State of the Ecosystem
Mid Atlantic and New England 2025

East Coast Climate Core Team
2 April 2025

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and all SOE contributors

State of the Ecosystem (SOE) reporting

Improving ecosystem information and synthesis for fishery managers

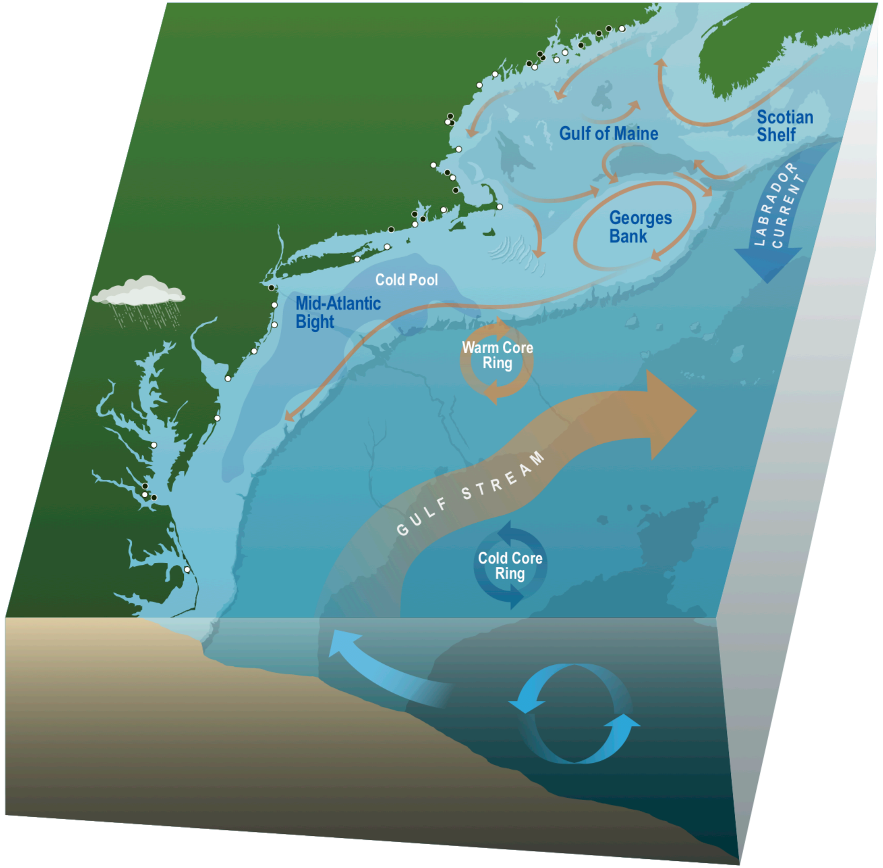
- Ecosystem indicators linked to management objectives (DePiper et al., 2017)
    - Contextual information
    - Report evolving since 2016
    - Fishery-relevant subset of full Ecosystem Status Reports
- Open science emphasis (Bastille et al., 2021)
- Used within MAFMC's Ecosystem Process (Muffley et al., 2021)
    - Risk assessment (Gaichas et al., 2018)
    - Conceptual modeling (DePiper et al., 2021)
    - Management strategy evaluation (MSE)
- Used within the NEFMC's Risk Policy

The IEA Loop[1]

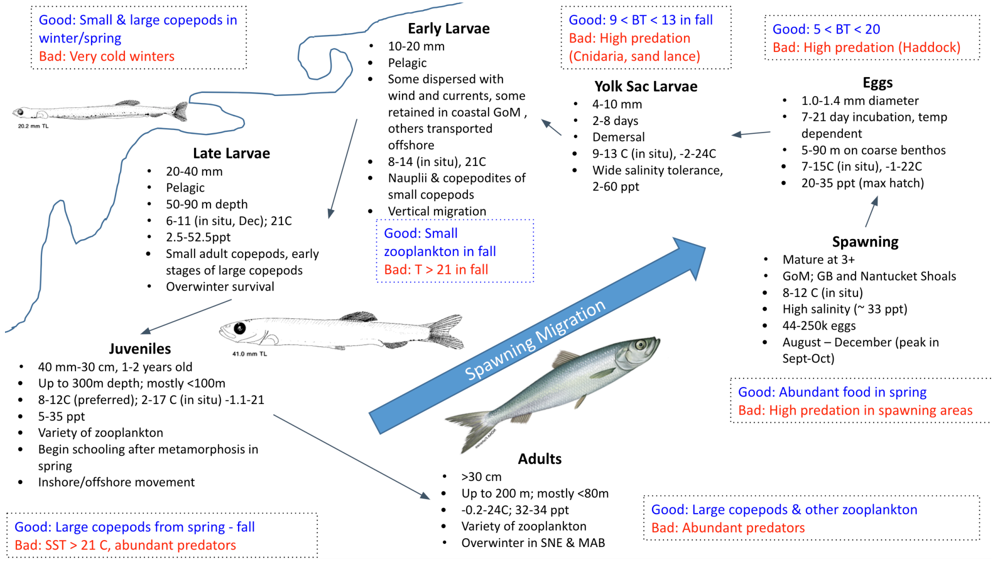
[1] https://www.integratedecosystemassessment.noaa.gov/national/IEA-approach

Ecosystem reporting at different levels of organization

Ecosystem Level → SOE

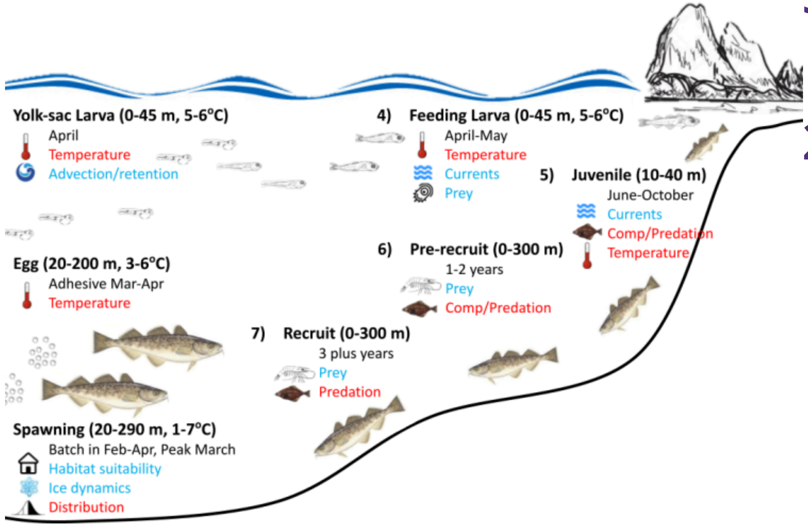


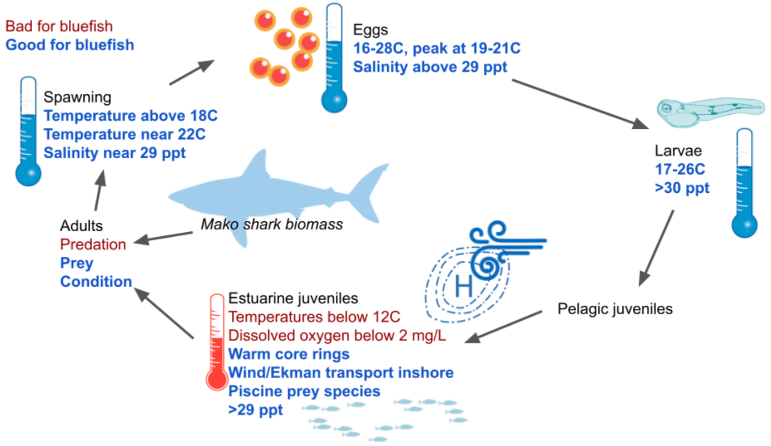
Stock Level → ESP



Ecosystem and Socioeconomic Profiles (ESPs)

Using ecosystem information at the stock level: Ecosystem Socioeconomic Profiles (ESPs)





Images courtesy ASFC, and Abigail Tyrell and Emily Liljestrand, NEFSC

State of the Ecosystem: Maintain 2024 structure for 2025

2025 Report Structure

1. Graphical summary
   - Page 1 report card re: objectives →
   - Page 2 risk summary bullets
   - Page 3 2024 snapshot
2. Performance relative to management objectives
3. Risks to meeting management objectives
   - Climate and Ecosystem risks
   - Offshore wind development
4. 2024 Highlights

Updated Objectives and Risks tables aligning with indicators

Ecosystem-scale fishery management objectives in the Mid-Atlantic Bight

Objective categories	Indicators reported
Objectives: Provisioning and Cultural Services	
Seafood Production	Landings; commercial total and by feeding guild; recreational harvest
Commercial Profits	Revenue decomposed to price and volume
Recreational Opportunities	Angler trips; recreational fleet diversity
Stability	Diversity indices (fishery and ecosystem)
Social & Cultural	Community fishing engagement and social vulnerability status
Protected Species	Bycatch; population (adult and juvenile) numbers; mortalities
Potential Drivers: Supporting and Regulating Services	
Management	Stock status; catch compared with catch limits
Biomass	Biomass or abundance by feeding guild from surveys
Environment	Climate and ecosystem risk indicators listed in Table 2

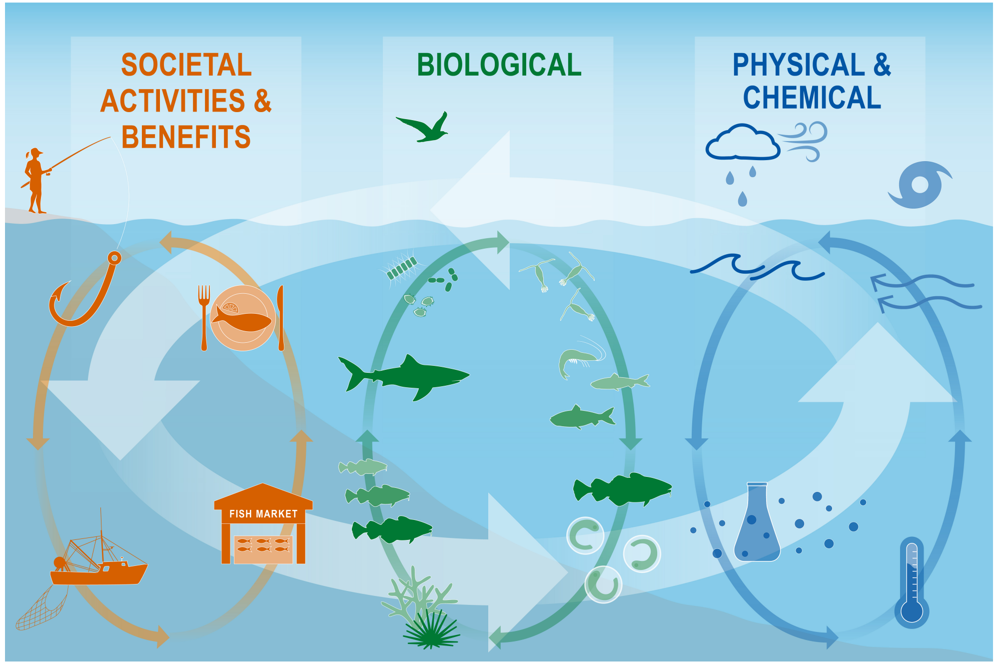
Risks to meeting fishery management objectives in the Mid-Atlantic Bight

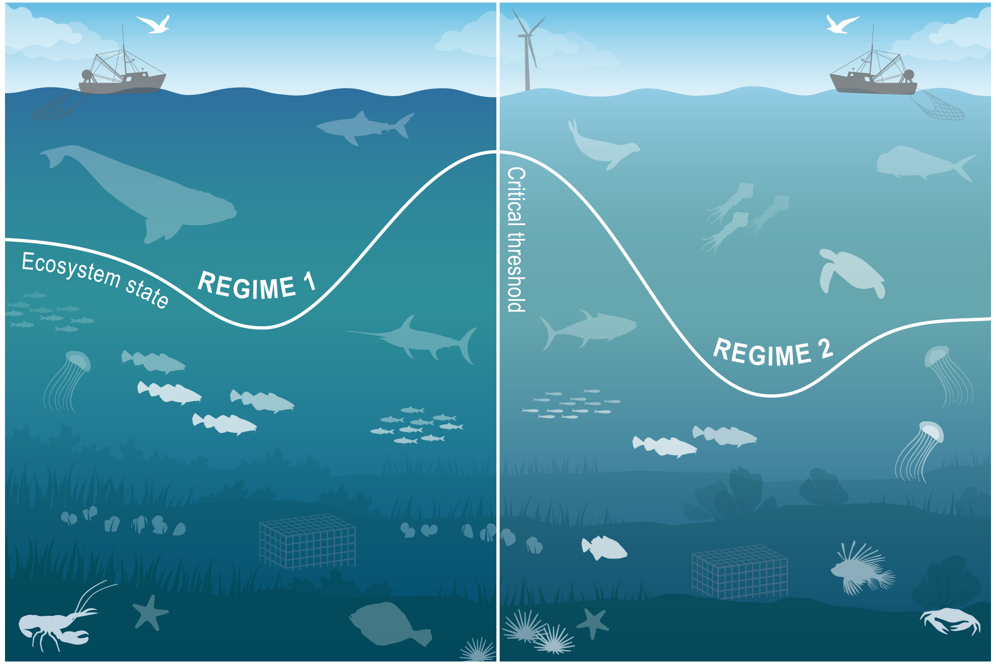
Risk categories	Observation indicators reported	Potential driver indicators reported
Climate and Ecosystem Risks		
Risks to Managing Spatially	Managed species (fish and cetacean) distribution shifts	Benthic and pelagic forage distribution; ocean temperature, changes in currents and cold pool
Risks to Managing Seasonally	Managed species spawning and migration timing changes	Habitat timing: Length of ocean summer, cold pool seasonal persistence
Risks to Setting Catch Limits	Managed species body condition and recruitment changes	Benthic and pelagic forage quality & abundance: ocean temperature & acidification
Other Ocean Uses Risks		
Offshore Wind Risks	Fishery revenue and landings from wind lease areas by species and port	Wind development speed; Protected species presence and hotspots

Ecosystem synthesis themes

Characterizing ecosystem change for fishery management

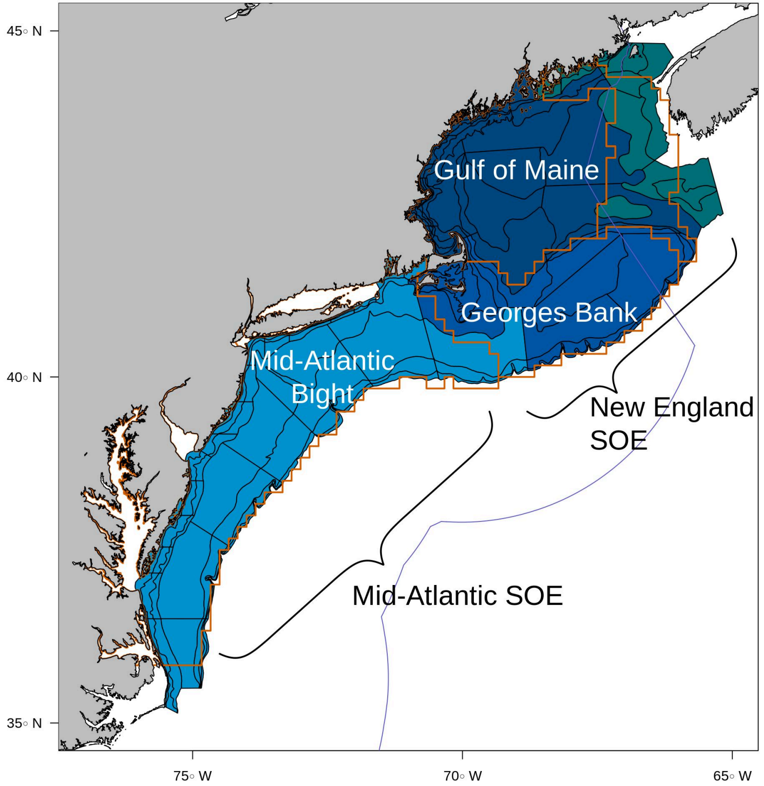
- Societal, biological, physical and chemical factors comprise the **multiple system drivers** that influence marine ecosystems through a variety of different pathways.
- Changes in the multiple drivers can lead to **regime shifts** — large, abrupt and persistent changes in the structure and function of an ecosystem.
- Regime shifts and changes in how the multiple system drivers interact can result in **ecosystem reorganization** as species and humans respond and adapt to the new environment.





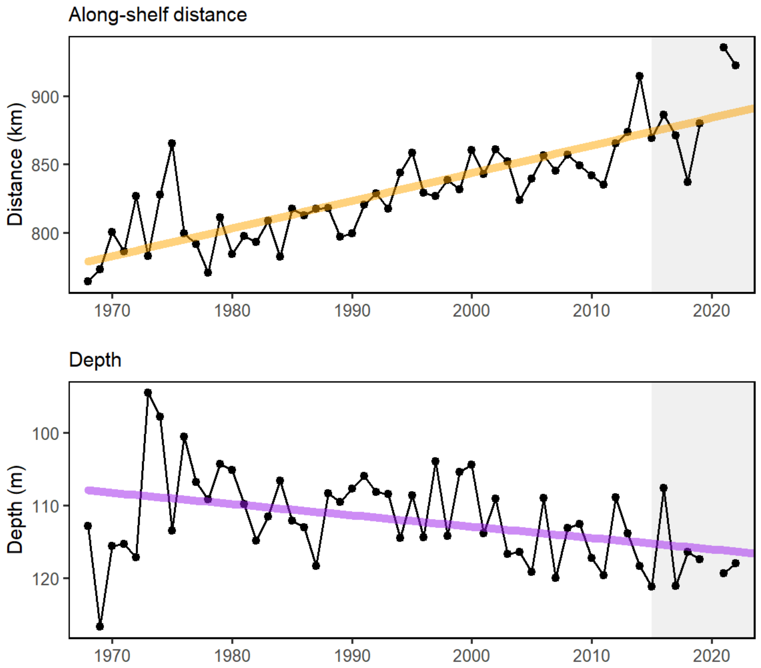
State of the Ecosystem report scale and figures

Spatial scale



A glossary of terms, detailed technical methods documentation, and indicator data and catalog are available online.

Key to figures



Trends assessed only for 30+ years: more information

Orange line = significant increase

Purple line = significant decrease

No color line = not significant or < 30 years

Grey background = last 10 years

Report structure 2024: same as 2021-2023 with more management risk emphasis

- Performance relative to management objectives
    - *What* does the indicator say--up, down, stable?
    - *Why* do we think it is changing: integrates synthesis themes
        - Multiple drivers
        - Regime shifts
        - Ecosystem reorganization
- Objectives
    - Seafood production
    - Profits
    - Recreational opportunities
    - Stability
    - Social and cultural
    - Protected species

- Risks to meeting fishery management objectives
    - Same *What* and *Why* as Performance Section
    - New structure for Climate section
        - Fishery risk indicator
        - Climate and ecosystem drivers of fishery risk
        - Future considerations
- Risk categories
    - *Climate and Ecosystem Change*
        - *Risk to spatial management*
        - *Risk to seasonal management*
        - *Risk to quota setting/rebuilding*
    - Other ocean uses
        - Offshore wind development

Mid Atlantic State of the Ecosystem Summary 2025:

Performance relative to management objectives

Seafood production ,

Profits ,

Recreational opportunities: Effort ; Effort diversity

Stability: Fishery not stable; Ecological not stable

Social and cultural:

- Fishing engagement and social vulnerability status by community
- Revenue climate vulnerability , majority high risk

Protected species:

- Maintain bycatch below thresholds (harbor porpoise, gray seals)
- Recover endangered populations (NARW)

Performance Relative to Fishery Management Objectives

Trends and status of indicators related to broad ecosystem-level fishery management objectives, with implications for the Mid-Atlantic Fishery Management Council (MAFMC)

OBJECTIVE (Indicator)	TREND	CURRENT STATUS	IMPLICATIONS
Seafood production (Total and MAFMC managed landings)	Decline	Below long-term average	Commercial landings were at a historic low in 2023, driven by menhaden fishery consolidation. MAFMC landings have declined since the mid-2000s. This is driven by surfclam and ocean quahog, and possibly by market conditions. Port landings combined across Mid-Atlantic states have moderate to high total climate vulnerability. Recreational harvest is declining due to multiple drivers.
Commercial profits (Total and managed revenue)	No trend	Below long-term average	Total revenue reached an all time low in 2022–2023, driven by both declining price and volume. Recent declining revenue is driven in part by managed clam species volume. Even when adjusting for inflation, falling prices are almost universal and due to market dynamics. Combined Mid-Atlantic port revenue has had high to very high total climate vulnerability for most of the period since 2000.
Recreational opportunities (Effort and fleet diversity)	EFFORT: Increase FLEET DIVERSITY: Decline	Above long-term average Below long-term average	Recreational effort shows an increasing long-term trend and is above average, but fleet diversity is decreasing because of a shift away from party/charter to shore-based fishing. This shift results in a decreased range of recreational fishing opportunities. Shore-based anglers have access to different species/sizes of fish than vessel-based anglers.
Stability (Fishery and ecosystem diversity maintained over time)	FISHERY Not stable ECOSYSTEM Not stable		**Commercial:** Indicators suggest changing commercial fleet composition but similar species revenue diversity, for those fleets continuing to fish. **Recreational:** Species catch diversity has been maintained by a different set of species over time and continues to be above the long-term mean. **Ecosystem:** Multiple ecosystem indicators suggest instability. While fish species richness is stable, zooplankton diversity has been increasing, and changes in biological traits of the fish community have been observed.
Social and cultural (Community fishery engagement, social and climate vulnerability)	Community total climate vulnerability trend No trend	Community social and climate vulnerability status varies by community.	Four Mid-Atlantic communities ranked among the top most engaged in both commercial and recreational fishing. Many of the top highly engaged fishing communities throughout the Mid-Atlantic region ranked medium-high or above for one or more of the social vulnerability indicators, including 4 commercial and 3 recreational communities, suggesting potential challenges for these communities adapting to change. A majority of Mid-Atlantic commercial fishing communities have high to very high revenue total climate vulnerability.
Protected species (Coastwide bycatch, population numbers, mortalities)	BYCATCH: Mixed trends POPULATION NARW: Decline	Meeting objectives Below recovery objective	Mixed bycatch trends through 2022 are related to fishery management, low observer coverage, shifts in population distribution combined with fishery shifts, and population increase for seals. Population drivers for North Atlantic Right Whales (NARW) include combined fishery interactions/vessel strikes and distribution shifts related to prey abundance and quality. Management measures to reduce adult mortality are reflected in more stable population numbers. Unusual mortality events continue for 3 large whale species.

New England State of the Ecosystem Summary 2025:

Performance relative to management objectives - Georges Bank

Seafood production Total , Managed , Both

Profits ,

Recreational opportunities: Effort , ; Effort diversity ,

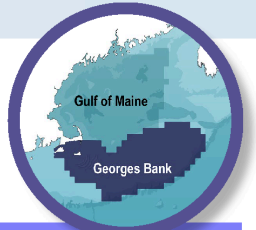
Stability: Fishery not stable; Ecological not stable

Social and cultural:

- Fishing engagement and social vulnerability status by community
- Revenue climate vulnerability , majority medium risk

Protected species:

- Maintain bycatch below thresholds (harbor porpoise, gray seals)
- Recover endangered populations , NARW Gray seal



Performance Relative to Fishery Management Objectives

Trends and status of indicators related to broad ecosystem-level fishery management objectives, with implications for the New England Fishery Management Council (NEFMC)

GEORGES BANK (GB)

OBJECTIVE (Indicator)	TREND	CURRENT STATUS	IMPLICATIONS
Seafood production (Total and NEFMC managed landings)	TOTAL: No trend MANAGED: Decline	TOTAL: Below long-term average MANAGED: Below long-term average	New England managed species seafood production is significantly declining and currently below the long-term average. Total commercial landings are also below the long-term average. Recreational harvest in New England is slightly above the low observed in 2020, but still well below the long-term average. Both the commercial and recreational landings status are driven in part by management to address mandated rebuilding of depleted stocks. Total Community Climate Vulnerability for landings is moderate with no long-term trend.
Commercial profits (Total and managed revenue)	No trend	Below long-term average	Despite high landings of scallops, lower prices drew total revenue down again in 2023. Despite substantial variability in volume of landings, price effects have kept revenue below 1982 levels over the past decade. Total Community Climate Vulnerability for revenue is moderate with no long-term trend.
Recreational opportunities (Effort and fleet diversity)	EFFORT: No trend DIVERSITY: No trend	EFFORT: Near long-term average DIVERSITY: Near long-term average	Recreational opportunities in the region are relatively stable recently, with respect to the types of trips (i.e., shore, private boat, charter/party) and numbers of species landed.
Stability (Fishery and ecosystem diversity maintained over time)	FISHERY: Not stable ECOSYSTEM: Not stable		**Commercial:** Fleet count is declining with 2023 below the long-term average, and species revenue diversity reflects a reliance on relatively few species. **Recreational:** Species diversity is increasing due to increases in southerly species and lower catch limits on traditional regional species. **Ecosystem:** Multiple ecosystem indicators suggest instability. Fish species richness is stable while zooplankton diversity has increased, indicating potential instability. Changes in biological traits of the fish community have been observed.
Social and cultural (Community fishery engagement, social and climate vulnerability)	**Community total climate vulnerability trend** Mixed trends	**Community social and climate vulnerability status varies by community.**	Three New England communities ranked among the top engaged for both commercial and recreational fishing. Several of the top highly engaged fishing communities throughout the New England region ranked medium-high or above for one or more of the social vulnerability indicators, including 2 commercial communities (New Bedford, and Boston, MA) and 2 recreational communities (Provincetown and Falmouth, MA). This suggests potential challenges for these communities adapting to change. Communities climate risk on revenue is shifting from moderate to high/very high suggesting an increased dependence on climate vulnerable species.
Protected species (Coastwide bycatch, population numbers, mortalities)	BYCATCH: Mixed trends POPULATIONS: Mixed trends	BYCATCH: Harbor porpoise: Meeting objectives; Gray seal: Meeting objectives POPULATIONS: NARW: Below recovery objective; Gray seal: Above long-term average	Bycatch objectives are being met for harbor porpoise and gray seals. Mixed bycatch trends through 2022 are related to fishery management, shifts in porpoise distribution combined with fishery shifts, and population increase for gray seals. Population drivers for North Atlantic Right Whales (NARW) include combined fishery interactions/vessel strikes and distribution shifts related to prey abundance and quality. Management measures to reduce adult mortality are reflected in more stable population numbers. Unusual mortality events continue for 3 large whale species.

