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Introduction

About This Report

This report is for the New England Fishery Management Council (NEFMC). The purpose of this report is to synthesize ecosystem information to allow the NEFMC to better meet fishery management objectives. The major messages of the report are synthesized on pages 1-3, with highlights of 2025 ecosystem events on page 4.

The information in this report is organized into two main sections; performance measured against ecosystem-level management objectives (Table 1), and potential risks to meeting fishery management objectives (Table 2: climate change and other ocean uses). A final section highlights notable 2025 ecosystem observations.

Report structure

A glossary of terms[1], detailed technical methods documentation[2], indicator data[3], and detailed indicator descriptions[4] are available online. We recommend new readers first review the details of standard figure formatting (Fig. 68a), categorization of fish and invertebrate species into feeding guilds (Table 7), and definitions of ecological production units (EPUs, including the Gulf of Maine (GOM) and Georges Bank (GB); Fig. 68b) provided at the end of the document.

The two main sections contain subsections for each management objective or potential risk. Within each subsection, we first review observed trends for indicators representing each objective or risk, including the status of the most recent data year relative to a threshold (if available) or relative to the long-term average. Second, we identify potential drivers of observed trends, and synthesize results of indicators related to those drivers to outline potential implications for management. For example, if there are multiple drivers related to an indicator trend, do indicators associated with the drivers have similar trends, and can any drivers be affected by management action(s)? We emphasize that these implications are intended to represent testable hypotheses at present, rather than "answers," because the science behind these indicators and syntheses continues to develop.

Table 1: Ecosystem-scale fishery management objectives in New England

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	Fishery and ecosystem volatility, adaptive capacity, and shifts from baseline
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

[1] https://noaa-edab.github.io/tech-doc/glossary.html
[2] https://noaa-edab.github.io/tech-doc/
[3] https://noaa-edab.github.io/ecodata/
[4] https://noaa-edab.github.io/catalog/index.html

Table 2: Risks to meeting fishery management objectives in New England

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

Performance Relative to Fishery Management Objectives

In this section, we examine indicators related to broad, ecosystem-level fishery management objectives. We also provide hypotheses on the implications of these trends—why we are seeing them, what's driving them, and potential or observed regime shifts or changes in ecosystem structure. Identifying multiple drivers, regime shifts, and potential changes to ecosystem structure, as well as identifying the most vulnerable resources, can help managers determine whether anything needs to be done differently to meet objectives and how to prioritize upcoming issues/risks.

Seafood Production

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Indicators: Landings; commercial and recreational

This year, we present updated indicators for total commercial landings (includes seafood, bait, and industrial landings), U.S. seafood landings (excludes industrial and bait uses) , and Council-managed U.S. seafood landings through 2024. Results show there are long-term declines in all New England landings time series (Fig. 1).

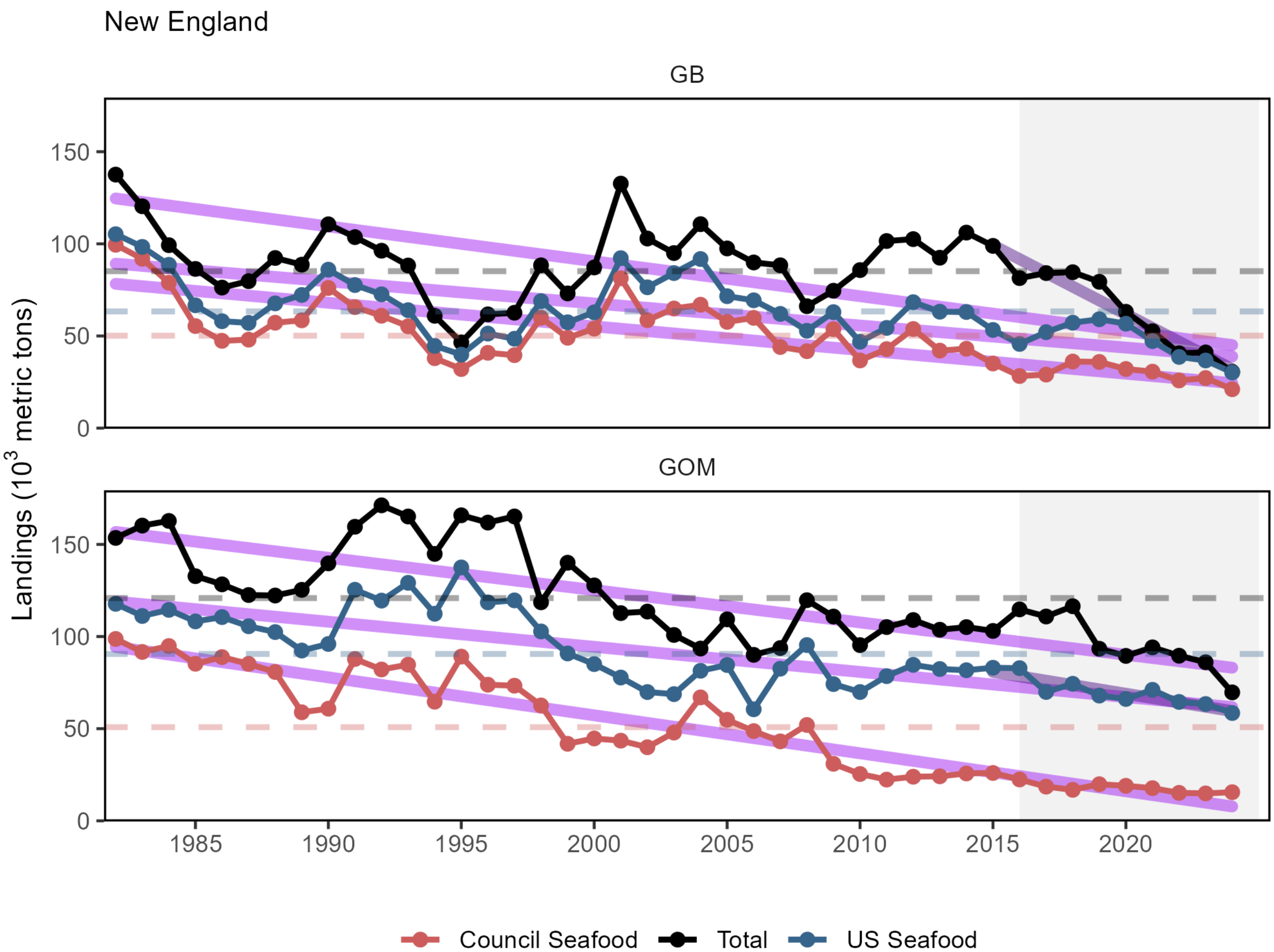

Figure 1: Total commercial landings (black), total U.S. seafood landings (blue), and New England managed U.S. seafood landings (red) for Georges Bank (GB, top) and the Gulf of Maine (GOM, bottom), with significant decline (purple) in total landings.

