

ToR 3: Surveys

Alex Hansell, Larry Alade, Cameron Hodgdon

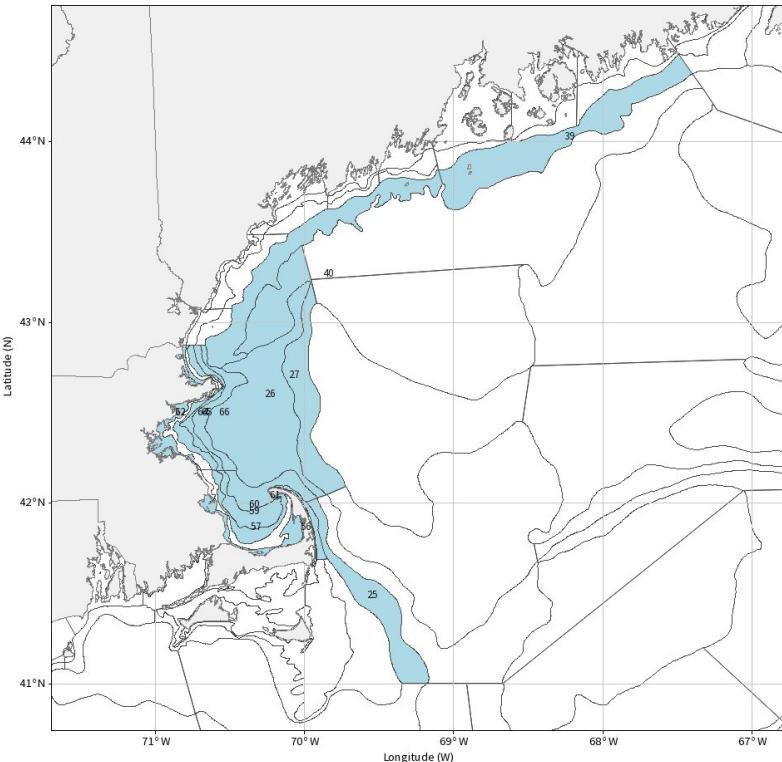


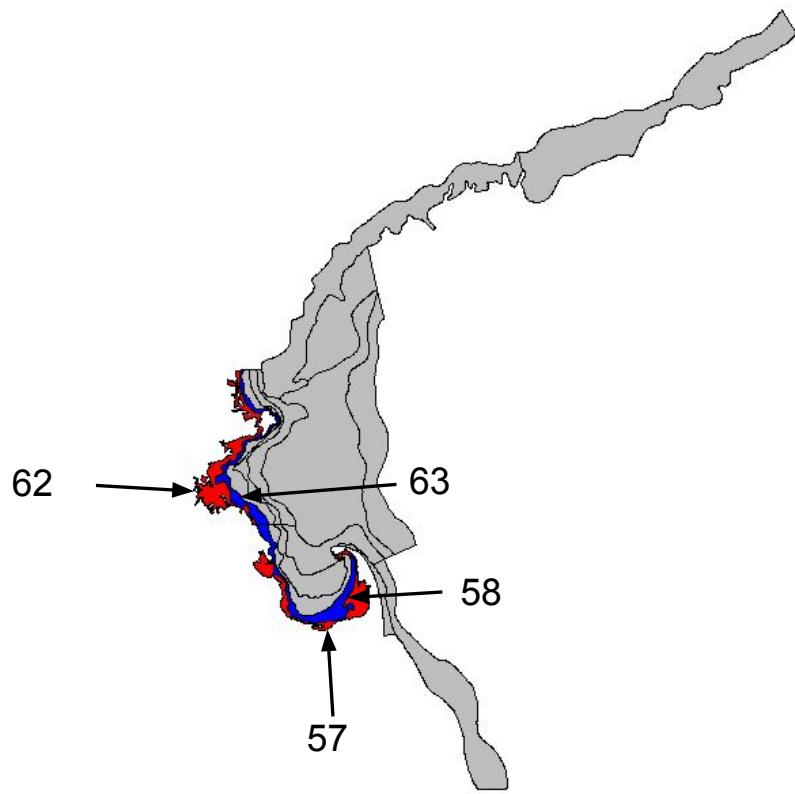
Cape Cod / Gulf of Maine

- NEFSC Bottom Trawl Survey
- MENH Inshore Trawl Survey (MEDMR*)
- MADMF Bottom Trawl Survey
- VIMS Scallop Surveys (not used in model development)

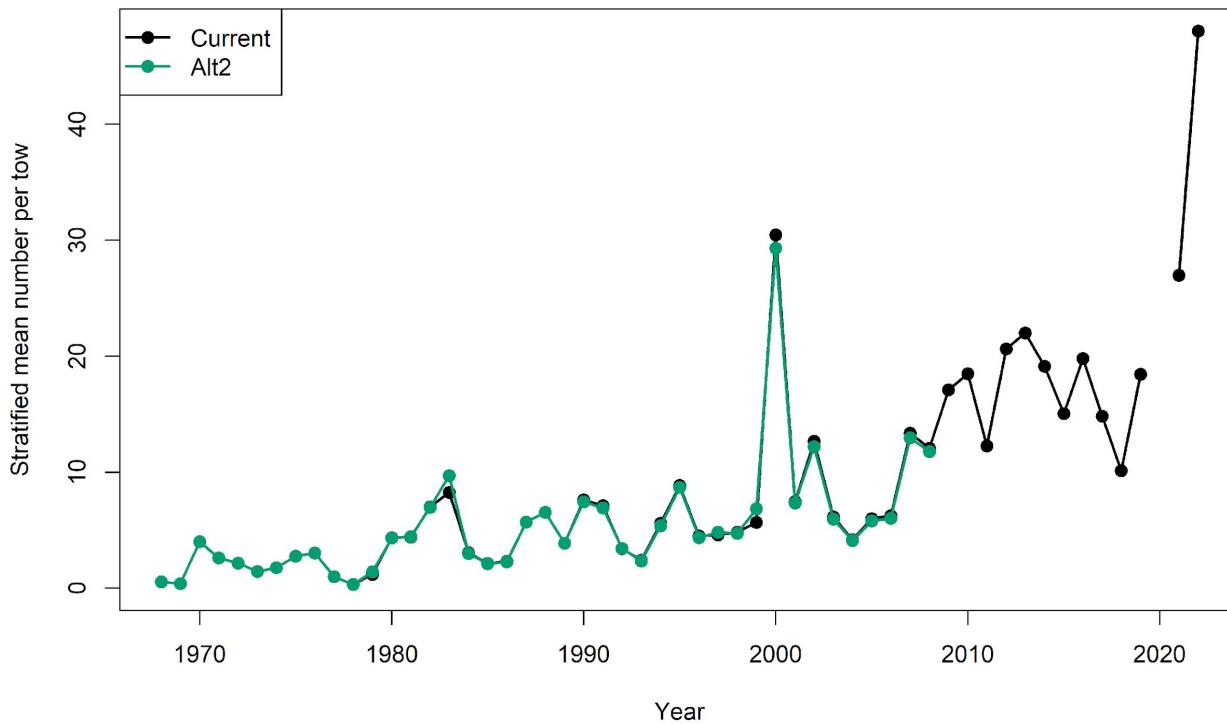
NEFSC Survey Strata

- NEFSC Survey Strata
 - Cape Cod grounds
 - offshore 25-27
 - Inshore 56-66 (58 and 63 excluded 2009-forward and restored pre-2009)-N
 - Northern GOM
 - Offshore 39 & 40
- Sampling inshore North of Cape Cod started in 1977
- Previous assessment - Only NEFSC spring index includes offshore 27
 - For RTA - Stratum 27 now included in the fall index