New England State of the Ecosystem Summary 2025:

Performance relative to management objectives - Gulf of Maine

Seafood production ↘, ⊖

Profits Total ↔, ≈; NEFMC Managed ↘, ⊖

Recreational opportunities: Effort ↔, ≈; Effort diversity ↔, ≈

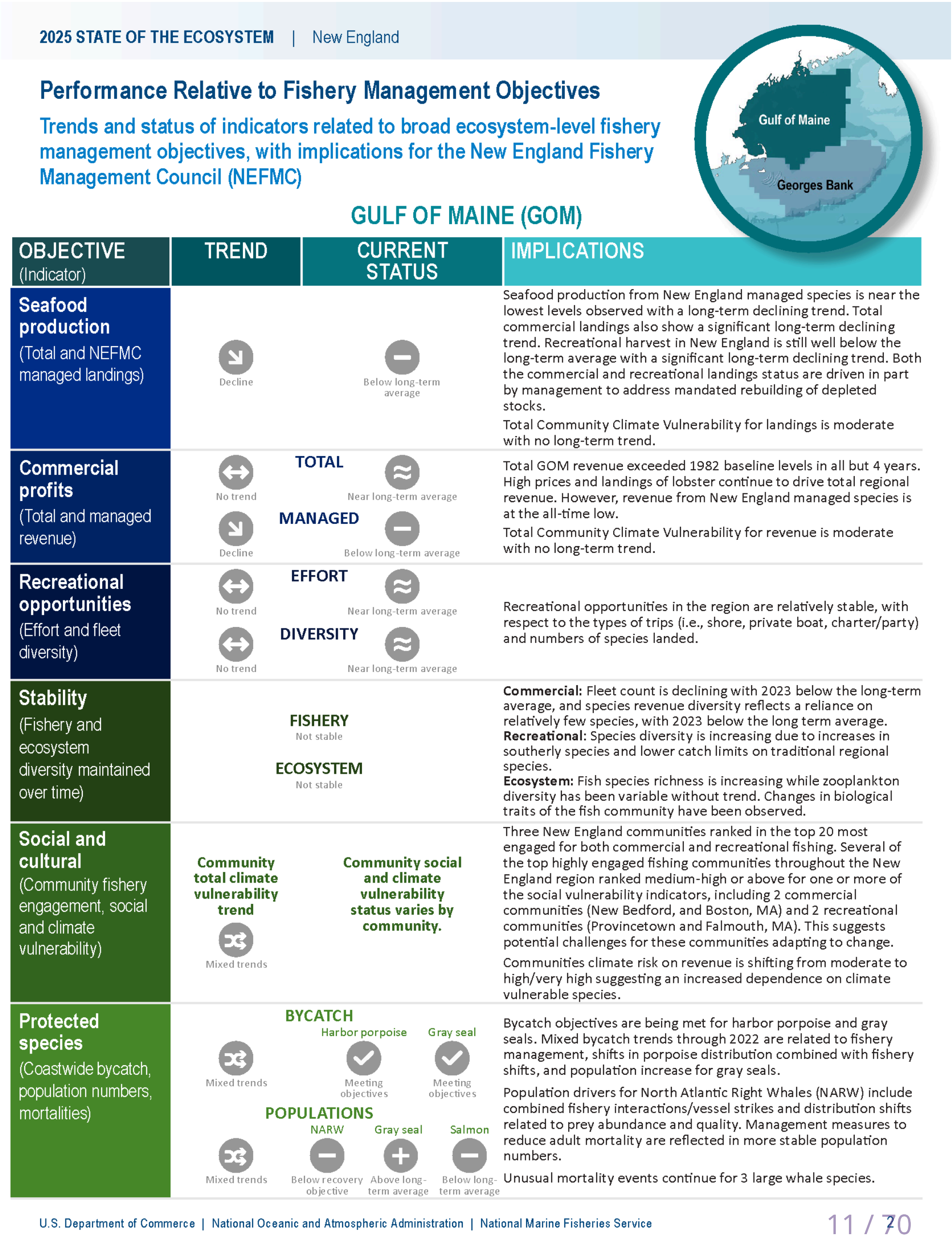
Stability: Fishery not stable; Ecological not stable

Social and cultural:

- Fishing engagement and social vulnerability status by community
- Revenue climate vulnerability ⤮, majority medium risk

Protected species:

- Maintain bycatch below thresholds (harbor porpoise, gray seals) ⤮ ✓
- Recover endangered populations ⤮, NARW ⊖ Gray seal ⊕ Salmon ⊖



Performance Relative to Fishery Management Objectives

Trends and status of indicators related to broad ecosystem-level fishery management objectives, with implications for the New England Fishery Management Council (NEFMC)

GULF OF MAINE (GOM)

OBJECTIVE (Indicator)	TREND	CURRENT STATUS	IMPLICATIONS
Seafood production (Total and NEFMC managed landings)	Decline	Below long-term average	Seafood production from New England managed species is near the lowest levels observed with a long-term declining trend. Total commercial landings also show a significant long-term declining trend. Recreational harvest in New England is still well below the long-term average with a significant long-term declining trend. Both the commercial and recreational landings status are driven in part by management to address mandated rebuilding of depleted stocks. Total Community Climate Vulnerability for landings is moderate with no long-term trend.
Commercial profits (Total and managed revenue)	TOTAL: No trend MANAGED: Decline	TOTAL: Near long-term average MANAGED: Below long-term average	Total GOM revenue exceeded 1982 baseline levels in all but 4 years. High prices and landings of lobster continue to drive total regional revenue. However, revenue from New England managed species is at the all-time low. Total Community Climate Vulnerability for revenue is moderate with no long-term trend.
Recreational opportunities (Effort and fleet diversity)	EFFORT: No trend DIVERSITY: No trend	EFFORT: Near long-term average DIVERSITY: Near long-term average	Recreational opportunities in the region are relatively stable, with respect to the types of trips (i.e., shore, private boat, charter/party) and numbers of species landed.
Stability (Fishery and ecosystem diversity maintained over time)	FISHERY ECOSYSTEM	FISHERY: Not stable ECOSYSTEM: Not stable	**Commercial:** Fleet count is declining with 2023 below the long-term average, and species revenue diversity reflects a reliance on relatively few species, with 2023 below the long term average. **Recreational**: Species diversity is increasing due to increases in southerly species and lower catch limits on traditional regional species. **Ecosystem:** Fish species richness is increasing while zooplankton diversity has been variable without trend. Changes in biological traits of the fish community have been observed.
Social and cultural (Community fishery engagement, social and climate vulnerability)	**Community total climate vulnerability trend** Mixed trends	**Community social and climate vulnerability status varies by community.**	Three New England communities ranked in the top 20 most engaged for both commercial and recreational fishing. Several of the top highly engaged fishing communities throughout the New England region ranked medium-high or above for one or more of the social vulnerability indicators, including 2 commercial communities (New Bedford, and Boston, MA) and 2 recreational communities (Provincetown and Falmouth, MA). This suggests potential challenges for these communities adapting to change. Communities climate risk on revenue is shifting from moderate to high/very high suggesting an increased dependence on climate vulnerable species.
Protected species (Coastwide bycatch, population numbers, mortalities)	BYCATCH: Mixed trends POPULATIONS: Mixed trends	BYCATCH: Harbor porpoise: Meeting objectives; Gray seal: Meeting objectives POPULATIONS: NARW: Below recovery objective; Gray seal: Above long-term average; Salmon: Below long-term average	Bycatch objectives are being met for harbor porpoise and gray seals. Mixed bycatch trends through 2022 are related to fishery management, shifts in porpoise distribution combined with fishery shifts, and population increase for gray seals. Population drivers for North Atlantic Right Whales (NARW) include combined fishery interactions/vessel strikes and distribution shifts related to prey abundance and quality. Management measures to reduce adult mortality are reflected in more stable population numbers. Unusual mortality events continue for 3 large whale species.

State of the Ecosystem Summary 2025:

Risks to meeting fishery management objectives

Climate: risks to managing spatially, managing seasonally, and catch specification

- Fish and protected species distribution shifts
- Changing spawning and migration timing
- Multiple stocks with poor condition, declining productivity

Other ocean uses: offshore wind development

- Current revenue in proposed areas
    - 1-46% by Mid-Atlantic port
    - 2-16% by MAFMC managed species
- Overlap with important right whale foraging habitats, increased vessel strike and noise risks

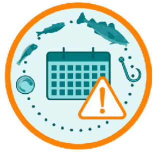
Risks to Meeting Fishery Management Objectives

Environmental Change and Ecosystem Risks

Climate and ecosystem change can directly and indirectly create risks to meeting fisheries management objectives by affecting the distribution, seasonal timing, productivity, and physiology of marine species.

Risks to Managing Spatially

- **Observations:** Species distributions for many fish and marine mammals are trending to the northeast along the continental shelf and into deeper water.
- **Potential Impacts:** Spatial misallocation of quotas within and across jurisdictions, leading to unmet quotas and/or increased discards. Specification of gear management areas may not utilize quotas and minimize bycatch.



Risks to Managing Seasonally

- **Observations**: Seasonal timing of spawning has changed for some managed species. Migration timing of some tunas and large whales has changed.
- **Potential Impacts:** Spawning closures are less effective if peak spawning occurs outside the seasonal closure. Seasonal openings of exemption areas may be inconsistent with species presence. Seasonal quota allocations may be misaligned with availability.

Risks to Setting Catch Limits

- **Observations:** Productivity and fish condition has changed for multiple fish species.
- **Potential Impacts:** Changes in environmental conditions can affect stock reference points and short-term stock projections. When productivity changes are not accounted for, they can lead to misspecified quotas and rebuilding plans.

Other Ocean Uses: Offshore Wind Risks

In 2024, four offshore wind projects were under construction in New England and the Mid-Atlantic, with seven additional projects approved by BOEM that may be built in the future. Currently approved lease areas cover more than 3.1 million acres on the Northeast shelf. Impacts at the wind project, local ocean, and regional scales are likely. Positive and negative effects are possible depending on species' preferred habitat. Wind energy updates include:

- Five lease areas within the Gulf of Maine, one research and four commercial, were leased in 2024 for floating offshore wind project development.
- 0–32% of New England port revenue (2008–2023) came from existing leased and proposed offshore wind areas.
- 1–20% and 1–19% of annual commercial revenue and landings, respectively, for New England Fishery Management Council managed species between 2008–2023 occurred within existing lease areas and may be displaced. Individual operators may depend on lease areas for even larger proportions of their annual landings or revenue.
- Lease areas overlap with North Atlantic right whale critical habitat in the Gulf of Maine. Development may alter local oceanography and prey availability, increase vessel traffic and therefore vessel strike risk, and result in pile driving noise impacts.
- Each project implements mitigation and monitoring measures to reduce impacts on trust resources during certain activities.

State of the Ecosystem Summary 2025: 2024 Highlights

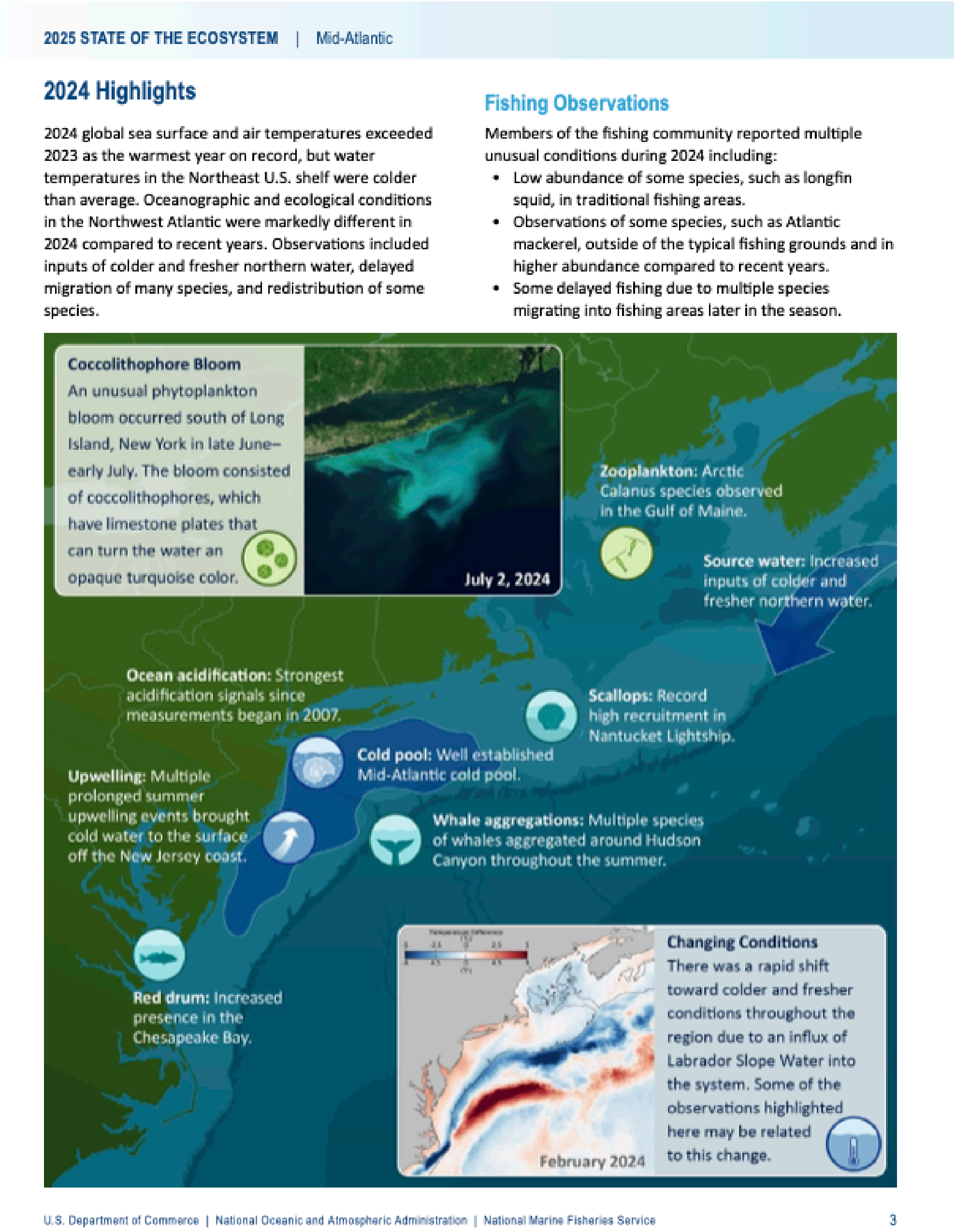
Notable 2024 events and conditions

- 2024 warmest year on record globally. Again.

- BUT

- Cooler conditions across the coast
- Well established Mid Atlantic Cold Pool
- Multiple summer upwelling events off NJ
- Extreme ocean acidification measured off NJ
- Many fishery observations of different spatial and timing patterns, changed abundance
- Good scallop recruitment in Nantucket lightship
- More red drum in Chesapeake Bay
- Arctic copepods in GOM
- Cocolithophore bloom off NY
- Large whale aggregations

We welcome your observations!
northeast.ecosystem.highlights@noaa.gov



SSC and Council Requests from 2024 and Prioritization

2025 State of the Ecosystem Request tracking memo

Request	Year	Rank	Source	Status	Progress
System level thresholds/ref pts					
Compare EOF (Link) thresholds to empirical thresholds (Large, Tam)	2021	Highest	MAFMC SSC	In progress	Analysis planning with Mid SSC
Simulation analysis to gauge effectiveness of indicators (e.g. EOF testing)	2024	Highest	MAFMC SSC	In progress for EOF	Analysis planning with Mid SSC
Trend Analysis / Inflection / Break points / Early warning variance	2019 - 2024	Highest	Both Councils and SSCs	In SOE (trends)	New short term trend analysis included
Optimum yield for ecosystem	2021	Highest	NEFMC	In progress	Analysis planning with Mid SSC
Include standardized language about uncertainty from e.g. IPCC or NCA applicable to each indicator or data input	2024	Highest	NEFMC SSC	Not started	Lacking resources this year
Establish more links between events and consequences (e.g. temp ranges for more species)	2024	Highest	MAFMC SSC	In progress	Temperature threshold analysis in progress
How does phyto size comp affect EOF indicator, if at all?	2021	High	MAFMC	In progress	Analysis planning with Mid SSC
Sum of TAC/ Landings relative to TAC	2021, 2023	Moderate	MAFMC SSC	In SOE-MAFMC, In progress-NEFMC	Seafood Production section
Nutrient input, Benthic Flux and POC (particulate organic carbon) to inform benthic productivity by something other than surface indicators	2021, 2023	Low	MAFMC SSC	In SOE	Benthos abuncance and distribution indices included
Reduce indicator dimensionality with multivariate statistics	2020	Lowest	NEFMC	In progress	Analysis planning with Mid SSC
Management					

Priority categories in the Request Memo

The memo is organized into categories by topic, and categories are listed in descending order of overall (2022) priority based on approximate weighting within the category.

Therefore, a range of priority may be applied to individual requests within a category even though the entire category has an overall priority.

The subgroup agreed to keep this group priority ranking

SSC: Link to current memo
SSC: Link to overview

- System level thresholds/reference points: highest, much methods work in progress
- Management: high, resource limited
- Short term forecasts: high, CEFI should help
- Regime shifts: high, need system level framework
- Multiple system drivers: moderate-high, many unranked requests
- Functional group level status/thresholds/reference points: moderate, many in progress
- Stock level indicators: moderate, ESPs better venue
- SOE administration: unranked

Discussion of 2023 and 2024 requests (1 of 2)

These newer requests were ranked highest within each category

- System level thresholds/reference points: highest
  - maintain high priority on trend/threshold evaluation
  - express indicators relative to biological thresholds
  - standardize uncertainty language (IPCC)
  - longer term: simulation analysis of thresholds
- Management: high
  - include indicators for risk policy/risk assessment processes
- Short term forecasts: high
  - include CEFI projections
- Regime shifts: high
  - instead characterize current conditions in context of expected short term change

SSC: link to full list, comments welcome!

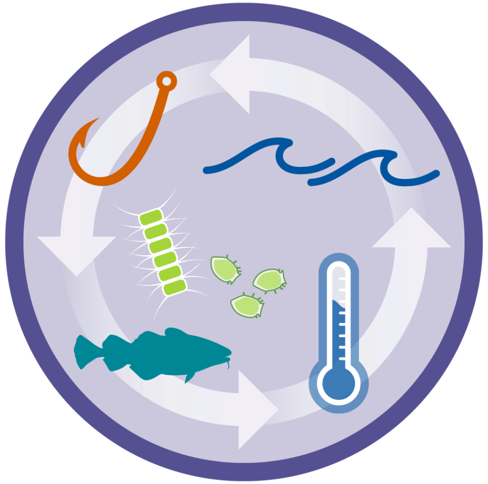
Discussion of 2023 and 2024 requests (2 of 2)

These newer requests were ranked highest within each category

- Multiple system drivers: moderate-high
    - profits vs revenue: provide incomplete net revenue and index of costs
    - clarify objectives and terminology for fishing community engagement/reliance
        - time series of community indicators
        - social and economic linkages to climate
        - consider appropriate scale for indicators
- Functional group level status/thresholds/reference points: moderate
    - not specifically prioritized
    - include more aggregations for biomass and landings (Council-managed, status)
- Stock level indicators: moderate, ESPs
    - not specifically prioritized
    - cross reference ESP products where appropriate

SSC: link to full list, comments welcome!

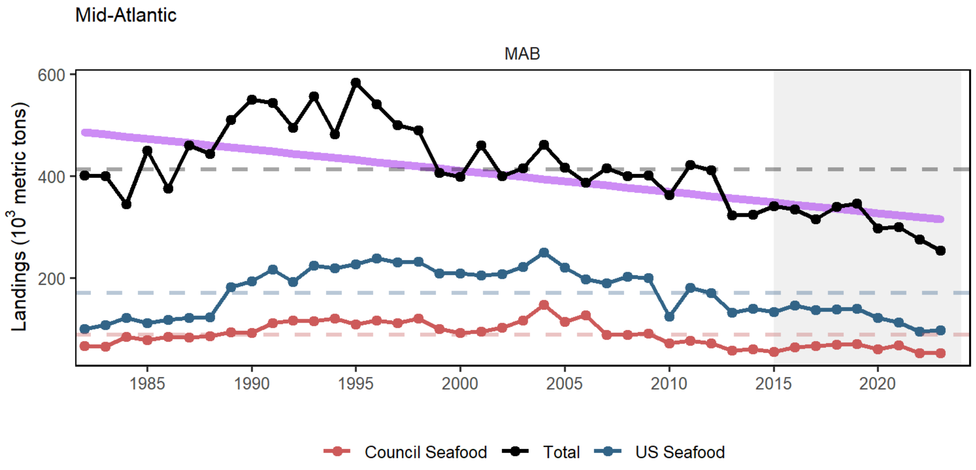
2025 Performance relative to management objectives

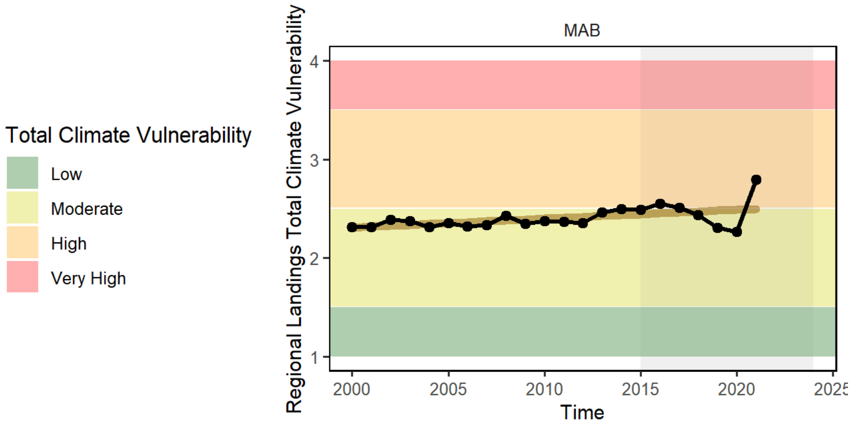


Objective: Mid Atlantic Seafood production

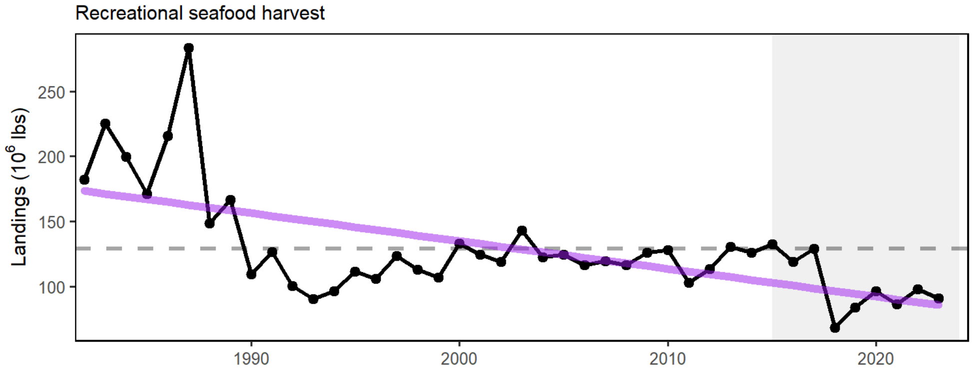
Risk elements: ComFood and RecFood, unchanged

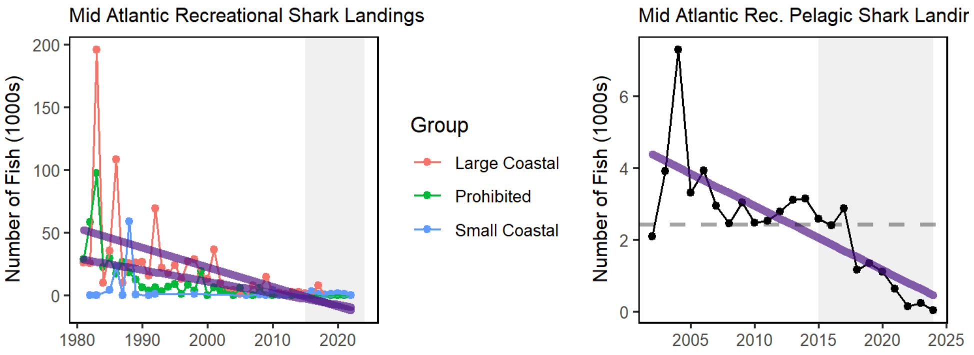
Indicators: Commercial landings, climate risk





Indicators: Recreational harvest

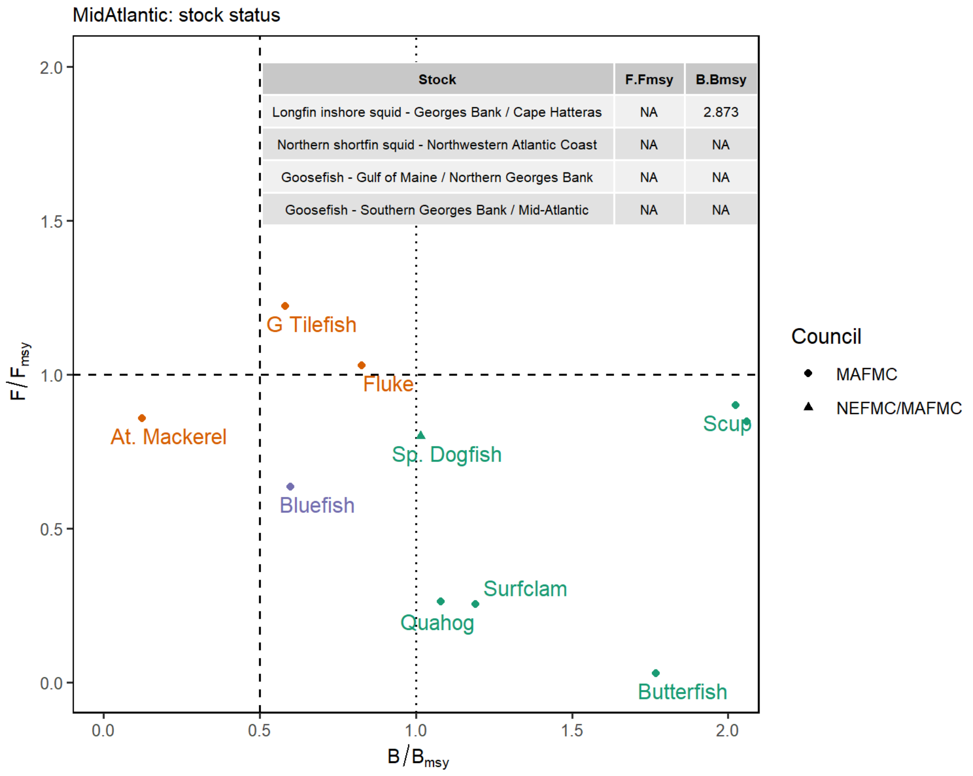




Multiple potential drivers: ecosystem and stock production, management, market conditions, and environmental change.

Mid Atlantic Landings drivers: Stock status? TAC?

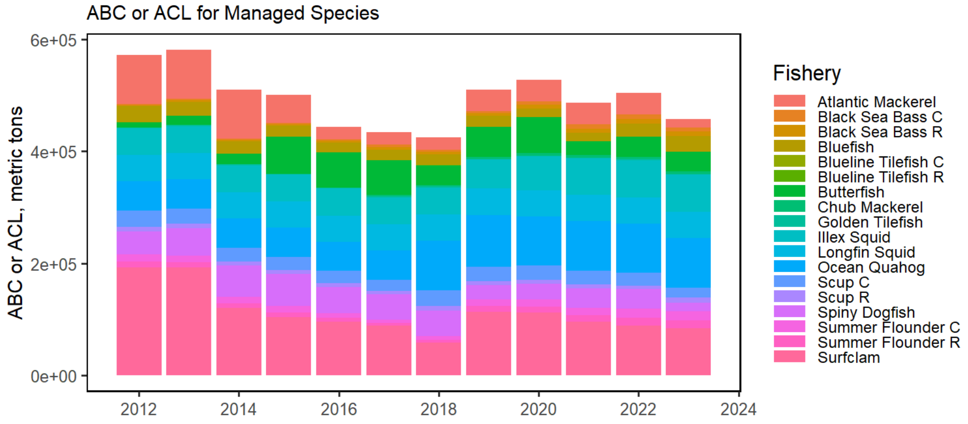
Indicator: Stock status

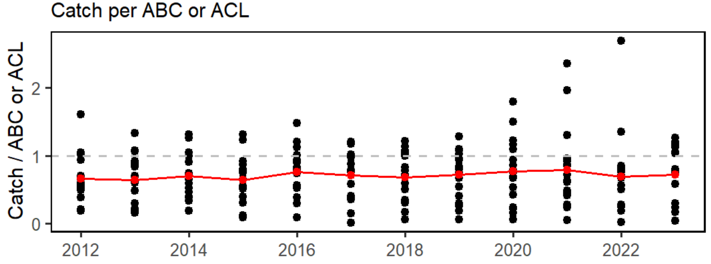


Stock	F.Fmsy	B.Bmsy
Longfin inshore squid - Georges Bank / Cape Hatteras	NA	2.873
Northern shortfin squid - Northwestern Atlantic Coast	NA	NA
Goosefish - Gulf of Maine / Northern Georges Bank	NA	NA
Goosefish - Southern Georges Bank / Mid-Atlantic	NA	NA

Risk elements: Fstatus, Bstatus, MgtControl

Indicators: Total ABC or ACL, and Realized catch relative to management target

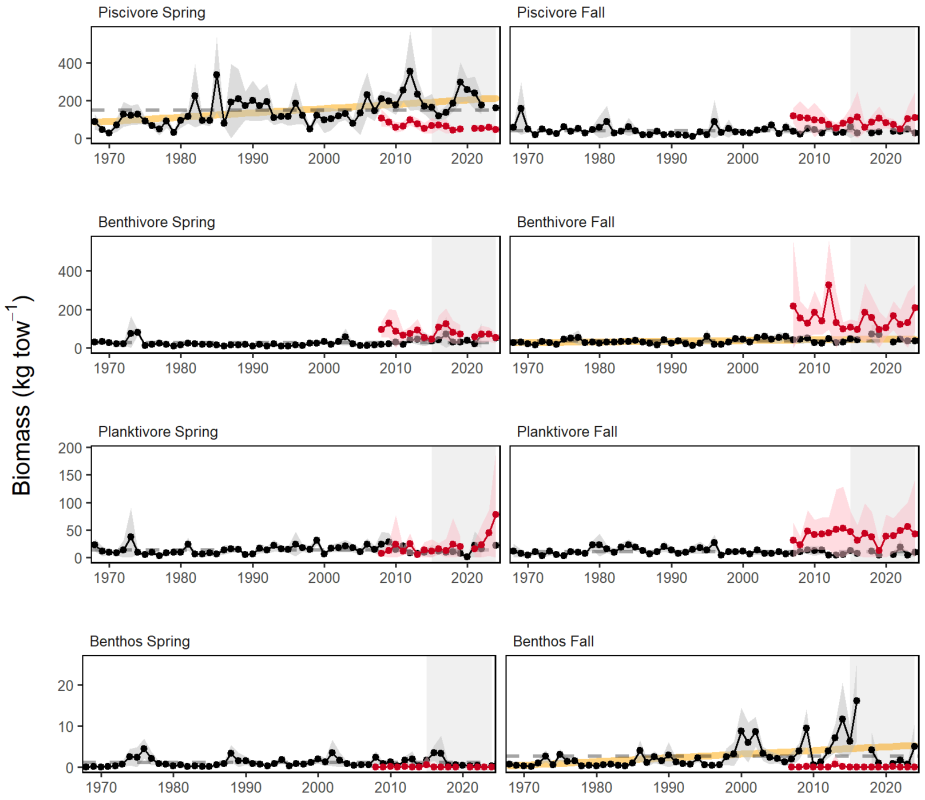




Few managed species have binding limits; Management less likely playing a role

Implications: Mid Atlantic Seafood Production Drivers

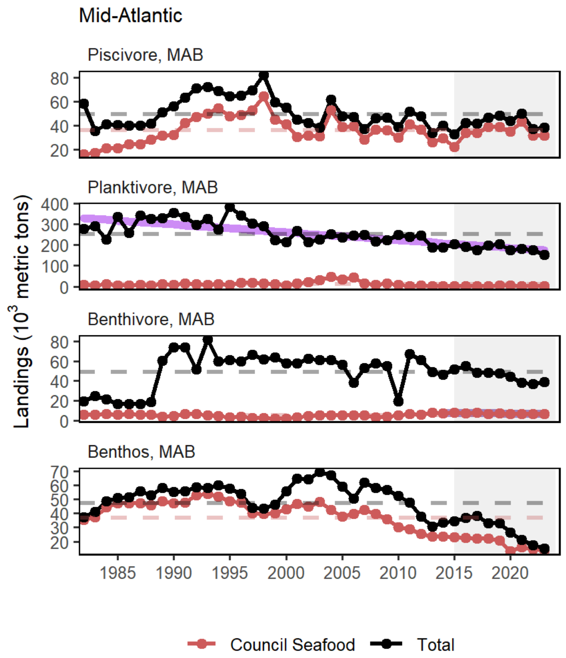
Biomass does not appear to drive landings trends



Key: Black = NEFSC survey;

Red = NEAMAP survey

- Declining aggregate planktivores, benthos?