Commercial landings by guild include all species and all uses, and are reported as total for the guild and the NEFMC managed species within the guild. As reported in previous years, downward trends persist for piscivores and benthivores in both regions. Current high total landings for benthivores (GOM) are attributable to American lobster, and high benthos landings (GB) is attributable to clams and scallops (Fig. 2). Current landings of planktivores and piscivores are still below the long-term mean.

Not all aquaculture productionis included in total seafood landings. In 2022, the Northeast region produced approximately 6,300 metric tons of aquacultured shellfish, with revenue of $133 million (Fisheries of the United States, 2022).

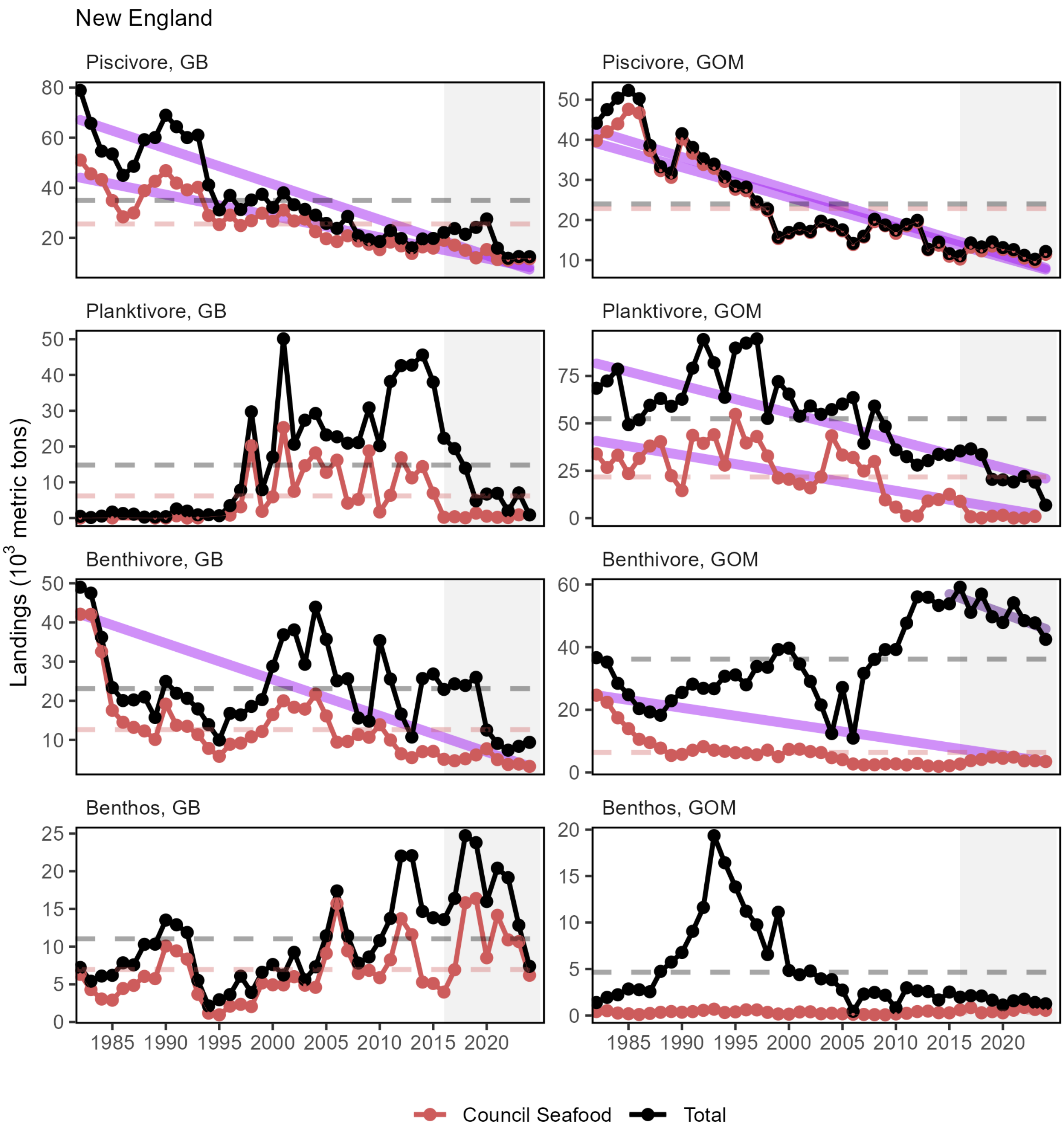

Figure 2: Total commercial landings (black) and NEFMC managed U.S seafood landings (red) by feeding guild for the Gulf of Maine (GOM, right) and Georges Bank (GB, left), with significant long-term declines (purple).

Total Community Climate Change Risk indicators evaluate port level risk to environmental variability based on dependence on species and their respective bioenvironmental vulnerabilities as assessed by regional experts. Total Vulnerability measures how much of a region's landings (or revenue) is dependent on species sensitive to different climate and environmental change factors including temperature and acidification. For New England ports, the Total Vulnerability of landings (Fig. 3) was moderate in 2024 with no suggestion of a long-term trend.