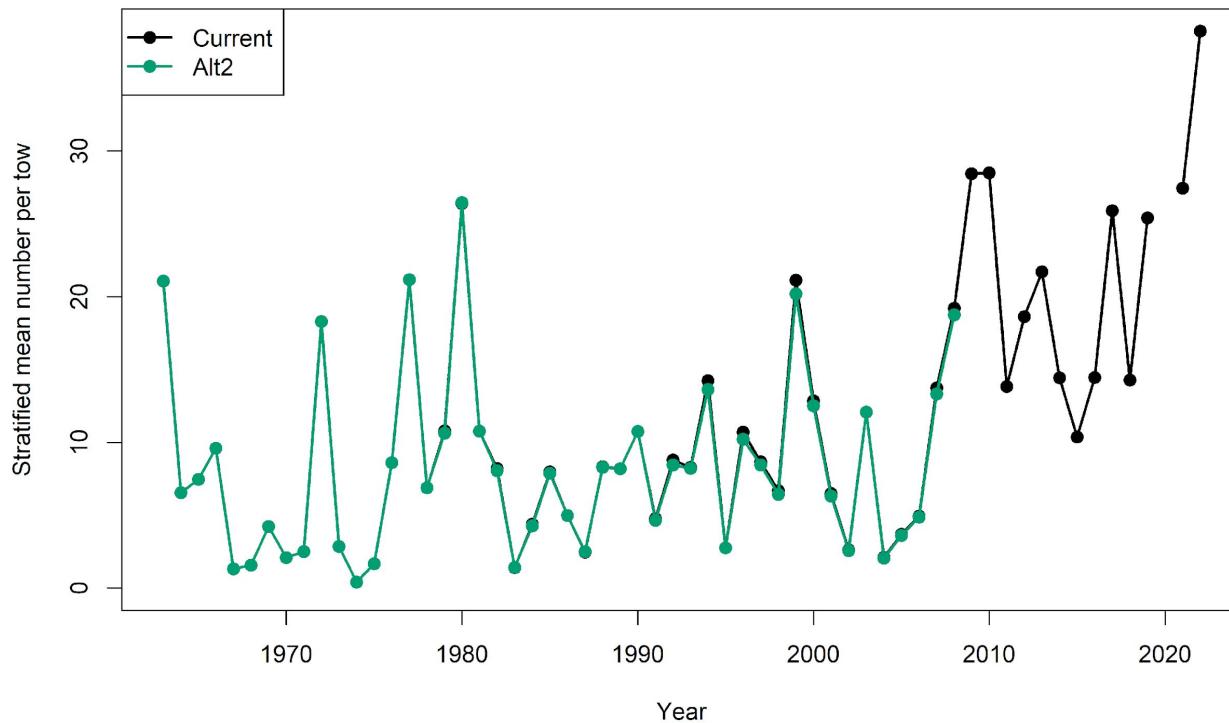




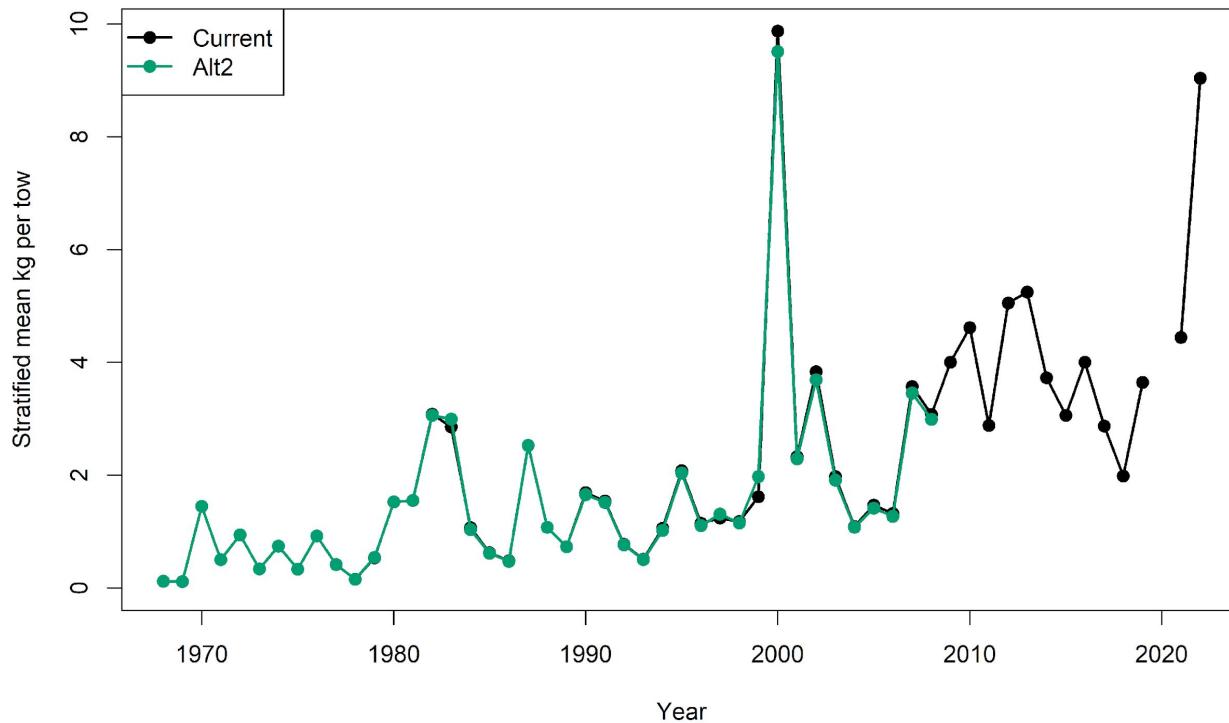
Spring



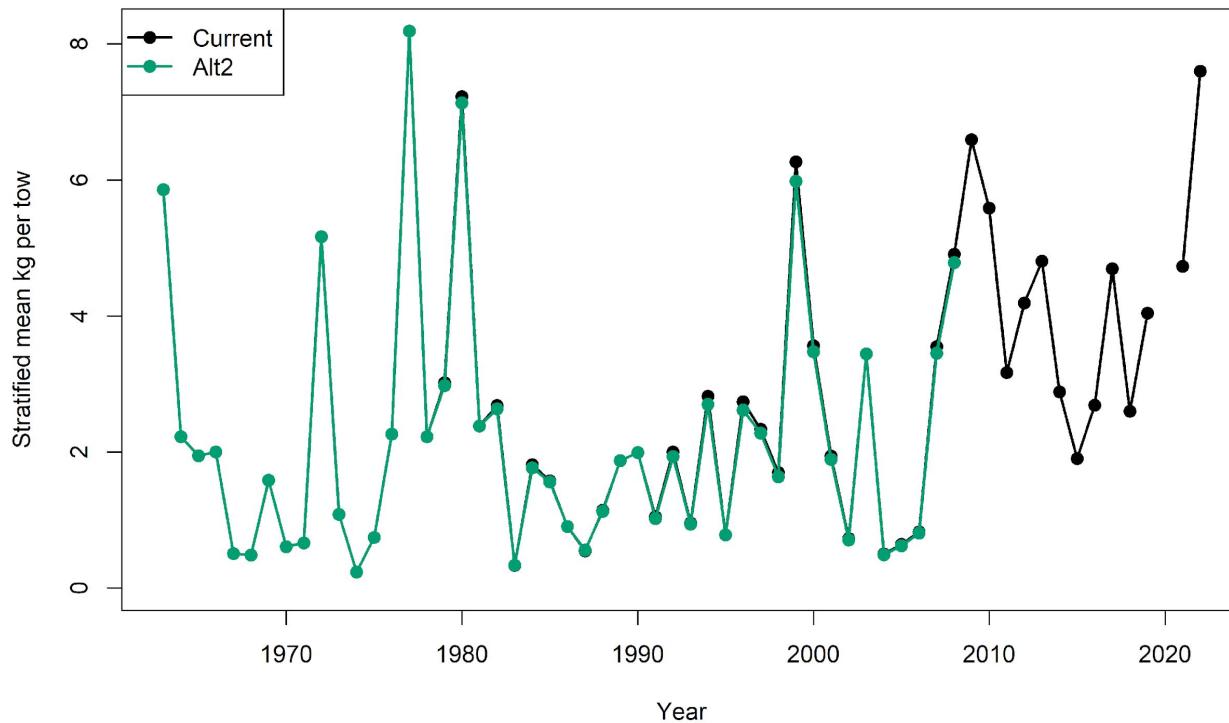
Fall



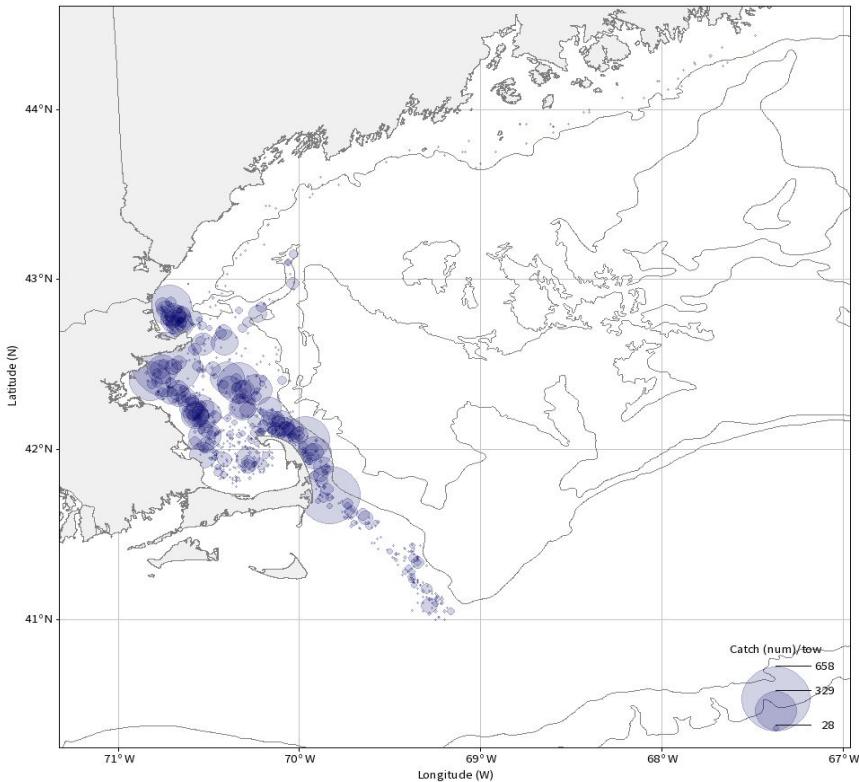
Spring



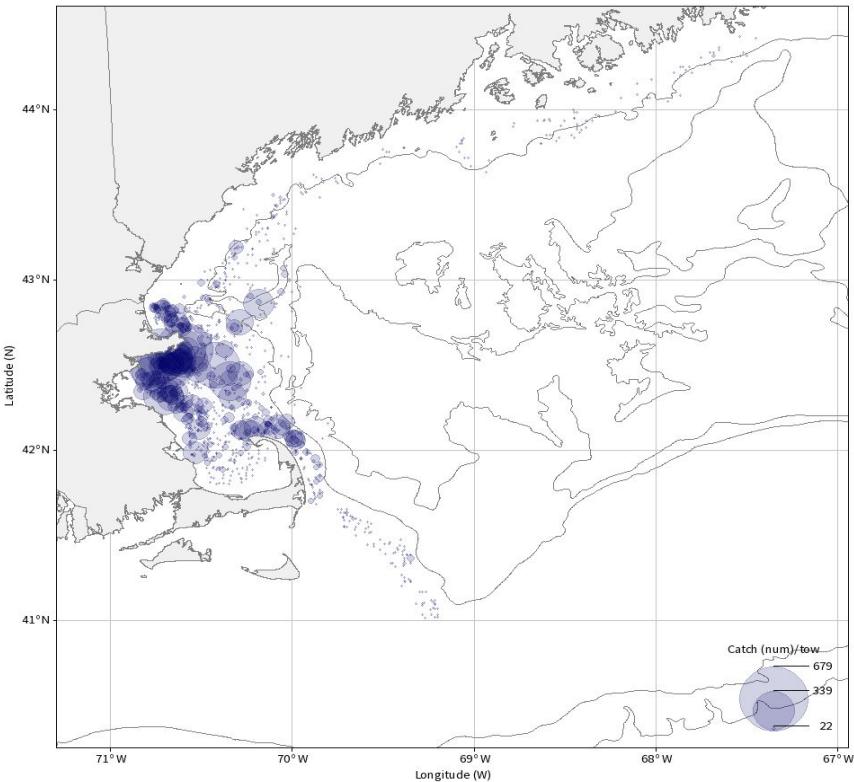
Fall



NEFSC Survey Map Distribution



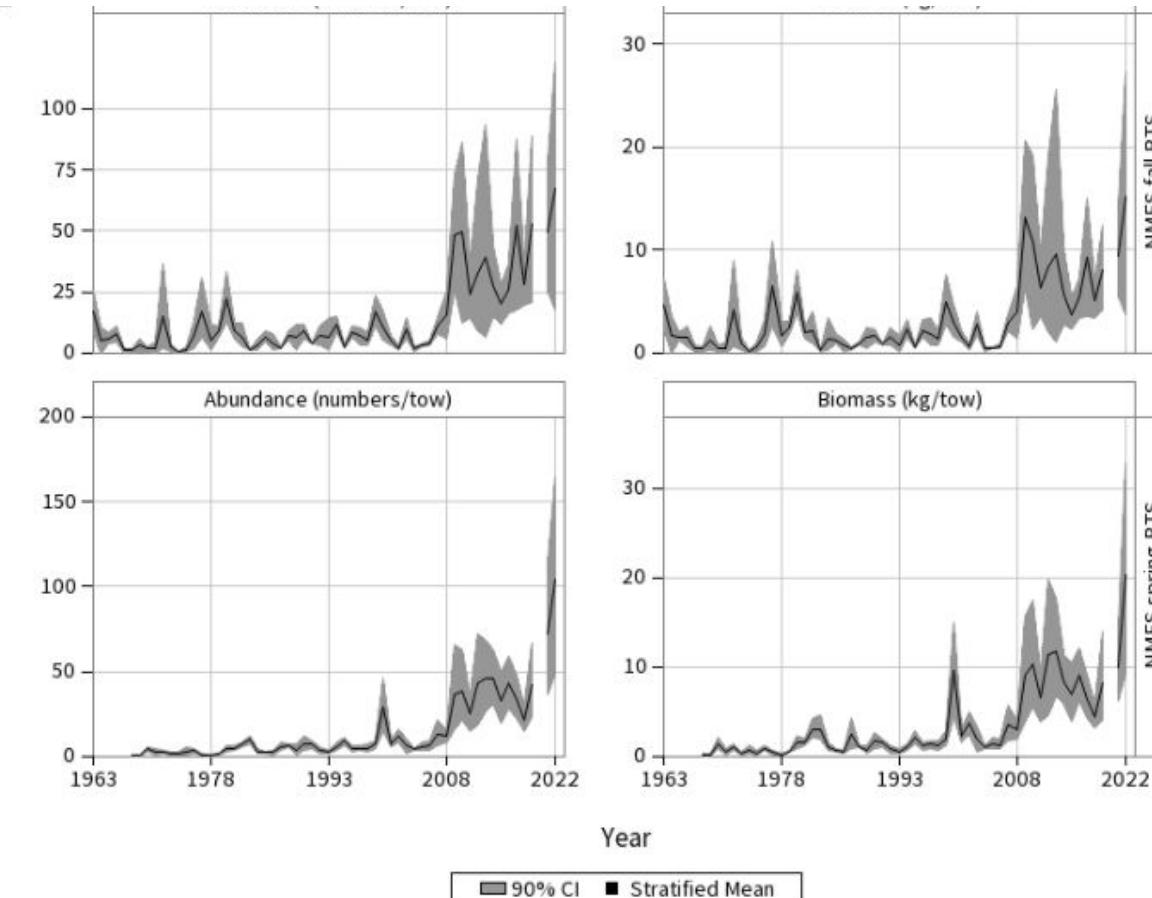
Fall 1963-2022



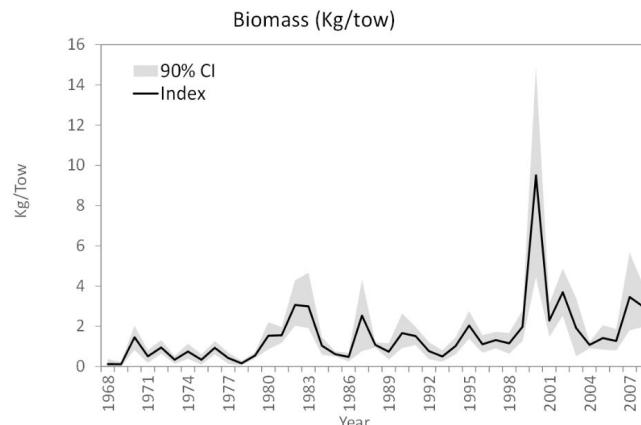
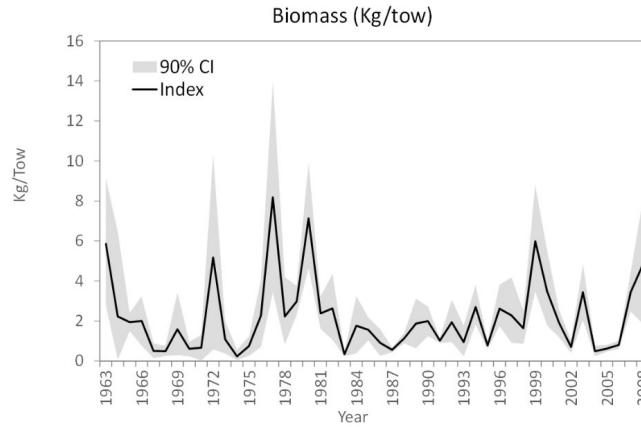
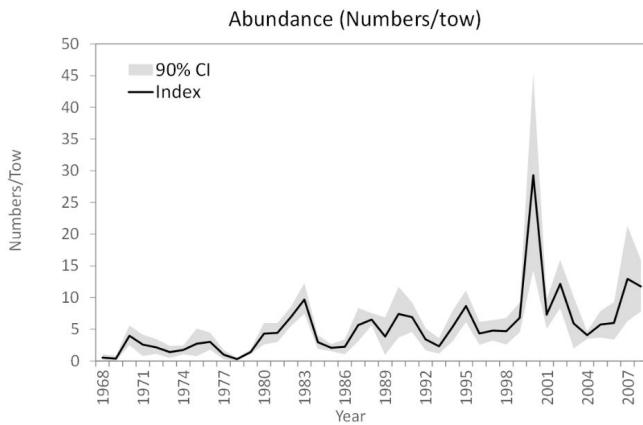
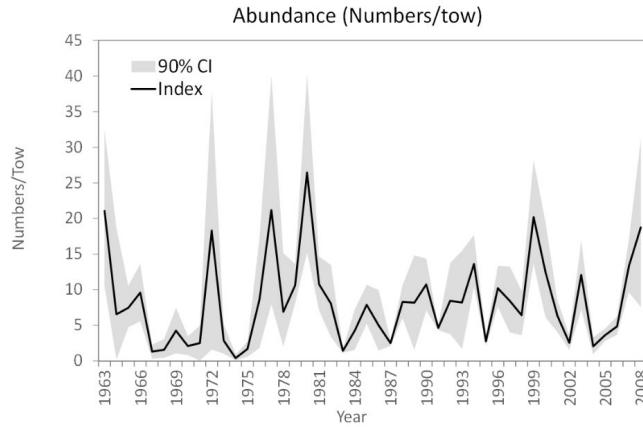
Spring 1968-2022

NEFSC Survey Distribution

NEFSC Aggregate Stratified Means



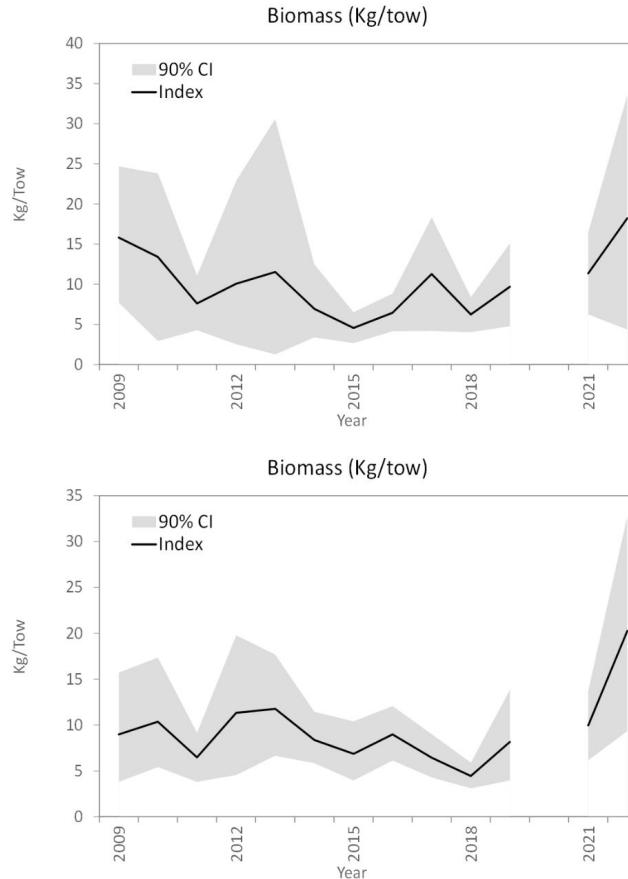
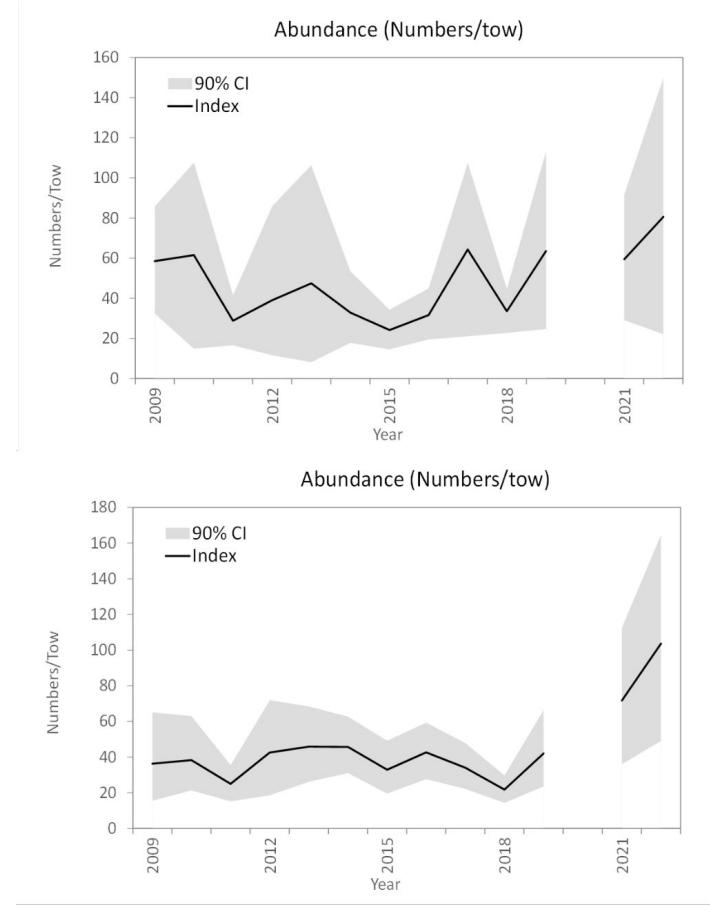
NEFSC Aggregate Stratified Means (Pre-2009)-N



NMFS Fall BTS

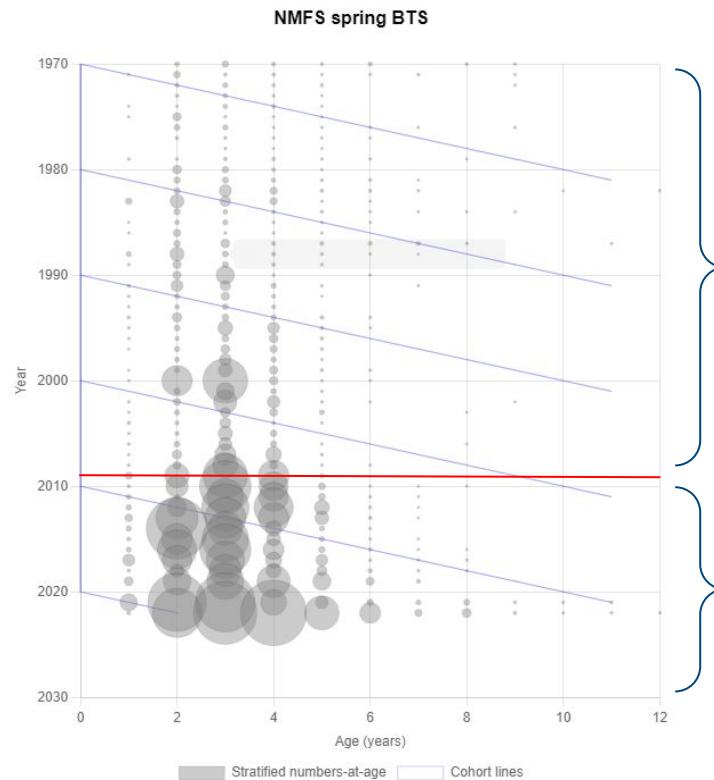
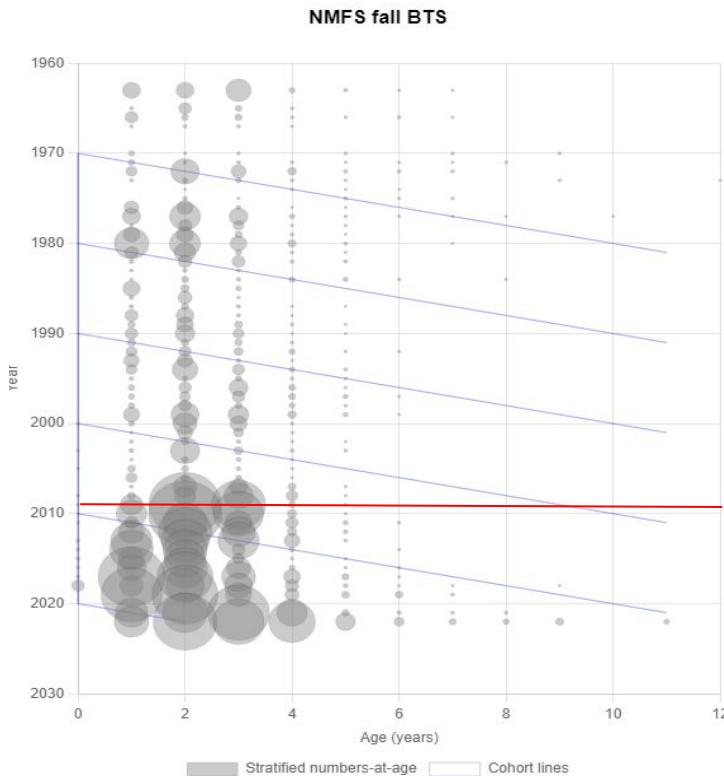
NMFS Spring BTS