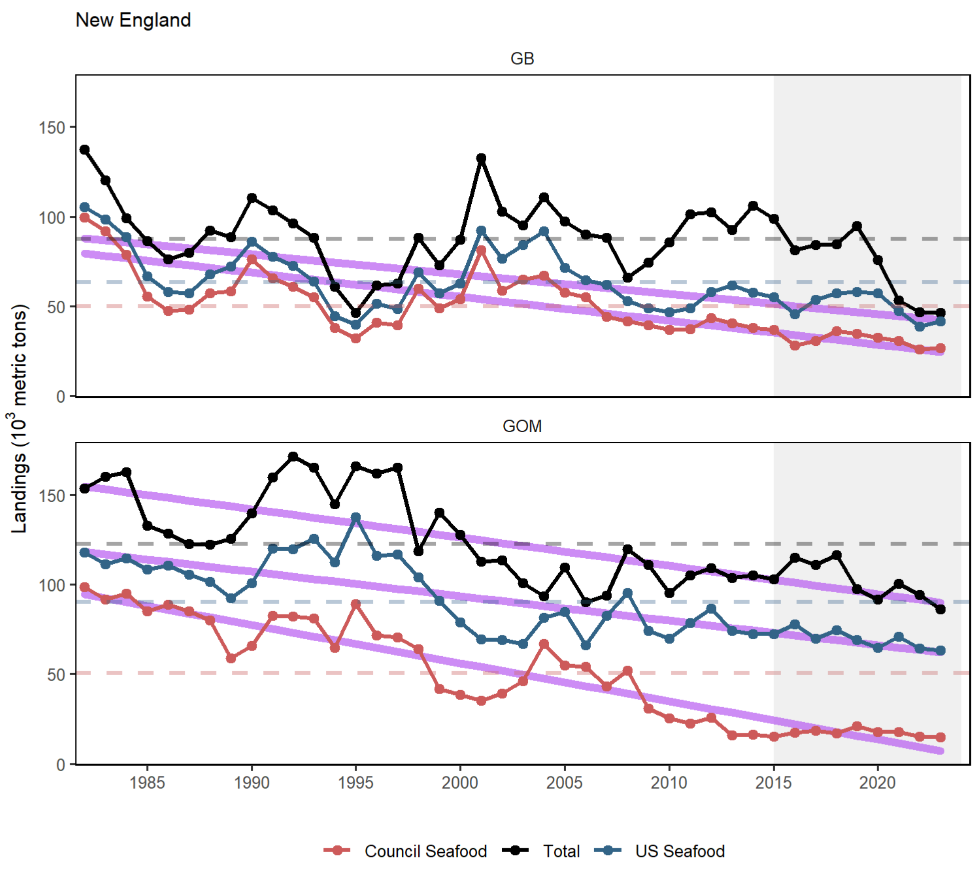
- Recreational drivers differ: shark fishery management, possibly survey methodology

Monitor:

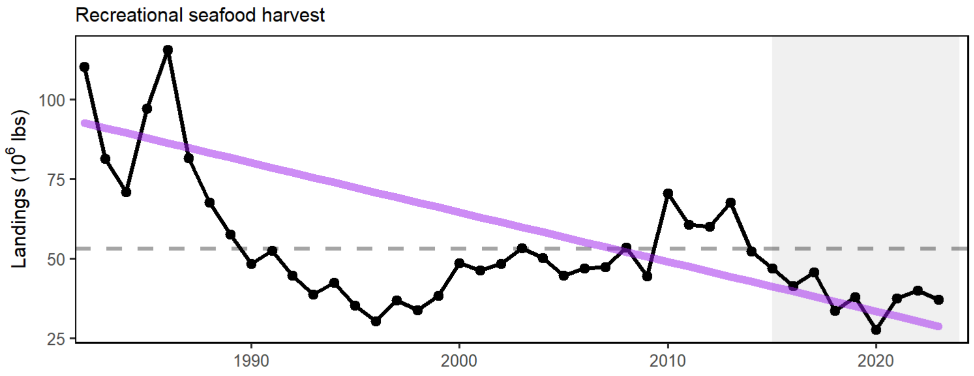
- climate risks including warming, ocean acidification, and shifting distributions
- ecosystem composition and production changes
- fishing engagement

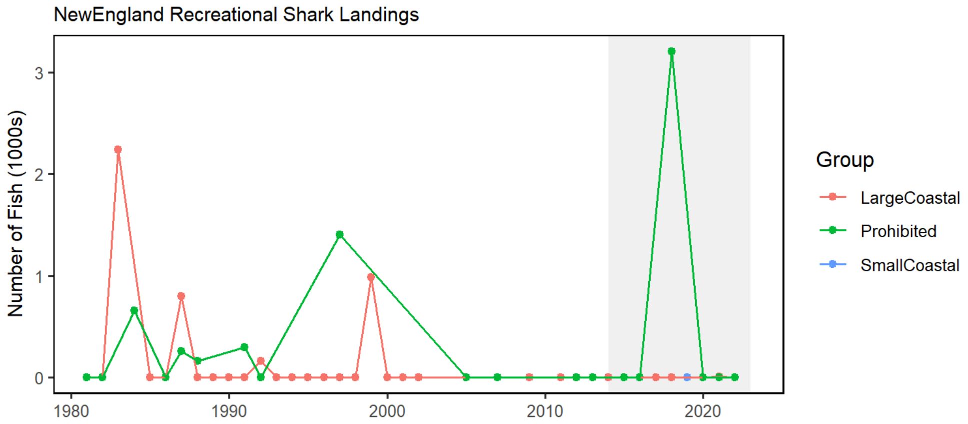
Objective: New England Seafood production ↘/↔ ⊖

Indicators: Commercial landings



Indicators: Recreational harvest

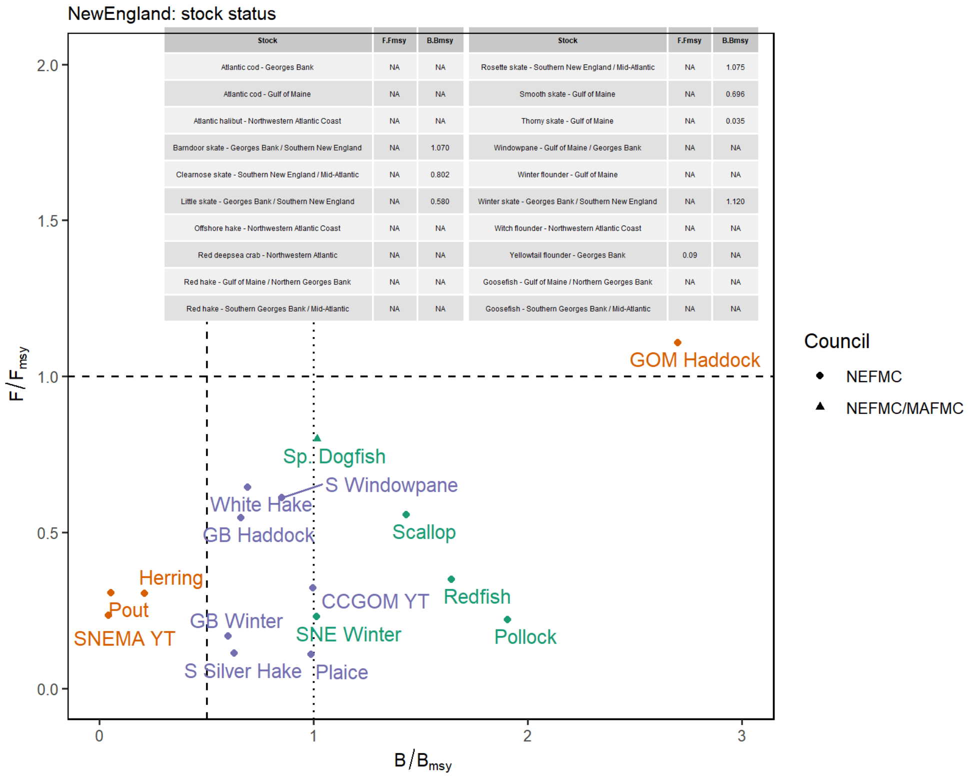




Multiple drivers: ecosystem and stock production, management actions (stock rebuilding), market conditions (including COVID-19 disruptions), and environmental change

New England Landings drivers: Stock status? Survey biomass?

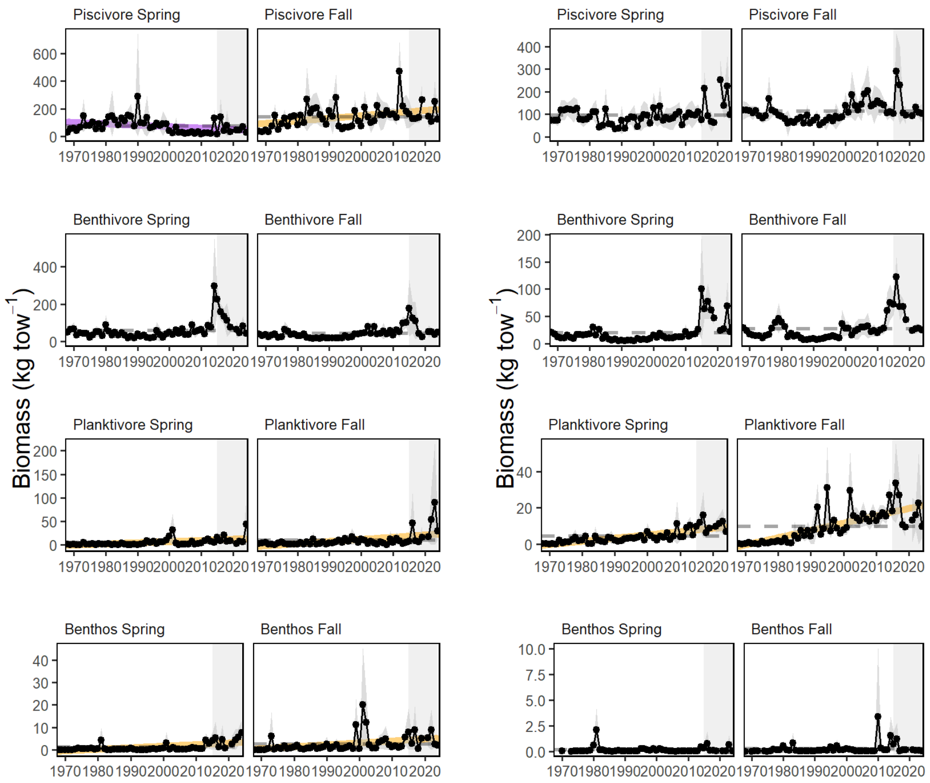
Indicator: Stock status



Stock	F.Fmsy	B.Bmsy	Stock	F.Fmsy	B.Bmsy
Atlantic cod - Georges Bank	NA	NA	Rosette skate - Southern New England / Mid-Atlantic	NA	1.075
Atlantic cod - Gulf of Maine	NA	NA	Smooth skate - Gulf of Maine	NA	0.696
Atlantic halibut - Northwestern Atlantic Coast	NA	NA	Thorny skate - Gulf of Maine	NA	0.035
Barndoor skate - Georges Bank / Southern New England	NA	1.070	Windowpane - Gulf of Maine / Georges Bank	NA	NA
Clearnose skate - Southern New England / Mid-Atlantic	NA	0.802	Winter flounder - Gulf of Maine	NA	NA
Little skate - Georges Bank / Southern New England	NA	0.580	Winter skate - Georges Bank / Southern New England	NA	1.120
Offshore hake - Northwestern Atlantic Coast	NA	NA	Witch flounder - Northwestern Atlantic Coast	NA	NA
Red deepsea crab - Northwestern Atlantic	NA	NA	Yellowtail flounder - Georges Bank	0.09	NA
Red hake - Gulf of Maine / Northern Georges Bank	NA	NA	Goosefish - Gulf of Maine / Northern Georges Bank	NA	NA
Red hake - Southern Georges Bank / Mid-Atlantic	NA	NA	Goosefish - Southern Georges Bank / Mid-Atlantic	NA	NA

One more stock below BMSY from last year (S Silver Hake). No change in stocsk below 1/2 BMSY. Stock status and required management actions still likely playing large role in seafood declines.

Indicator: Survey biomass



Biomass availability still seems unlikely driver

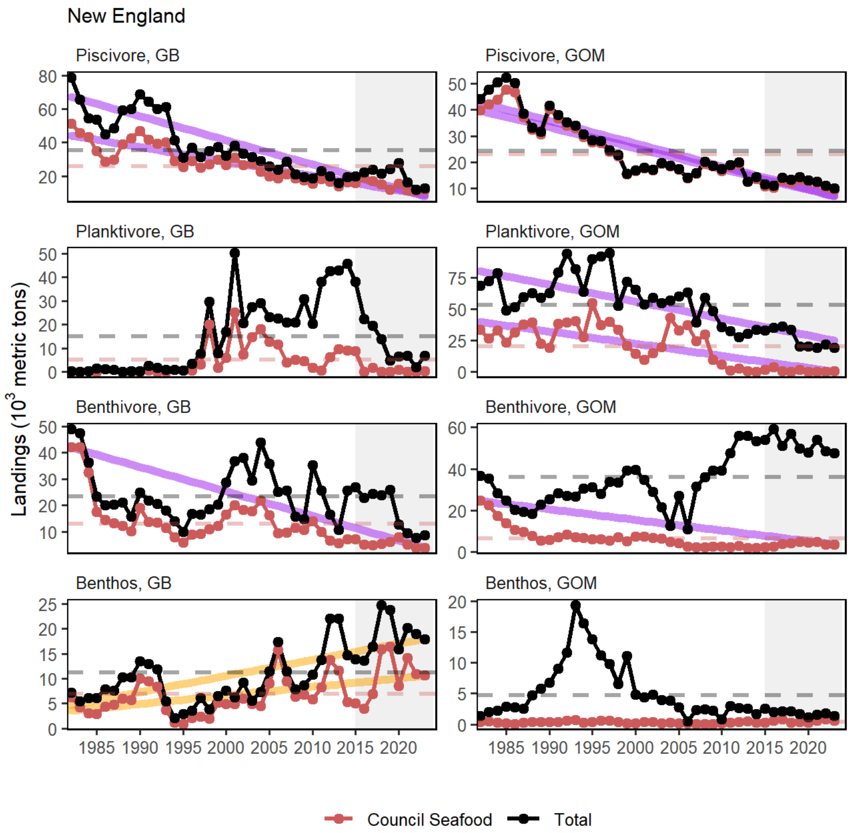
Implications: New England Seafood Production

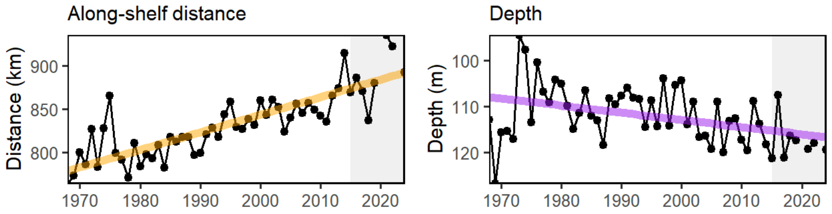
Drivers:

- decline in commercial landings is most likely driven by the requirement to rebuild individual stocks (lower quotas) as well as market dynamics
- other drivers affecting recreational landings: tighter shark fishery regulations, changing demographics and preferences of anglers

Monitor:

- climate risks including warming, ocean acidification, and shifting distributions
- ecosystem composition and production changes
- fishing engagement

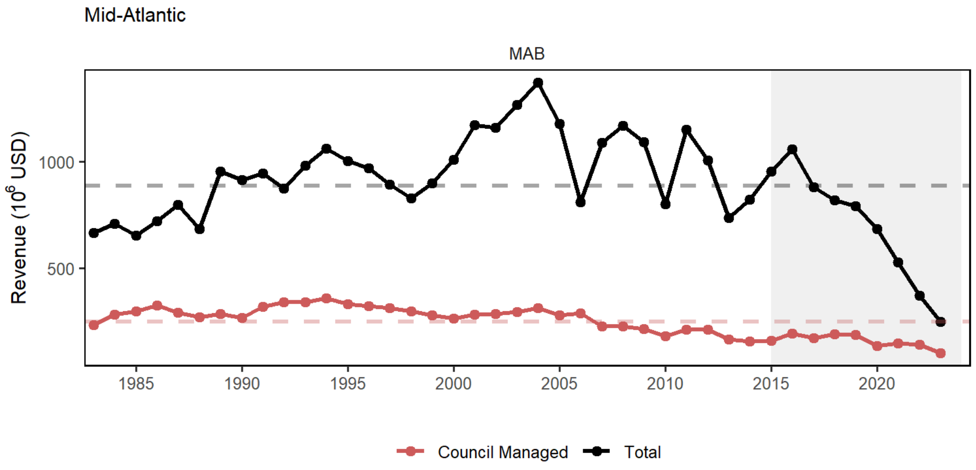


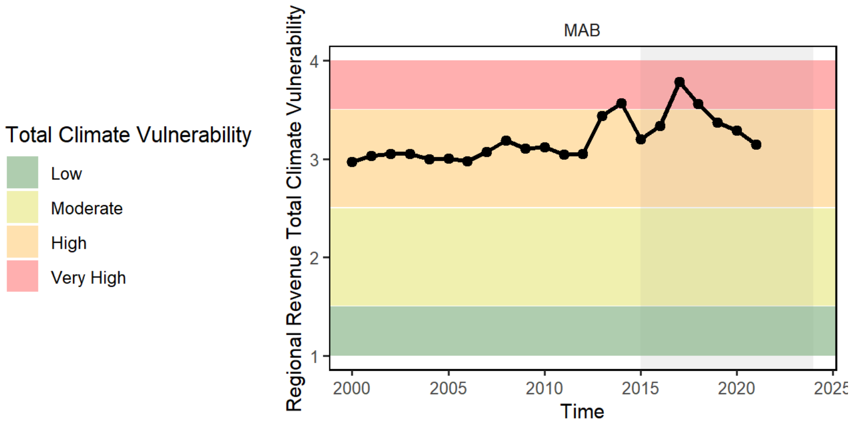


Objective: Mid Atlantic Commercial Profits

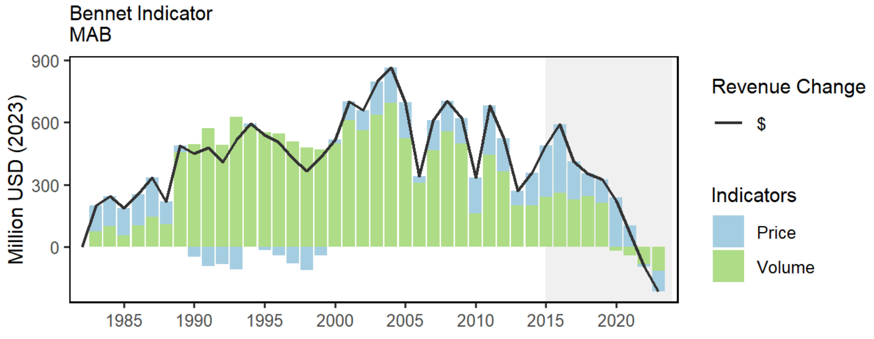
Risk element: CommRev, unchanged

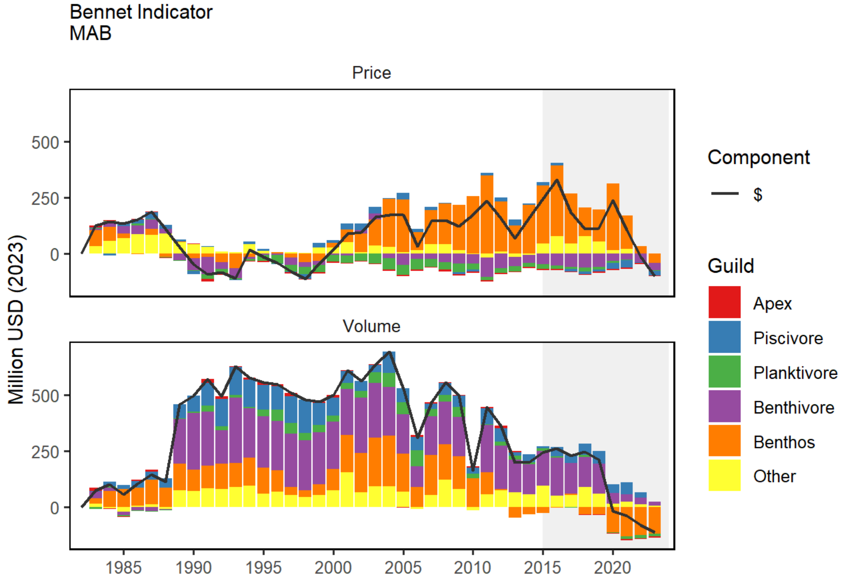
Indicator: Commercial Revenue





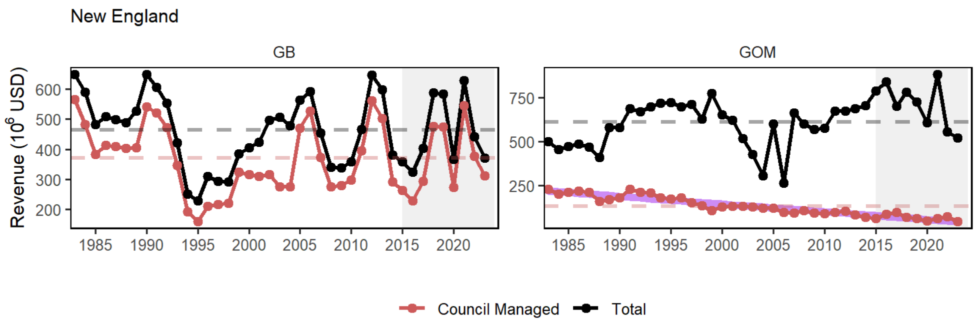
Indicator: Bennet--price and volume indices

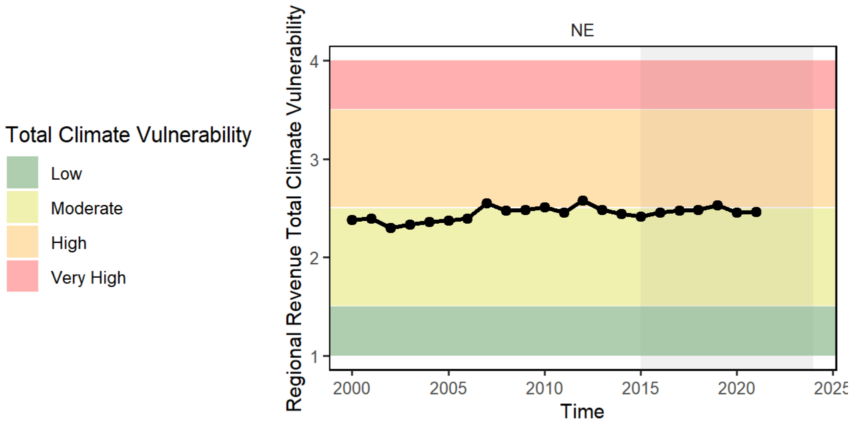




Objective: New England Commercial Profits

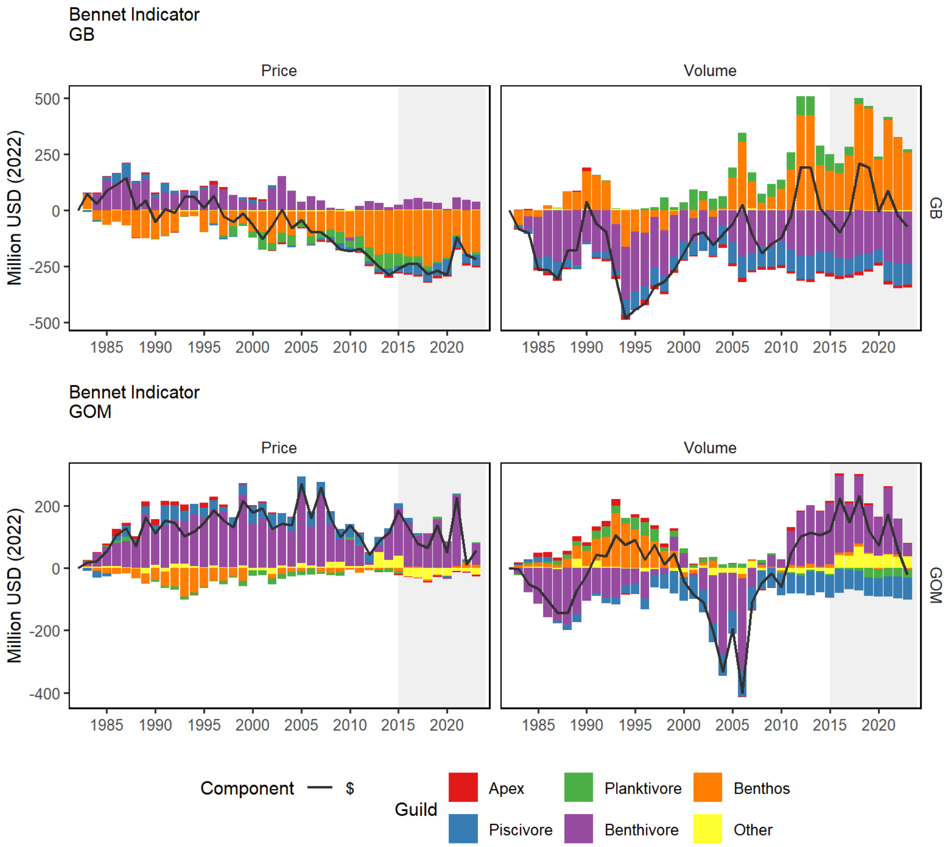
Indicator: Commercial Revenue





Both regions dependent on single climate-vulnerable species

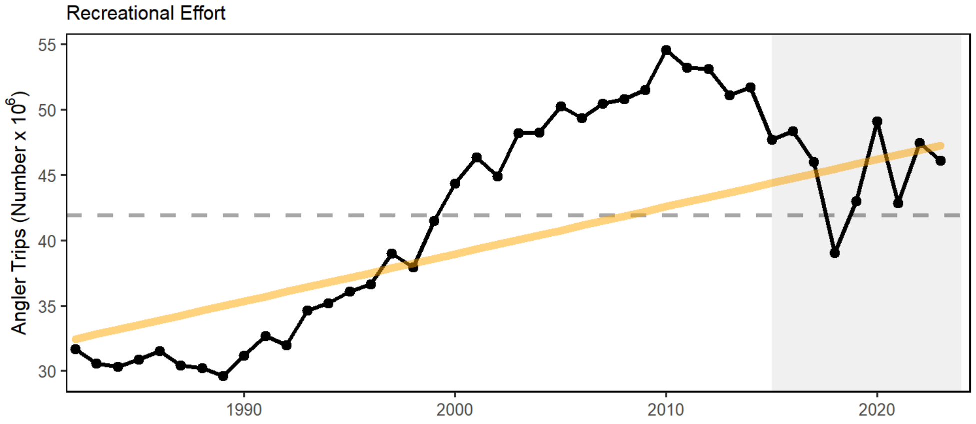
Indicator: Bennet--price and volume indices

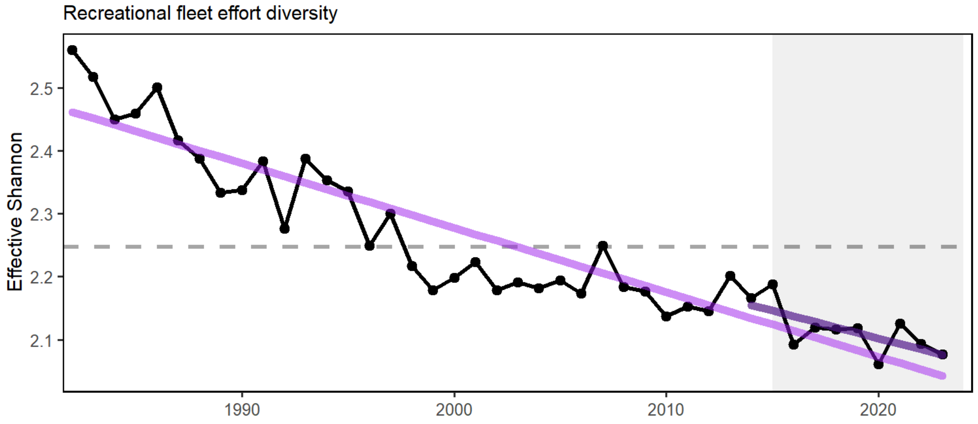


GOM high revenue despite low volume

Objective: Mid Atlantic Recreational opportunities ; Risk elements: RecValue, RecDiv

Indicators: Recreational effort and fleet diversity



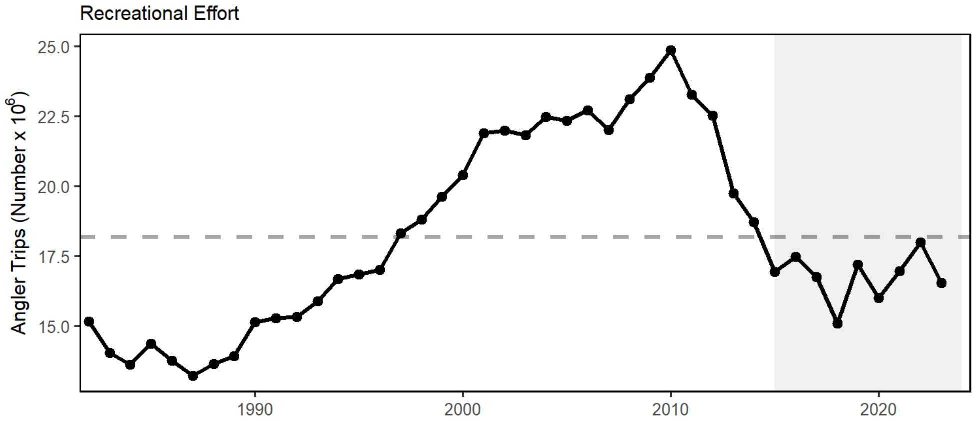


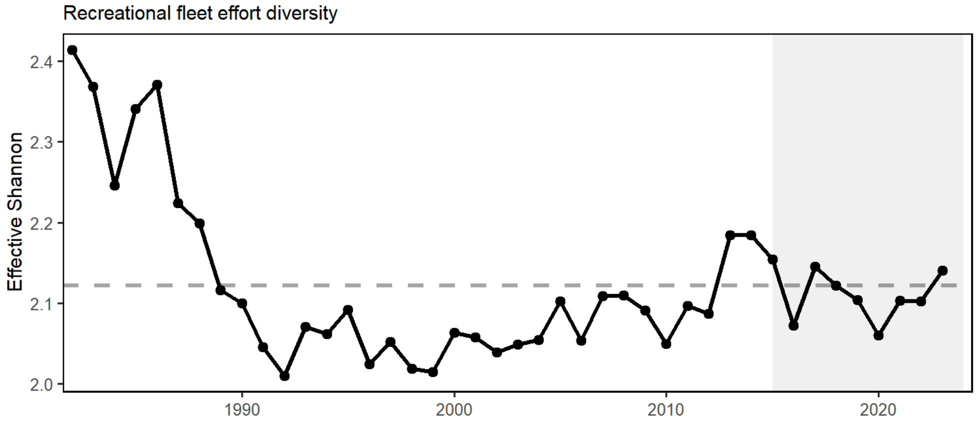
Implications

- Adding 2023 data, recreational effort (angler trips) retains the long term increase.
- The increasing long term trend changed the risk category for the RecValue element back to low-moderate (previously ranked low risk).
- *New risk element*: Decline in recreational fleet diversity suggests a potentially reduced range of opportunities.
- Driven by party/charter contraction and a shift toward shore based angling.