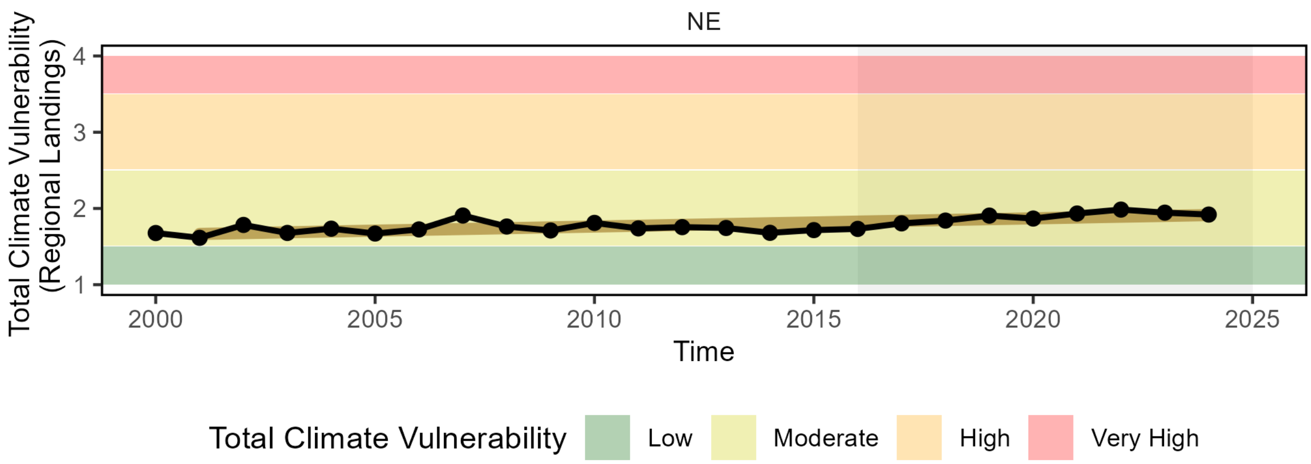

Figure 3: New England region total climate vulnerability of commercial landings (sum of New England port landings weighted by species climate vulnerability from Hare et al. 2016). Horizontal colored bars show different climate risk levels.

Overall, recreational harvest (retained fish presumed to be eaten) has declined in New England (Fig. 4). Recent harvest remains near a time series low. The recent low in pelagic shark landings is largely driven by regulatory changes implemented in 2018, followed by the closure of the shortfin mako fishery in 2022. These actions were intended to rebuild the North Atlantic shortfin mako stock and comply with binding recommendations by the International Commission for the Conservation of Atlantic Tunas (ICCAT).

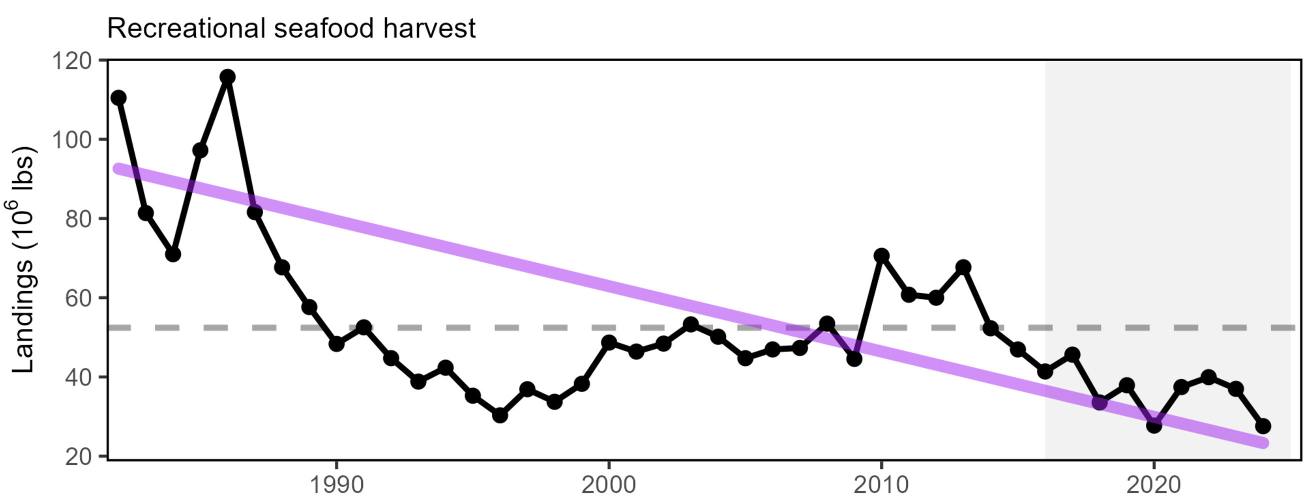

Figure 4: Total recreational seafood harvest (millions of pounds, black, significant decrease, purple) in the New England region.