NEFSC Aggregate Stratified Means (2009-onward)-N



NMFS Fall BTS NMFS Spring BTS

NEFSC Survey Stratified Mean-at-age

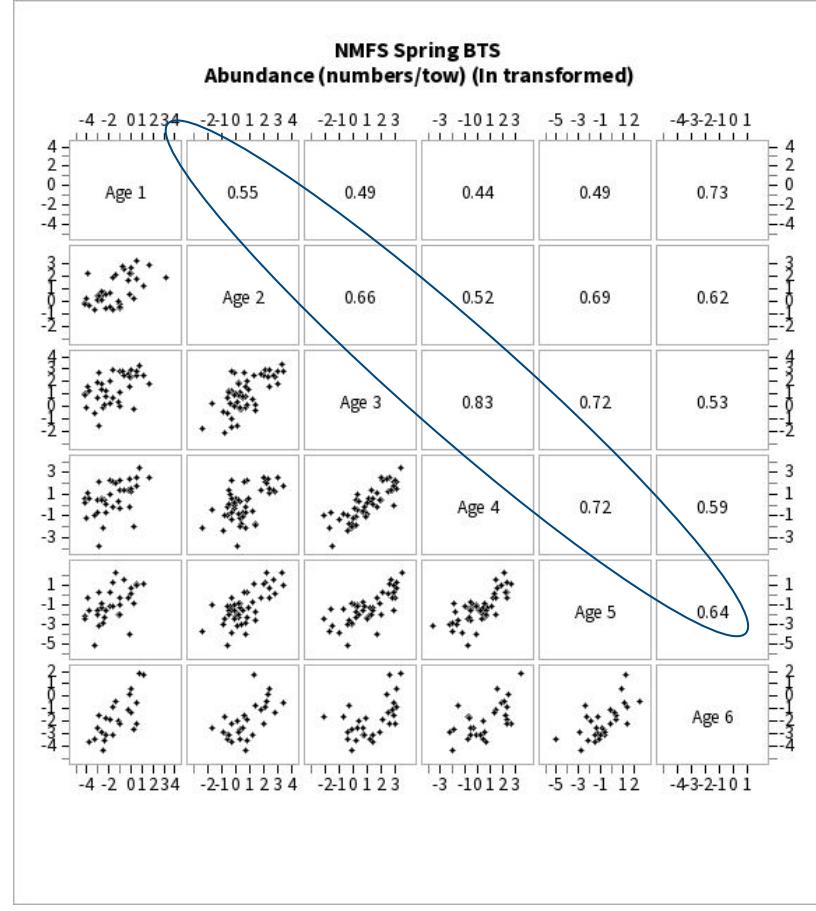
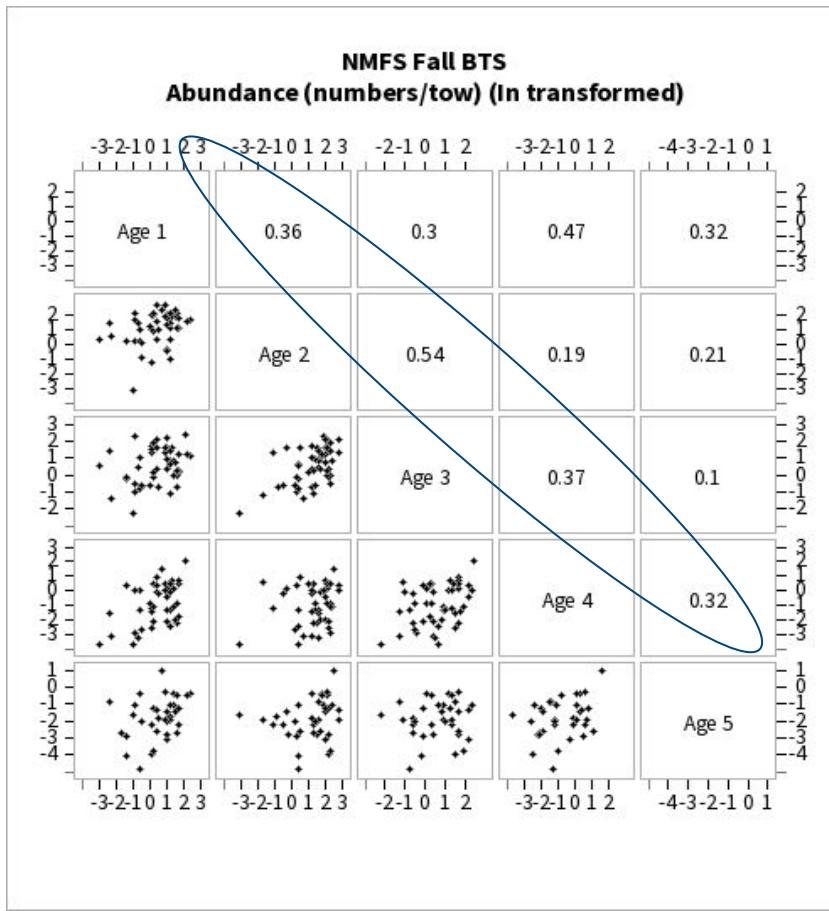


R/V Albatross

R/V Bigelow

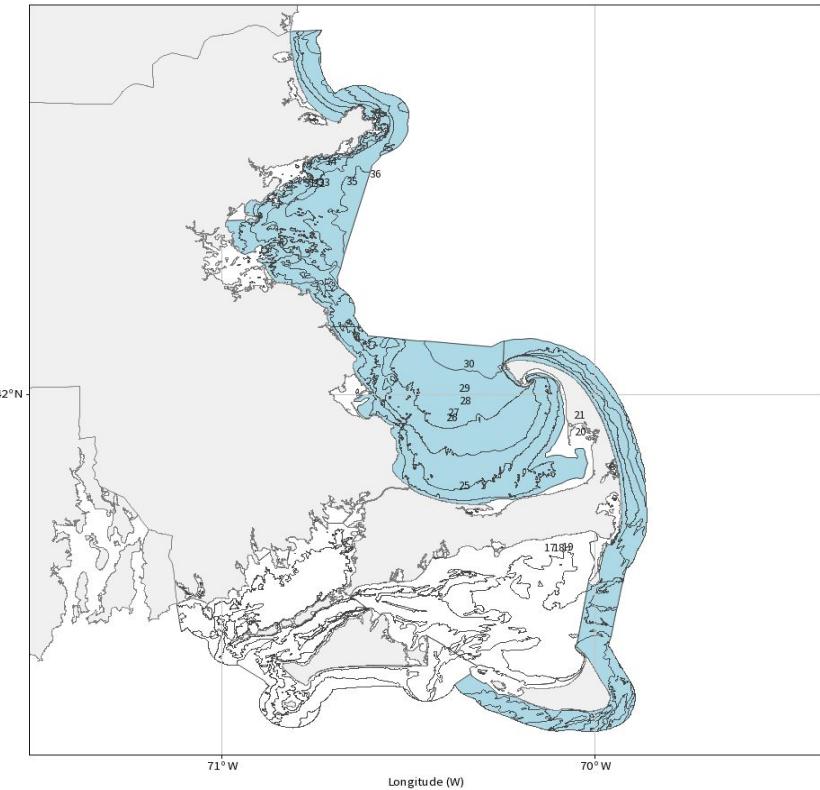
NEFSC Survey Cohort Tracking

Weak to Strong (R^2 : 0.32 - 0.54 in Fall ; 0.55 - 0.83 in spring)

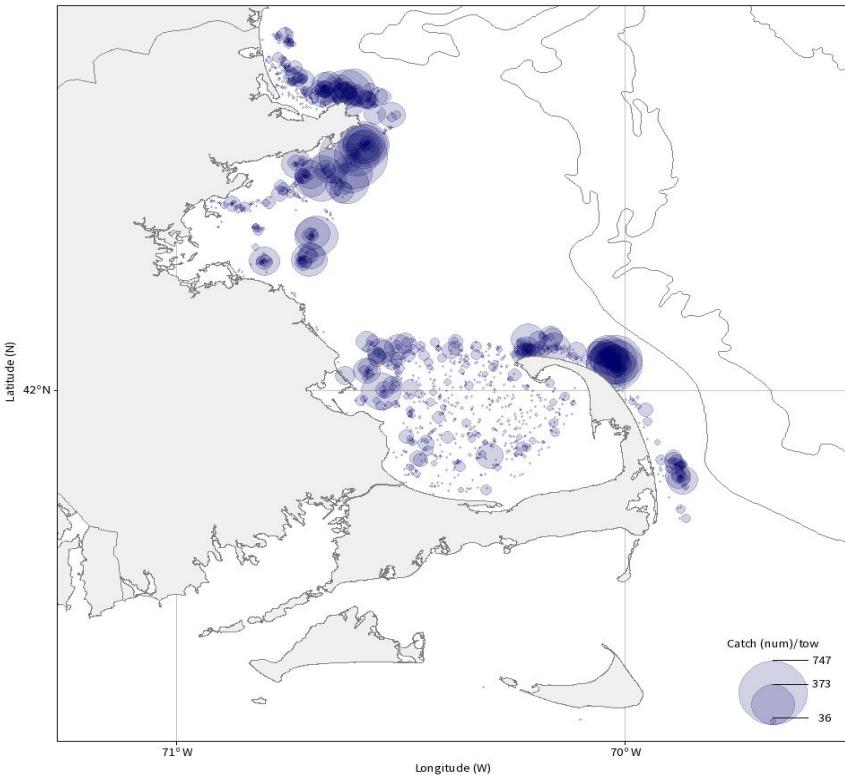


MADMF Survey Strata

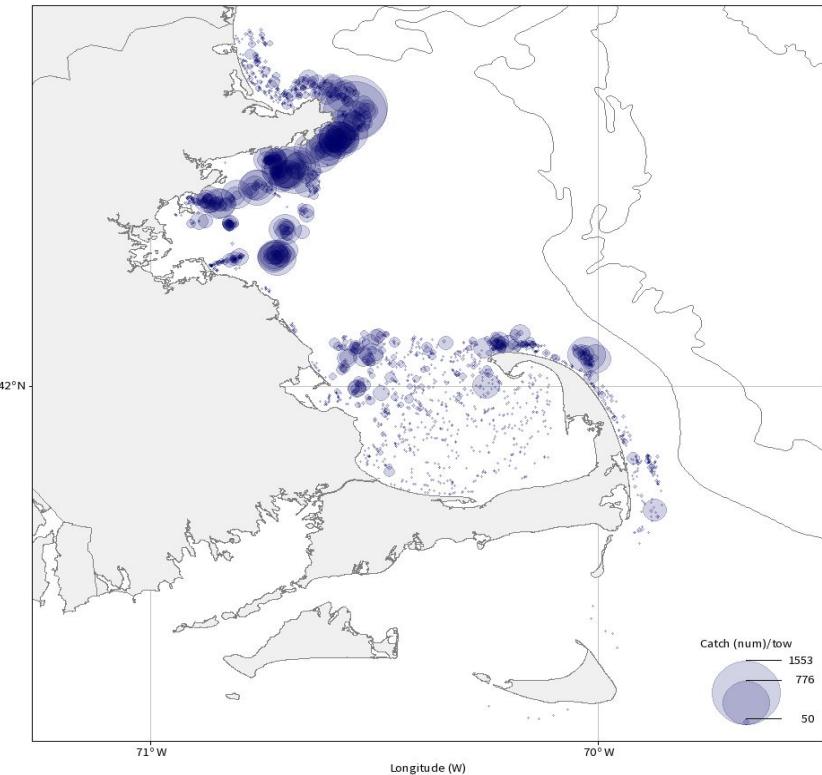
- MADMF Survey Conducted Since 1978
 - Strata 17-36



MADMF Survey Map Distribution



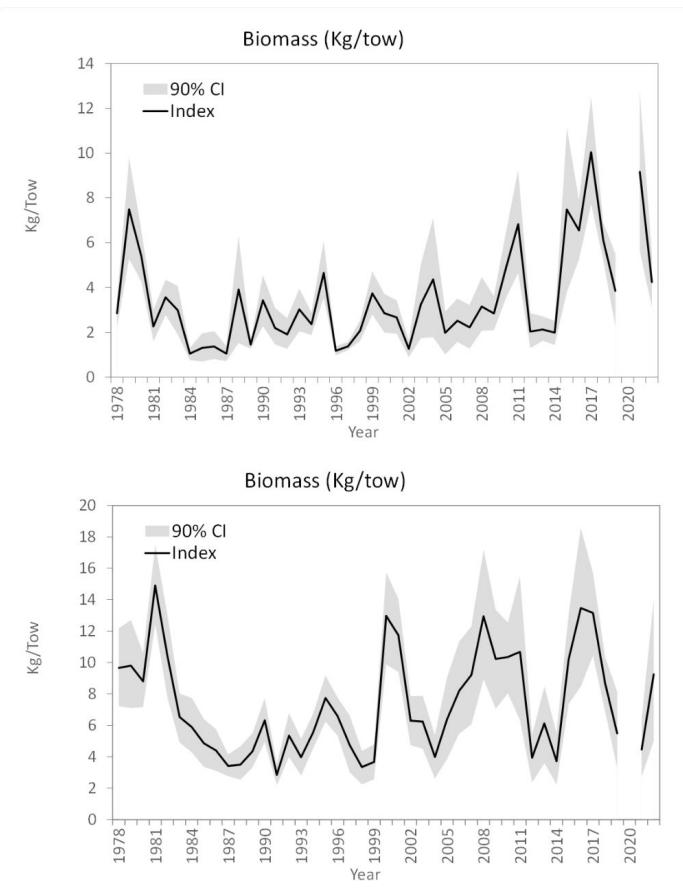
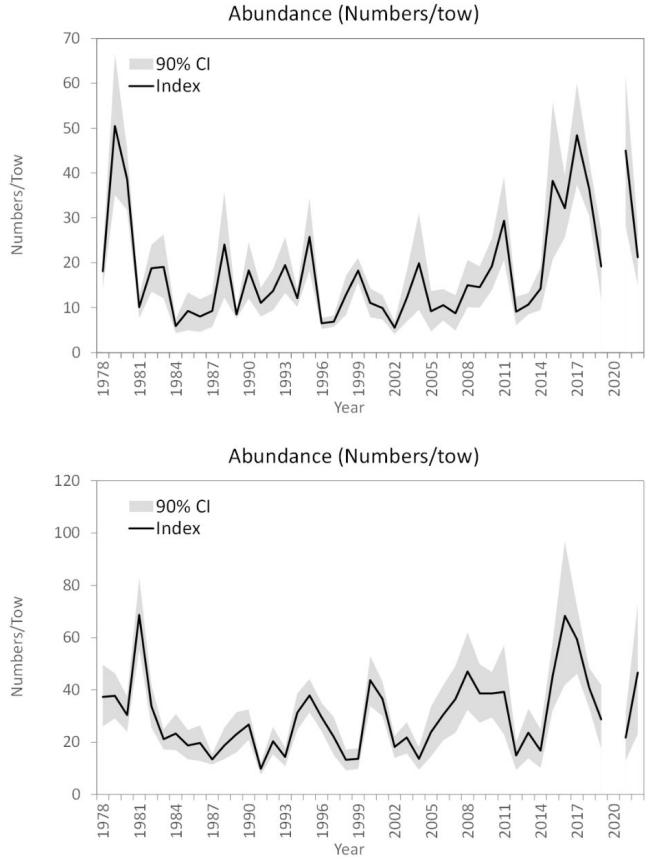
Fall 1978-2022