Objective: New England Recreational opportunities ↔ ●

Indicators: Recreational effort and fleet diversity





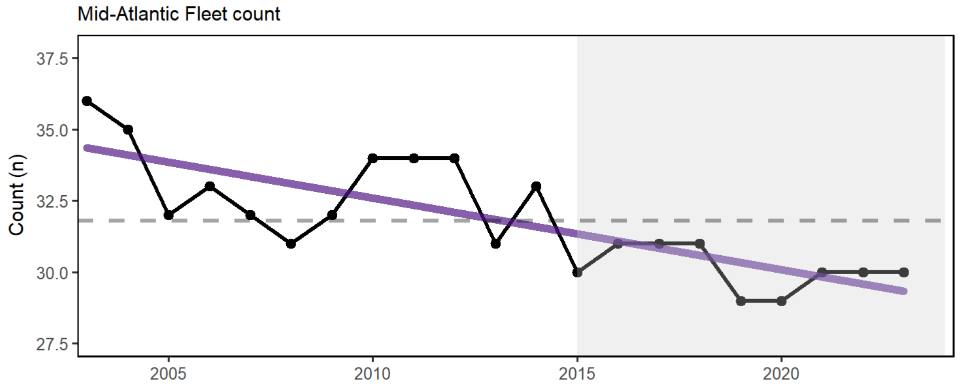
Implications

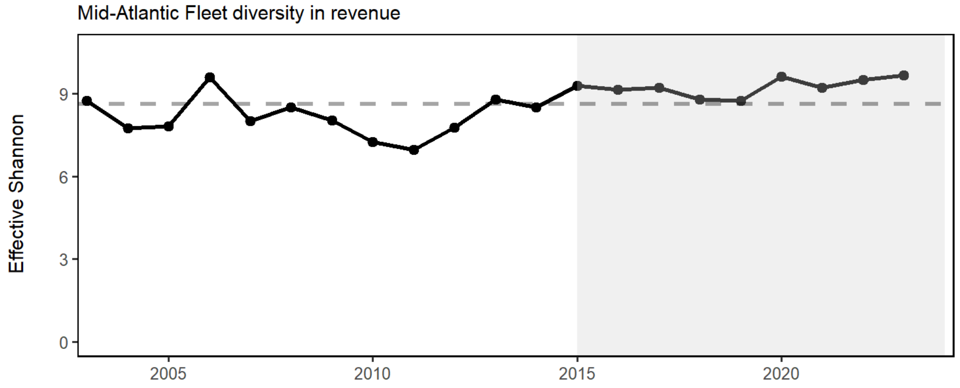
- Absence of a long-term trend in recreational effort suggests relative stability in the overall number of recreational opportunities in New England

Objective: Mid Atlantic Fishery Stability: Not Stable

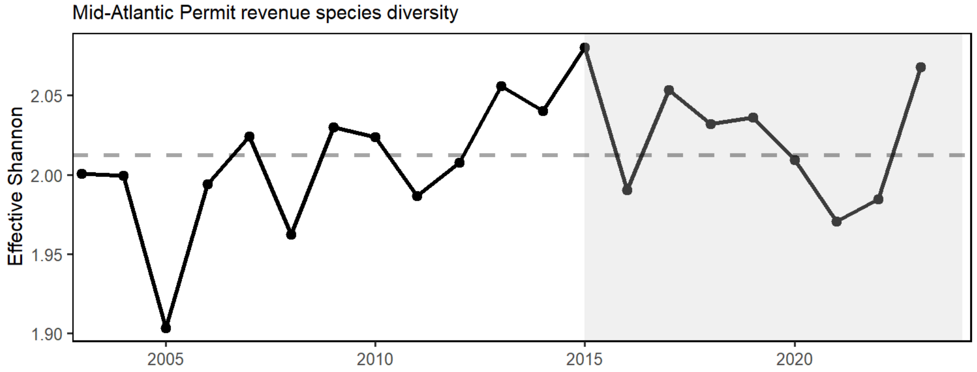
Risk elements: FleetDiv and FishRes1

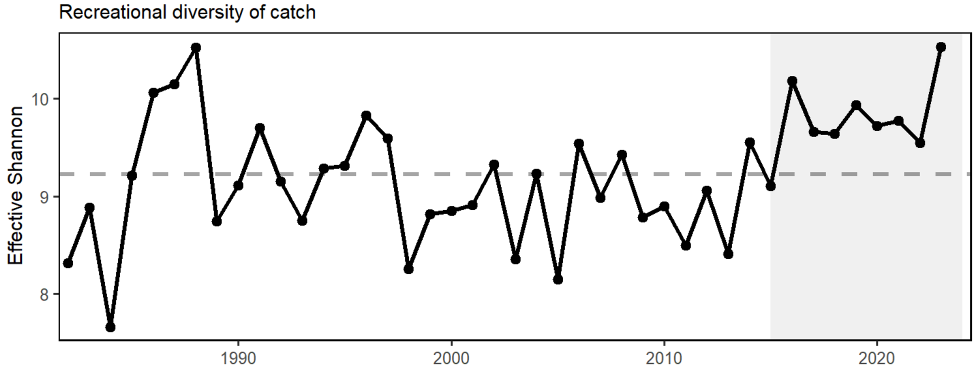
Fishery Indicators: Commercial fleet count, fleet diversity





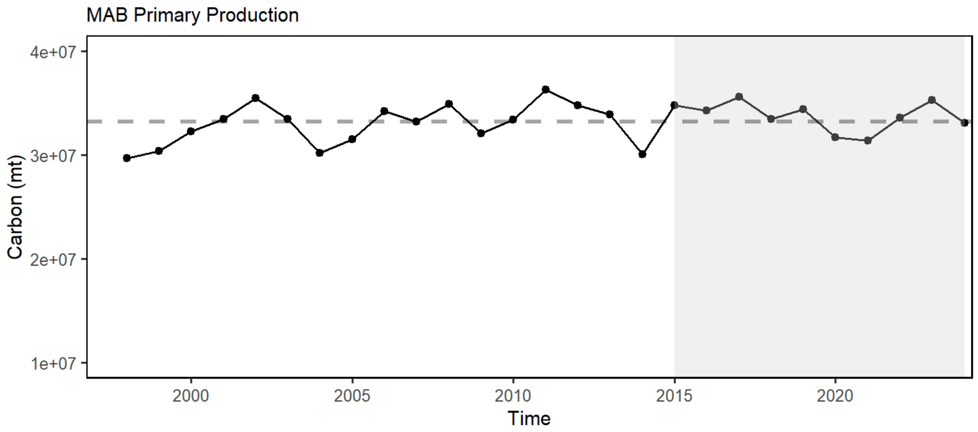
Fishery Indicators: commercial species revenue diversity, recreational species catch diversity

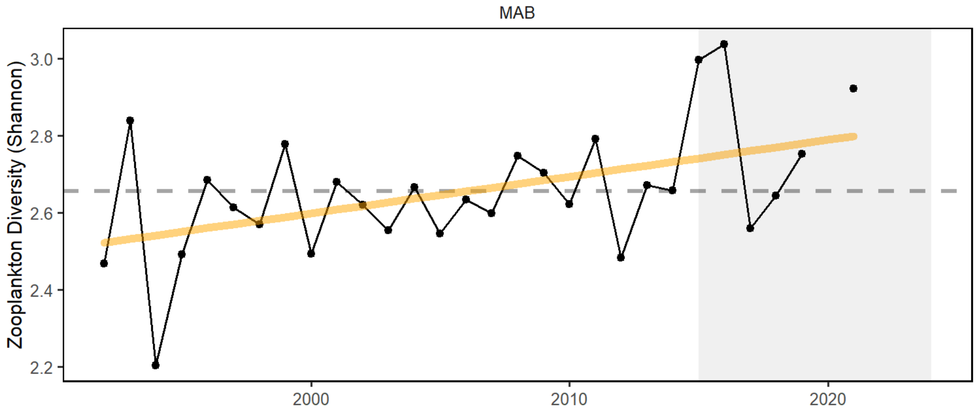




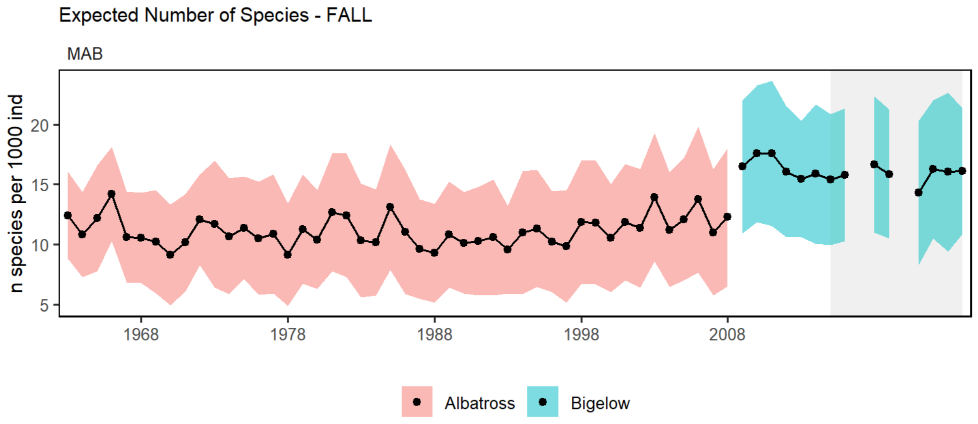
Objective: Mid Atlantic Ecological Stability: Not Stable

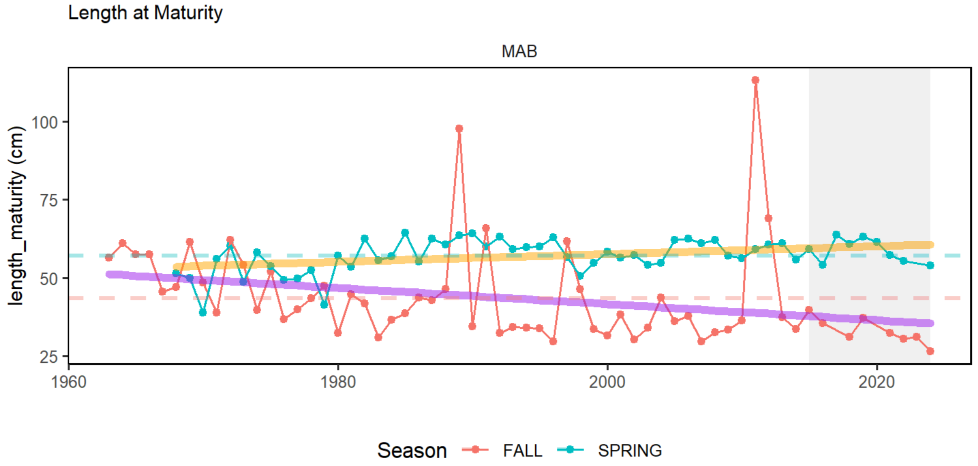
Ecological Indicators: PP and zooplankton





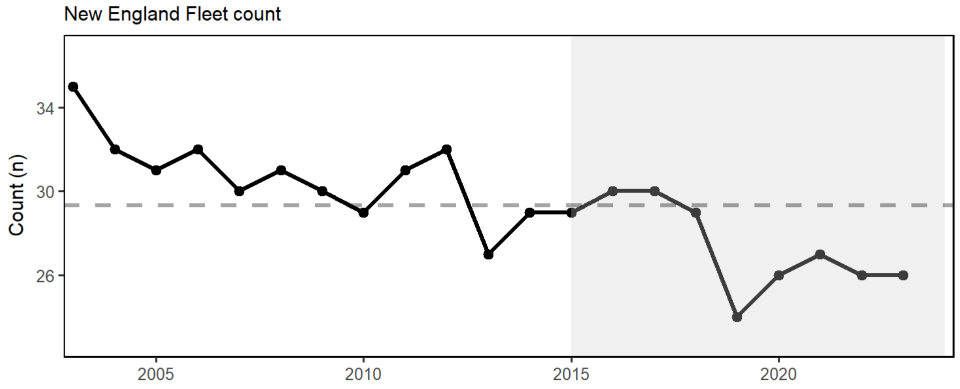
Ecological Indicators: fish richness and traits

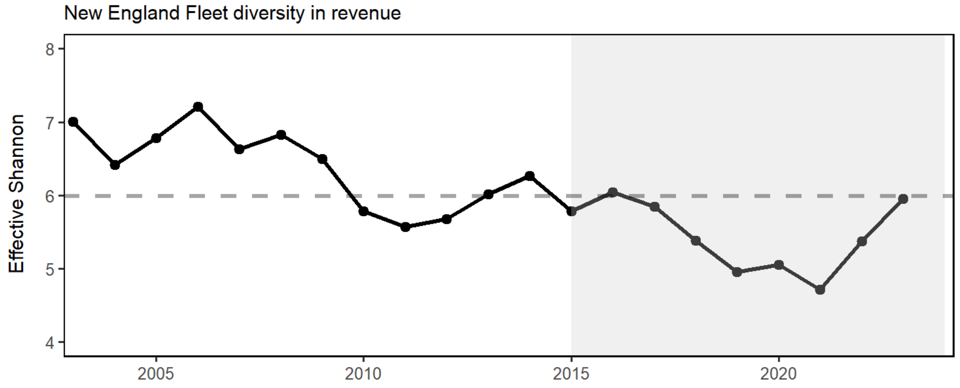




Objective: New England Fishery Stability: Not Stable

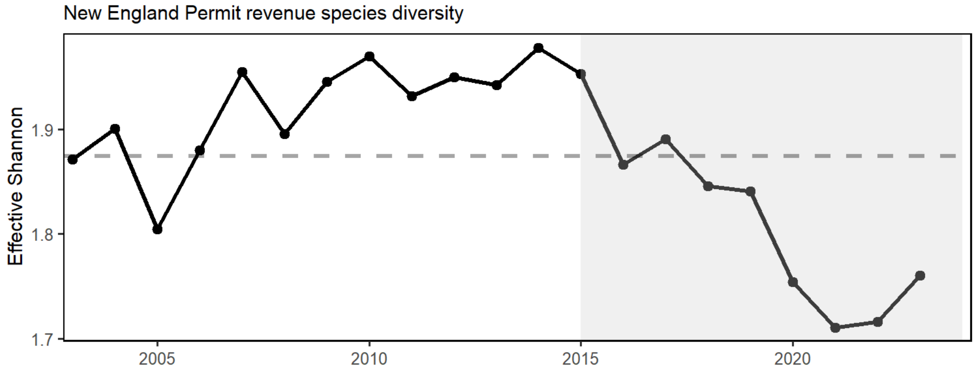
Fishery Indicators: Commercial fleet count, fleet diversity



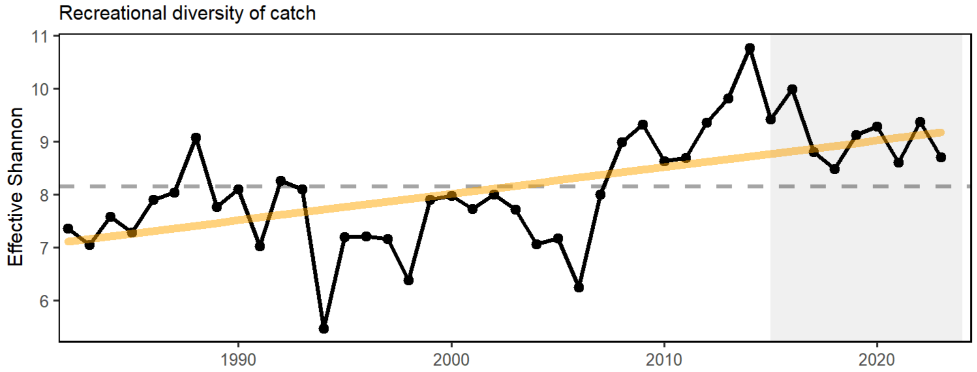


Most recent around lowest points in series

Fishery Indicators: commercial species revenue diversity, recreational species catch diversity

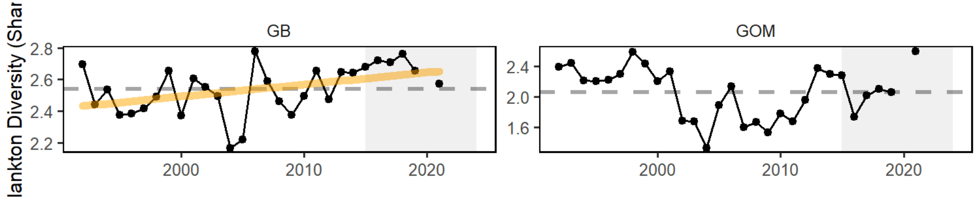


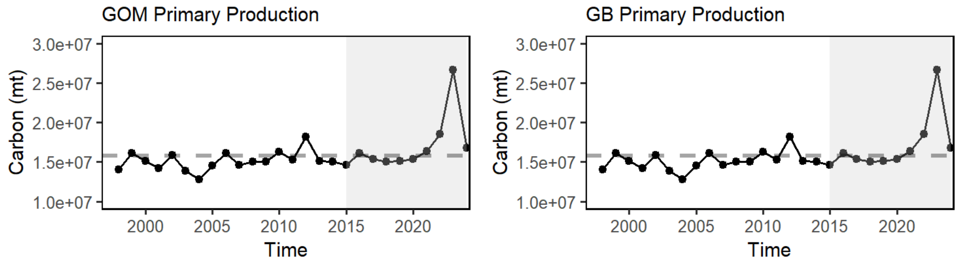
Most recent lowest point in series. Covid role?



Objective: New England Ecological Stability

Ecological Indicators: zooplankton diversity (*not updated*) and total primary production

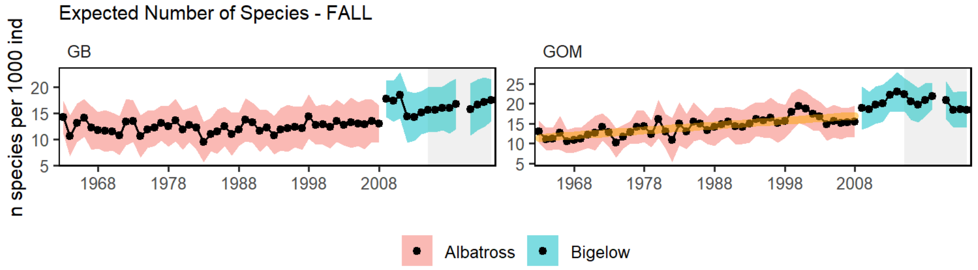


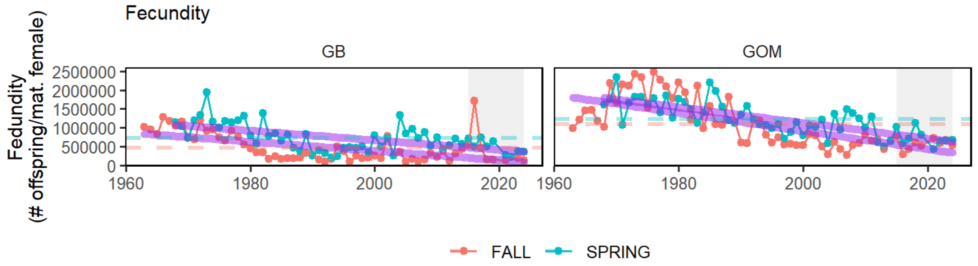


Ecological Implications:

- Commercial fishery diversity driven by small number of species -> less capacity to respond to new opportunities
- Recreational diversity increase due to increase in ASFMC and MAFMC managed species

Ecological Indicators: fish richness and traits



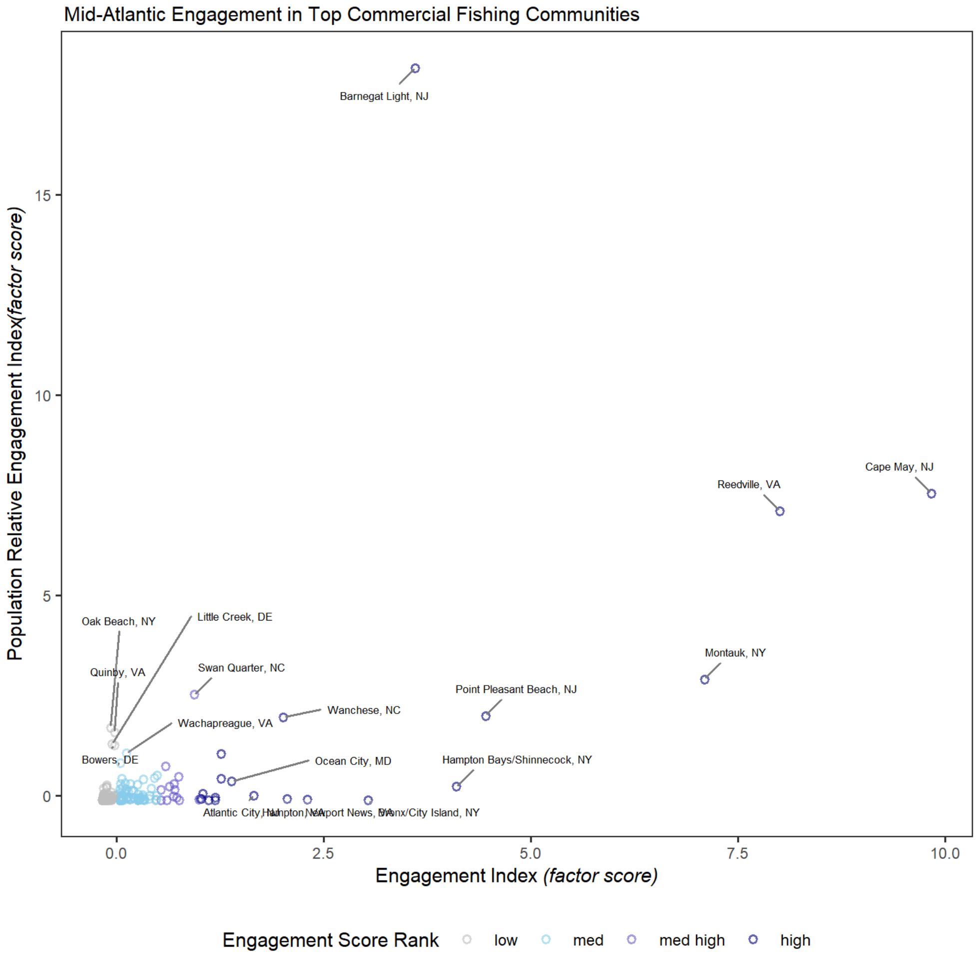


Fishery Implications:

- Adult diversity in GOM suggests increase in warm-water species
- Declines in species fecundity & other life history traits suggests changing ecology

Mid-Atlantic Social and Climate Vulnerability   Risk element: Social

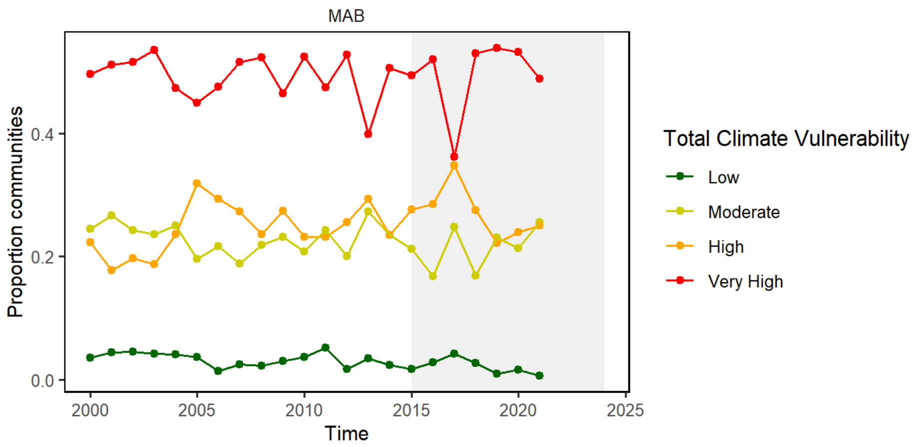
Indicators: Commercial fishery engagement, social vulnerability, revenue climate vulnerability



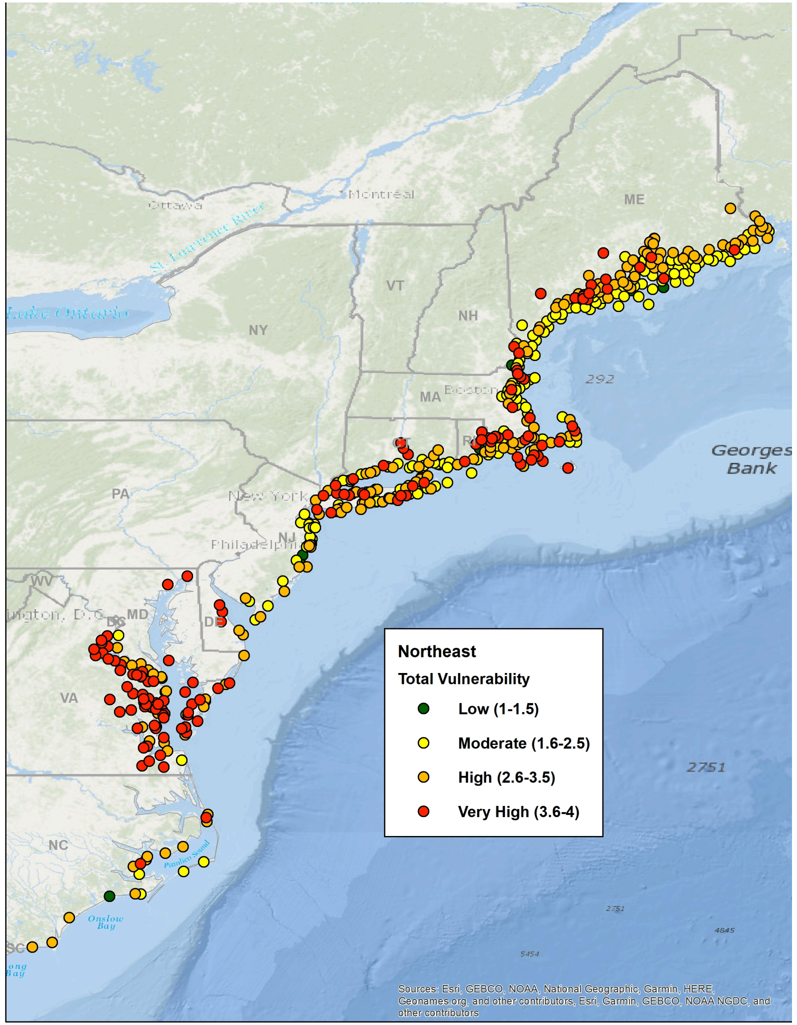
Time	EPU	Town	Eng	Eng_ct	Rel	Rel_ct	Personal Disruption	Population Composition	Poverty
2,022	MAB	Cape May, NJ	9.828	4	7.546	4	1	2	1
2,022	MAB	Reedville, VA	8.005	4	7.105	4	1	1	1
2,022	MAB	Montauk, NY	7.095	4	2.903	4	1	1	1
2,022	MAB	Point Pleasant Beach, NJ	4.455	4	1.987	4	2	1	1
2,022	MAB	Hampton Bays/Shinnecock, NY	4.097	4	0.226	2	1	4	1
2,022	MAB	Barnegat Light, NJ	3.606	4	18.175	4	1	1	1
2,022	MAB	Bronx/City Island, NY	3.037	4	-0.120	1	4	4	4
2,022	MAB	Newport News, VA	2.301	4	-0.101	1	2	1	2
2,022	MAB	Hampton, VA	2.059	4	-0.092	1	2	1	2
2,022	MAB	Wanchese, NC	2.014	4	1.955	4	1	1	1

Mid-Atlantic Social and Climate Vulnerability   Risk element: Social

Indicators: Commercial fishery revenue climate vulnerability

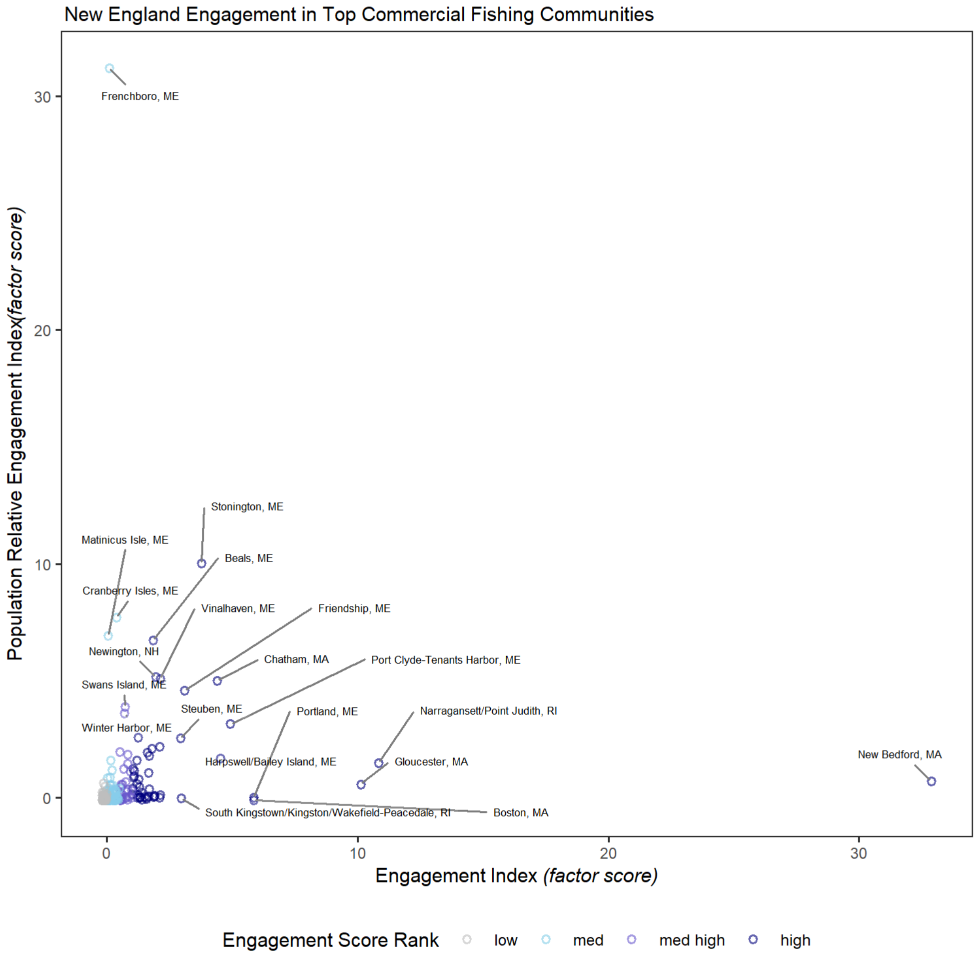


The Community Climate Change Risk Indicators are calculated by multiplying the percent contribution of species to the total value landed in a community by their respective Total Vulnerability scores (based on NOAA's Climate Vulnerability Assessment) for different sensitivity and exposure factors and then summing the resulting values by year.