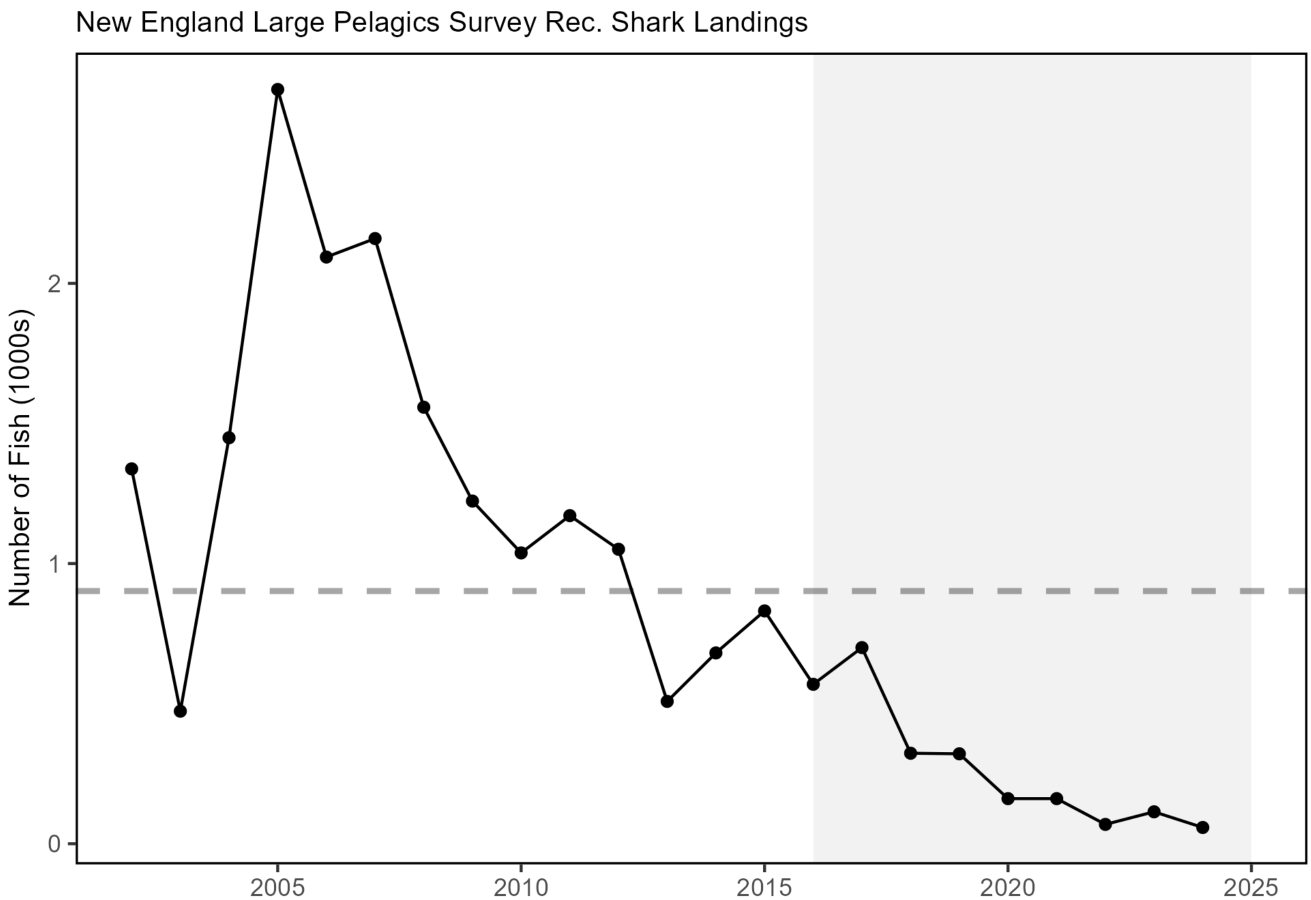

Figure 5: Recreational shark landings in the New England region from NOAA Fisheries' Large Pelagics Survey (top) with declining trends (purple).

Implications

Declining commercial landings (total and seafood) and recreational harvest can be attributed to many interacting factors, including combinations of ecosystem and stock production, management actions, market conditions, and environmental change. While we cannot evaluate all possible drivers at present, here we evaluate the extent to which stock status, management, and system biomass trends may play a role.

Stock Status Single species management objectives (1. maintaining biomass above minimum thresholds and 2. maintaining fishing mortality below overfishing limits) are not being met for some NEFMC managed species. Thirteen stocks are currently estimated to be below B_{MSY} (Fig. 6), while status relative to B_{MSY} could not be assessed for 13 additional stocks (Table 3). Although stock status and associated management constraints are likely contributing to decreased landings, current management constraints are in turn a response to biological conditions and not necessarily the primary cause of declining landings. To better address the role of management in future reports, we could examine how the total allowable catch (TAC) and the percentage of the TAC utilized for each species has changed through time.

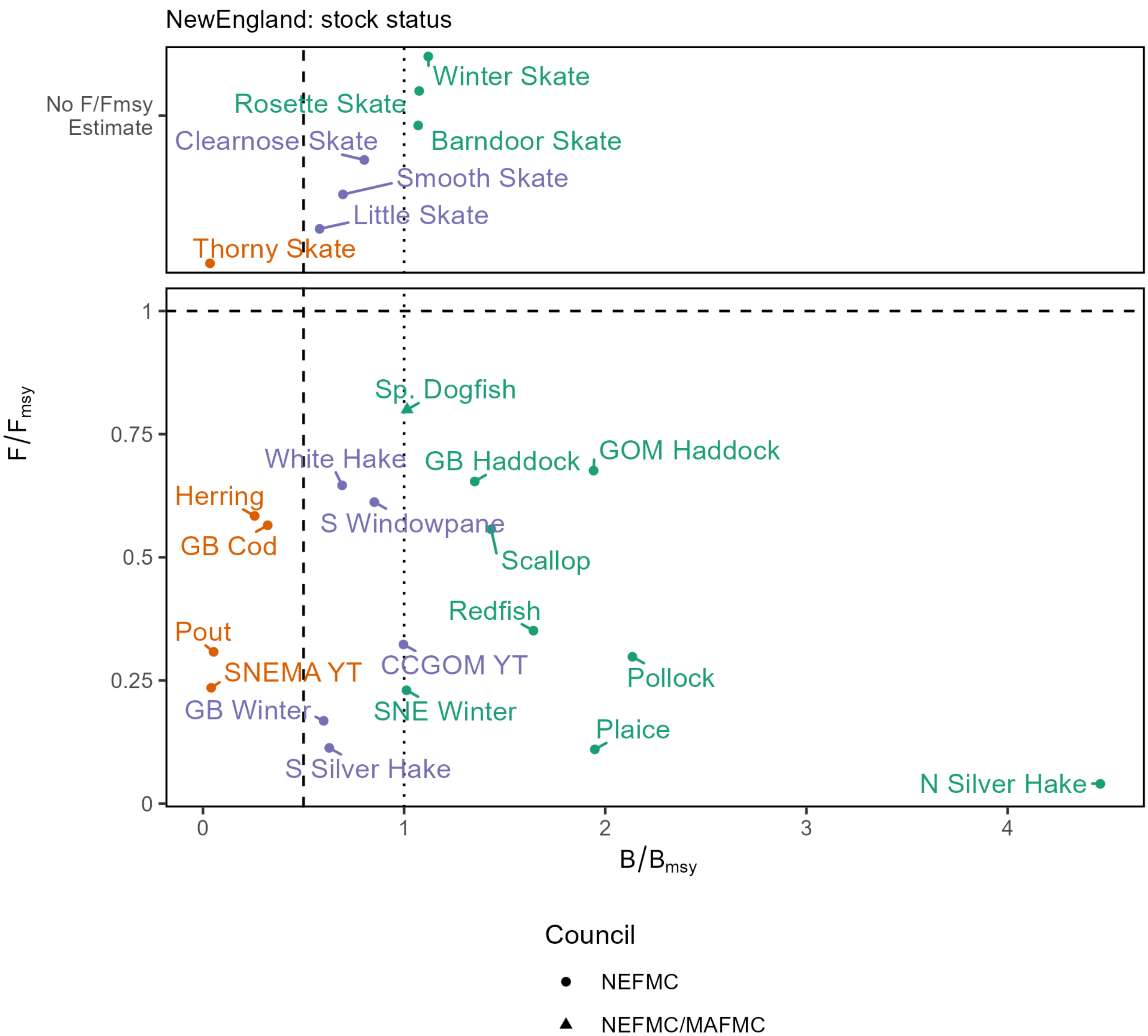

Figure 6: Summary of single species status for NEFMC and jointly federally managed stocks (goosefish and spiny dogfish). The dotted vertical line at one is the target biomass reference point of B. The dashed lines are the management thresholds of B (vertical) or F (horizontal). Stocks with a B/B_{MSY} estimate but without an F/F_{MSY} estimate are denoted in a separate box plot (top). Colors denote stocks with B/B_{MSY} < 0.5 or F/F_{MSY} (orange), stocks 0.5<B/B_{MSY}<1 (blue), and stocks B/B_{MSY}>1 (green).CCGOM = Cape Cod Gulf of Maine, GOM = Gulf of Maine, GB = Georges Bank, SNEMA = Southern New England Mid Atlantic

Table 3: Unknown or partially known stock status for NEFMC and jointly managed species.