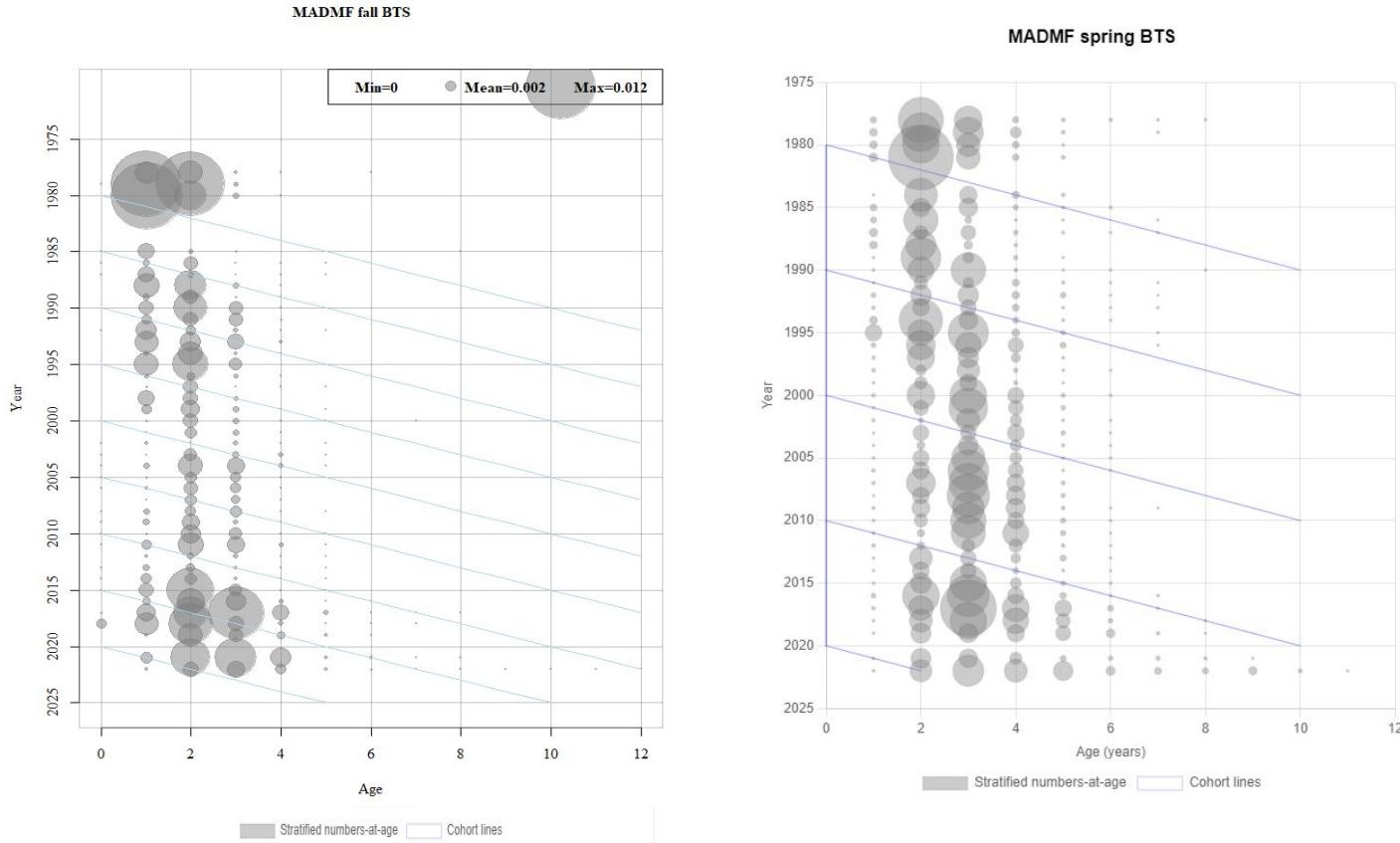
Spring 1978-2022

MADMF Survey Distribution

MADMF Aggregate Stratified Means

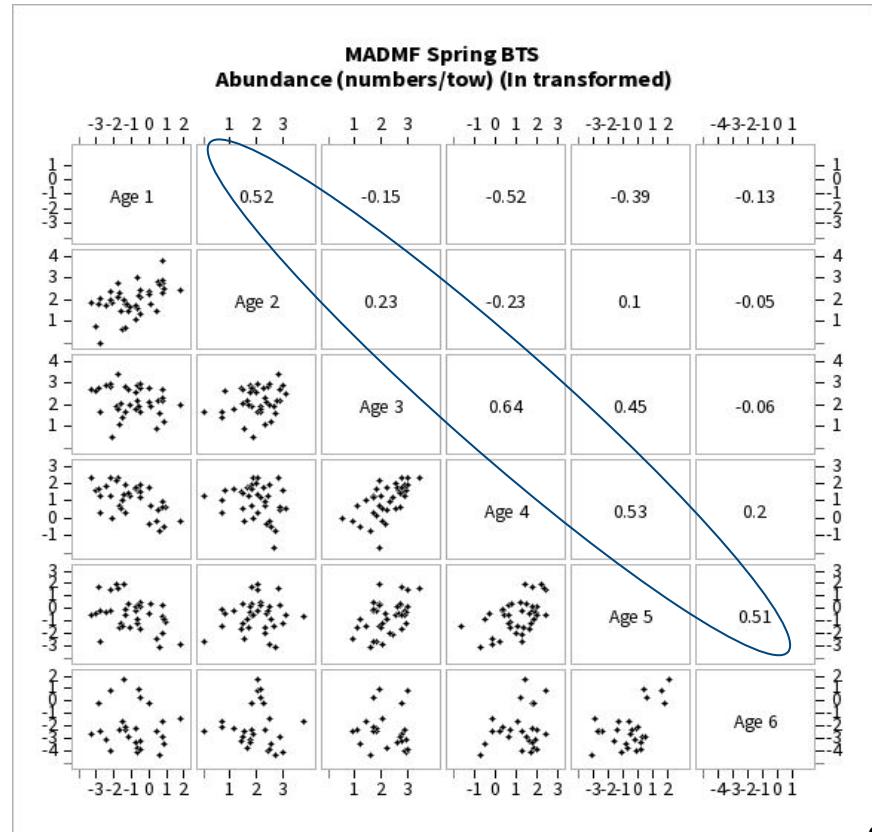
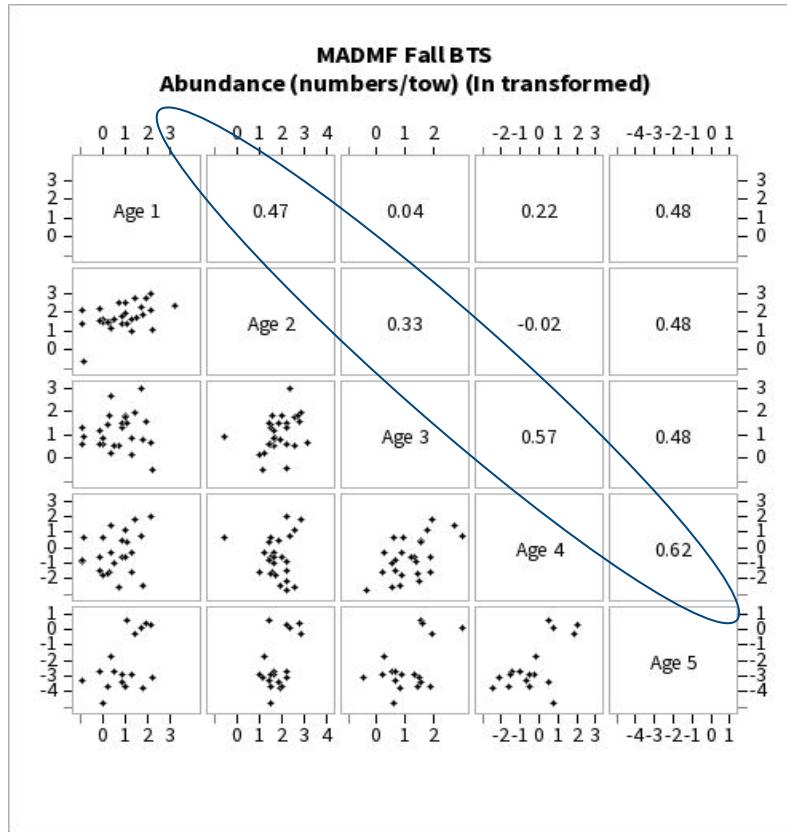


MADMF Survey Stratified Mean-at-age



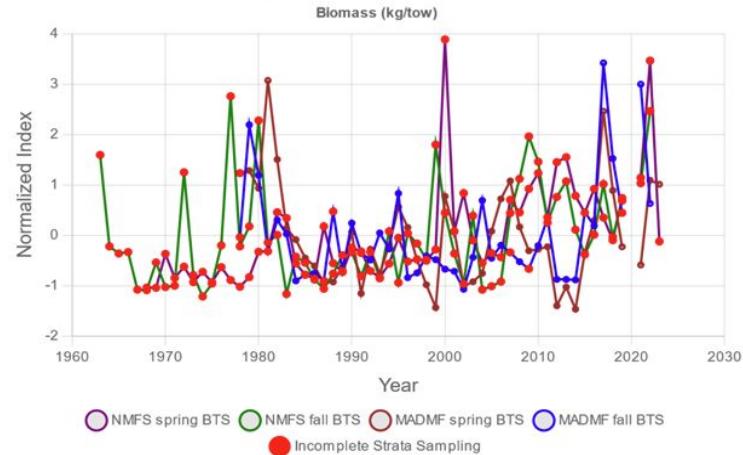
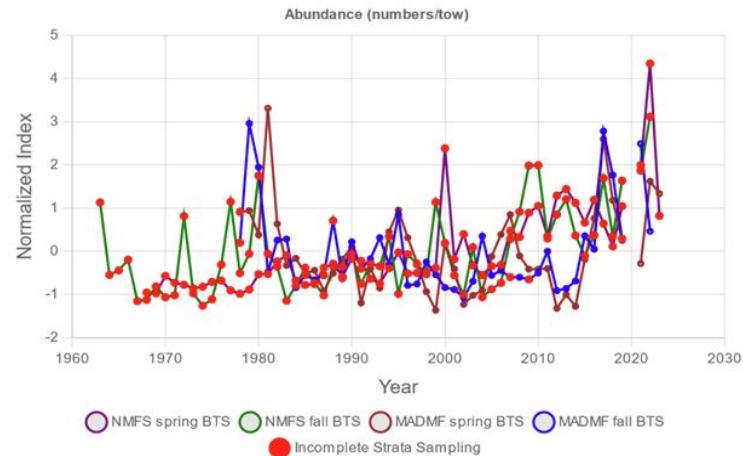
MADMF Survey Cohort Tracking

Weak to Moderate (R^2 : 0.33 - 0.57 in Fall ; 0.23 - 0.64 in spring)

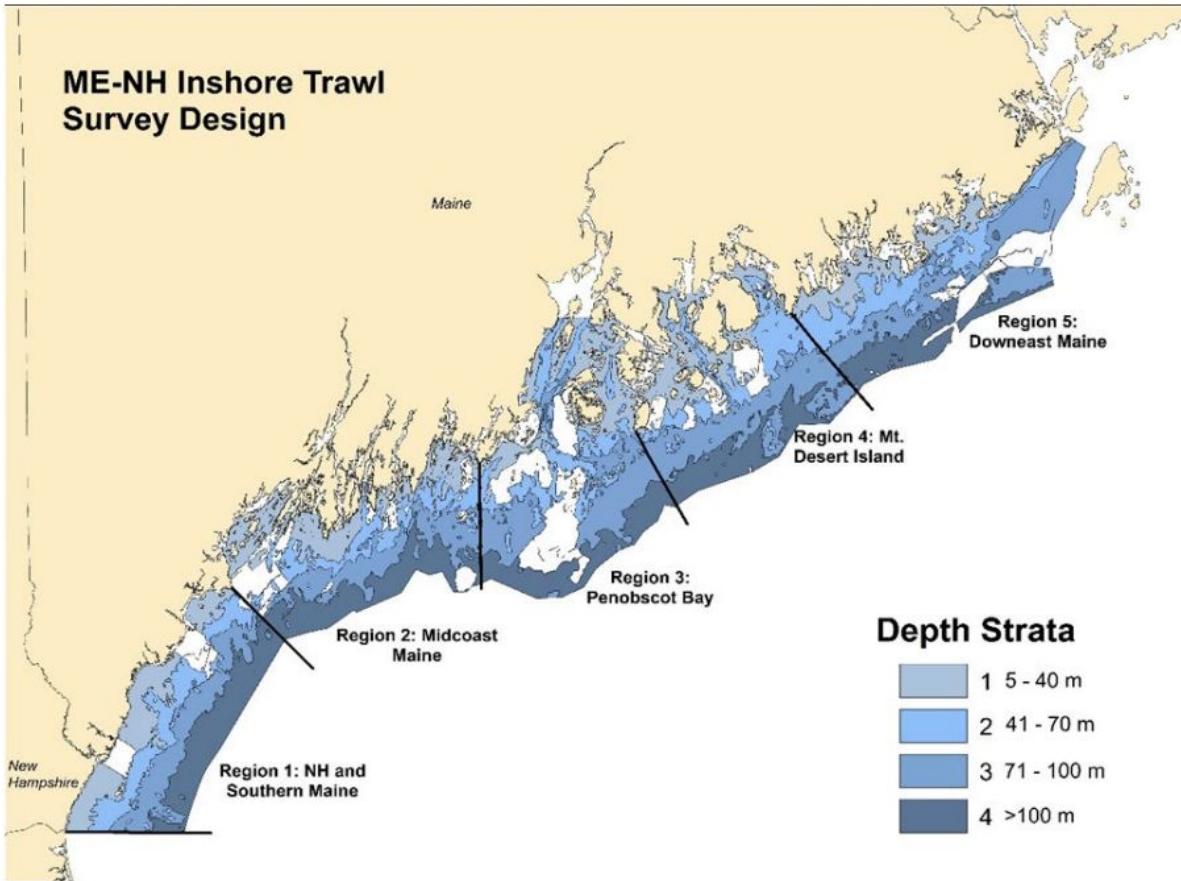


Aggregate Survey Stratified Means

- Survey biomass indices are variable
- High biomass in the late 1970's and early 1980's
- Moderate biomass during early to mid 1990's
- Brief increase in the late in the early 2000's
- Decline around the early 2010's followed by another brief increase