New England Community Social and Climate Vulnerability

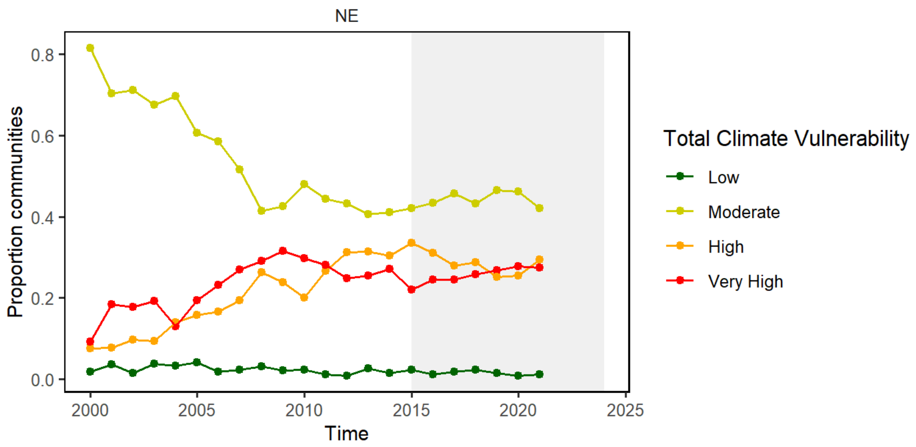
Indicators: Commercial fishery engagement, social vulnerability, revenue climate vulnerability



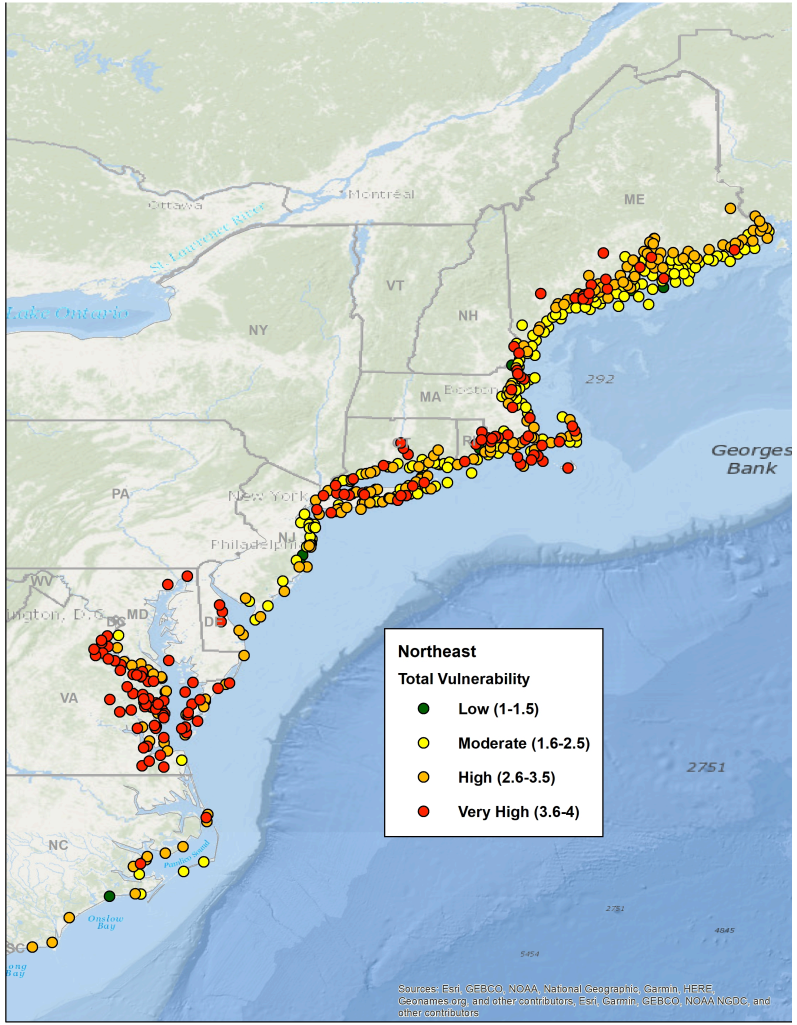
Time	EPU	Town	Eng	Eng_ct	Rel	Rel_ct	Personal Disruption	Population Composition	Poverty
2,022	NE	New Bedford, MA	32.873	4	0.702	3	3	4	3
2,022	NE	Narragansett/Point Judith, RI	10.842	4	1.476	4	1	1	1
2,022	NE	Gloucester, MA	10.126	4	0.570	3	1	1	1
2,022	NE	Portland, ME	5.870	4	0.010	2	1	1	1
2,022	NE	Boston, MA	5.860	4	-0.109	1	2	4	3
2,022	NE	Port Clyde-Tenants Harbor, ME	4.940	4	3.147	4	2	1	2
2,022	NE	Harpswell/Bailey Island, ME	4.533	4	1.660	4	1	1	1
2,022	NE	Chatham, MA	4.404	4	5.002	4	1	1	1
2,022	NE	Stonington, ME	3.773	4	10.002	4	1	1	1
2,022	NE	Friendship, ME	3.107	4	4.573	4	1	1	1

New England Social and Climate Vulnerability

Indicators: Commercial fishery revenue climate vulnerability

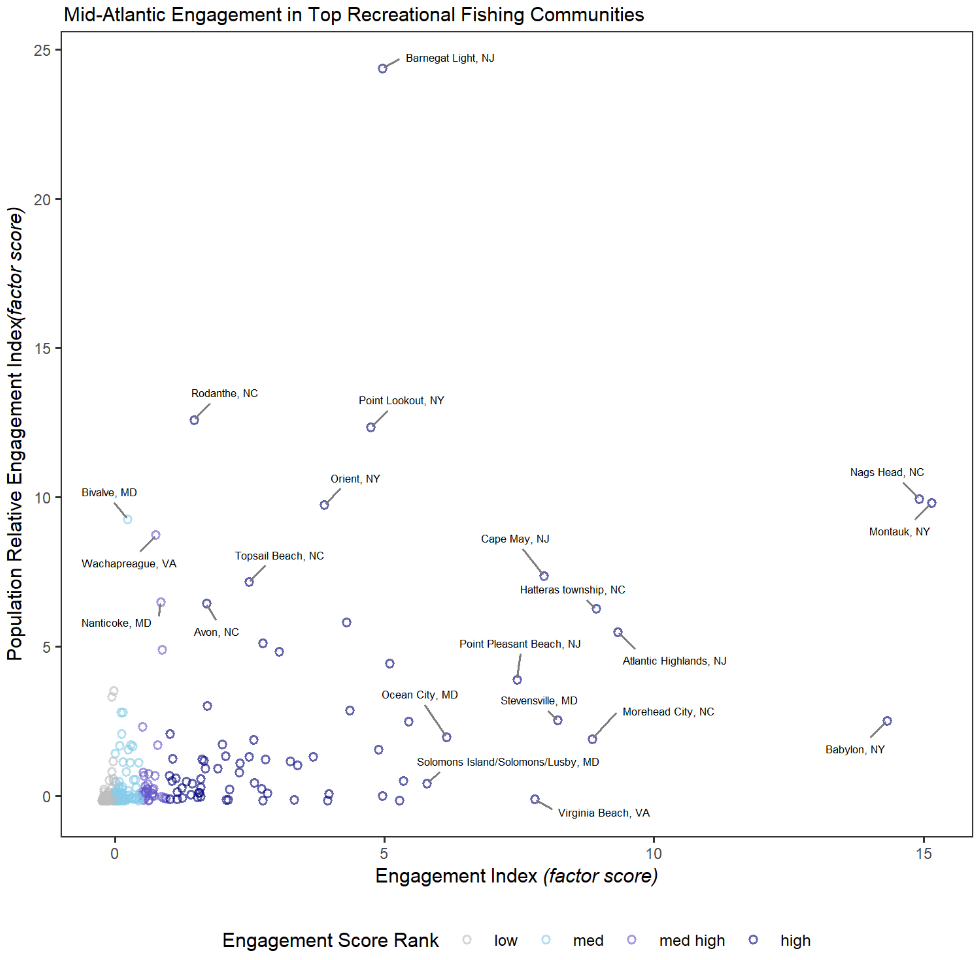


The Community Climate Change Risk Indicators are calculated by multiplying the percent contribution of species to the total value landed in a community by their respective Total Vulnerability scores (based on NOAA's Climate Vulnerability Assessment) for different sensitivity and exposure factors and then summing the resulting values by year.



Mid-Atlantic Community Social and Climate Vulnerability   Risk element: Social

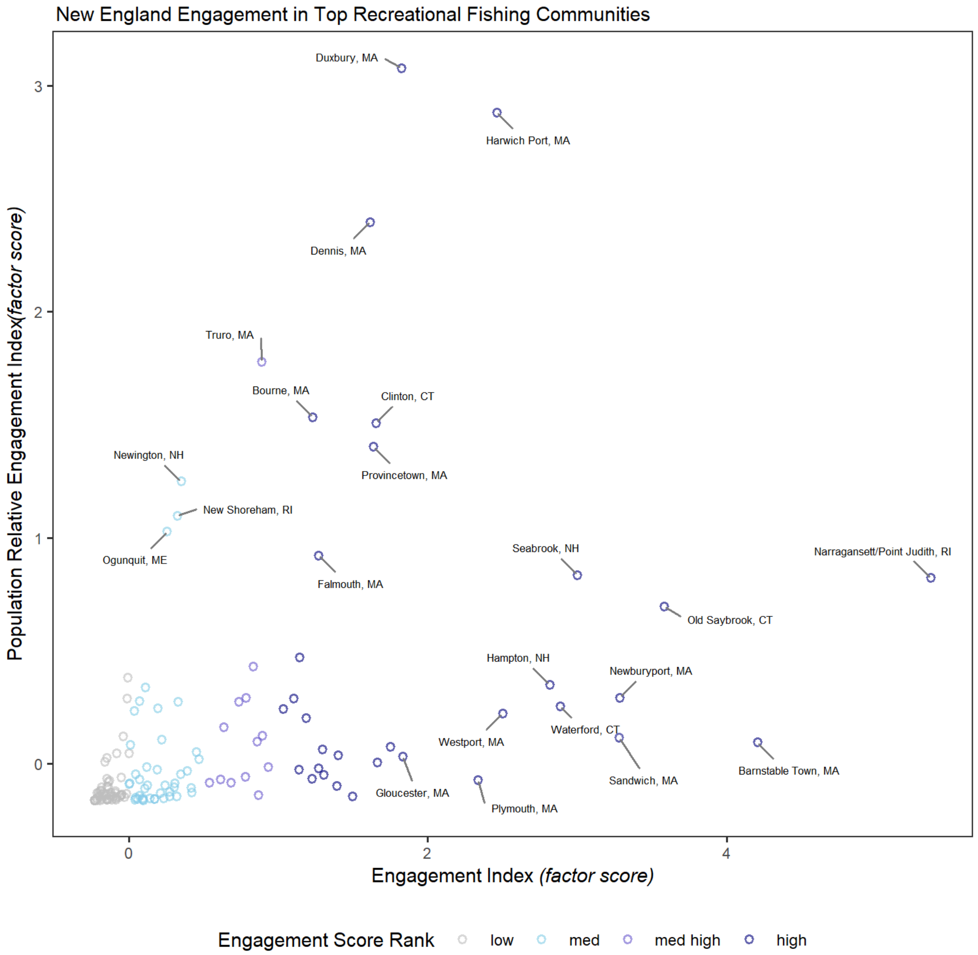
Indicators: Recreational fishery engagement, social vulnerability



Time	EPU	Town	Eng	Eng_ct	Rel	Rel_ct	Personal Disruption	Population Composition	Poverty
2,022	MAB	Montauk, NY	15.146	4	9.803	4	1	1	1
2,022	MAB	Nags Head, NC	14.922	4	9.951	4	1	1	1
2,022	MAB	Babylon, NY	14.322	4	2.510	4	1	1	1
2,022	MAB	Atlantic Highlands, NJ	9.326	4	5.486	4	1	1	1
2,022	MAB	Hatteras township, NC	8.928	4	6.265	4	1	1	1
2,022	MAB	Morehead City, NC	8.854	4	1.899	4	2	1	2
2,022	MAB	Stevensville, MD	8.214	4	2.522	4	2	1	1
2,022	MAB	Cape May, NJ	7.961	4	7.369	4	1	2	1
2,022	MAB	Virginia Beach, VA	7.792	4	-0.120	1	1	1	1
2,022	MAB	Point Pleasant Beach, NJ	7.457	4	3.896	4	2	1	1

New England Community Social and Climate Vulnerability   Risk element: Social

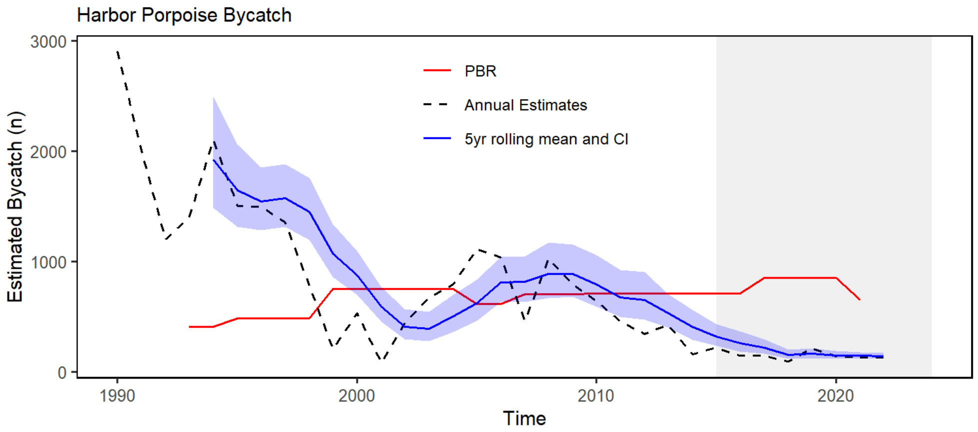
Indicators: Recreational fishery engagement, social vulnerability

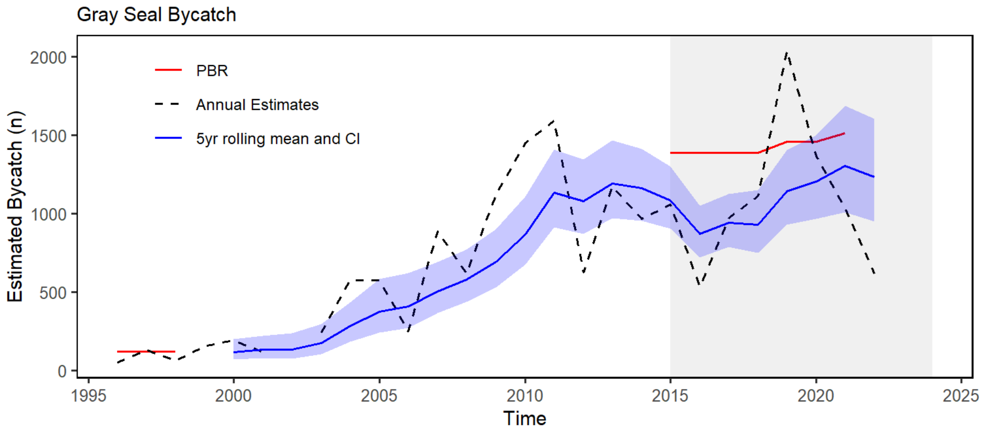


Time	EPU	Town	Eng	Eng_ct	Rel	Rel_ct	Personal Disruption	Population Composition	Poverty
2,022	NE	Narragansett/Point Judith, RI	5.365	4	0.822	3	1	1	1
2,022	NE	Barnstable Town, MA	4.204	4	0.094	2	1	2	1
2,022	NE	Old Saybrook, CT	3.581	4	0.696	3	1	1	1
2,022	NE	Newburyport, MA	3.284	4	0.292	2	1	1	1
2,022	NE	Sandwich, MA	3.280	4	0.116	2	1	1	1
2,022	NE	Seabrook, NH	3.000	4	0.835	3	2	1	1
2,022	NE	Waterford, CT	2.884	4	0.253	2	1	1	1
2,022	NE	Hampton, NH	2.815	4	0.350	2	1	1	1
2,022	NE	Westport, MA	2.499	4	0.221	2	1	1	1
2,022	NE	Harwich Port, MA	2.460	4	2.883	4	1	1	1

Objectives: Coastwide Protected species *Maintain bycatch below thresholds*

Indicators: Harbor porpoise and gray seal bycatch



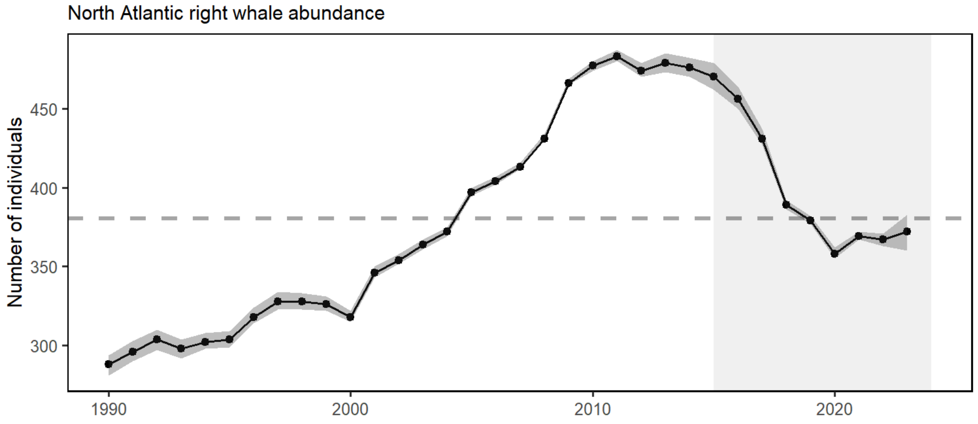


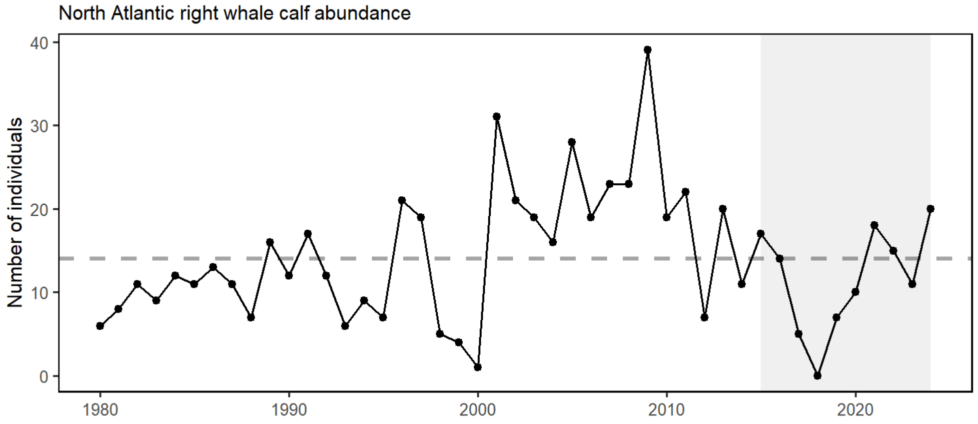
Implications:

- Currently meeting objectives, but uncertainty in gray seal estimates
- Risk element: TechInteract, evaluated by species and sector: 14 low, 7 low-mod, 2 mod-high risk
- The downward trend in harbor porpoise bycatch can also be due to a decrease in harbor porpoise abundance in US waters, reducing their overlap with fisheries, and a decrease in gillnet effort.
- Gray seal among the highest bycatch of any U.S. marine mammal. The increasing trend in gray seal bycatch may be related to an increase in the gray seal population (U.S. pup counts).

Objectives: Coastwide Protected species *Recover endangered populations*

Indicators: North Atlantic right whale population, calf counts

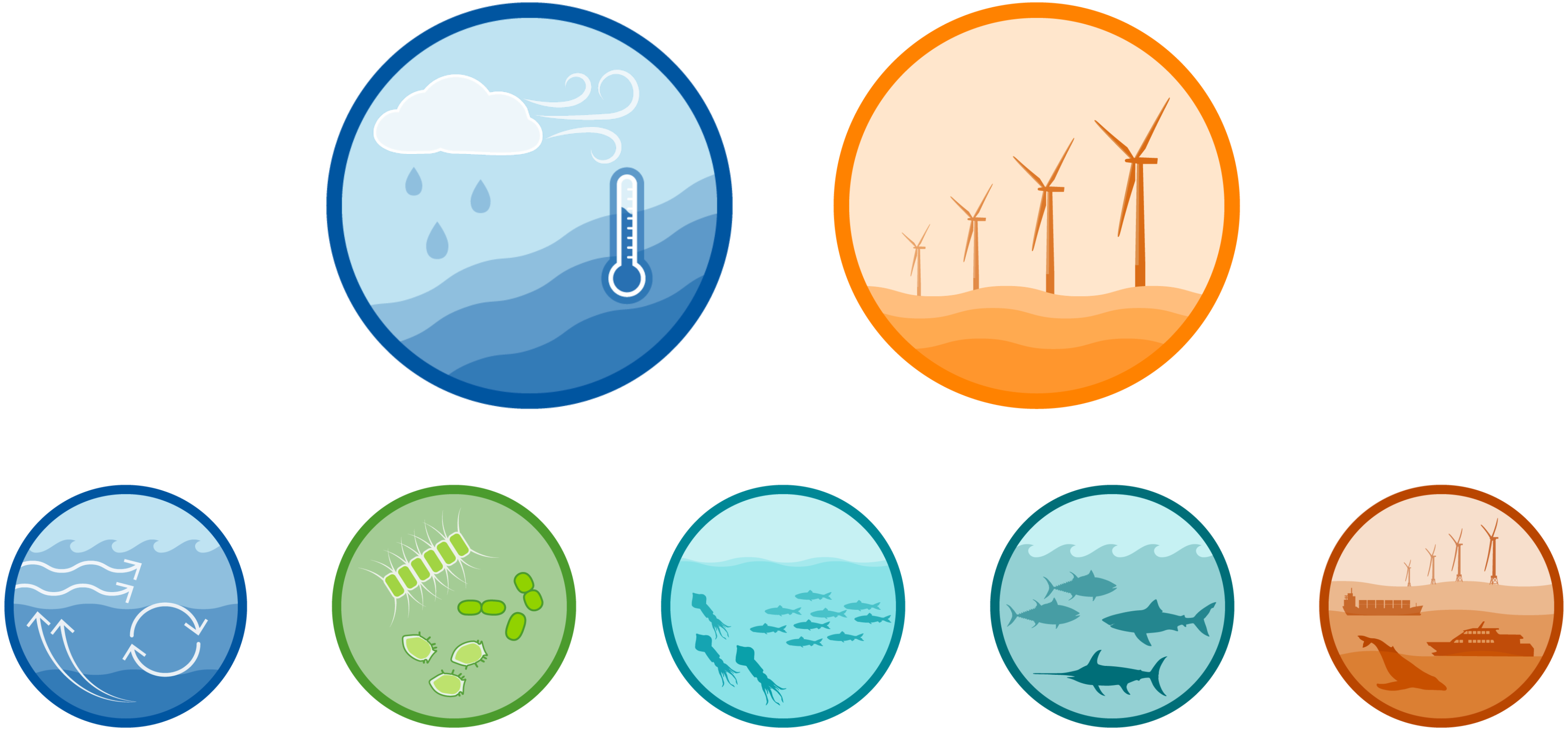




Implications:

- Signs the adult population stabilized 2020-2023
- Population drivers for North Atlantic Right Whales (NARW) include combined fishery interactions/ship strikes, distribution shifts, and copepod availability.
- Additional potential stressors include offshore wind development, which overlaps with important habitat areas used year-round by right whales, including mother and calf migration corridors and foraging habitat.
- Unusual mortality events continue for 3 large whale species.

2025 Risks to meeting fishery management objectives



Revised Risks: Climate and Ecosystem Change

Risks to meeting fishery management objectives in the Mid-Atlantic Bight

Risk categories	Observation indicators reported	Potential driver indicators reported
Climate and Ecosystem Risks		
Risks to Managing Spatially	Managed species (fish and cetacean) distribution shifts	Benthic and pelagic forage distribution; ocean temperature, changes in currents and cold pool
Risks to Managing Seasonally	Managed species spawning and migration timing changes	Habitat timing: Length of ocean summer, cold pool seasonal persistence
Risks to Setting Catch Limits	Managed species body condition and recruitment changes	Benthic and pelagic forage quality & abundance: ocean temperature & acidification
Other Ocean Uses Risks		
Offshore Wind Risks	Fishery revenue and landings from wind lease areas by species and port	Wind development speed; Protected species presence and hotspots

Risks to Managing Spatially

Potential Impacts: Spatial misallocation of quotas within and across jurisdictions, leading to unmet quotas and/or increased discards. Specification of gear management areas may not utilize quotas and minimize bycatch.

Risks to Managing Seasonally

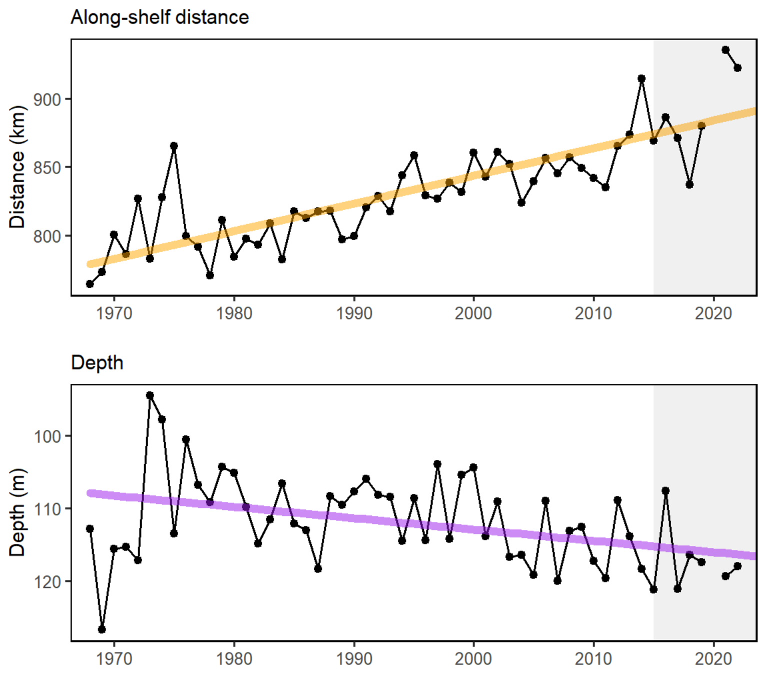
Potential Impacts: Spawning closures are less effective if peak spawning occurs outside the seasonal closure. Seasonal openings of exemption areas may be inconsistent with species presence. Seasonal quota allocations may be misaligned with availability.

Risks to Setting Catch Limits

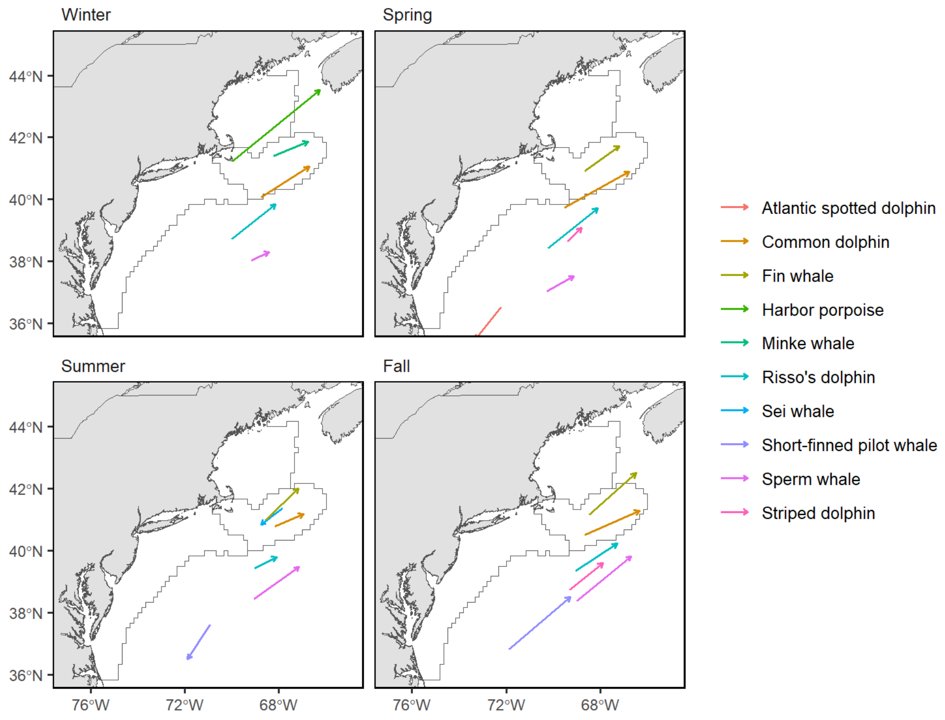
Potential Impacts: Changes in environmental conditions can affect stock reference points and short-term stock projections. When productivity changes are not accounted for, they can lead to misspecified quotas and rebuilding plans.