Stock	F/Fmsy	B/Bmsy
Red deepsea crab - Northwestern Atlantic[1]	-	-
Atlantic cod - Gulf of Maine[1]	-	-
Atlantic halibut - Northwestern Atlantic Coast	-	-
Offshore hake - Northwestern Atlantic Coast	-	-
Red hake - Gulf of Maine / Northern Georges Bank	-	-

Table 3: Unknown or partially known stock status for NEFMC and jointly managed species.

Stock	F/Fmsy	B/Bmsy
Red hake - Southern Georges Bank / Mid-Atlantic	-	-
Windowpane - Gulf of Maine / Georges Bank	-	-
Winter flounder - Gulf of Maine	-	-
Witch flounder - Northwestern Atlantic Coast	-	-
Yellowtail flounder - Georges Bank	-	-
Goosefish - Gulf of Maine / Northern Georges Bank	-	-
Goosefish - Southern Georges Bank / Mid-Atlantic	-	-

[1] The most recent cod assessment made stock status recommendations for the four new stocks (Eastern Gulf of Maine, Western Gulf of Maine, Georges Bank, and Southern New England) but were not available yet for this report.

System Biomass Aggregate biomass trends derived from scientific resource surveys have been stable to increasing in both regions (Fig. 7 & Fig. 8).The benthivores group spiked during the last decade, due to a large haddock recruitment, but appears to be returning to average levels. Planktivore biomass on GB continues to rise with the highest fall biomass observed since 1968. There are mixed trends in piscivores on GB, and increasing trends for planktivores across both regions and seasons and benthos on GB in both seasons. The New Hampshire/Maine state survey time series is too short to estimate trends, while the Massachusetts state survey shows the increasing trend in planktivores in the fall but a decrease in piscivores in the spring and benthos in both seasons (Fig. 9). While managed species comprise varying proportions of aggregate biomass, trends in landings are not mirroring shifts in the overall trophic structure of survey-sampled fish and invertebrates. Therefore, major shifts in feeding guilds or ecosystem trophic structure are unlikely to be driving the decline in landings.

Declining landings are likely driven by the relative abundance of specific targeted species rather than major shifts in ecosystem trophic structure or feeding guilds. Scientific surveys show that Aggregate biomass has been mostly stable or increasing in both regions (Fig. 7 & Fig. 8). The benthivores(bottom-feeder) biomass recently peaked due to a large haddock recruitment, but appears to be returning to average levels. Planktivore (plankton-eater) biomass on GB continues to rise. On GB, trends in piscivores (fish-eaters) on GB are mixed, and benthos are increasing in both seasons. State-level data show the Massachusetts survey mirroring the increase in fall planktivores but noting a spring decrease in fish-eaters and a year-round decline in benthos; the New Hampshire/Maine survey remains too short to establish definitive trends (Fig. 9).

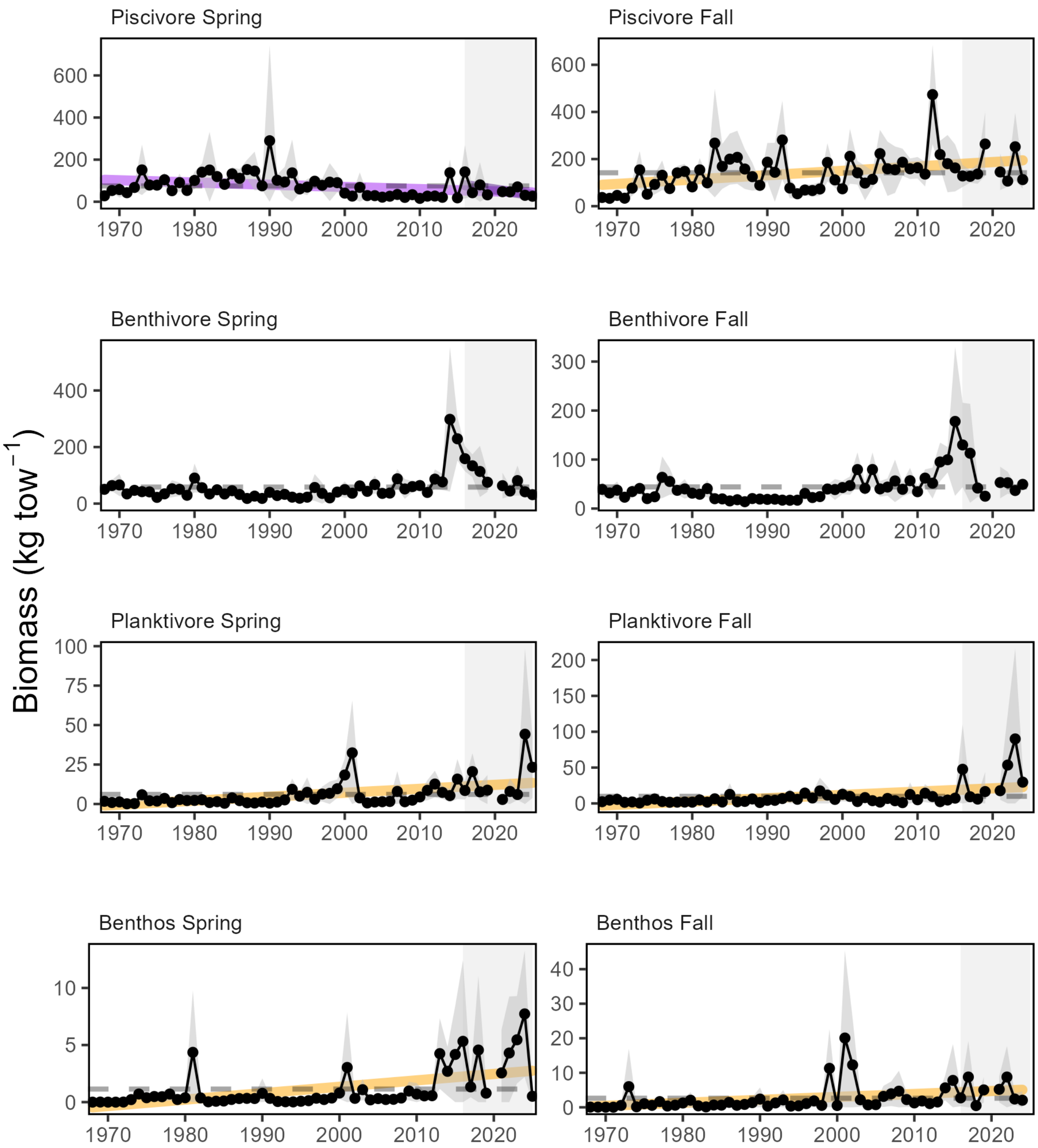

Figure 7: Spring (left) and fall (right) surveyed biomass on Georges Bank, with long-term increasing (orange) and decreasing (purple) trends. The shaded area around each annual mean represents 2 standard deviations from the mean.