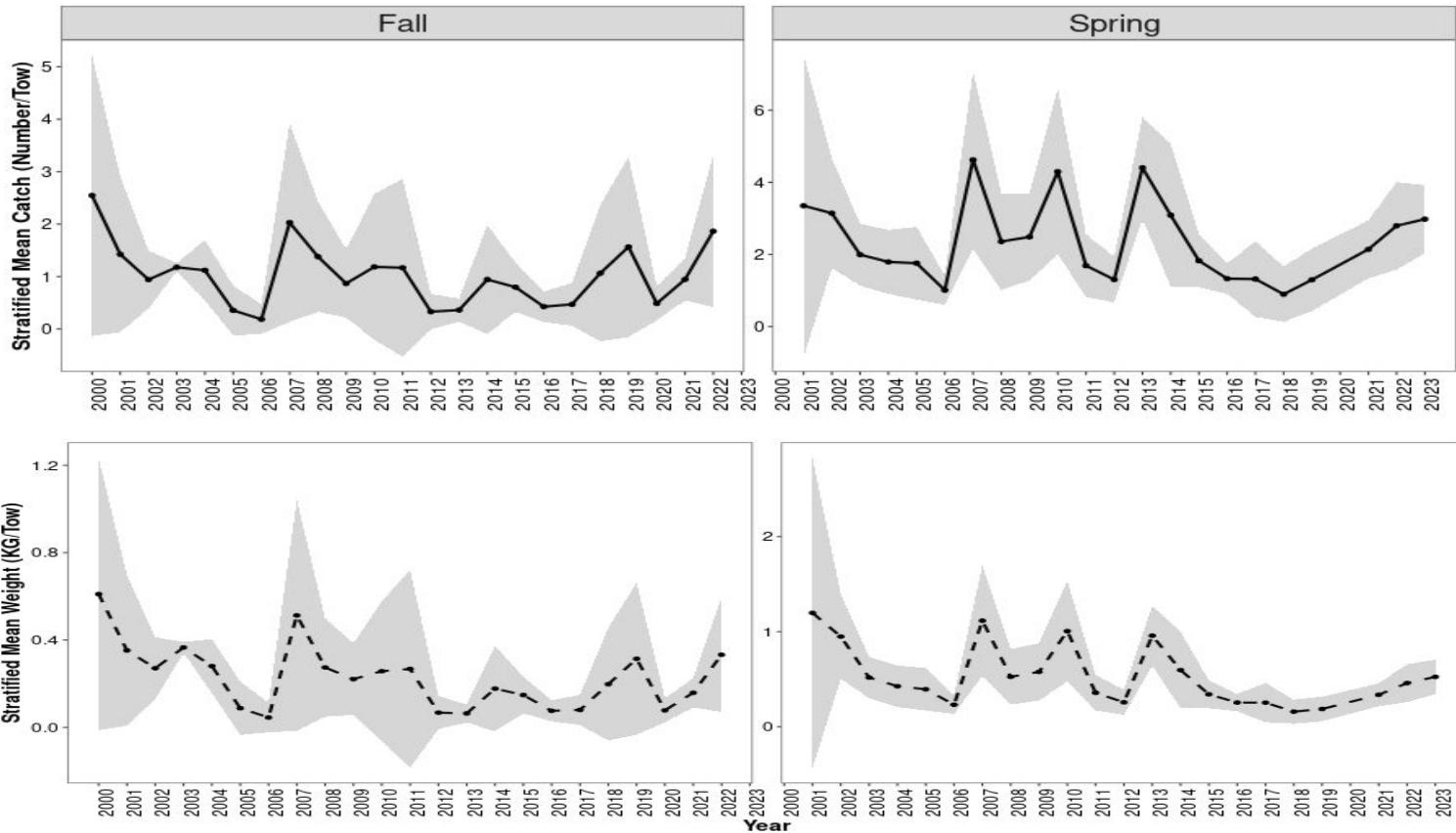


MENH Inshore Trawl Survey

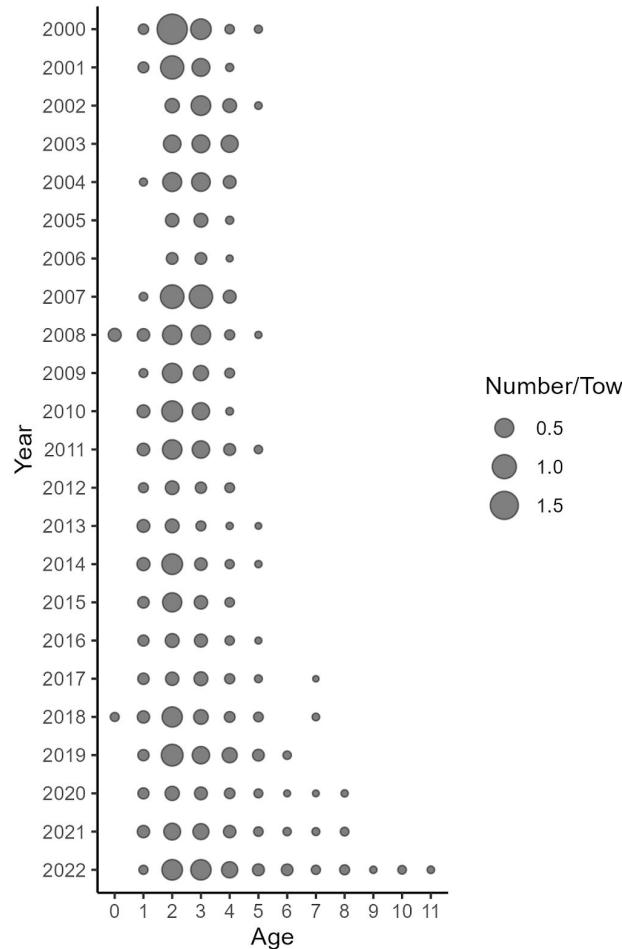


MENH Inshore Trawl Survey

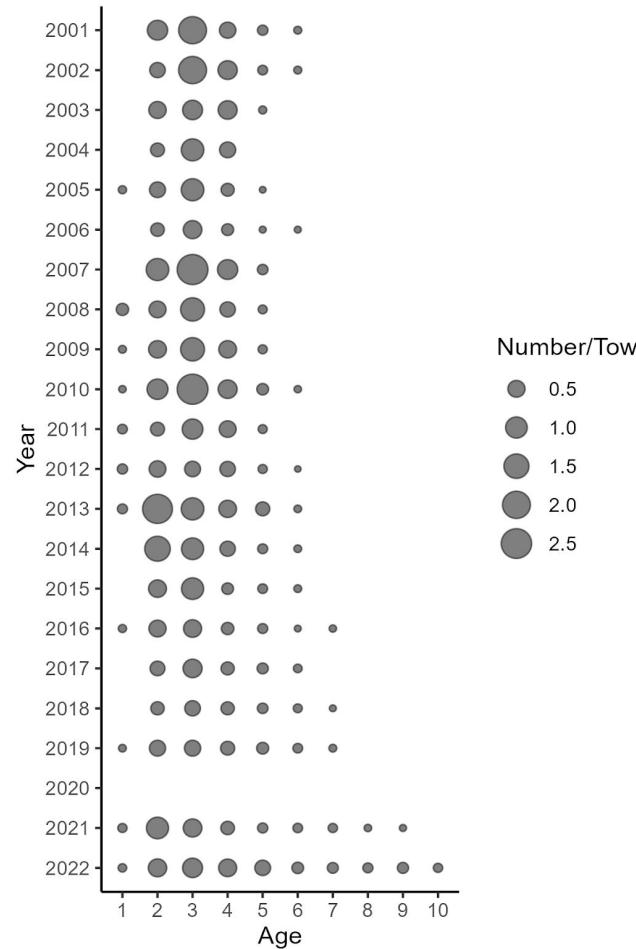
Flounder Yellowtail Indices



MENH Spring

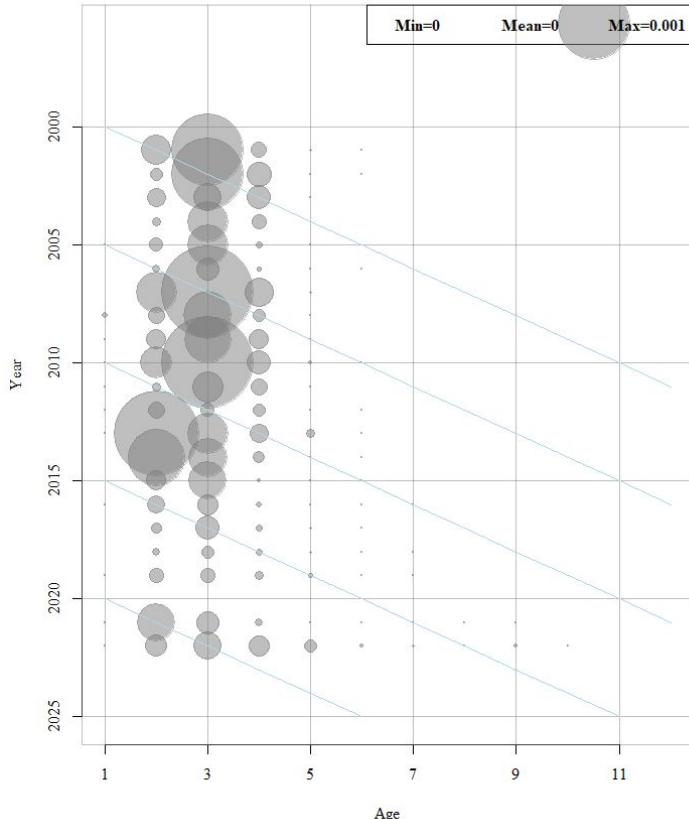


MENH Fall

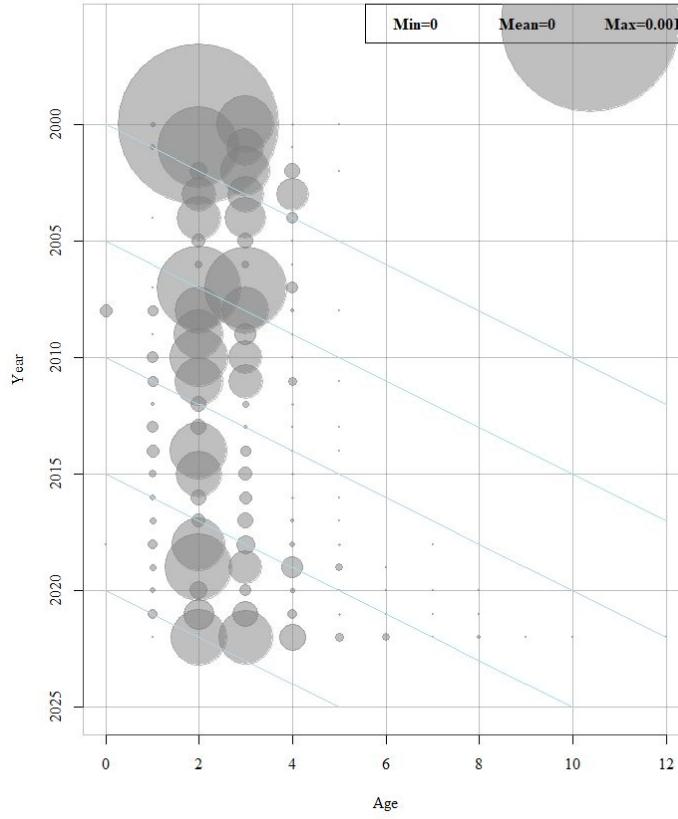


MENH Proportion at age -N

MENH Spring BTS



MENH Fall BTS



VIMS Scallop Survey

- Was not considered in model development due to small overlap with CCGOM region and small temporal coverage.

CCGOM Summary

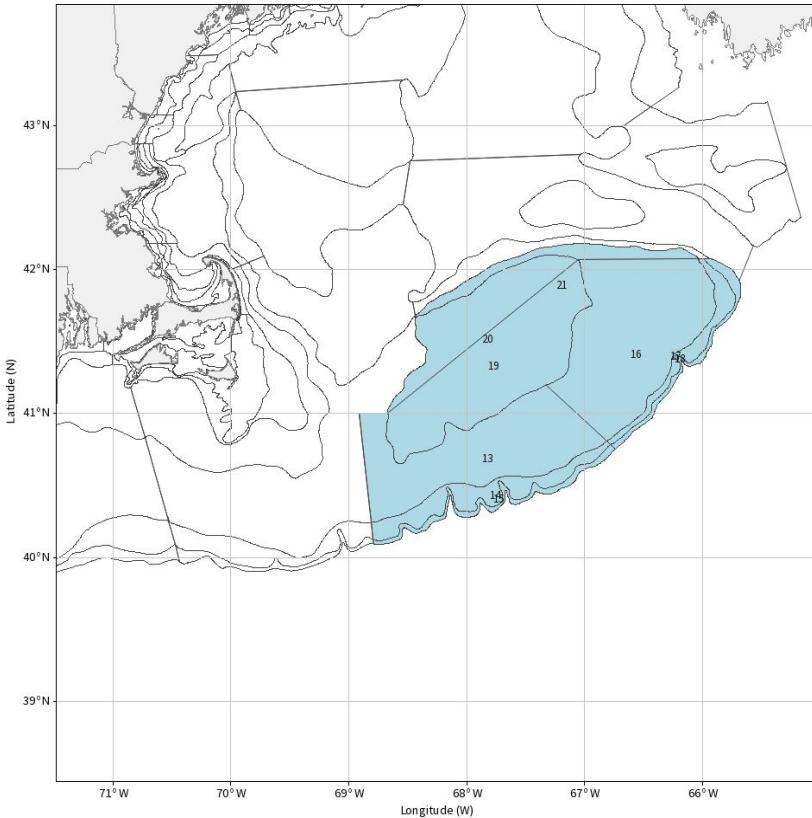
- **Seasonal Patterns:** Yellowtail flounder move inshore in spring for spawning and offshore in fall.
- **Aggregate Survey Trends:** surveys indicate variable abundance trends, with significant year-to-year changes. Both spring and fall indices show an upward trend in recent years, with notable peaks in 2021 and 2022 for most surveys.
- **Age composition:** Dominance of younger ages, with more older fish and broader age structure, especially 2021-2022.

Georges Bank

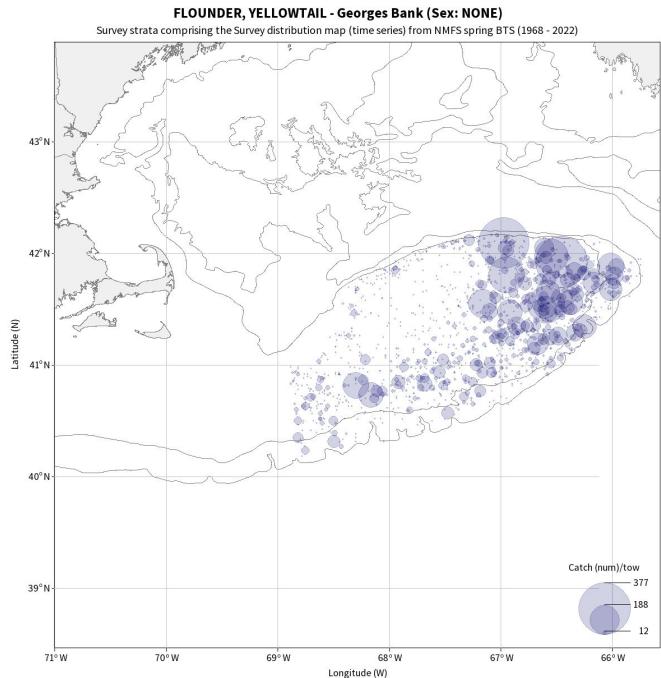
- NEFSC Bottom Trawl Survey
- Canadian Ecosystem Survey
- Scallop Surveys (not used in model development)

NEFSC Survey

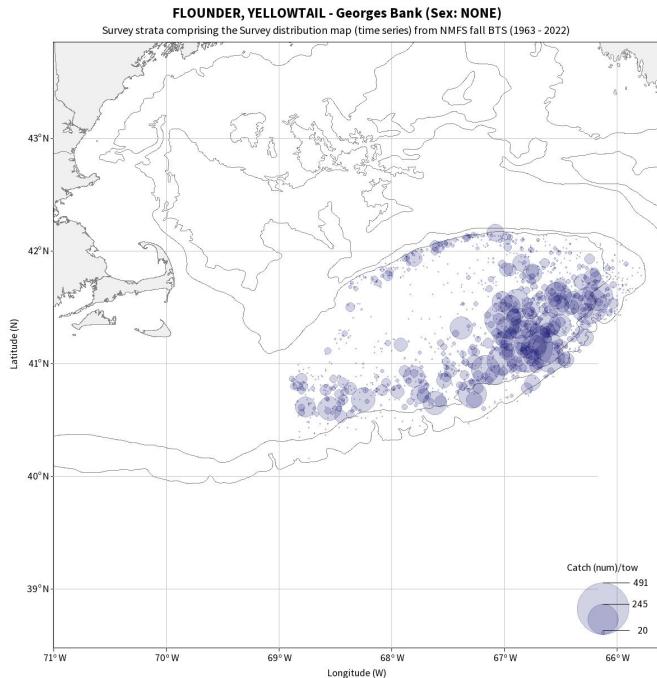
- Strata: 13-21
- Spring: 1968:2022
- Fall: 1963:2022