Risks to Managing Spatially: Coastwide

Indicators: Fish distribution shifts

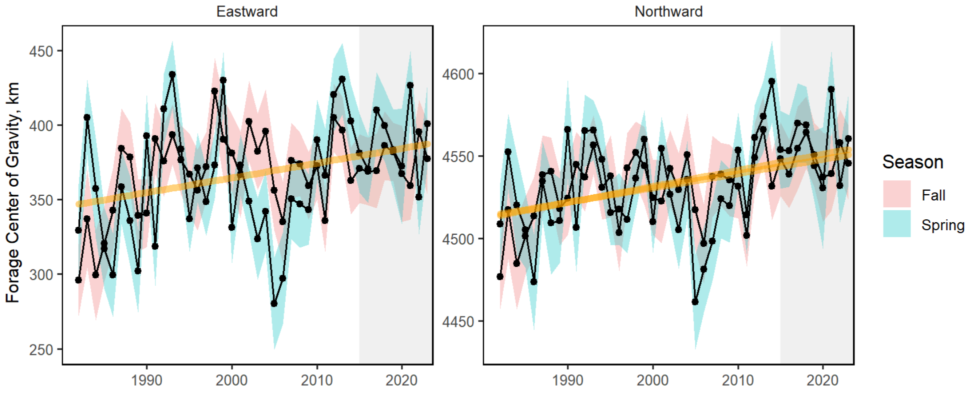


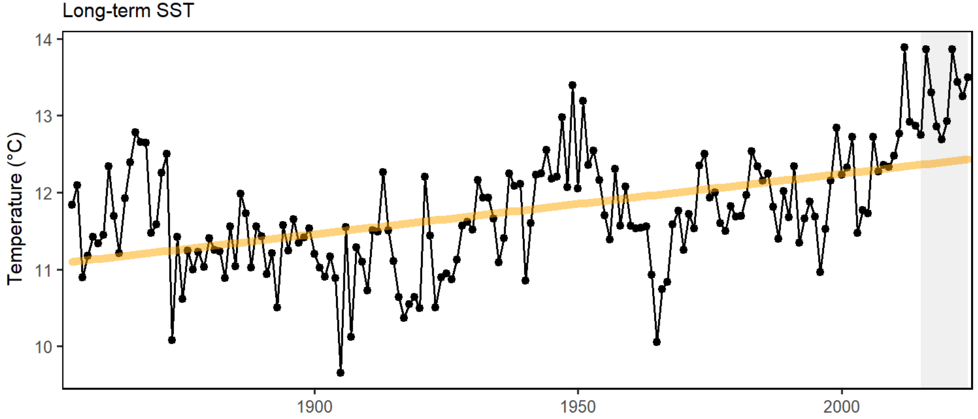
Cetacean distribution shifts



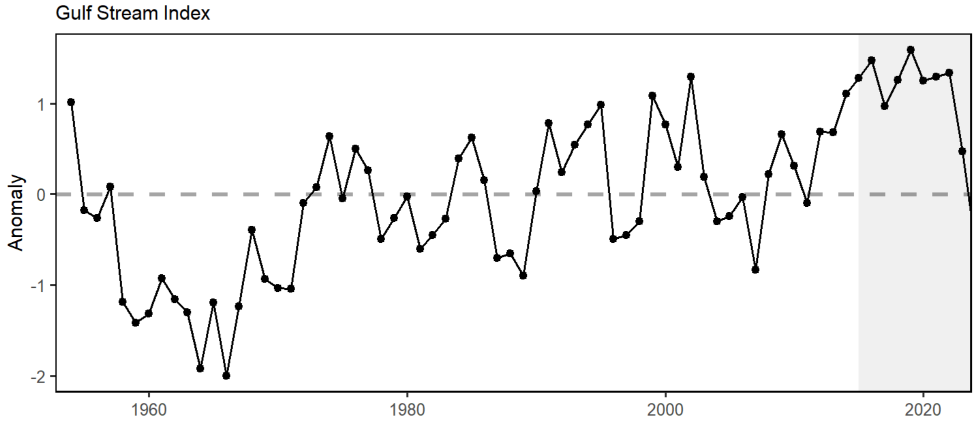
Risks to Spatial Management: All Areas

Drivers: Forage shifts, temperature increase

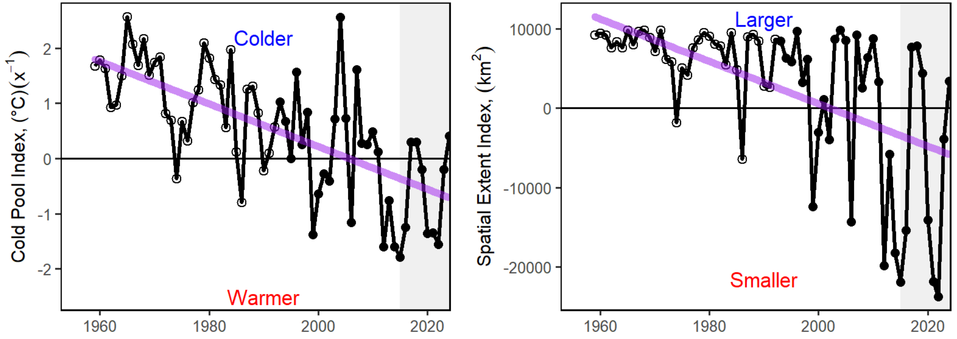




Drivers: changing ocean habitat

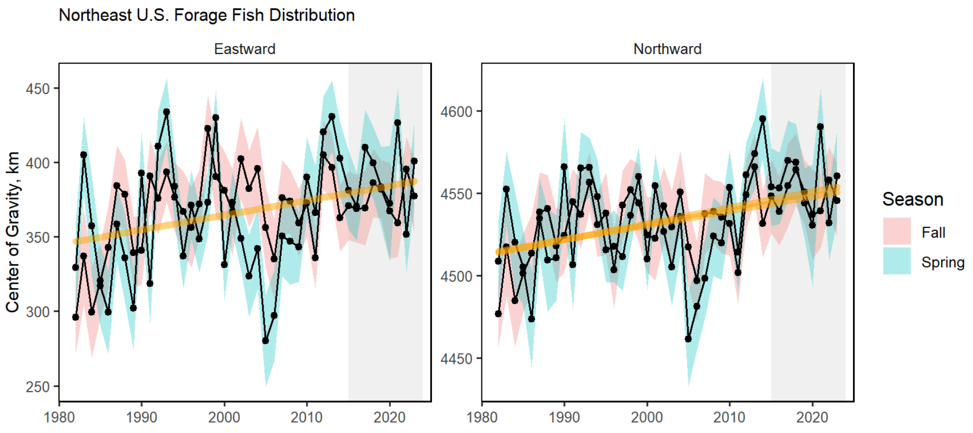


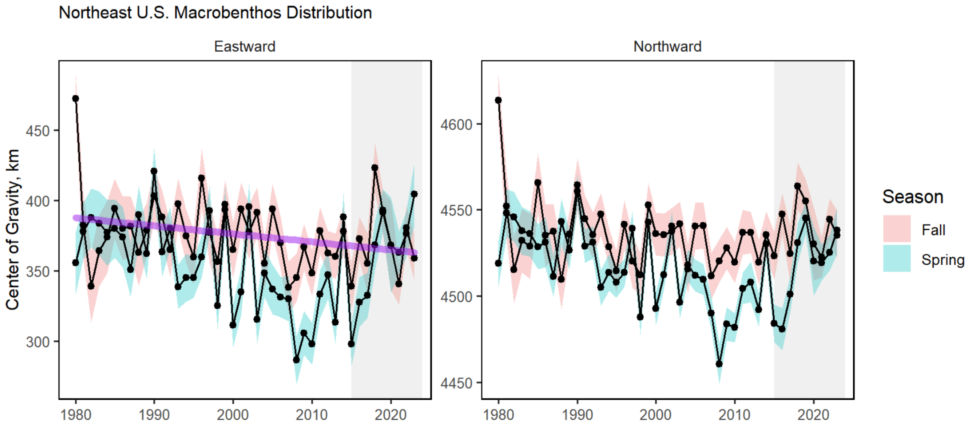
Cold pool temperature and spatial extent



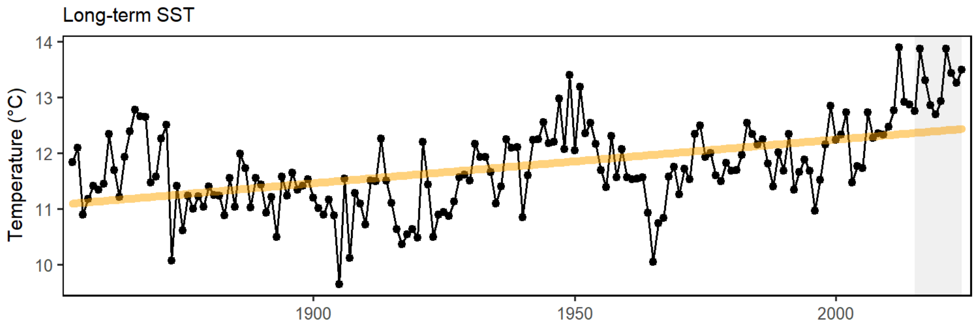
Risks to Managing Spatially: Coastwide

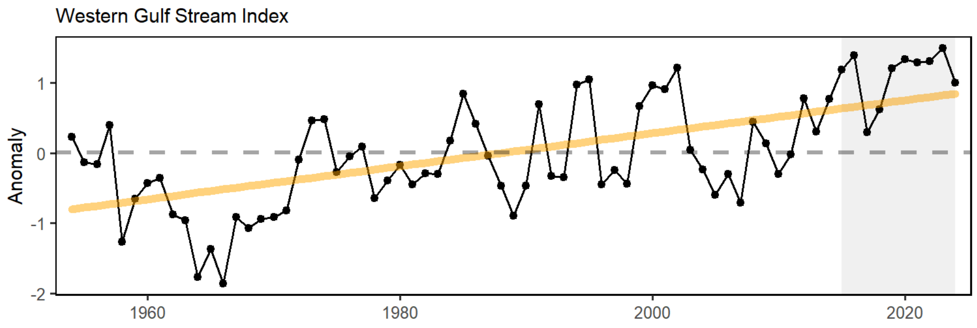
Drivers: Forage shifts, pelagic and benthic



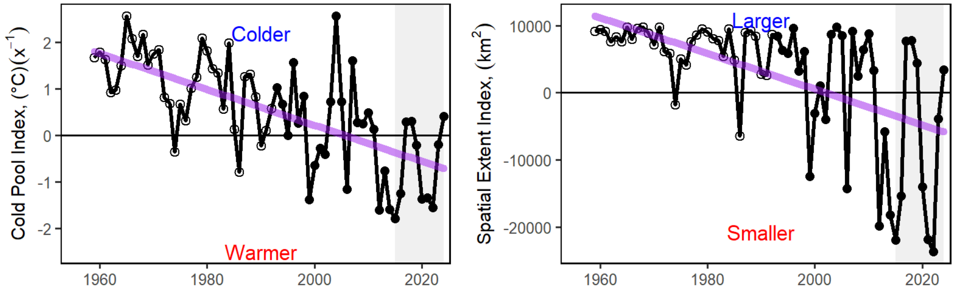


Drivers: changing ocean habitat



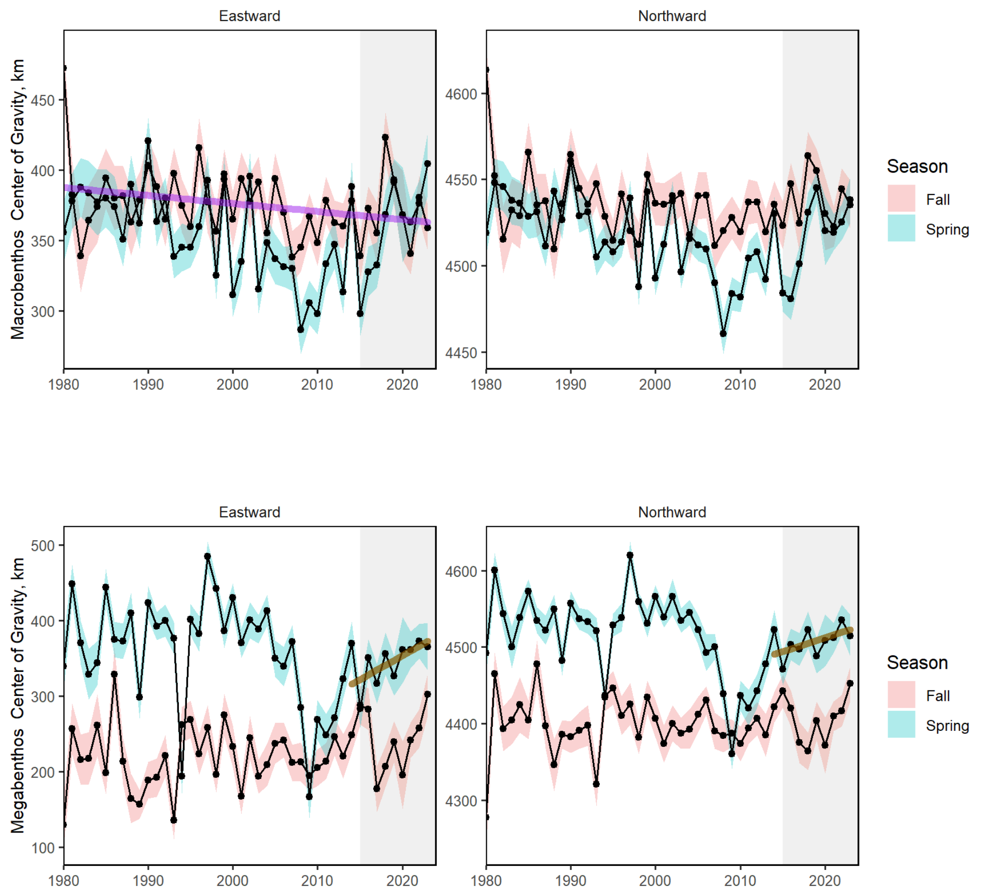


Cold pool temperature and spatial extent

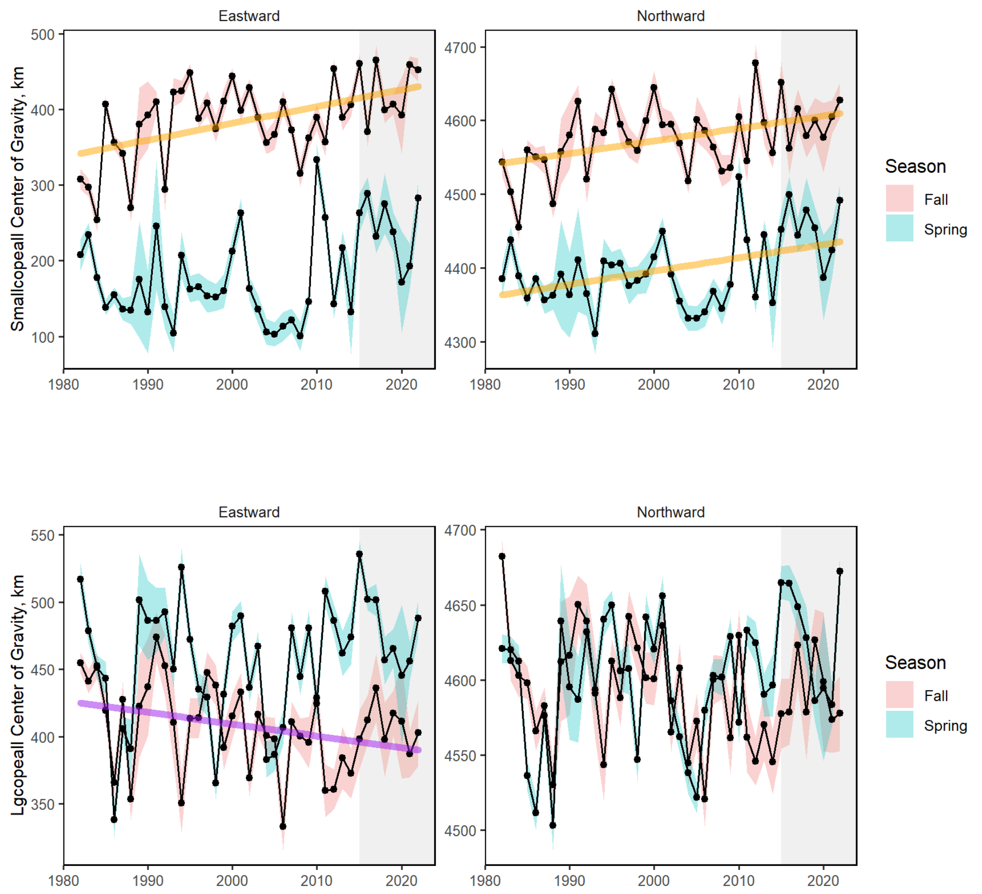


New Spatial Shift Indicators: Benthos, Zooplankton

Benthos center of gravity from fish stomachs



Copepods center of gravity from ECOMON



Risks to Managing Spatially: Coastwide

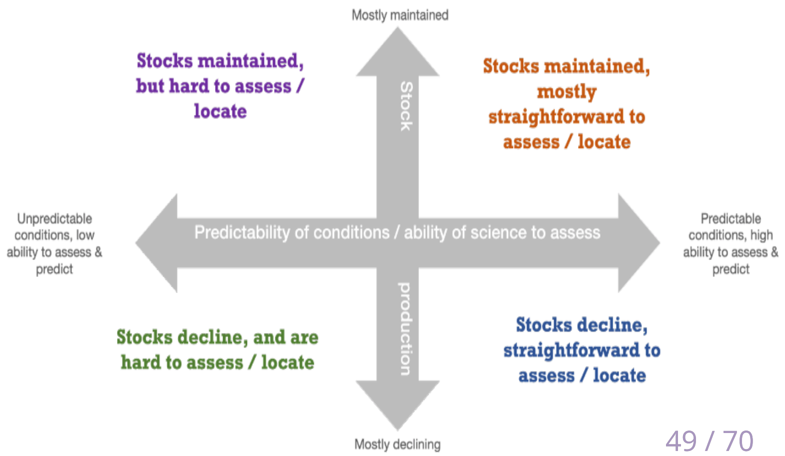
Future considerations

Distribution shifts caused by changes in thermal habitat and ocean circulation are likely to continue as long as long-term trends persist. Episodic and short-term events (see 2024 Highlights) may increase variability in the trends, however species distributions are unlikely to reverse to historical ranges in the short term. Increased mechanistic understanding of distribution drivers is needed to better understand future distribution shifts: species with high mobility or short lifespans react differently from immobile or long lived species.

Long-term oceanographic projections forecast a temporary pause in warming over the next decade due to internal variability in circulation and a southward shift of the Gulf Stream. Near-term forecasts are being evaluated to determine how well they are able to predict episodic and anomalous events that are outside of the long-term patterns.

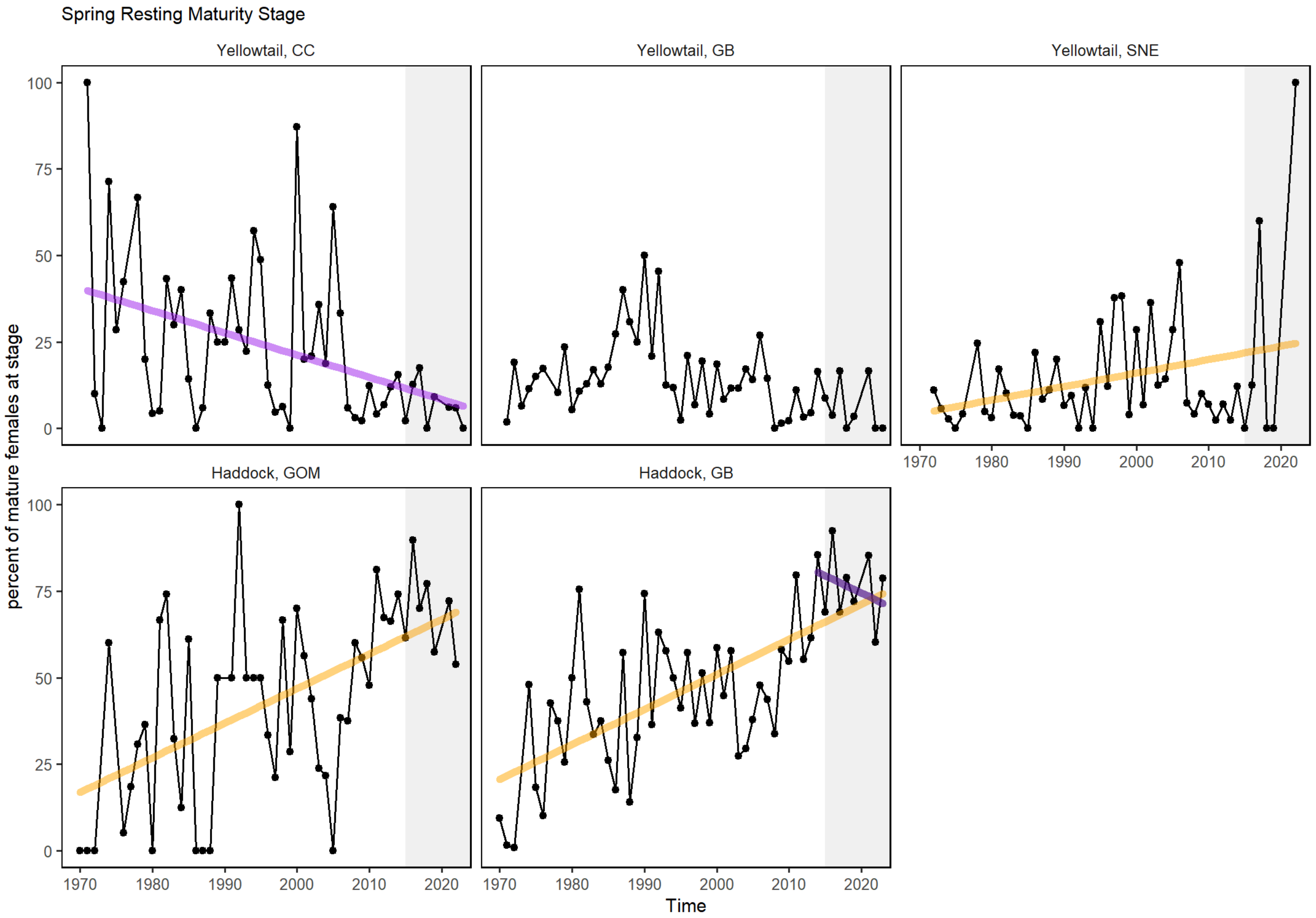
Adapting management to changing stock distributions and dynamic ocean processes will require continued monitoring of populations in space and evaluating management measures against a range of possible future spatial distributions. Processes like the East Coast Climate Scenario Planning, and subsequent formation of the East Coast Climate Coordination Group, can help coordinate management.

Final Scenario Framework



Risks to Managing Seasonally: Coastwide

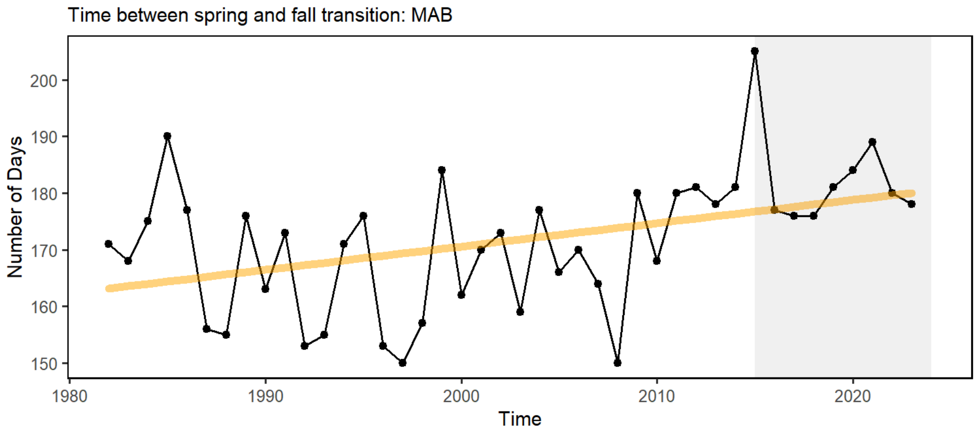
Indicators: spawning timing, migration change



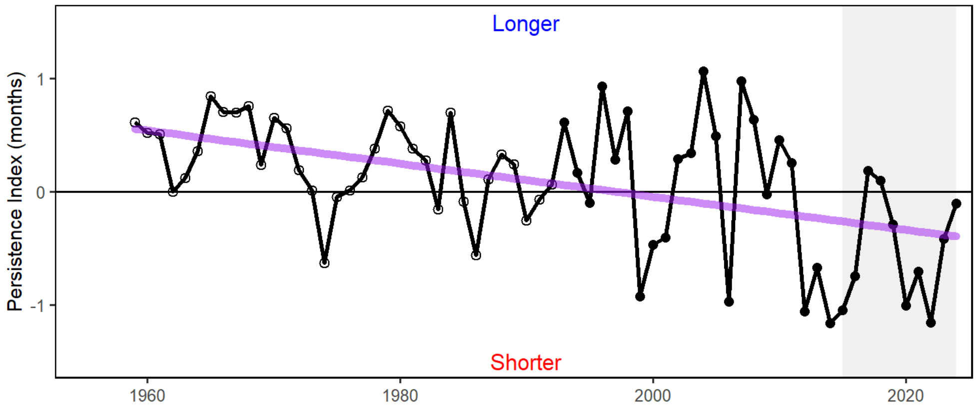
- Recreational tuna fisheries 50 days earlier in the year in 2019 compared to 2002.
- In Cape Cod Bay, peak spring habitat use by right and humpback whales has shifted 18-19 days later over time.
- Baseline information on large whale seasonal presence has been collected.