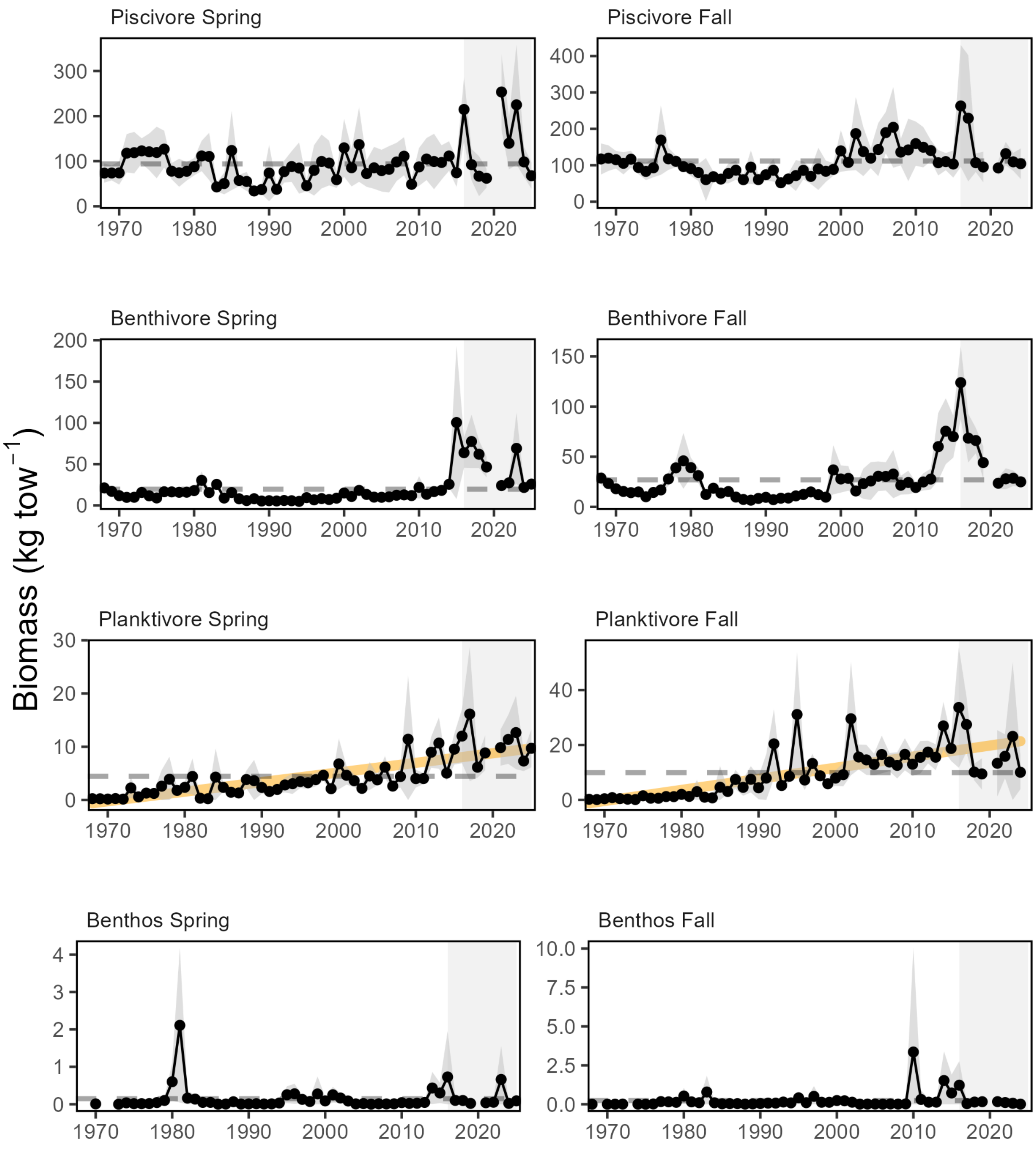

Figure 8: Spring (left) and fall (right) surveyed biomass in the Gulf of Maine, with increasing long-term trends (orange). The shaded area around each annual mean represents 2 standard deviations from the mean.

Effect on Seafood Production With the poor or unknown stock status of many managed species, the decline in commercial seafood landings in the Gulf of Maine most likely reflects lower catch quotas implemented to rebuild overfished stocks, as well as market dynamics.

The decline in recreational seafood harvest stems from multiple drivers. Some of the decline, such as for recreational shark landings, continues to be driven by tightening regulations. However, changes in demographics and preferences for recreational activities likely play a role in non-HMS (Highly Migratory Species) declines in recreational harvest, with current harvests well below the time series average. Recreational fishing may be shifting to catch-and-release strategies as opposed to catch for harvest.