NEFSC Survey Map Distribution

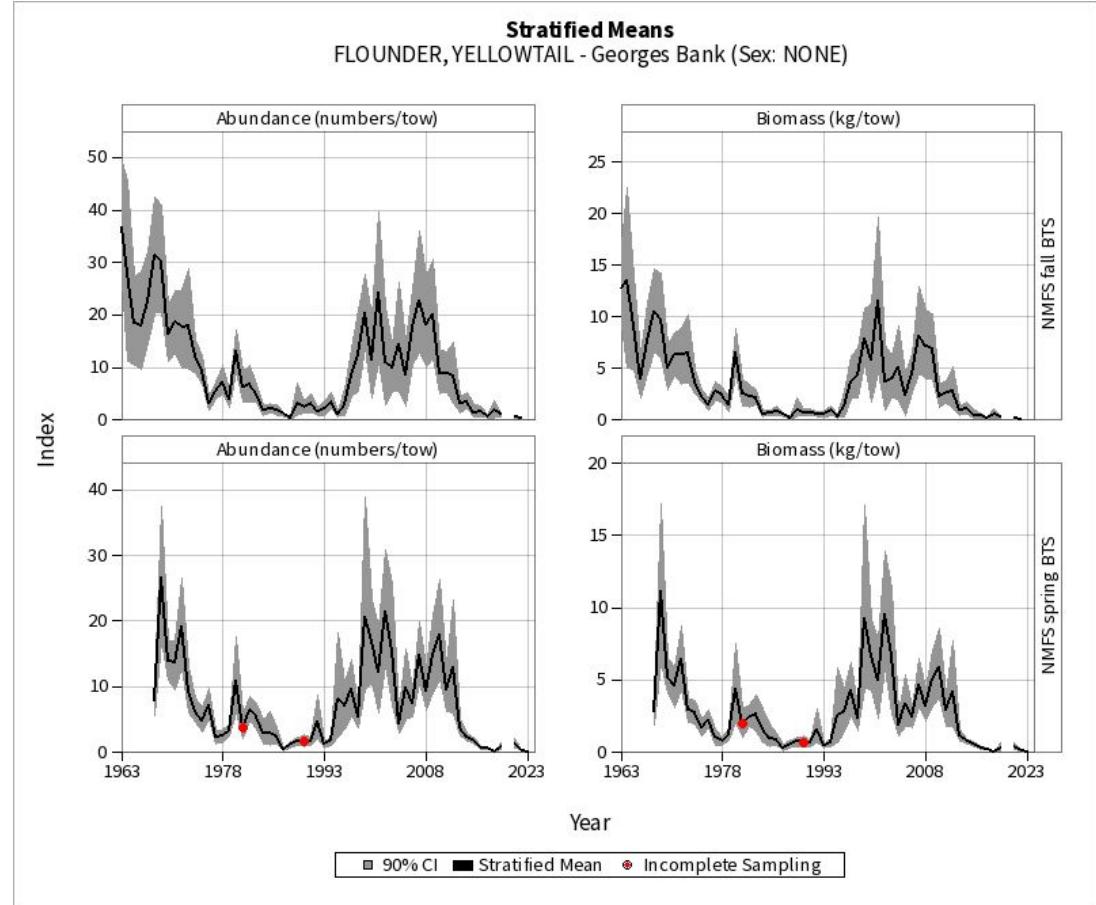


Spring 1968-2022

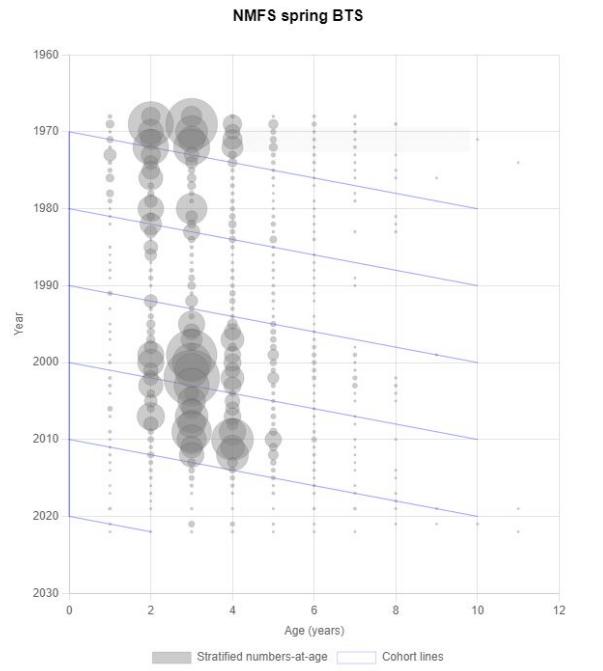


Fall 1963-2022

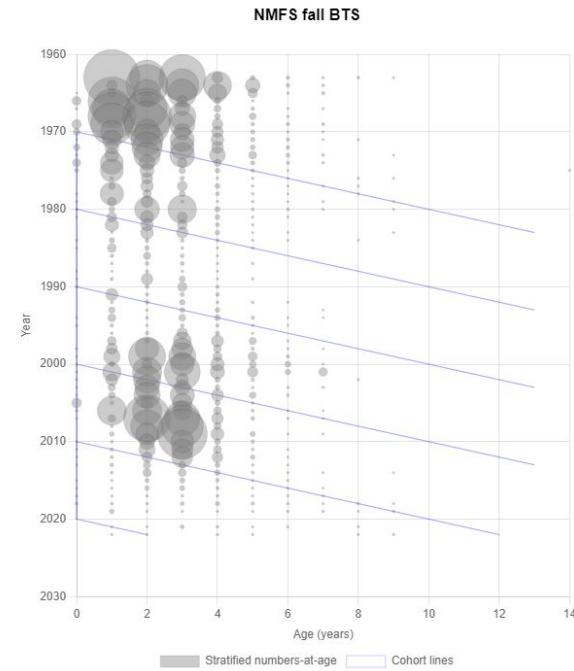
Aggregate Survey Stratified Means



NEFSC Survey Stratified Mean-at-age

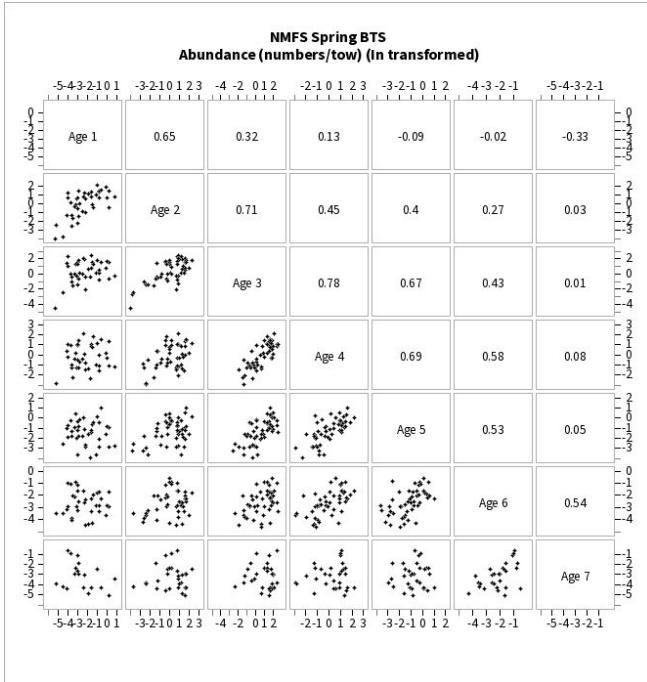


Spring 1968-2022

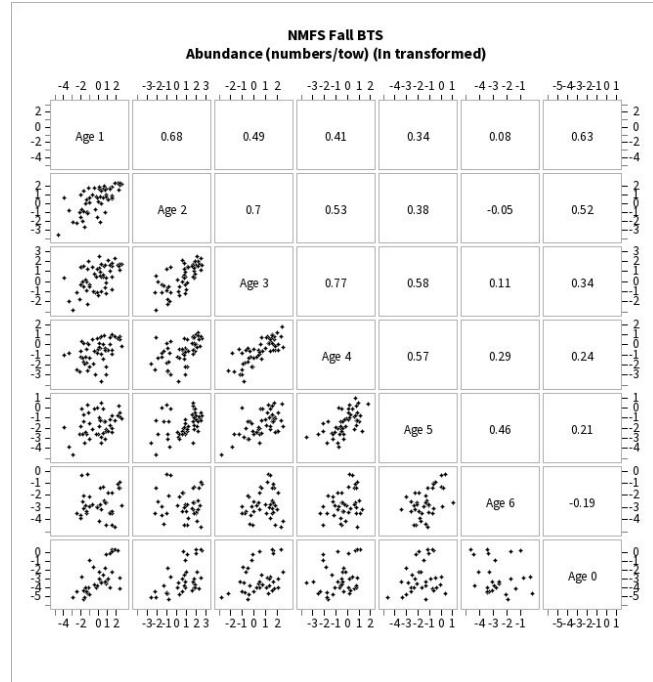


Fall 1963-2022

NEFSC Survey Cohort Tracking



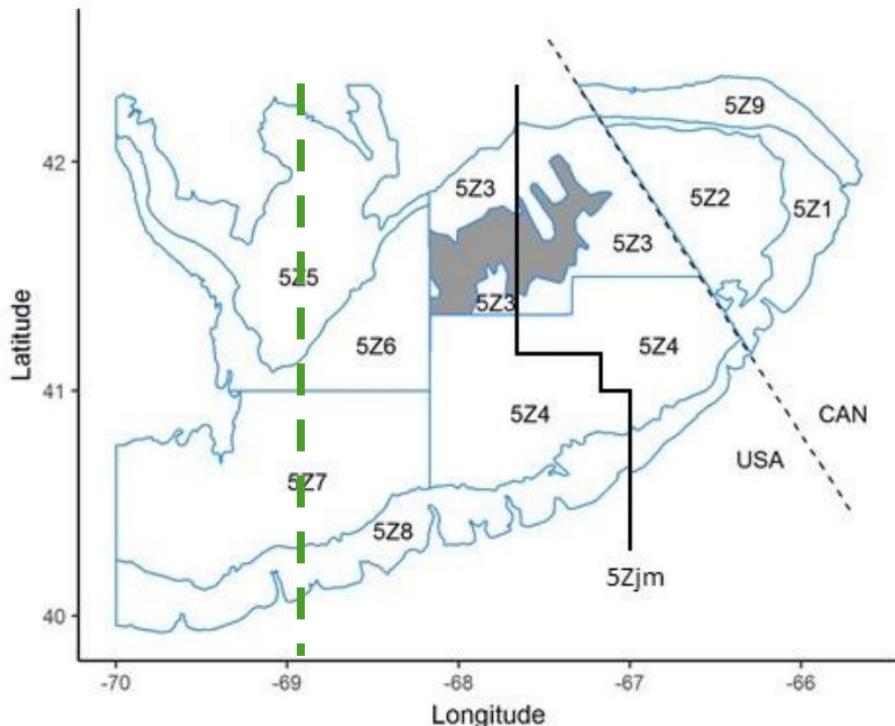
Spring 1968-2022



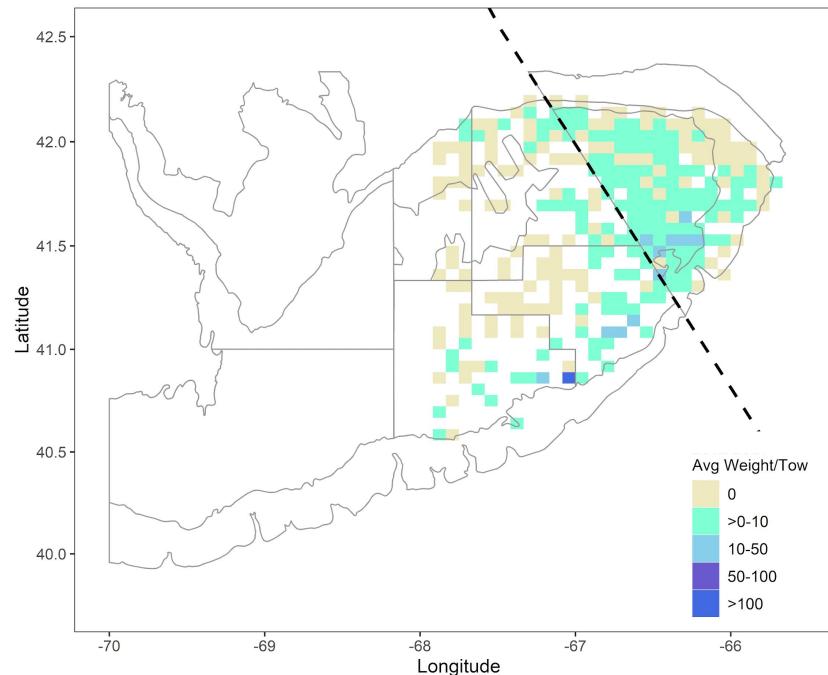
Fall 1963-2022

DFO Survey

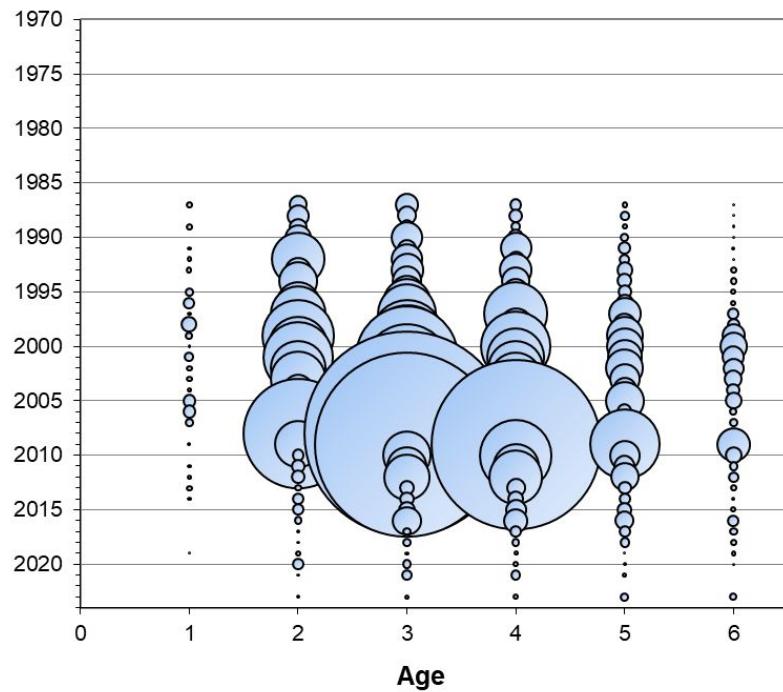
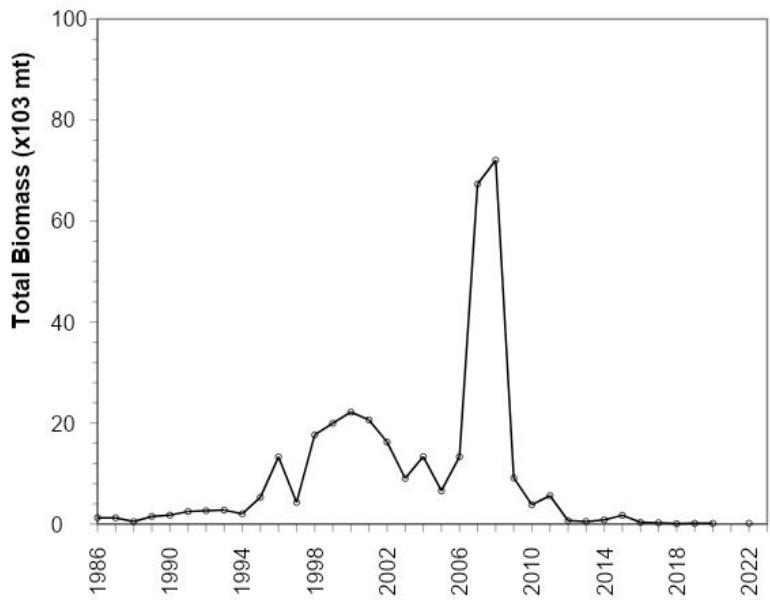
- Grey area is the shoals and no sets are completed
- Red line is approximate area cut off of the survey
- Coverage
 - 103 stations allocated 5Z1-5Z9
 - Coverage of 5Z5–5Z8 has been irregular in recent years
 - 5Z1–5Z4 covered in all years
 - 5Z9 covered since 2009



