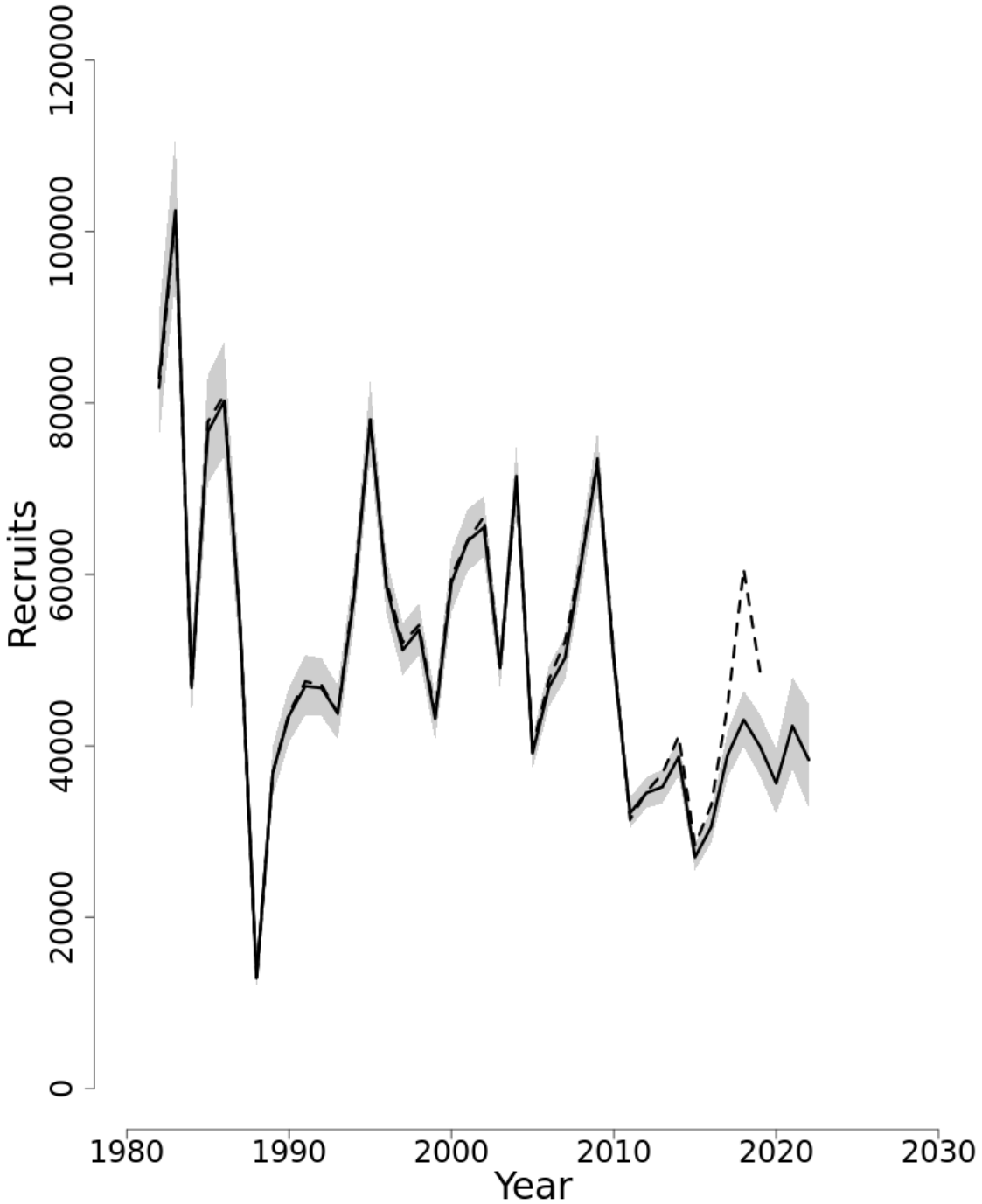
4. Re-estimate or update the BRP's as defined by the management track level and recommend stock status. Also, provide qualitative descriptions of stock status based on simple indicators/metrics (e.g., age- and size-structure, temporal trends in population size or recruitment indices, etc.).