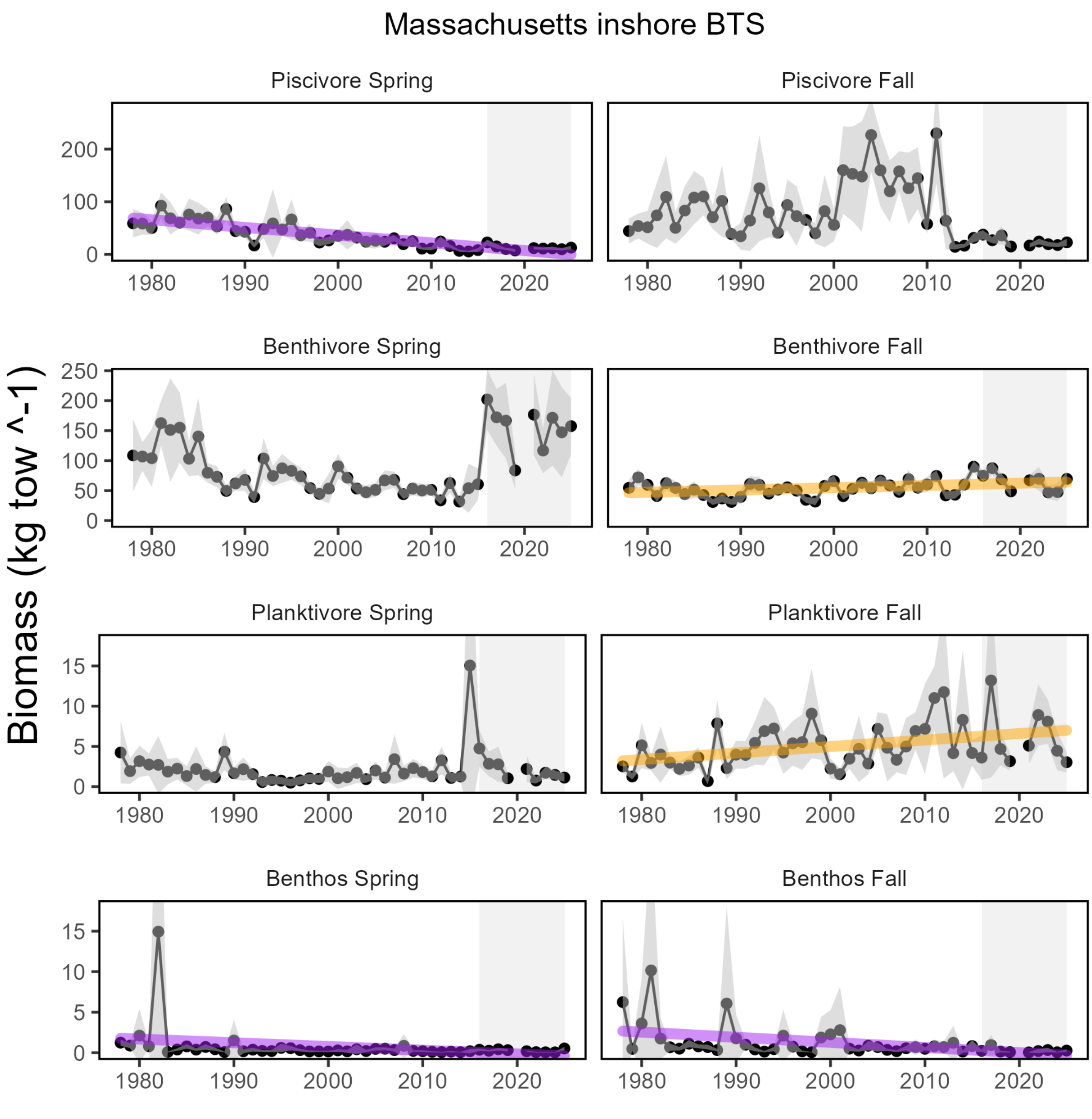

Figure 9: Spring (left) and fall (right) surveyed biomass from the state of Massachusetts inshore survey, with increasing (orange) and decreasing (purple) long-term trends. The shaded area around each annual mean represents 2 standard deviations from the mean.

Fisheries and communities rely on different combinations of stocks,and individual stocks will respond differently to these drivers. Some key drivers include :

- Climatological conditions are trending into uncharted territory. Globally, 2025 had the warmest ocean temperatures on record[5] (see 2025 Highlights section). However, the 2025 Northwest Atlantic water temperatures were in line with the long-term average.
- Stocks are shifting their distribution, moving towards the northeast and into deeper waters throughout the Northeast US Large Marine Ecosystem (Fig. 31, Climate Risks section).
- Some ecosystem composition and production changes have been observed (see Stability section and Risks to Setting Catch Limits section).
- Some fishing communities are affected by Social and Community Risks (see Social Vulnerability section).

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Commercial Profits

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Indicators: revenue (a proxy for profits)

Total commercial revenues from all species is below the long-term mean for GB and near the long-term mean for the GOM in 2024 (Fig. 10). In addition, revenue from NEFMC managed species shows a long-term decline in the GOM. GB continues to exhibit a cyclical nature with regards to revenue, largely driven by rotational management of Atlantic sea scallops.