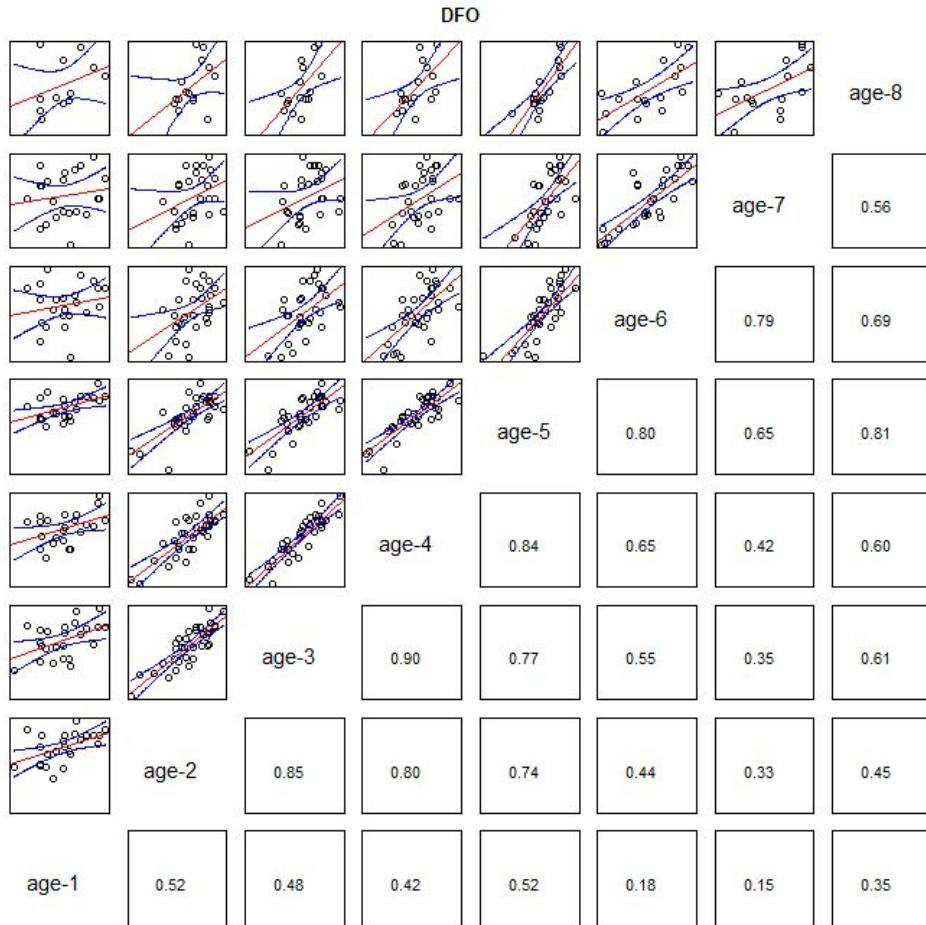
DFO Survey Map Distribution



DFO Survey Results



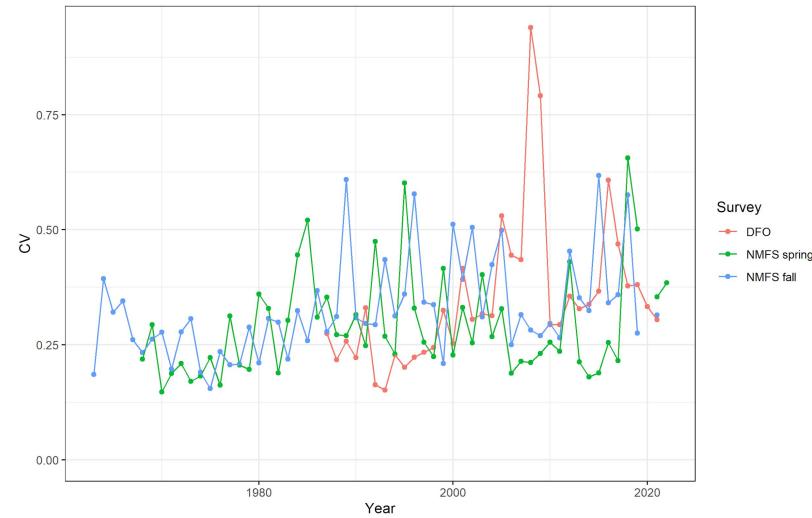
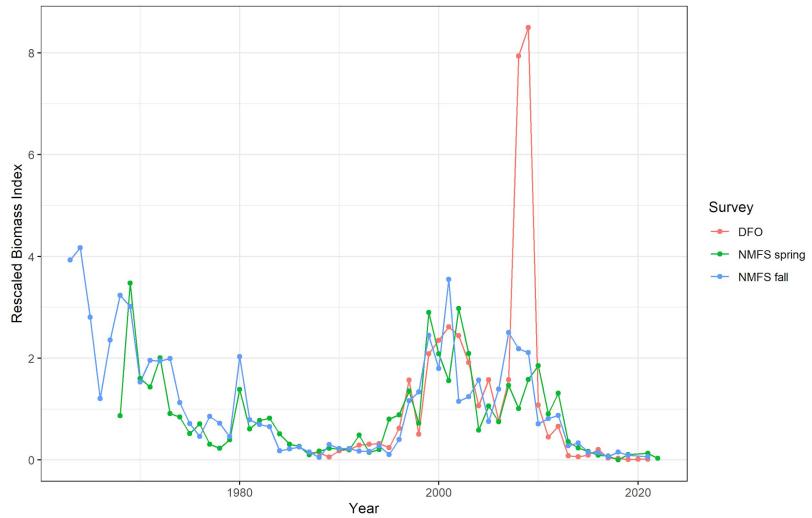
DFO Survey Cohort Tracking



Other Surveys Explored

- SMAST trawl survey
- VIMS trawl survey
- Coonamessett farm survey
- Not explored in models:
 - Limited spatial sampling
 - Limited temporal sampling
 - Reliant on funding
 - Operationalization concerns

Aggregate NEFSC and DFO Survey Trends

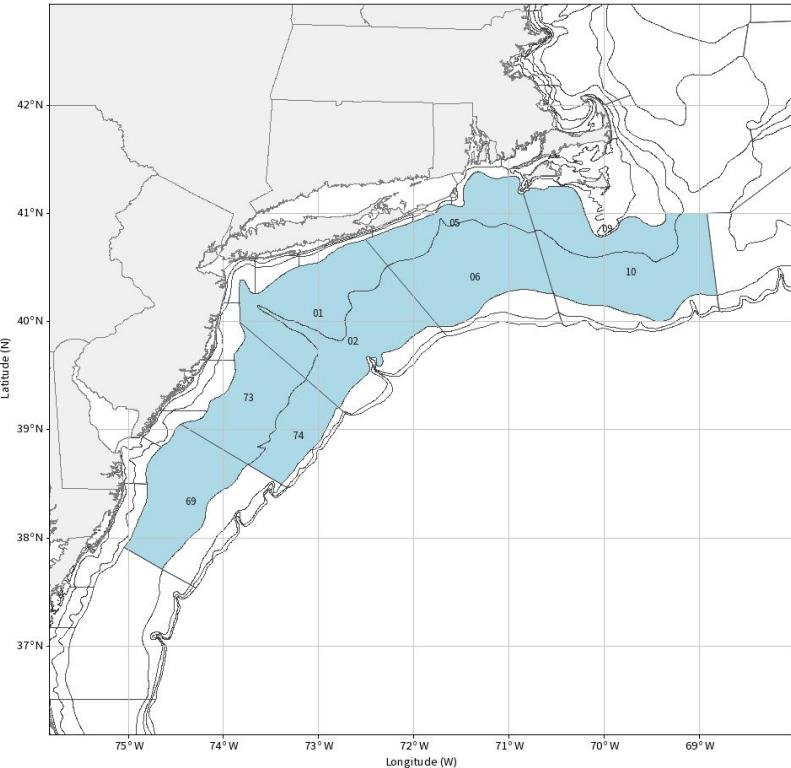


Southern New England-Mid Atlantic

- NEFSC Bottom Trawl Survey
- Larval Surveys: MARMAP and ECOMON (considered, but not in candidate model)
- NEAMAP Survey (not used in model development)
- VIMS Scallop Dredge Survey (not used in model development)

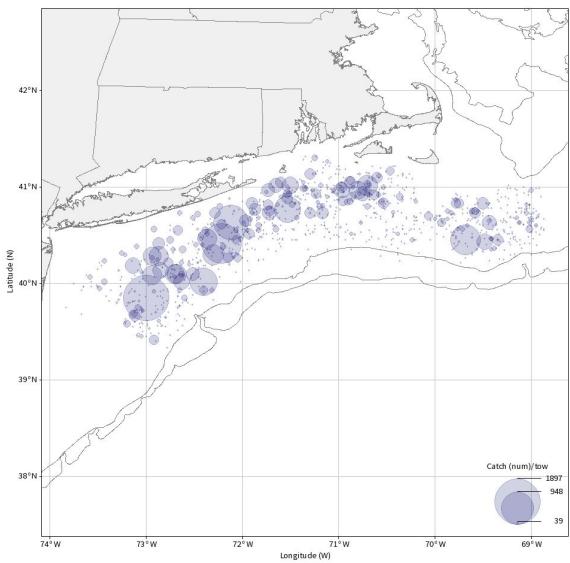
NEFSC Survey Strata

- NEFSC Survey Strata
 - Southern New England Mid Atlantic grounds (SNEMA)
 - offshore 1-2, 5-6, 9-10, 69, 73-74
 - southernmost strata 61-76 not sampled until 1967

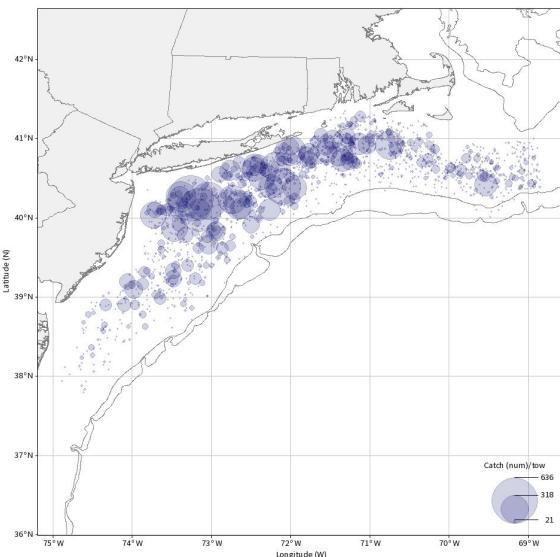


NEFSC Survey Map Distribution

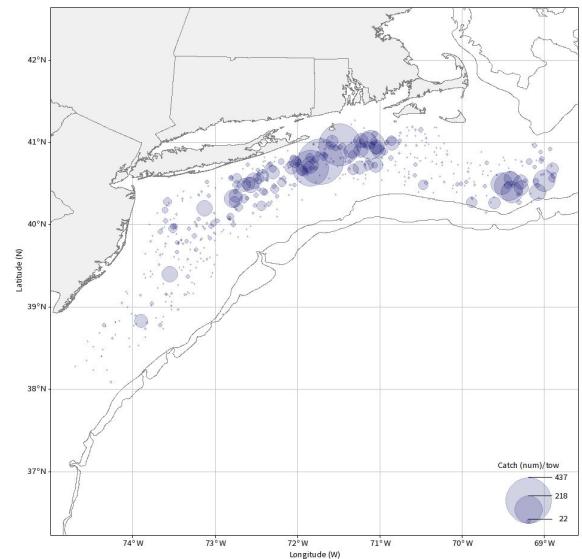
Fall 1963-2022



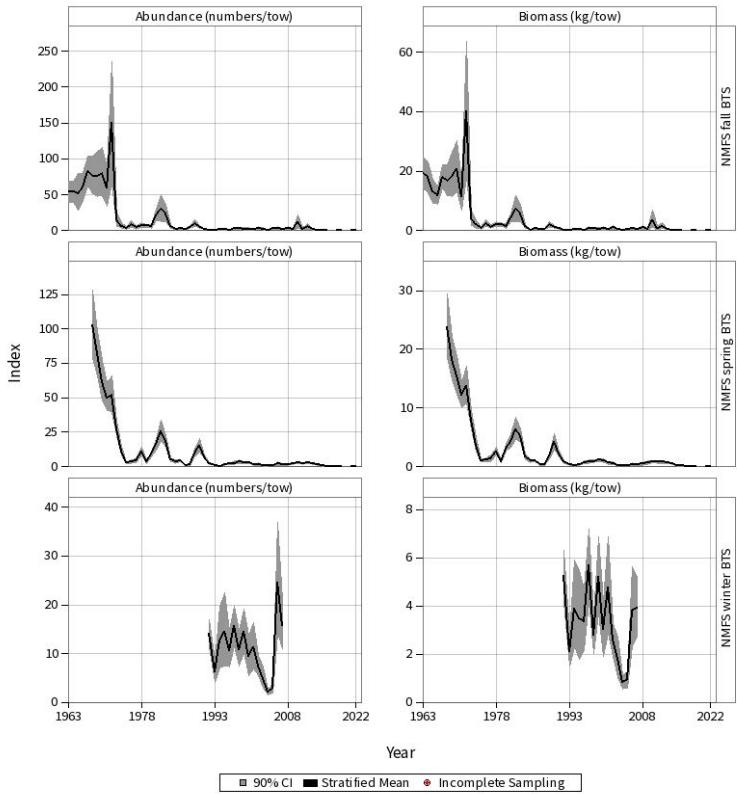
Spring 1968-2022



Winter 1992-2007



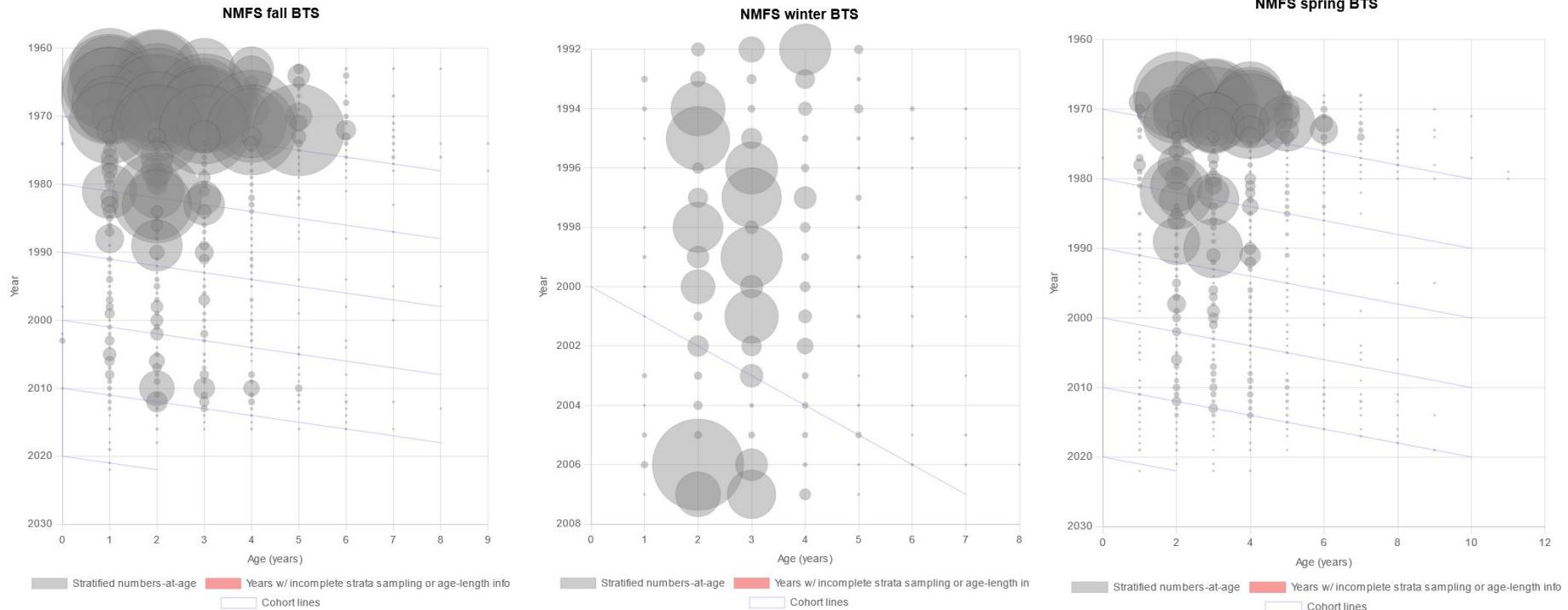
Stratified Means
FLOUNDER, YELLOWTAIL - Southern New England/Mid-Atlantic Bight (Sex: NONE)



NEFSC Survey Aggregate Stratified Means

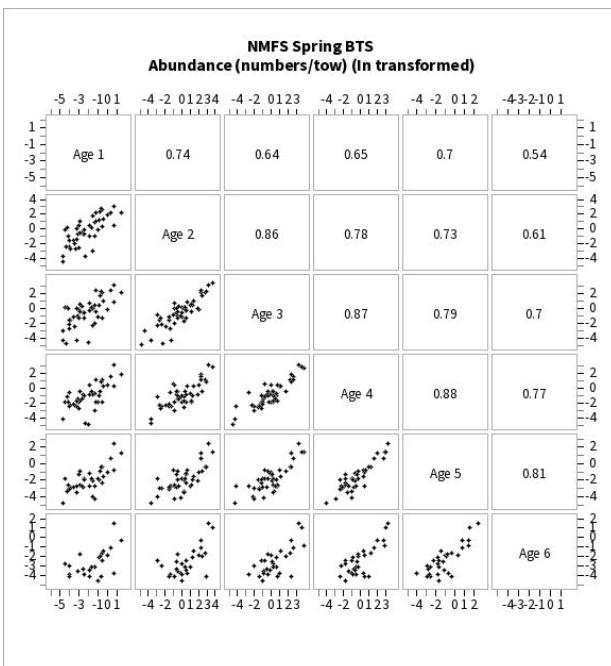
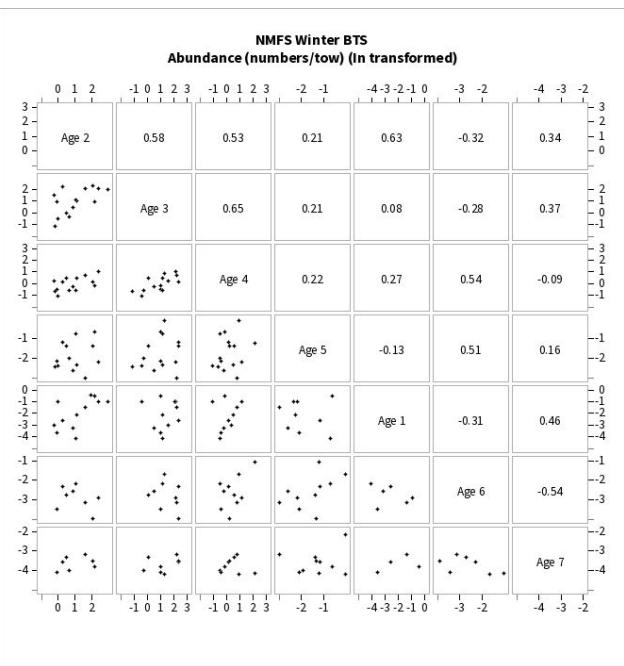
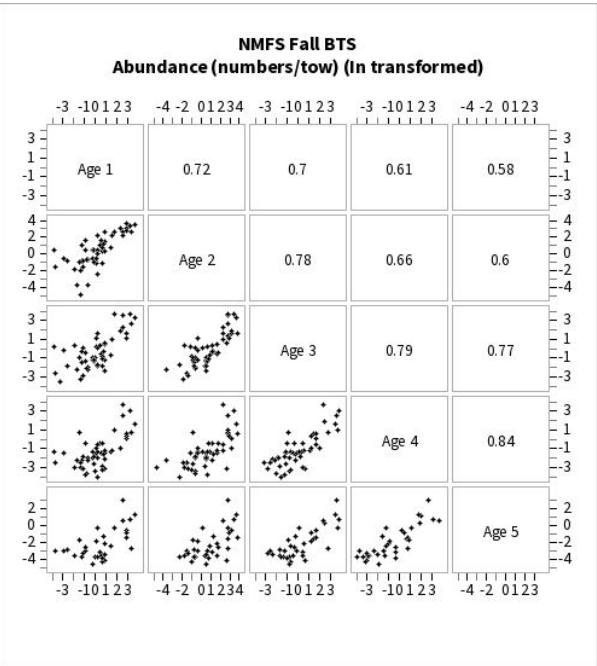
- High biomass in the 1960's and early 1970's
- Rapid decrease in the mid-1970's
- Temporary increase in the early and late 1980's (1980 and 1987 YC)
- Remained low through recent times