- **2021 Management Track Assessment: through 2019**
- **Recruitment sampled from 1982-2019: avg = 53 million**
- **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**

- **2023 Management Track Assessment: through 2022**
- **Recruitment sampled from 1982-2022; avg = 51 million**
- **BMSY = SSB35% = 49,561 mt**
- **FMSY = F35% = 0.451**
- **MSY = 14,097 mt = 31.079 mlb**
- **Not Overfished: SSB2022 = 40,994 mt, 83% of BMSY**
- **Overfishing is occurring: F2022 = 0.464, 103% of FMSY**


Biomass
0
10000
20000
30000
40000
50000
60000
70000
1980
1990
2000
2010
2020
2030
Year


Exploitation rate
0.0
0.5
1.0
1.5
2.0
1980
1990
2000
2010
2020
2030
Year


Recruits
0
20000
40000
60000
80000
100000
120000
1980
1990
2000
2010
2020
2030
Year

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 about 2010**
- **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)**

TOR 5: Projections

5. Conduct short-term stock projections when appropriate.

2023 Management Track Assessment
OFL Projections 2024-2025

- **Projections for 2024-2025 OFLs at FMSY = 0.451**
- **During 2018-2022, an average of 96% of the ABC was caught; assume 2023 ABC caught = 15,023 mt**
- **Recruitment sampled from 2011-2022; avg = 36 million**
- **OFL 2024 = 10,422 mt (CV = 16%)**
- **OFL 2025 = 10,839 mt (CV = 11%)**
- ***Subsequent MAFMC SSC, MC, and Staff recommendations will determine OFLs/ABCs under the risk policy and any other options***

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

- 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; latter point will be addressed when model transitions to NEFSC WHAM state-space model in next RTA

- 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)

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

MAFMC SSC 2019-2022

- Evaluate the causes of decreased recruitment and changes in the recruit per spawner relationship in recent years: no new research progress; however the 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; test 2016+ selectivity block, but retained 2018+ selectivity block
- 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 2021 and NEFSC WHAM state-space by-sex model in development

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

MAFMC SSC 2019-2022

- **Validate the otolith-based age determination*:* no explicit validation, however, going aging method exchanges have ensured 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 (Nye lab); Gulf Stream Index and exploitation influences on growth and natural mortality)**

- **The MAFMC 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 2025 in the 2023 MTA**

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

MAFMC SSC 2019-2022

- 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 2022 in the 2023 MTA; no large increase in discards evident through 2022

- 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): based on surveys indices and assessment model estimates through 2022, the 2018 year class was initially overestimated, with a current model retrospective error (7 'peels' for 2015-2022) of +28%; the 2021 MTA initial estimate of the 2018 year class at 61 million age 0 fish has been revised downward to 43 million fish in the current 2023 MTA

- Understand the objectives and performance measures for the fishery from a socioeconomic perspective, to evaluate the balance of costs and benefits of ABC specifications. Reconsider stock structure based on modern approaches: an MSE for the recreational fishery was completed in 2023 to partially address these concerns. No further research on stock structure has been initiated to date

TOR 3b:

Backup – Aggregate Survey Trends (plots) and/or PlanBsmooth trend (cod/monkfish model)