Risks to Managing Seasonally: Mid-Atlantic

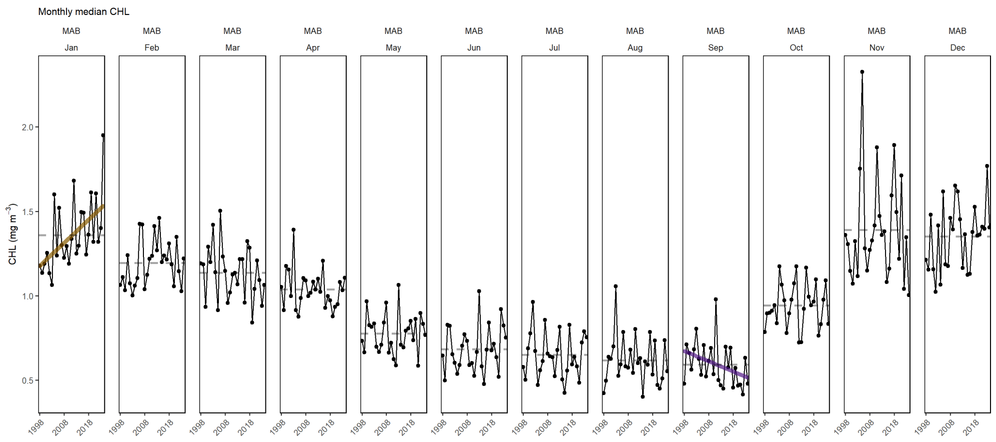
Drivers: thermal transition, habitat persistence, bloom timing



Cold pool seasonal persistence

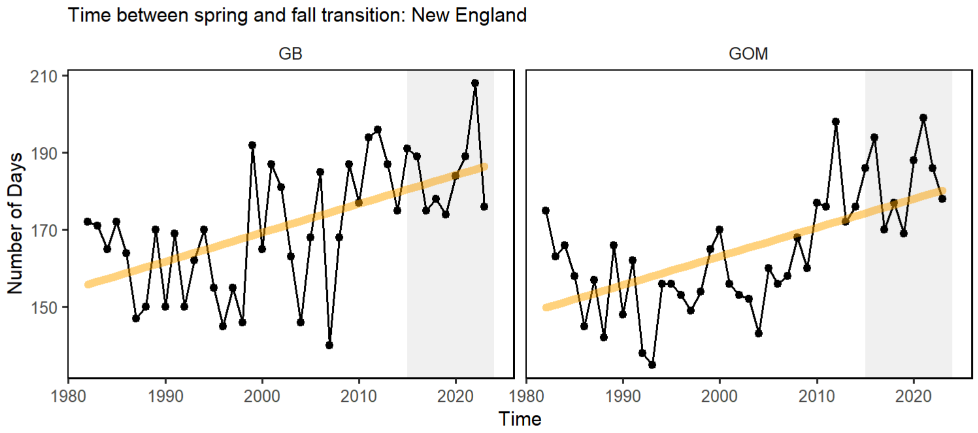


Bloom timing

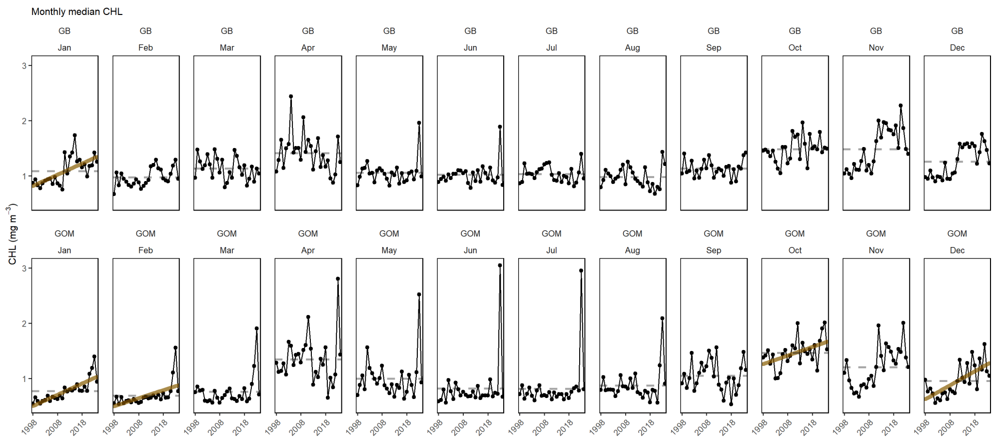


Risks to Managing Seasonally: New England

Drivers: thermal transition, habitat persistence, bloom timing



Bloom timing

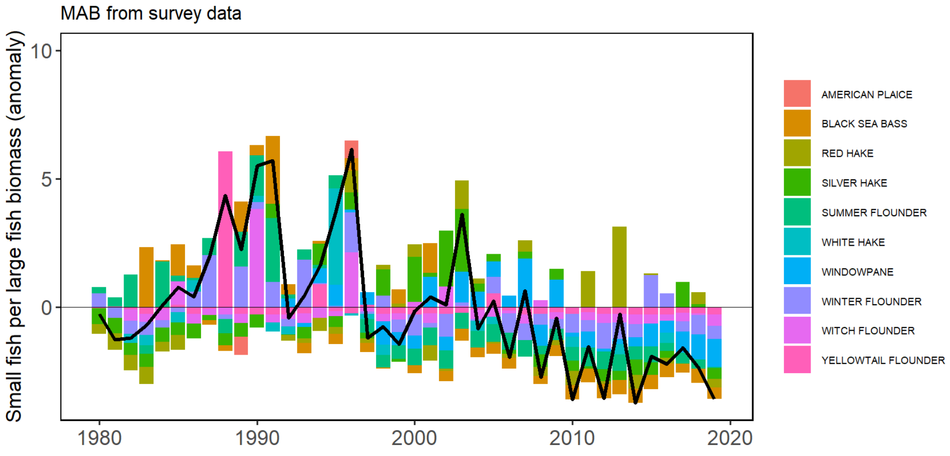


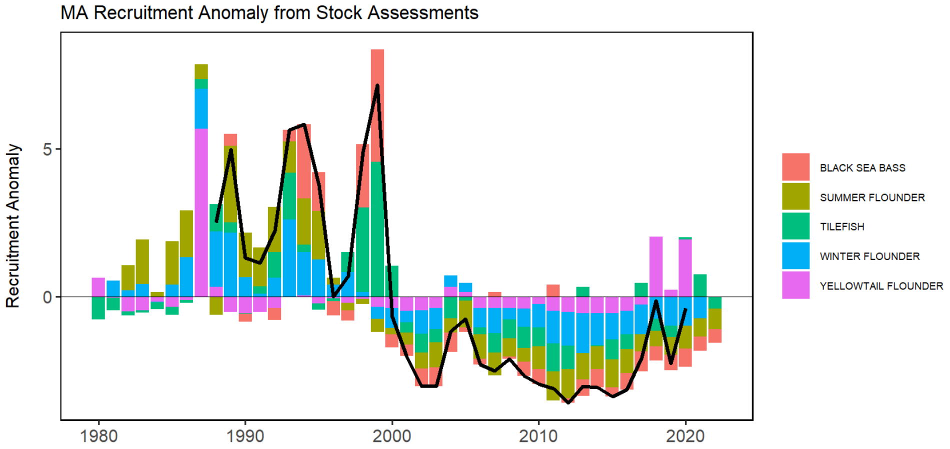
Future considerations

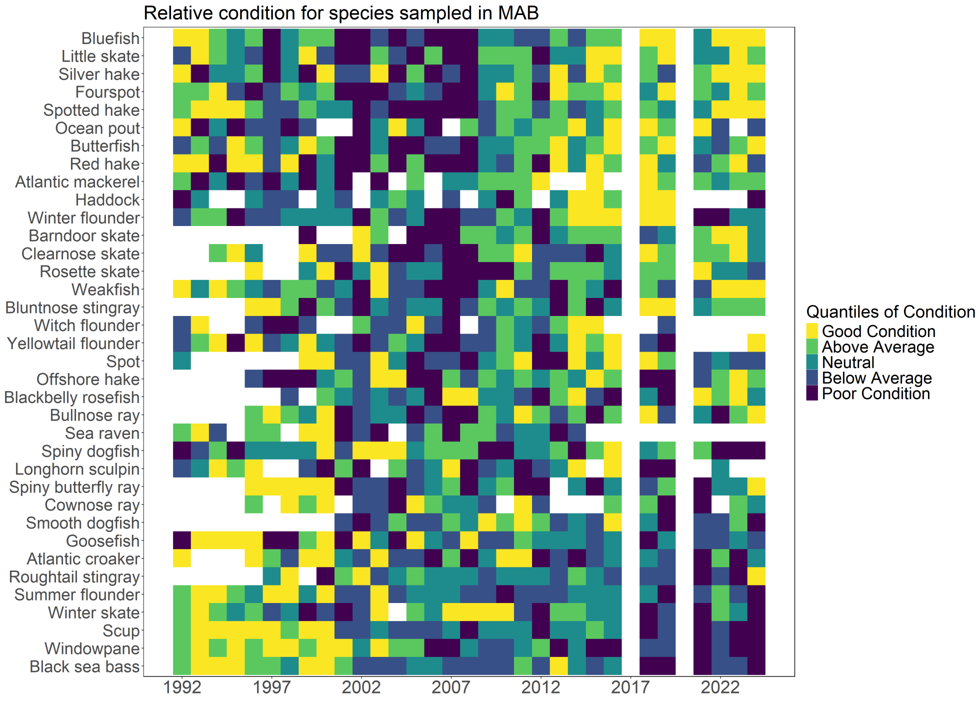
- Management actions that rely on effective alignment of fisheries availability and biological processes should continue to evaluate whether prior assumptions on seasonal timings still hold.
- New indicators should be developed to monitor timing shifts for stocks.

Risks to Setting Catch Limits: Mid-Atlantic

Indicators: fish productivity and condition

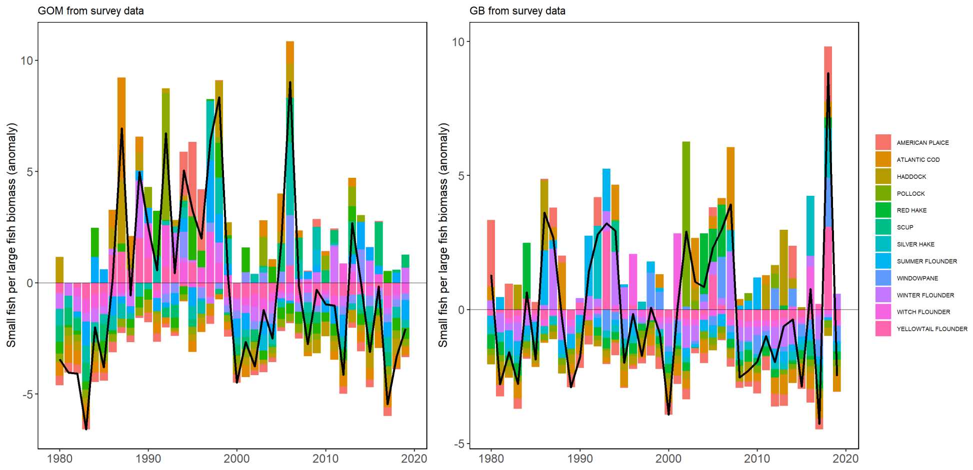


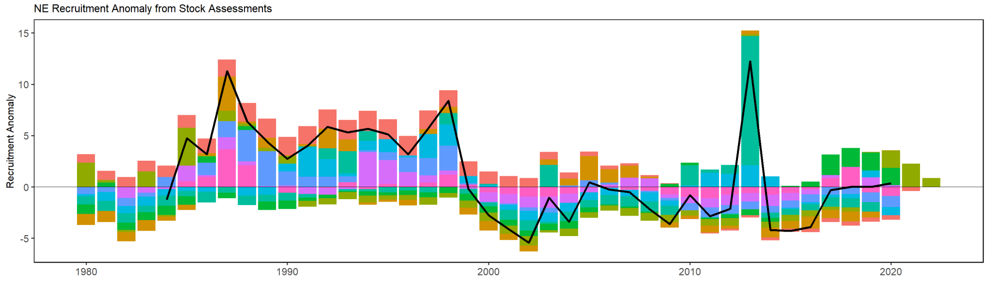


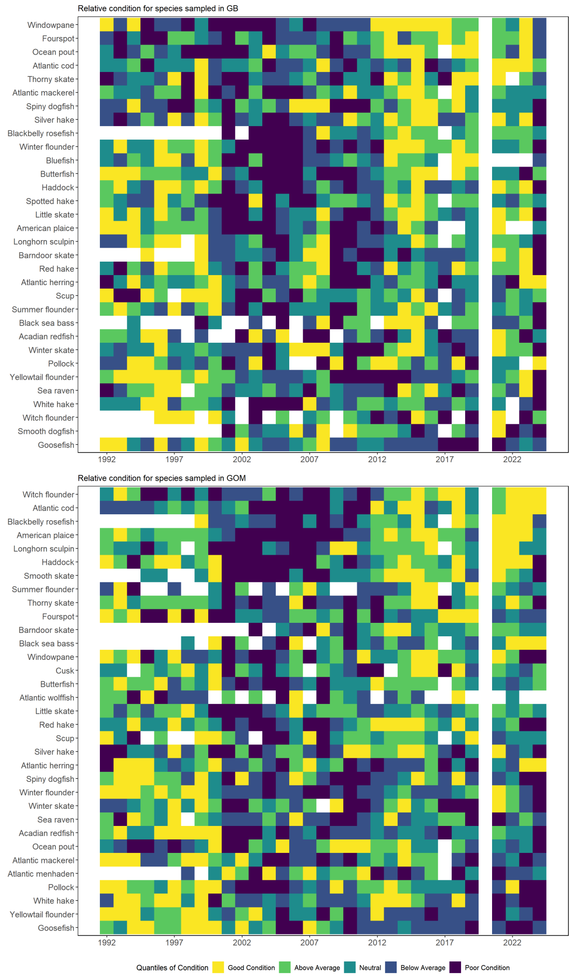


Risks to Setting Catch Limits: New England

Indicators: fish productivity and condition

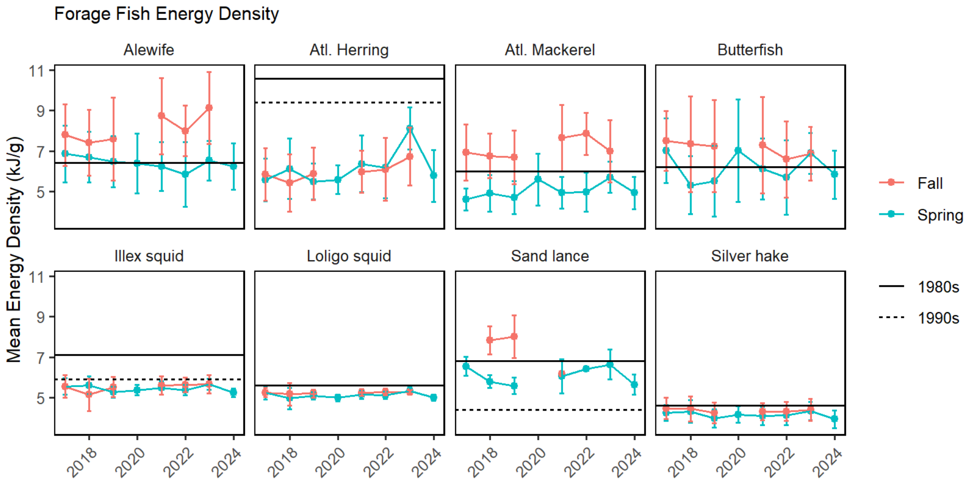


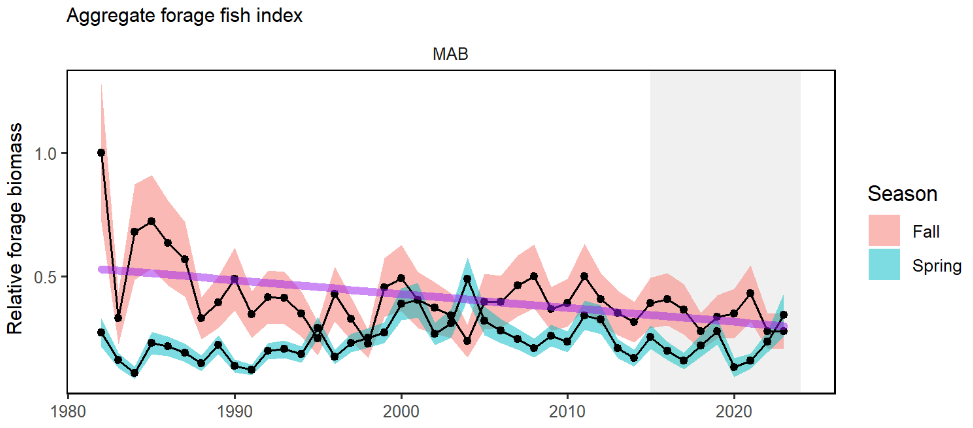




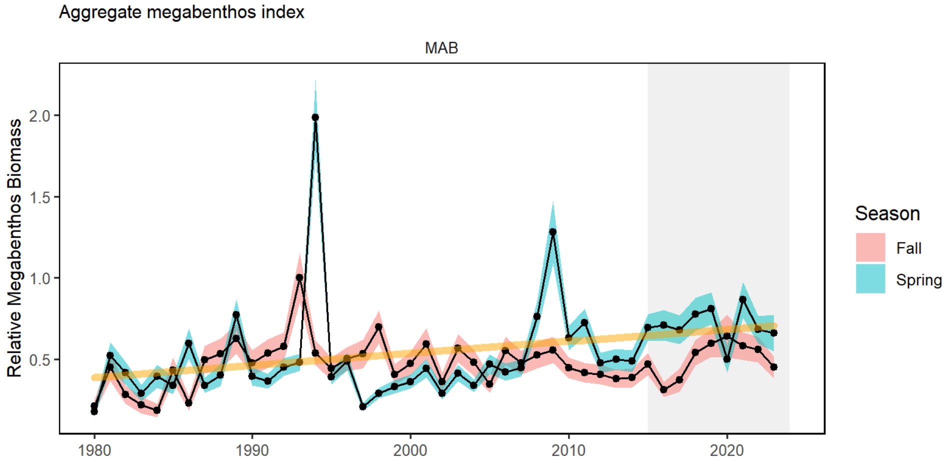
Risks to Setting Catch Limits: Mid Atlantic Drivers

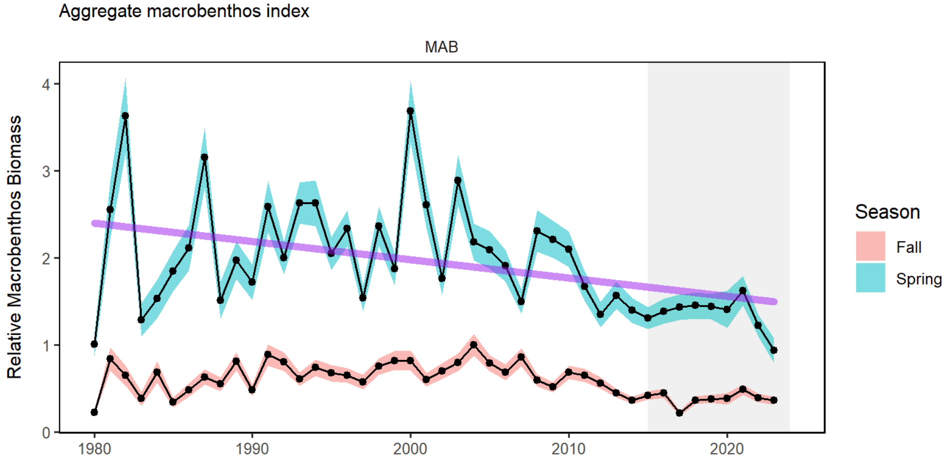
Drivers: Forage Quality and Abundance





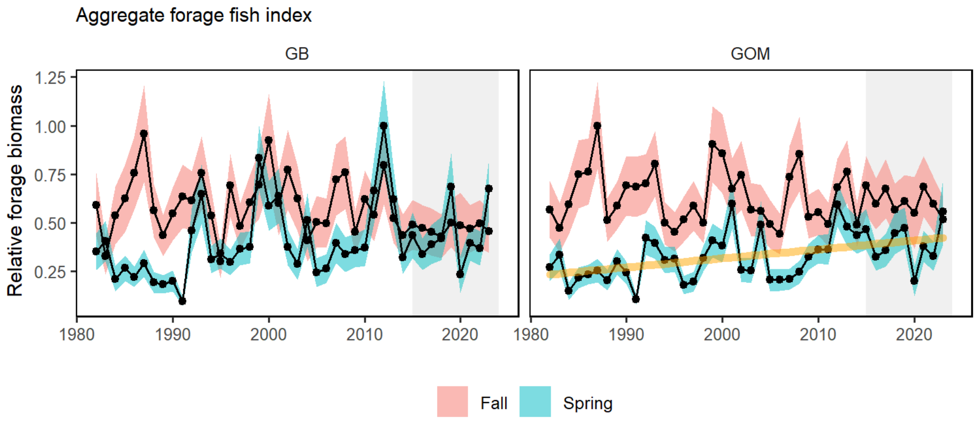
New indicators: benthos abundance



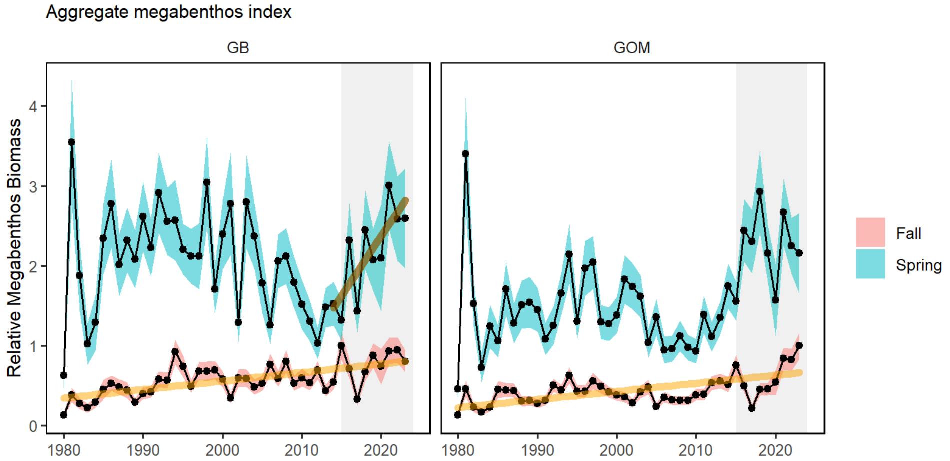


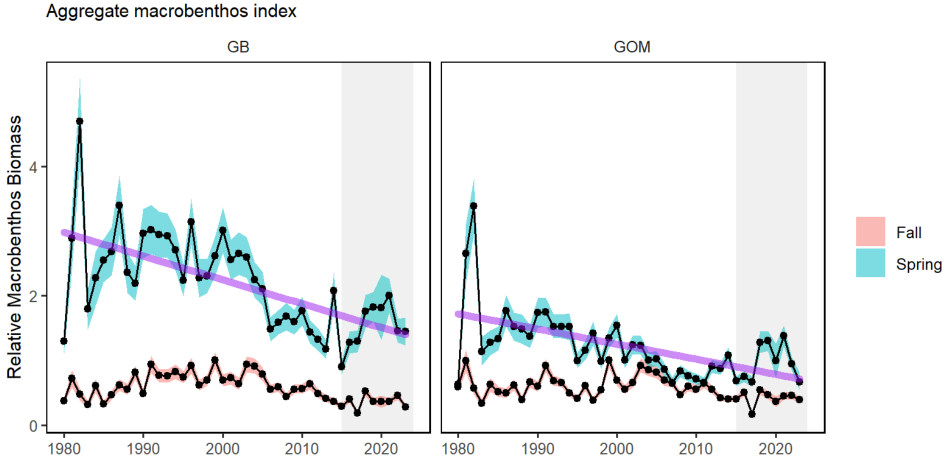
Risks to Setting Catch Limits: New England Drivers