NEFSC Survey Stratified Mean-at-age



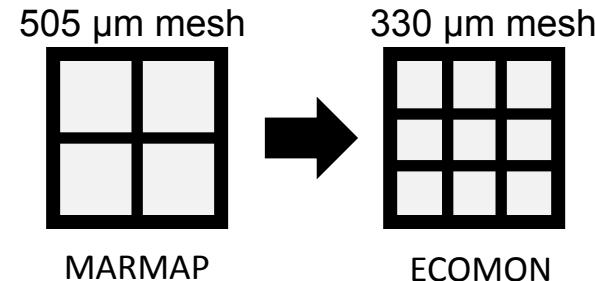
NEFSC Survey Cohort Tracking

Low correlation for the winter and strongest for Spring and Fall



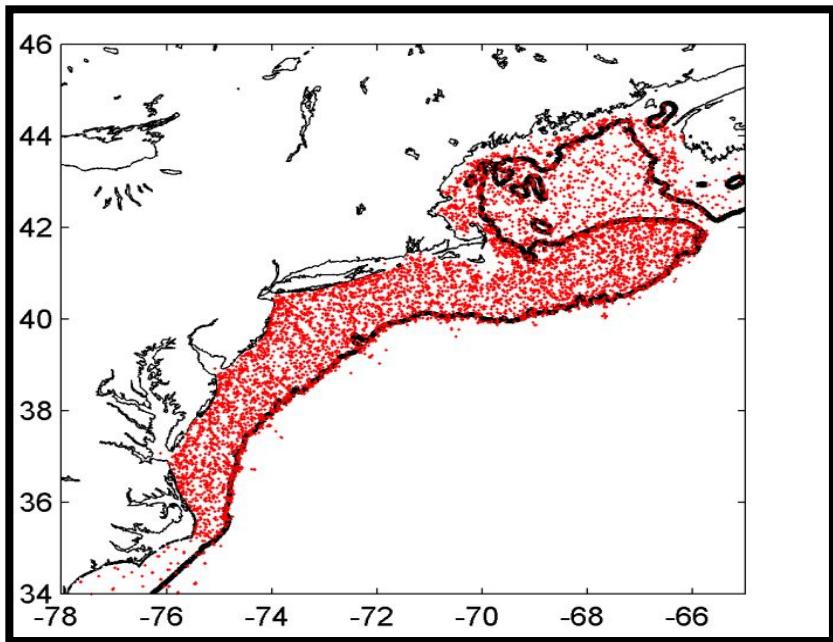
The NEFSC Ichthyoplankton Dataset (The Larval Surveys) Sampling Protocol

- 61 cm diameter Bongo net towed to 200 m or within 5 m of bottom
- Up to 50 individuals of each species measured in each tow
- Mesh size reduced from 505 μm to 330 μm
- No length-based calibration factors for yellowtail were calculated during the calibration study
- Net extrusion is clearly an issue with the wider mesh net

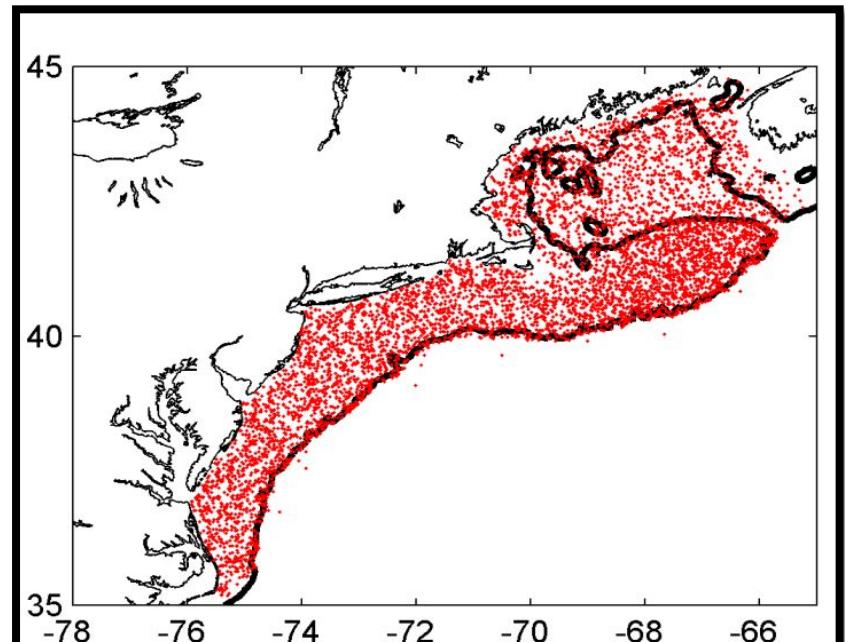


MARMAP and ECOMON

1977-1988: MARMAP: Year-round

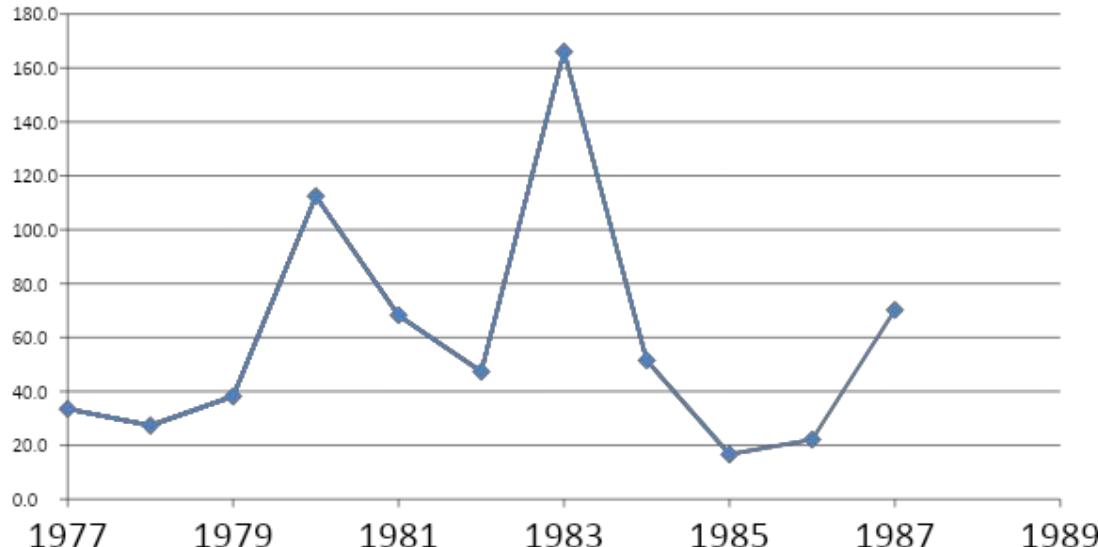


1999-present: ECOMON: Year-round



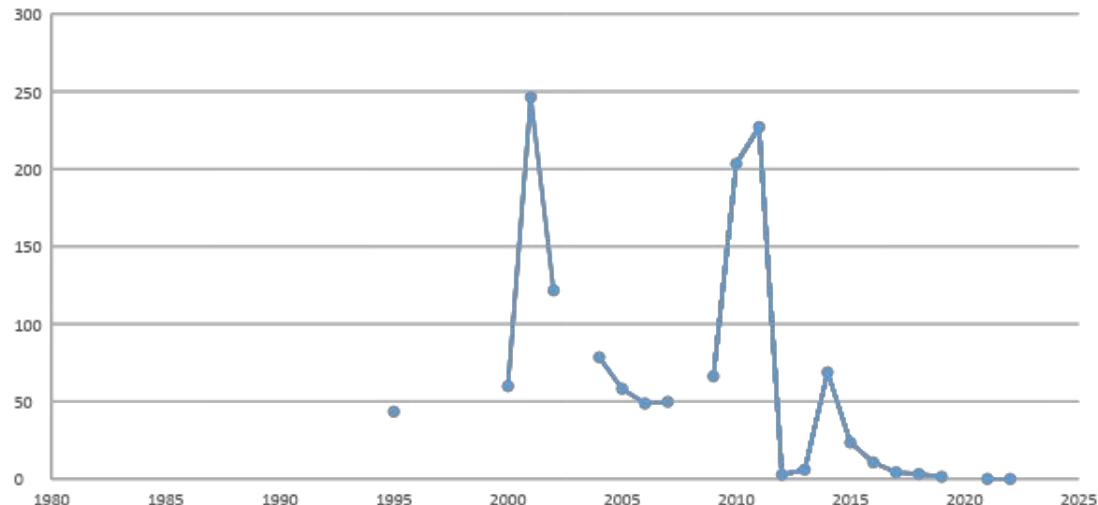
505 µm Mesh Index: MARMAP

1977	33.6
1978	27.3
1979	38.2
1980	112.5
1981	68.2
1982	47.3
1983	166.0
1984	51.5
1985	16.6
1986	22.2
1987	70.2



330 µm Mesh Index: ECOMON

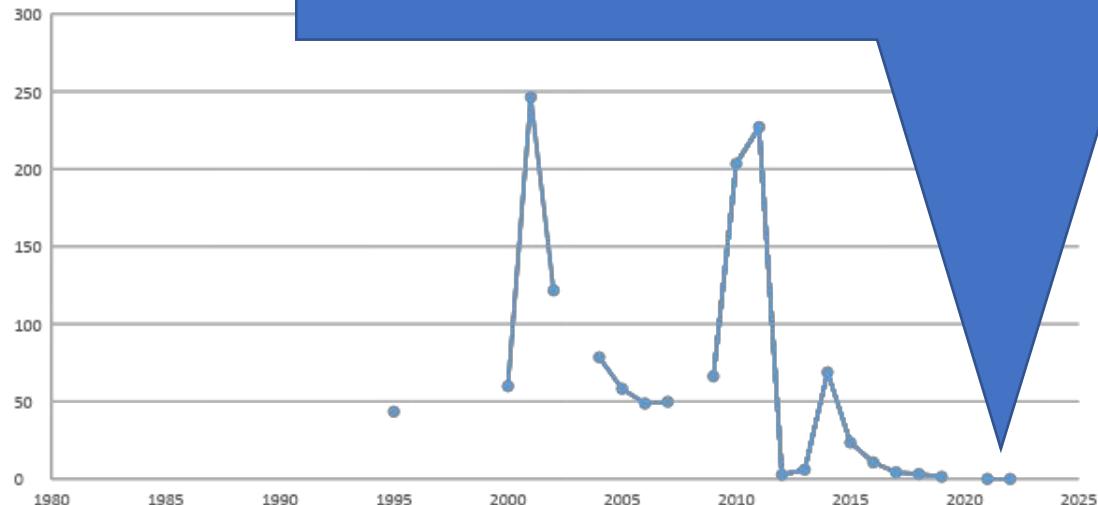
1995	43.4468
1996	
1997	
1998	
1999	
2000	59.88497
2001	246.3912
2002	121.6693
2003	
2004	78.51687
2005	58.21532
2006	48.69633
2007	49.8195
2008	
2009	66.24169
2010	203.4016
2011	227.0802
2012	2.732967
2013	6.053297
2014	68.82691
2015	23.50539
2016	10.72402
2017	4.296039
2018	3.197082
2019	1.427731
2020	
2021	0.060708
2022	0.003685



330 µm Mesh Index: ECOMON

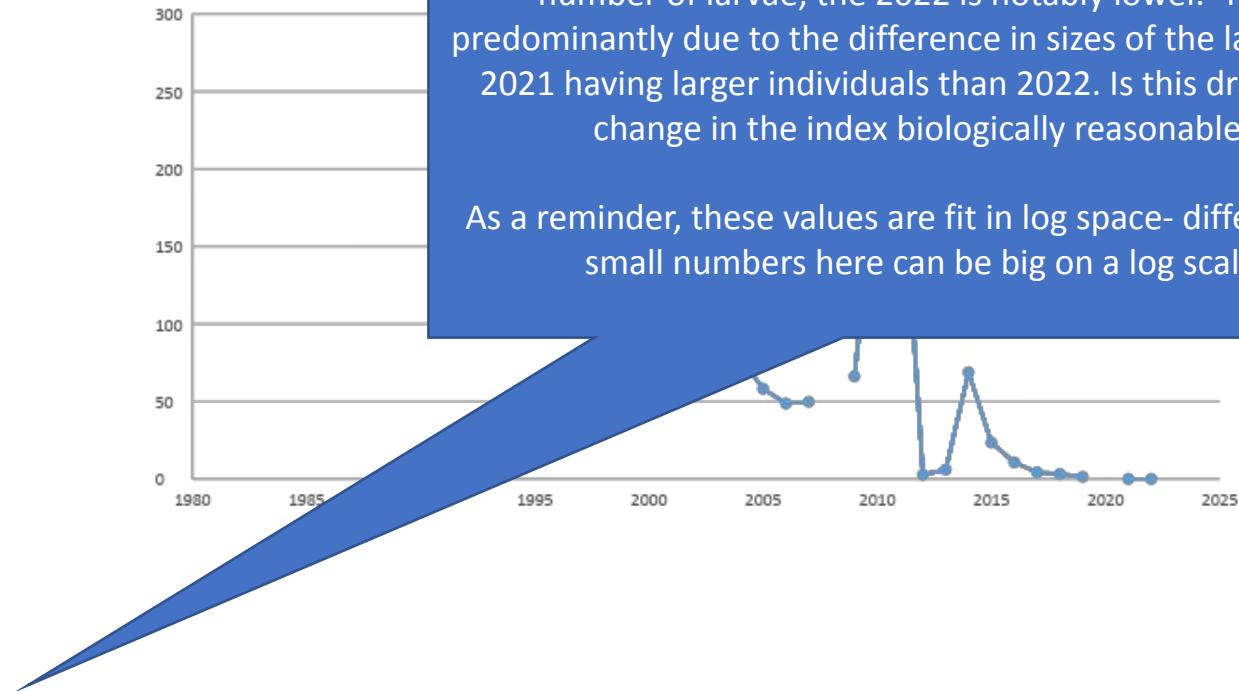
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2019	1.427731
2020	
2021	0.060708
2022	0.003685

Recent catch is orders of magnitude lower than in earlier years.



330 µm Mesh Index: ECOMON

1995	43.4468
1996	
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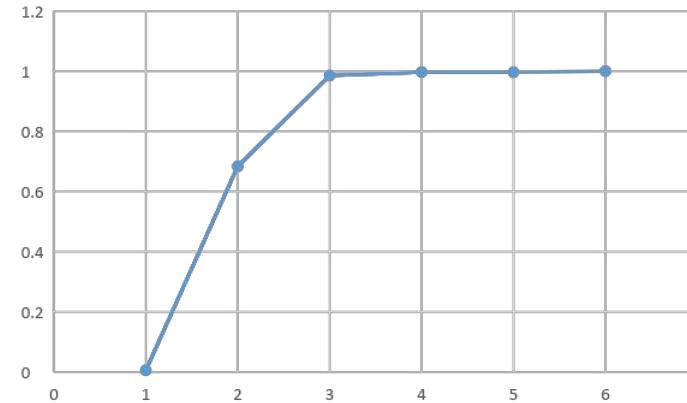
Even though both 2021 and 2022 caught the same total number of larvae, the 2022 is notably lower. This is predominantly due to the difference in sizes of the larvae, with 2021 having larger individuals than 2022. Is this drastic of a change in the index biologically reasonable?

As a reminder, these values are fit in log space- differences in small numbers here can be big on a log scale.

How were the indices used previously?

- In the 2022 MT, both the MARMAP and ECOMON larval indices were used.
- They were used as separate indices of abundance.
- Both indices represent a spawning stock biomass proxy.
- Both index selectivities were set as the maturity ogive.

Age Group	Selectivity
1	0.0052
2	0.6836
3	0.9854
4	0.997
5	0.9963
6+	1



NEAMAP Survey

- Was not considered in model development due to very low catches (e.g., a total of 6 fish have been caught since 2016).
- The NEAMAP project concluded that “the number of yellowtail flounder caught is so small that meaningful abundance indices cannot be calculated”

VIMS Scallop Survey

- Was not considered in model development due to too few yellowtail caught in the SNEMA region.
- Changes in protocols and sampling areas over time.

Questions?