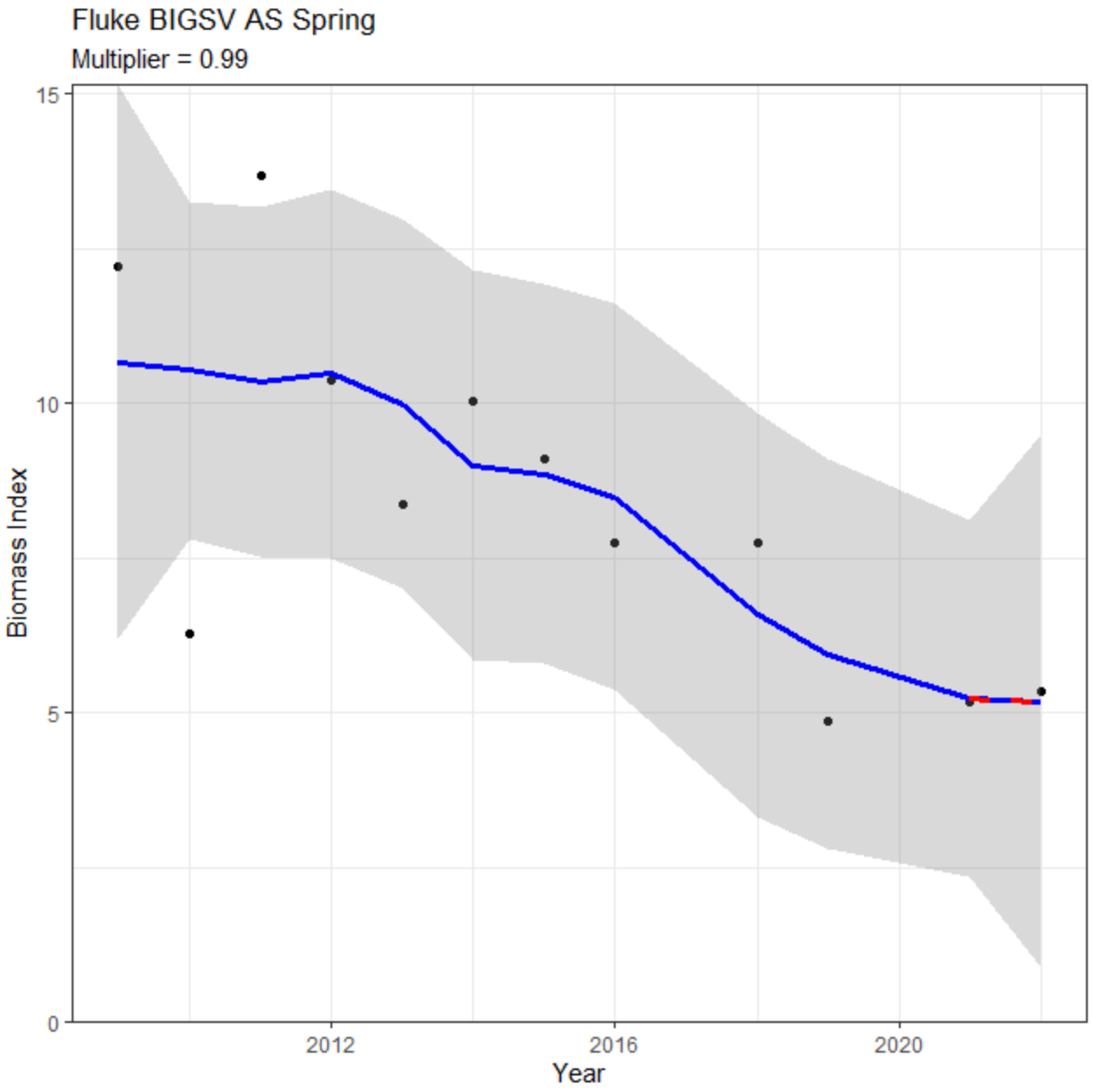
- **PlanBsmooth:**

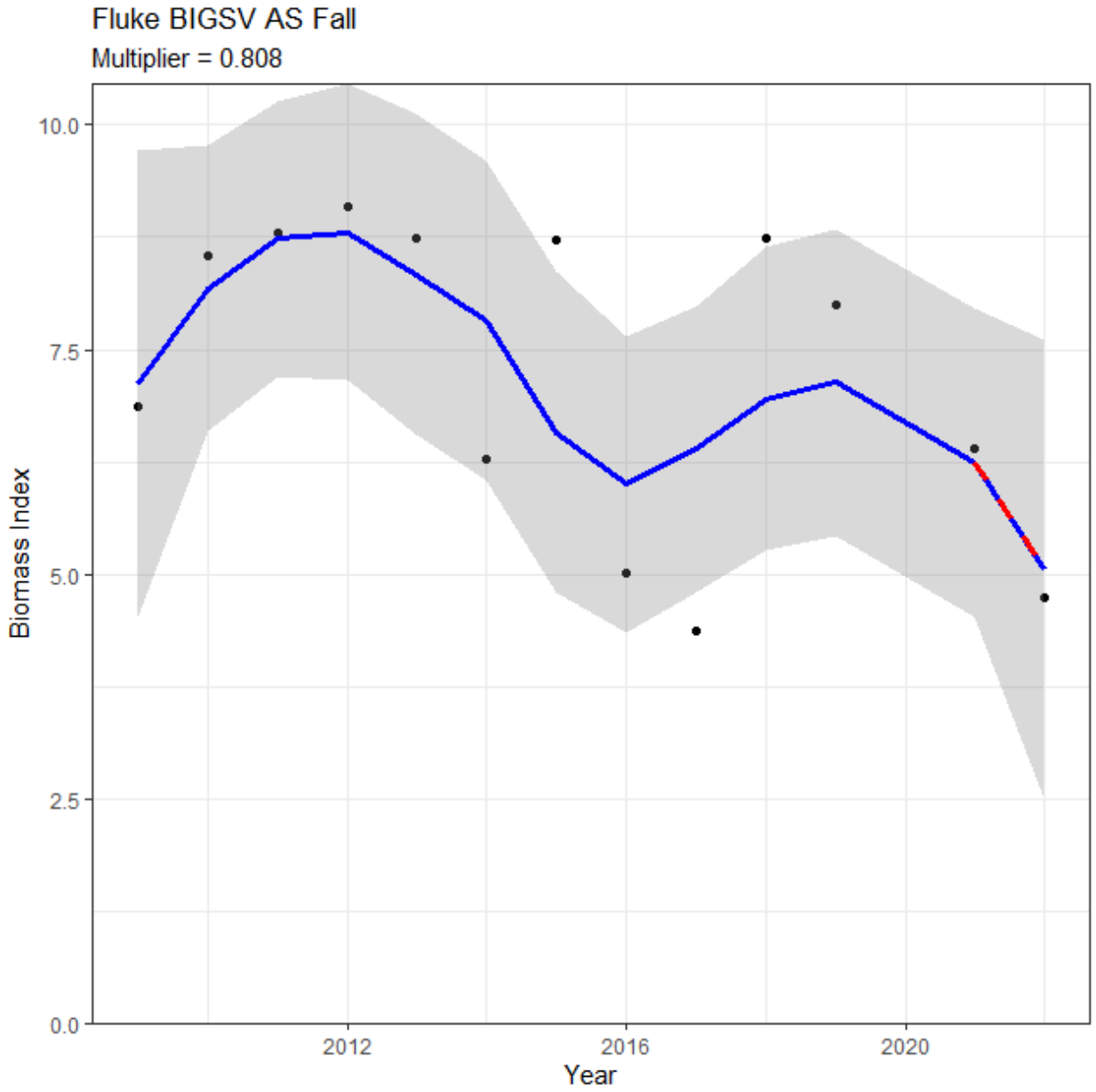
- **NEFSC Spring and Fall surveys**
- **Use only 2009-2022 series in BIG units**
  (no calibration, sweep q at length, individual tow wing spread, using 'Blaylock' SAS code)
- **Note: omit Fall 2017, Spring and Fall 2020 (no interpolation)**