Drivers: Forage Quality and Abundance



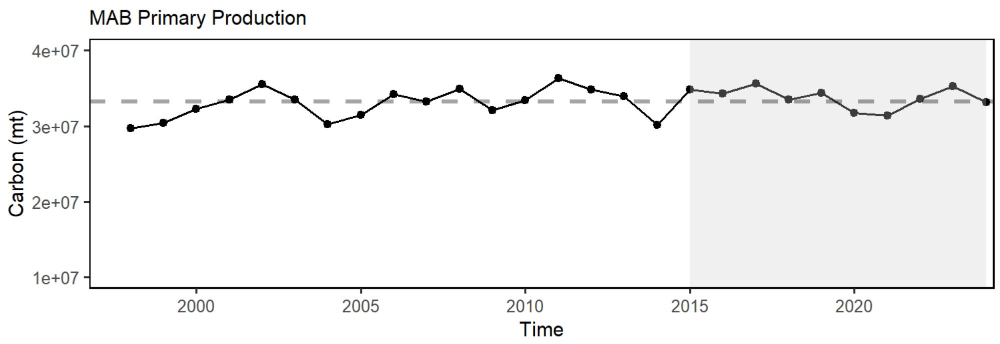
New indicators: benthos abundance

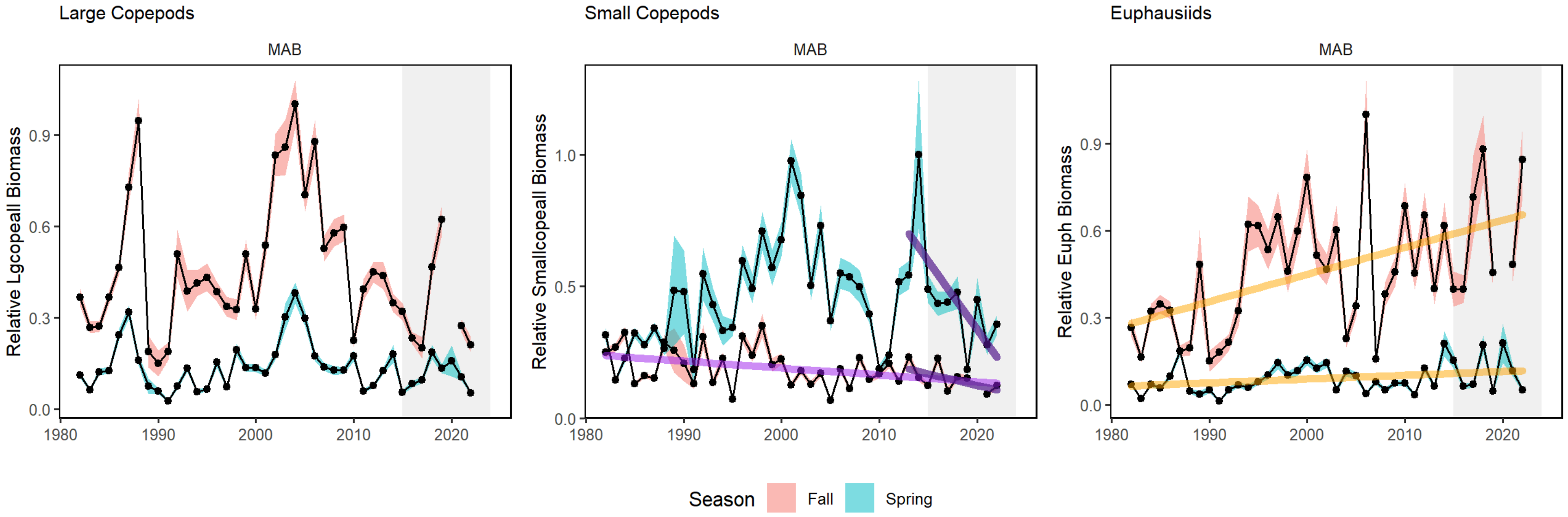




Risks to Setting Catch Limits: Mid Atlantic Drivers

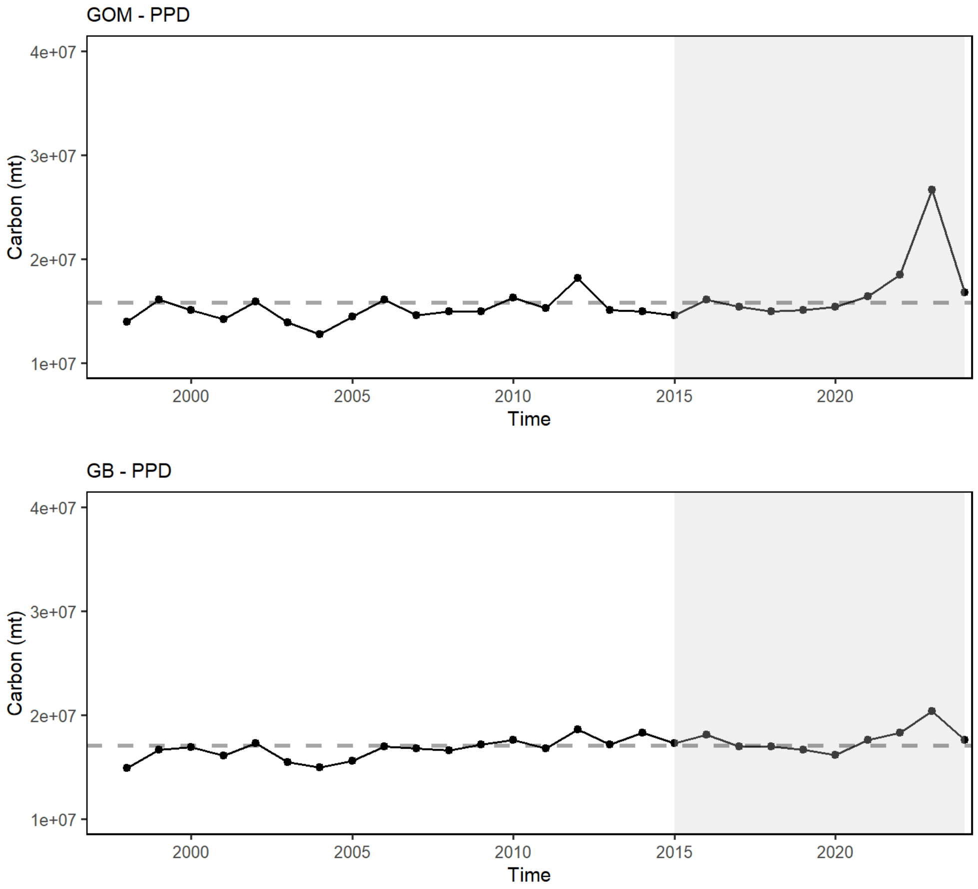
Drivers: Low trophic levels

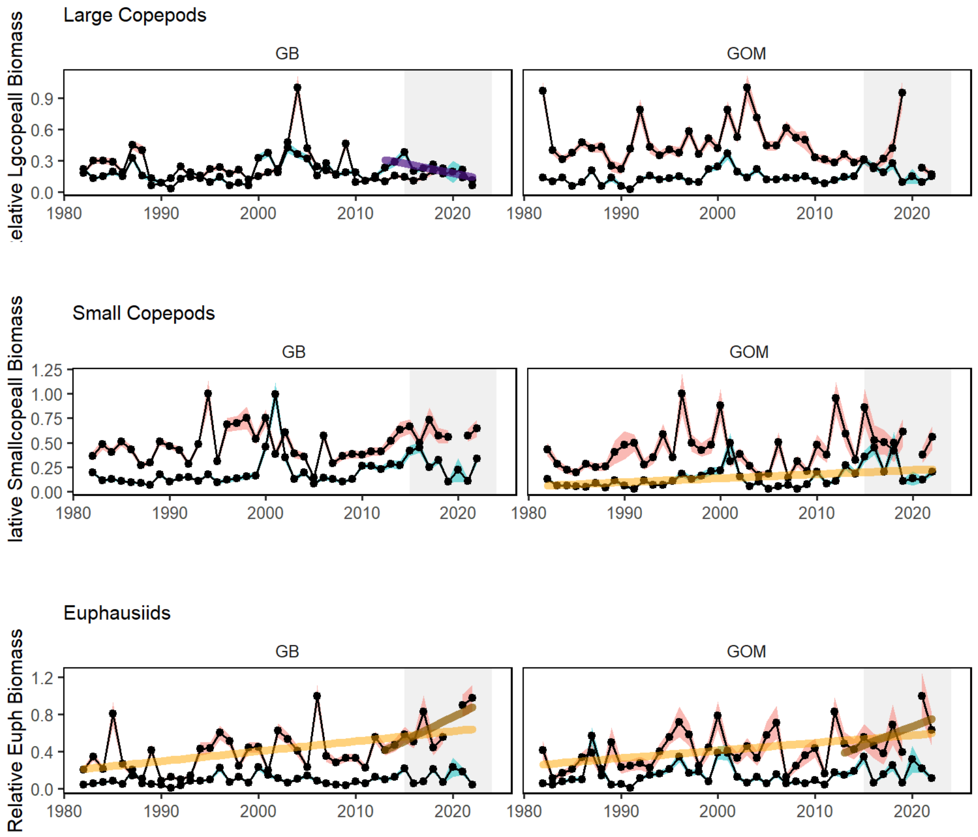




Risks to Setting Catch Limits: New England Drivers

Drivers: Low trophic levels

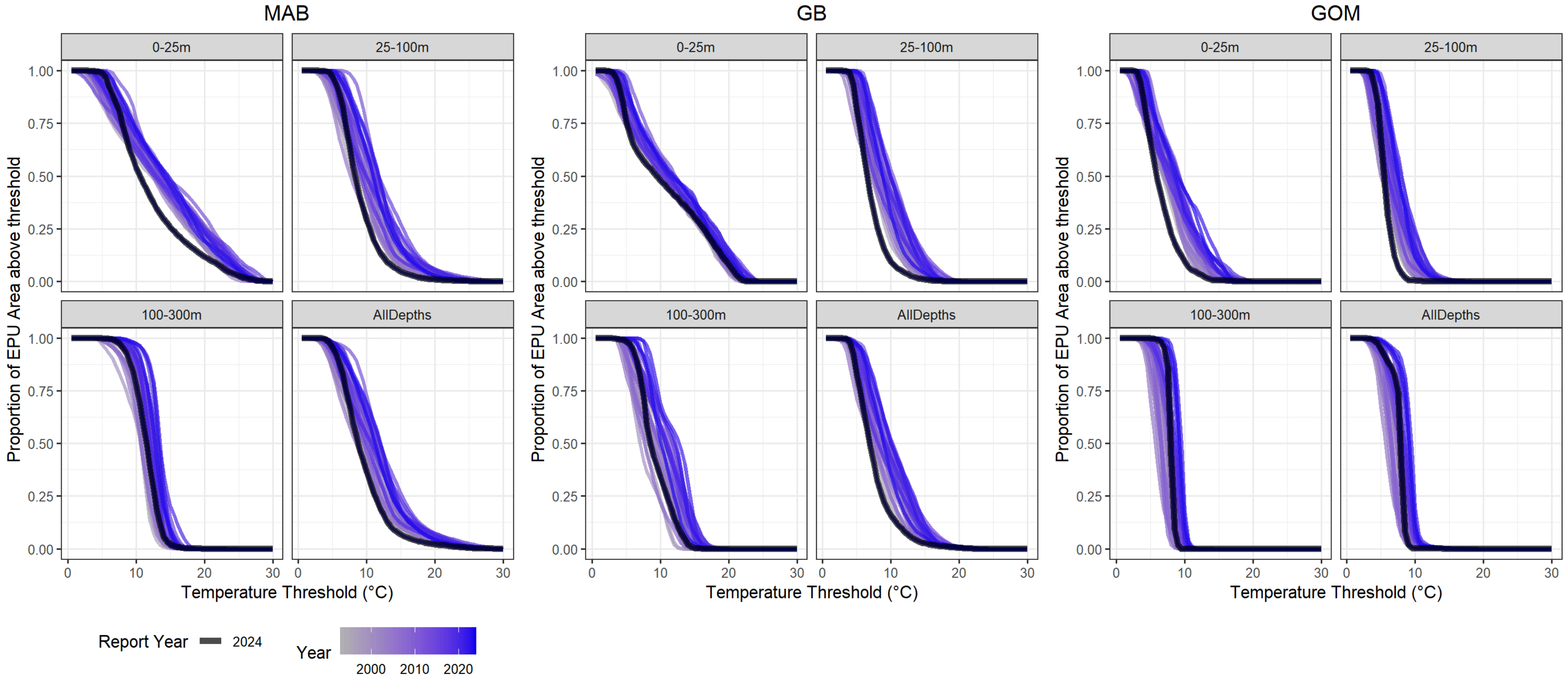




Risks to Setting Catch Limits: Coastwide

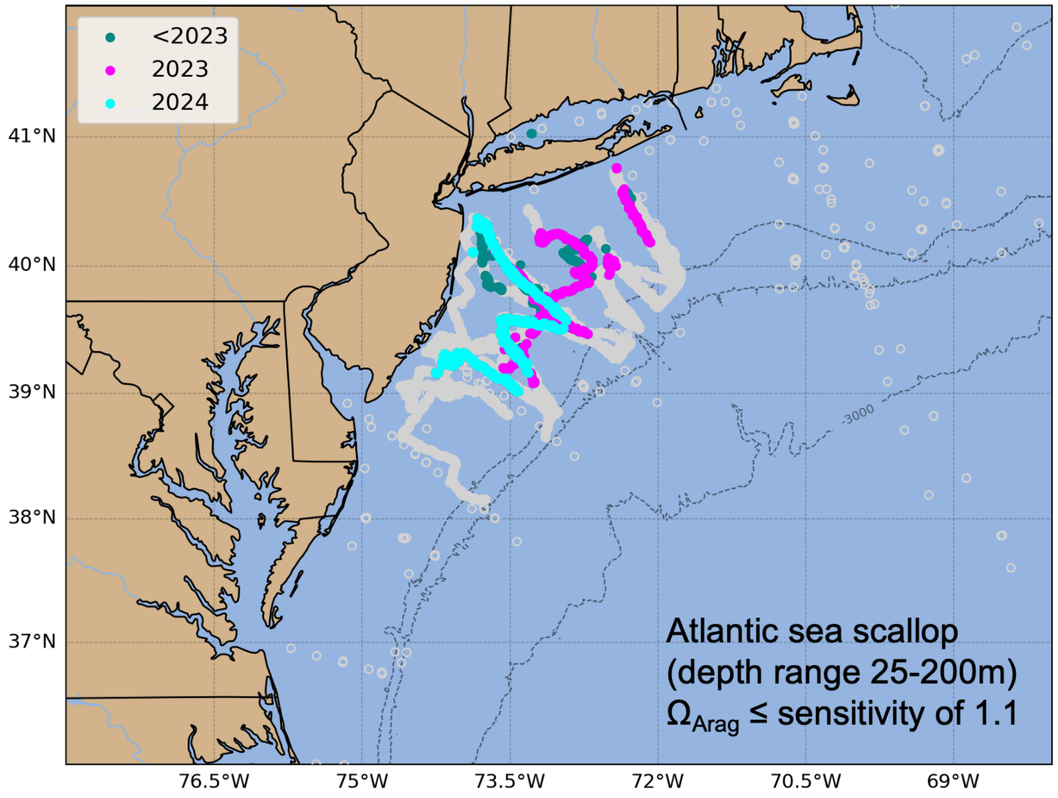
Drivers: Environmental

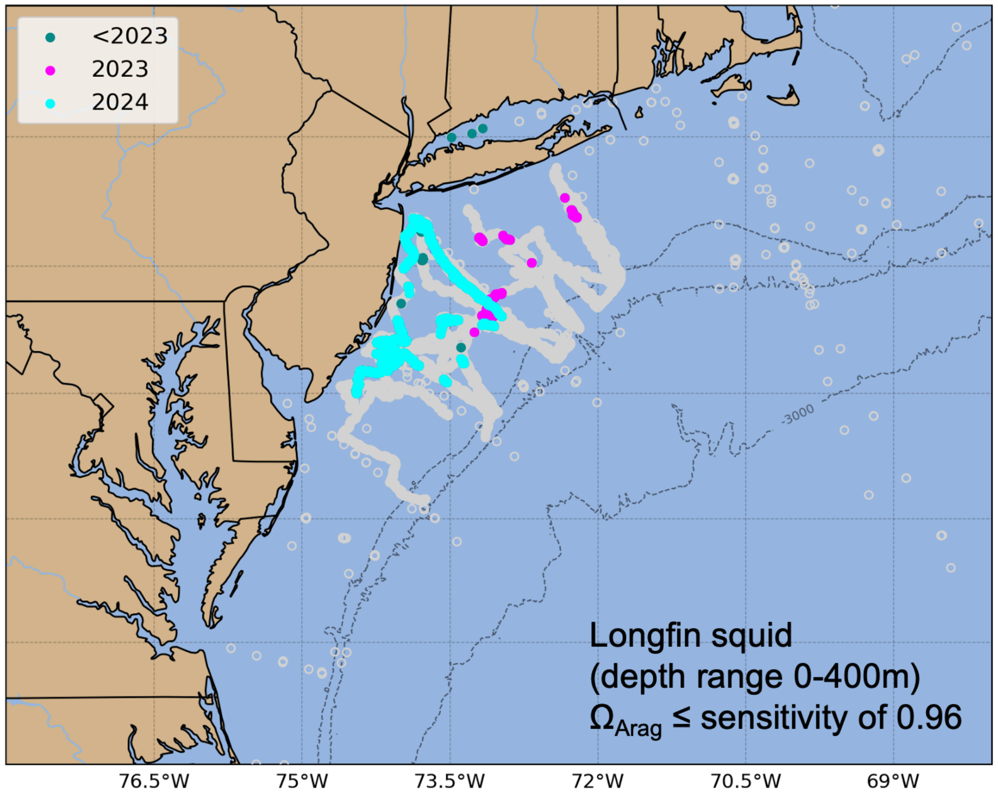
2024 Thermal habitat area by depth



Risks to Setting Catch Limits: Coastwide

Drivers: Environmental *Potential Ocean Acidification Impacts: Scallops and Longfin squid*





Drivers: Predation

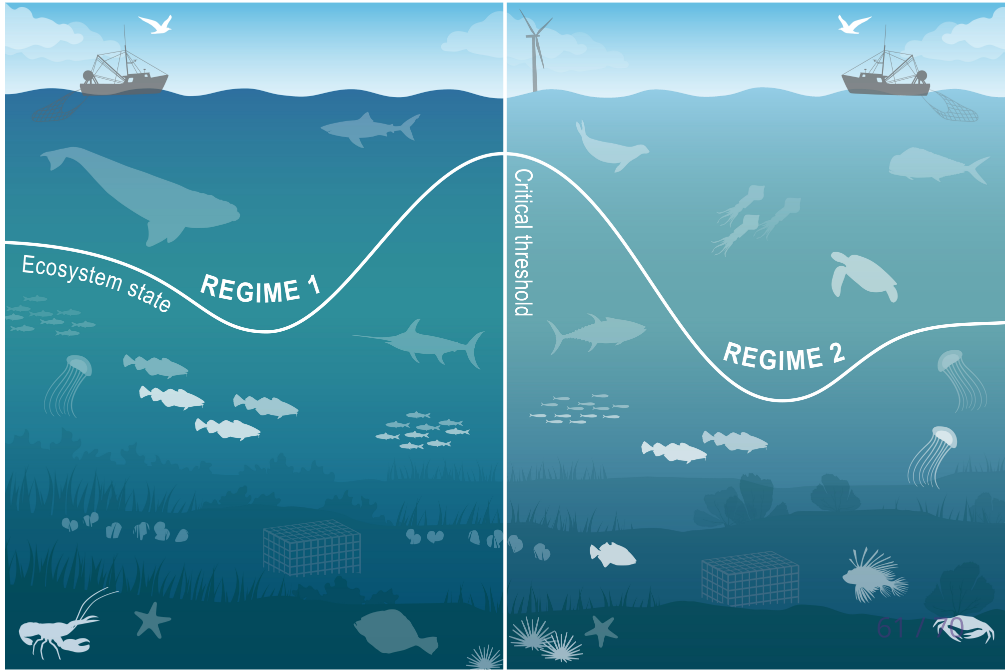
Seals increasing, mix of population status for HMS

Risks to Setting Catch Limits

Future considerations

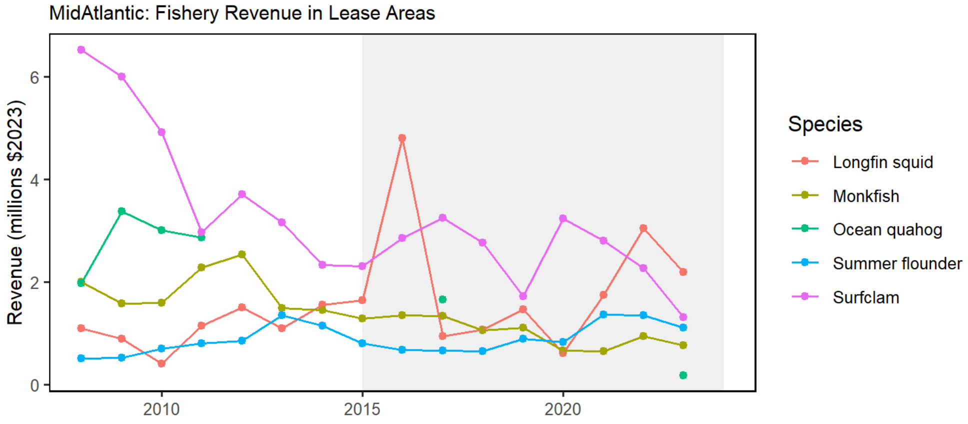
- Processes that control fish productivity and mortality are dynamic, complex, and are the result of the interactions between multiple changing system drivers.
- There is a real risk that short-term predictions in assessments and rebuilding plans that assume unchanging underlying conditions will not be as effective, given the observed change documented in the prior sections in both ecological and environmental processes.
- Assumptions for species’ growth, reproduction, and natural mortality should continue to be evaluated for individual species.

- With observations of system-wide productivity shifts of multiple managed stocks, more research is needed to determine whether regime shifts or ecosystem reorganization are occurring, and how this should be incorporated into management.

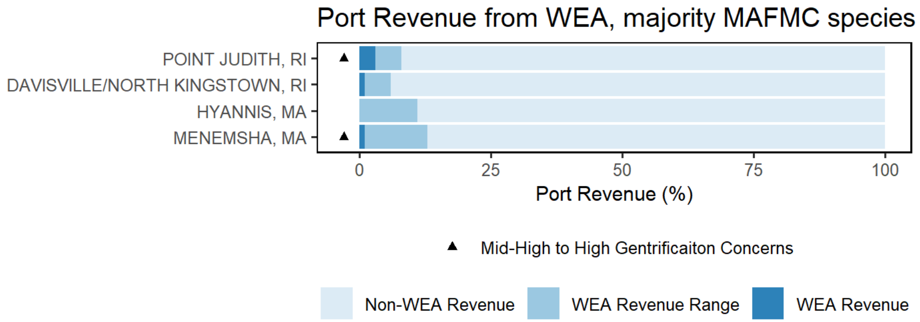


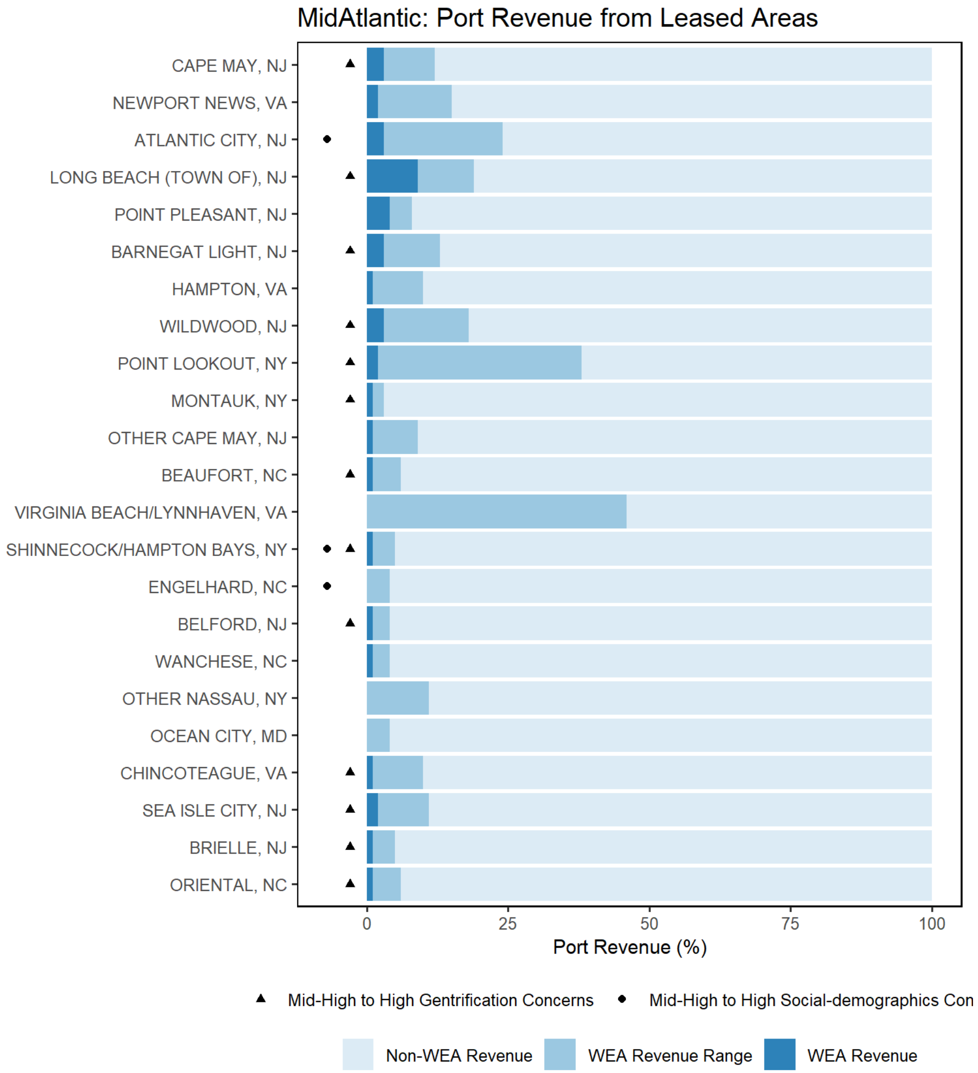
Risks: Offshore Wind Development Mid Atlantic   Elements: OSW1 and OSW2

Indicators: fishery and community specific revenue in lease areas

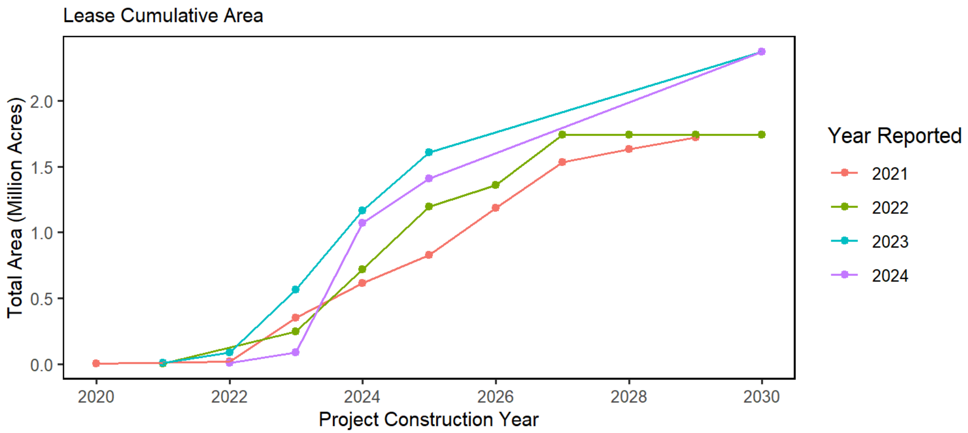


Council request: New England ports relying on Mid-Atlantic managed species





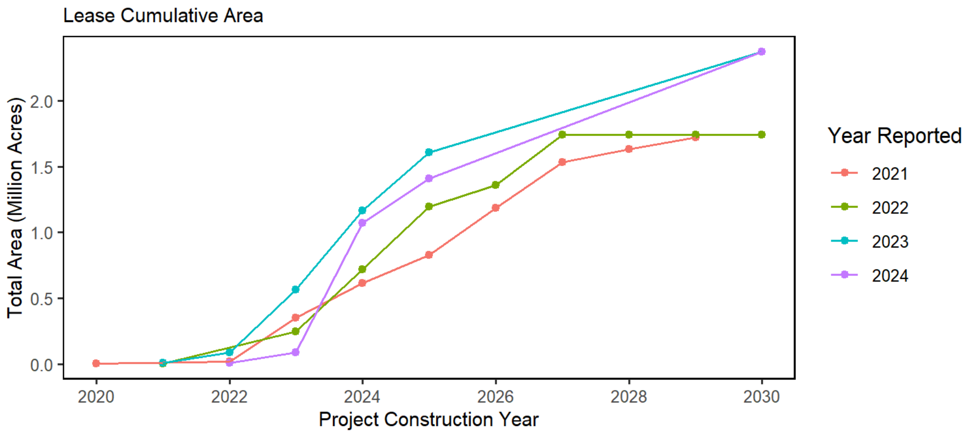
Risks: Offshore Wind Development: Implications



Implications:

- Current plans for buildout of offshore wind in a patchwork of areas spreads the impacts differentially throughout the region.
- Lease areas overlap with North Atlantic right whale habitat. Development may alter local oceanography and prey availability, increase vessel strike risk, and result in pile driving noise impacts.

Risks: Offshore Wind Development Summary



Implications:

- Current plans for buildout of offshore wind in a patchwork of areas spreads the impacts differentially throughout the region
- Planned wind areas overlap with one of the only known right whale foraging habitats, and altered local oceanography could affect right whale prey availability. Development also brings increased vessel strike risk and the potential impacts of pile driving noise.

2024 Highlights: Methods

Observations solicited from:

- SOE contributors
- NEFSC colleagues
- Academic colleagues
- Management partners
- Fishing industry

We welcome your observations!
northeast.ecosystem.highlights@noaa.gov

Observations included if:

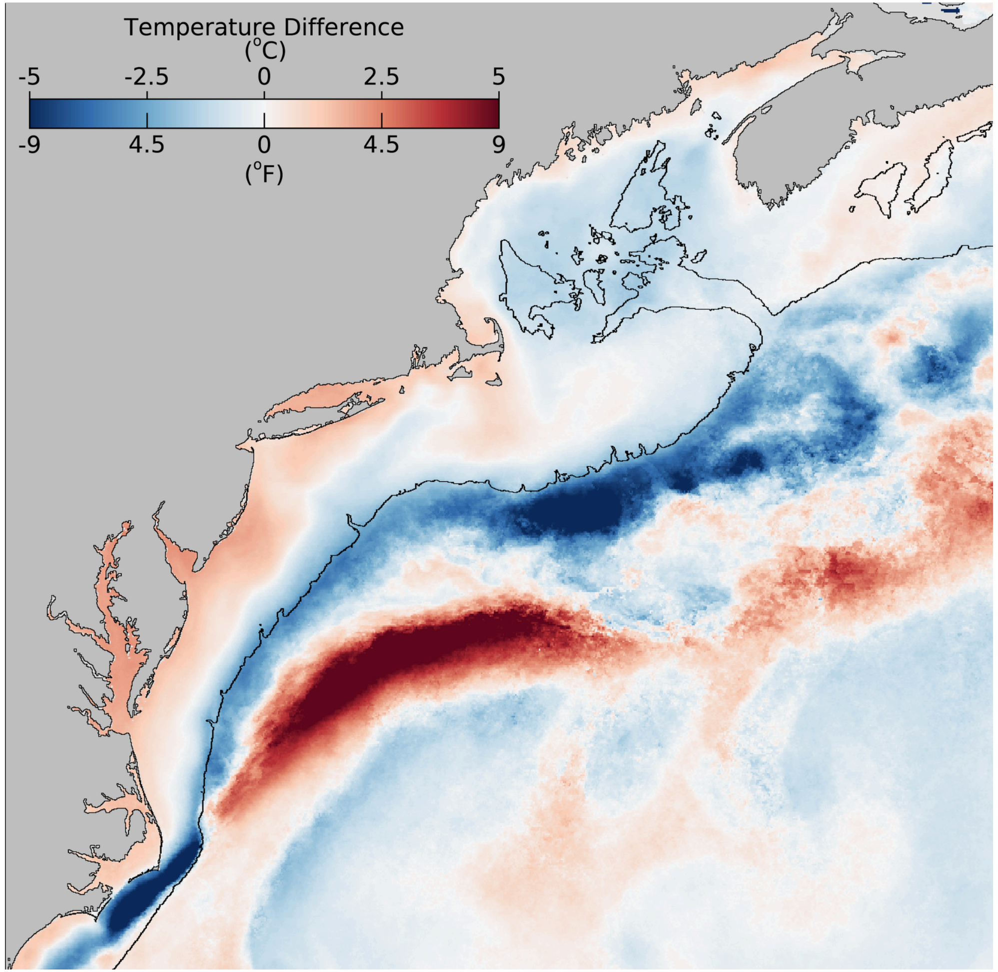
- Record high or low observations
- Different from recent conditions
- Reported by multiple sources
- Affecting fishery operations
- Newsworthy

Not exhaustive list; Full impacts remain to be seen

Reprinted from Cape Cod Commercial Fisherman's Alliance February 2025 Newsletter →

A Chatham gillnetter has spent much of the last 20 years fishing about 70 miles south of Nantucket, February through April. In the last two years he has been bringing up strange, spiraled shells in his net. The appearance of what is likely Big or Giant Tun, a tropical or sub-tropical species, is one of many ocean anomalies in recent years, with more reports of “Gulf Steam orphans” than ever before. This would be a great anecdote to add to the Northeast Fisheries Science Center 2025 **State of the Ecosystem** reports. The center is looking for industry input for the 2024 Highlights section, particularly unusual or anomalous observations during the 2024 fishing season. Were water temperatures warmer/colder than normal or were there any other unusual conditions on the water that you observed? Was fishing unusually low/high or was the fishing season for specific species early/delayed? Did you see species in different places or at different times of the year than you normally see them? Email **northeast.ecosystem.highlights@noaa.gov** the details.

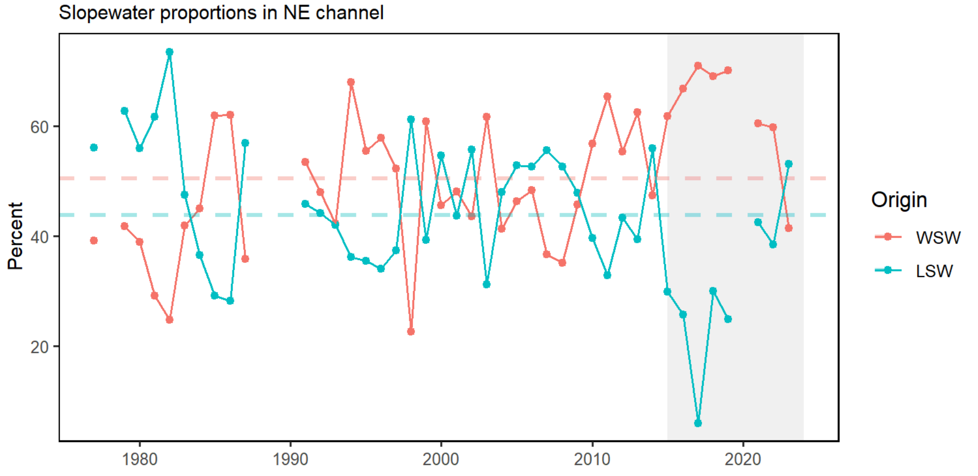
2024 Highlights: generally cooler, fresher Northeast Shelf



Globally, 2024 warmest year on record (above previous record 2023)

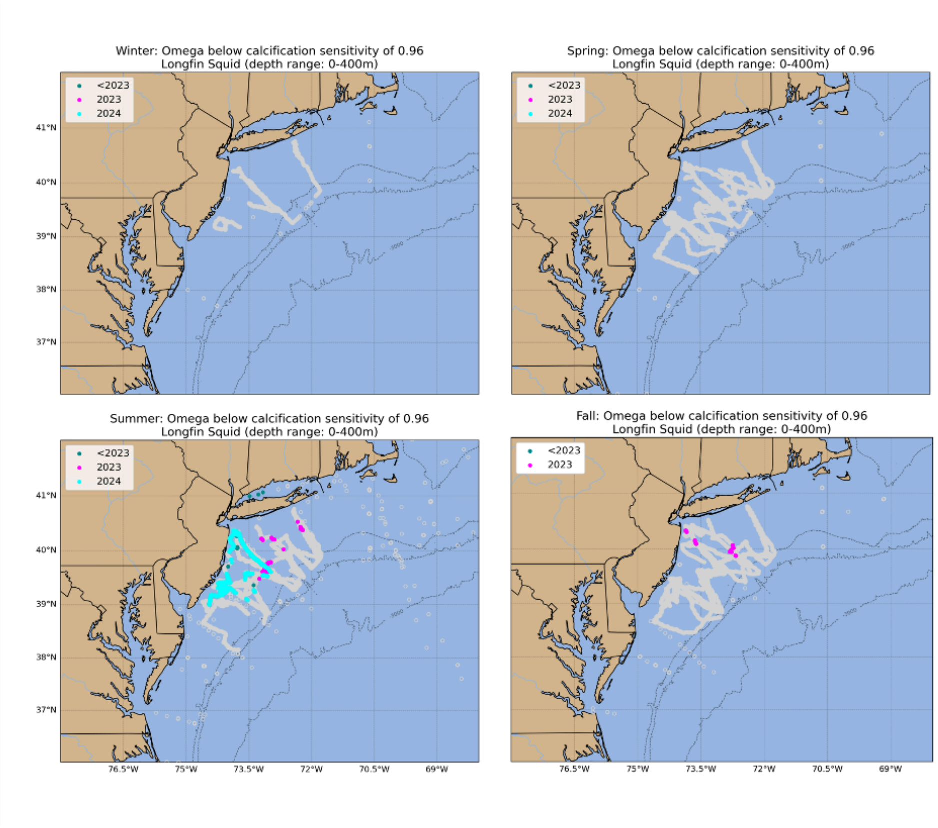
BUT, nearly all NE shelf seasonal surface and bottom temperatures back to longer term average

2023-2024 data suggest more Labrador slope water into the GOM



Linked to well-developed 2024 Mid Atlantic Cold Pool

2024 Highlights



Extreme observation of ocean acidification risk off NJ

Multiple summer upwelling events off NJ

Unusual timing, location, abundance:

- Fishery observations
  - Delayed migration of longfin squid, black sea bass, haddock
  - Unusual locations for pollock, bluefin tuna, Atlantic mackerel, longfin squid, bluefish, and bonito
  - Local abundance of Atlantic mackerel
  - Record catches of red drum in Chesapeake Bay
- Good scallop recruitment in Nantucket lightship
- Arctic copepods in GOM
- Cocolithophore bloom off NY
- Large whale aggregations

THANK YOU! SOEs made possible by (at least) 88 contributors from 20+ institutions

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Andy Beet
Brandon Beltz
Ruth Boettcher (Virginia Department of Game and Inland Fisheries)
Mandy Bromilow (NOAA Chesapeake Bay Office)
Joseph Caracappa
Samuel Chavez-Rosales
Baoshan Chen (Stony Brook University)
Zhuomin Chen (UConn)
Doug Christel (GARFO)
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Lisa Colburn
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Bart DiFiore (GMRI)
Emily Farr (NMFS Office of Habitat Conservation)
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Additional resources

- ecodata R package
- Indicator catalog
- SOE Technical Documentation

- SOE Reports on the web

- Slides available at https://noaa-edab.github.io/presentations
- Contact: joseph.caracappa@noaa.gov