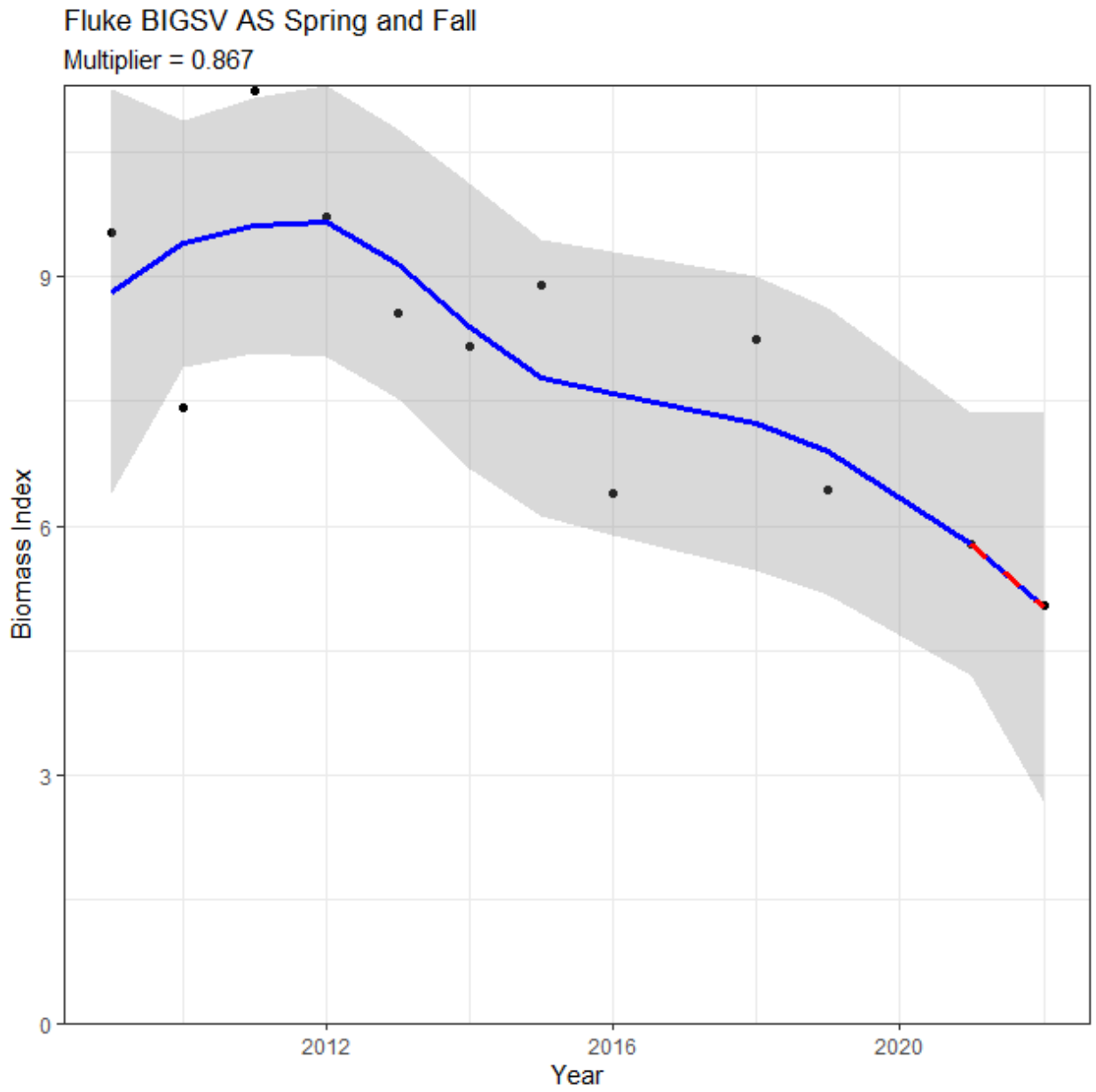
- **'Average Multiplier' = 0.867**
- **So, use 0.867 as 'Multiplier' for future OFL**

- **Example: future 2024-2025 OFL/ABCs is ~87% of current 2023 OFL/ABC**

- **Relationship of OFL to ABC will depend on SSC application of risk-policy and assumption for OFL CV under Backup Plan**


Fluke BIGSV AS Spring
Multiplier = 0.99
Biomass Index
15
10
5
0
2012
2016
2020
Year


Fluke BIGSV AS Fall
Multiplier = 0.808
10.0
7.5
5.0
2.5
0.0
Biomass Index
2012
2016
2020
Year


Fluke BIGSV AS Spring and Fall
Multiplier = 0.867
Biomass Index
0
3
6
9
2012
2016
2020
Year