[5] https://noaa-edab.github.io/catalog/observation_synthesis.html

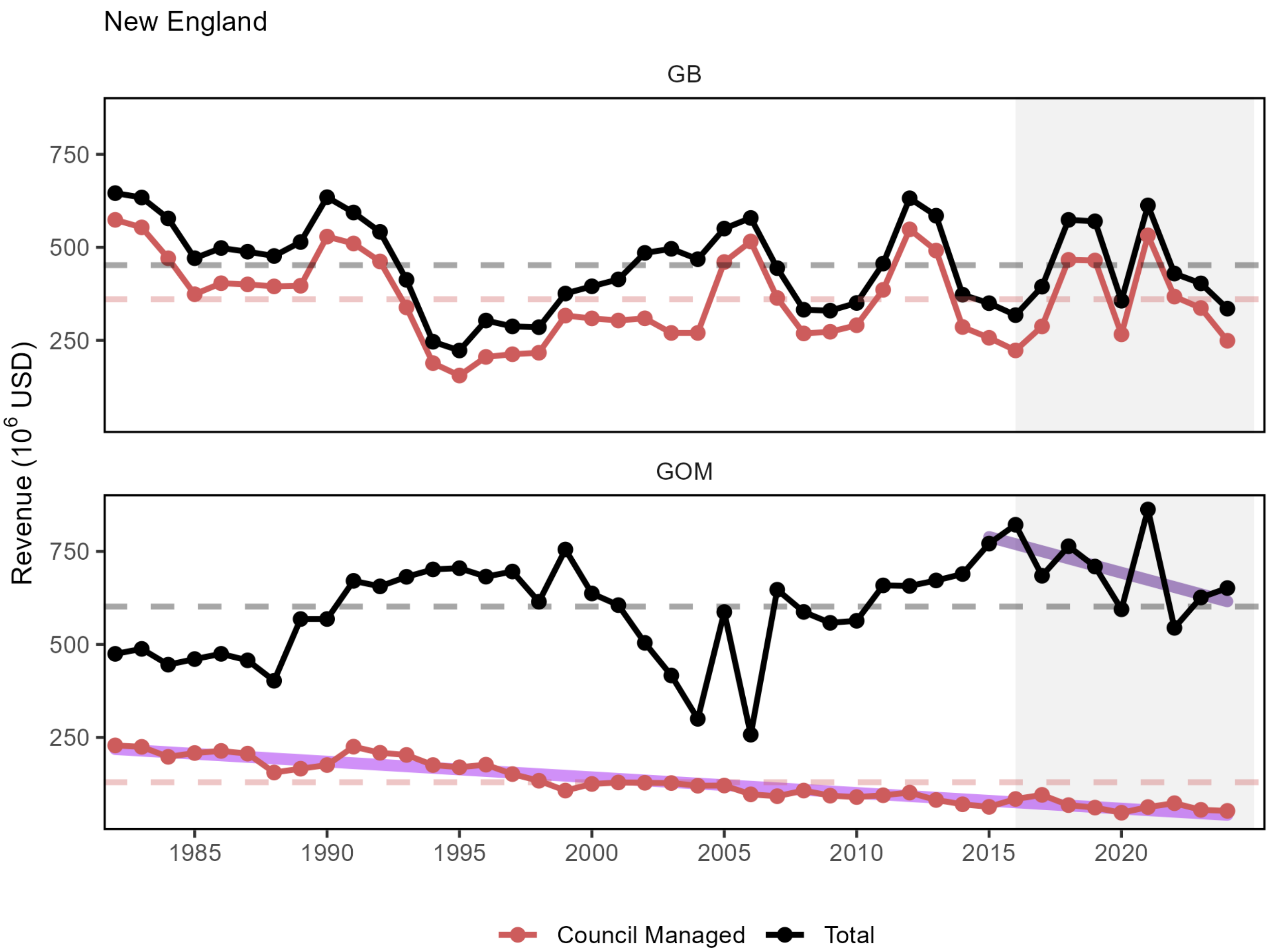

Figure 10: Commercial revenue through 2023 for Georges Bank (top) and the Gulf of Maine (bottom): total (black) and from NEFMC managed species (red), with significant long-term (light purple) and short-term (dark purple) declines. Dashed lines represent the long-term annual mean.

Revenue earned by harvesting resources is a function of both the quantity landed of each species and the prices paid for landings. Therefore, total revenue patterns can be driven by harvest levels, the mix of species landed, price changes, or a combination of these. The Bennet Indicator (BI) decomposes revenue change into two parts, one driven by changing quantities (volumes), and a second driven by changing prices. All changes are in relation to a base year (1982). The 1982 base year was selected because that is the first year the relevant data is available and it allows for an extended period of time to evaluate market trends and dynamics.

In the GB region, revenues have been consistently lower than the 1982 baseline throughout the time series. The changes in total revenue in GB was primarily driven by volumes prior to 2010 rather than by prices (Fig.11).In more recent years, prices have played a larger role in revenue upticks (such as in 2020), but the overall lower than baseline landings have caused a decreasing revenue in the past three years. In the GOM, revenues have been above the 1982 baseline in all but three years, with the increase being driven more by relatively higher prices rather than landings. Breaking down the GB revenue by guild (Fig. 12), both the volume and price trend have been largely driven by benthivores (lobster) and benthos (scallops, quahogs and surfclams). In the GOM region, increased prices for benthivores (lobster) drove the year-over-year increases in overall prices. Benthivores also had a large influence on the overall volume indicator in the GOM.

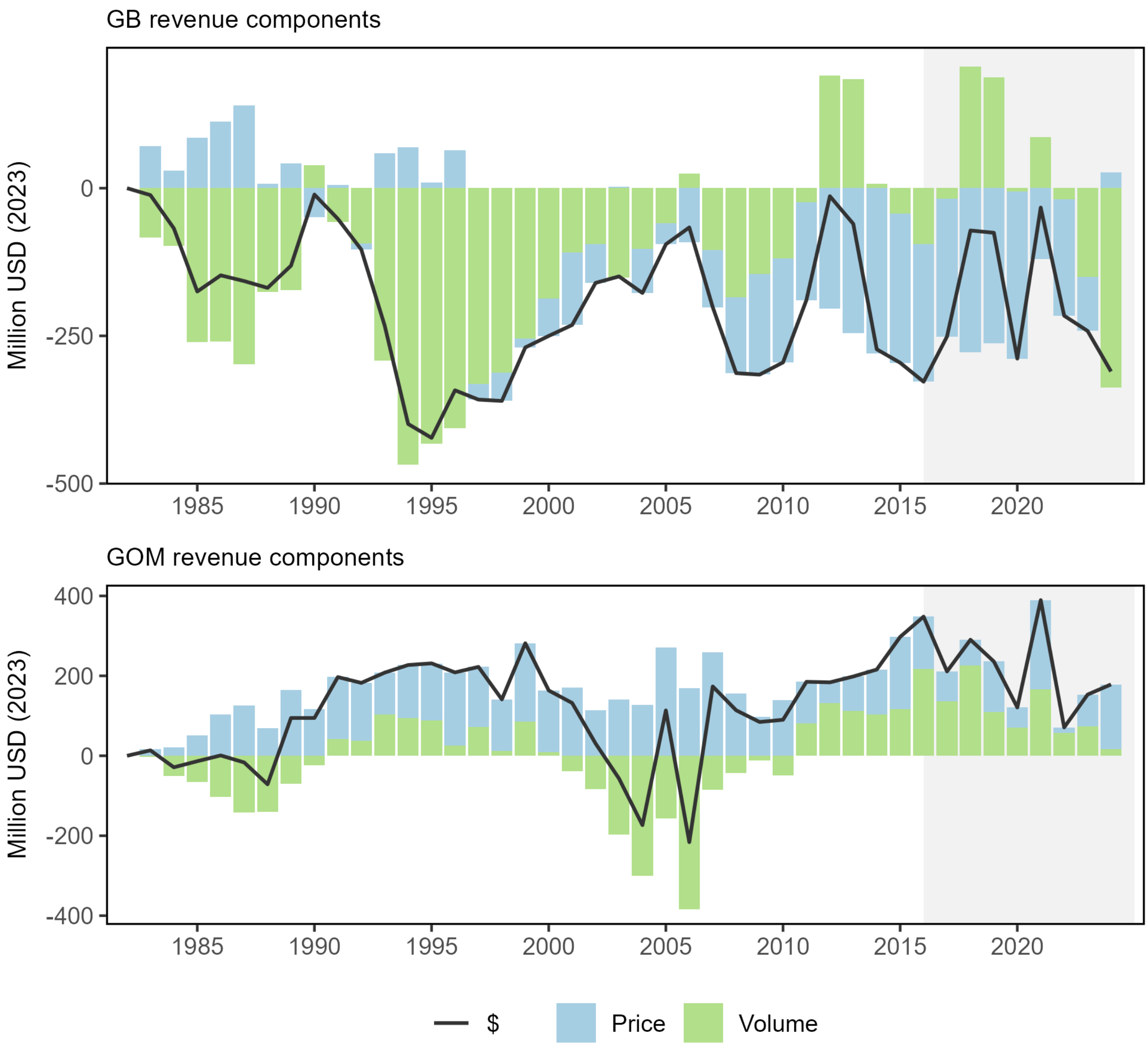

Figure 11: Revenue change from 1982 values in 2023 dollars (black); Price (blue), and Volume Indicators (green) for total commercial landings in Georges Bank (GB: top) and the Gulf of Maine (GOM: bottom)

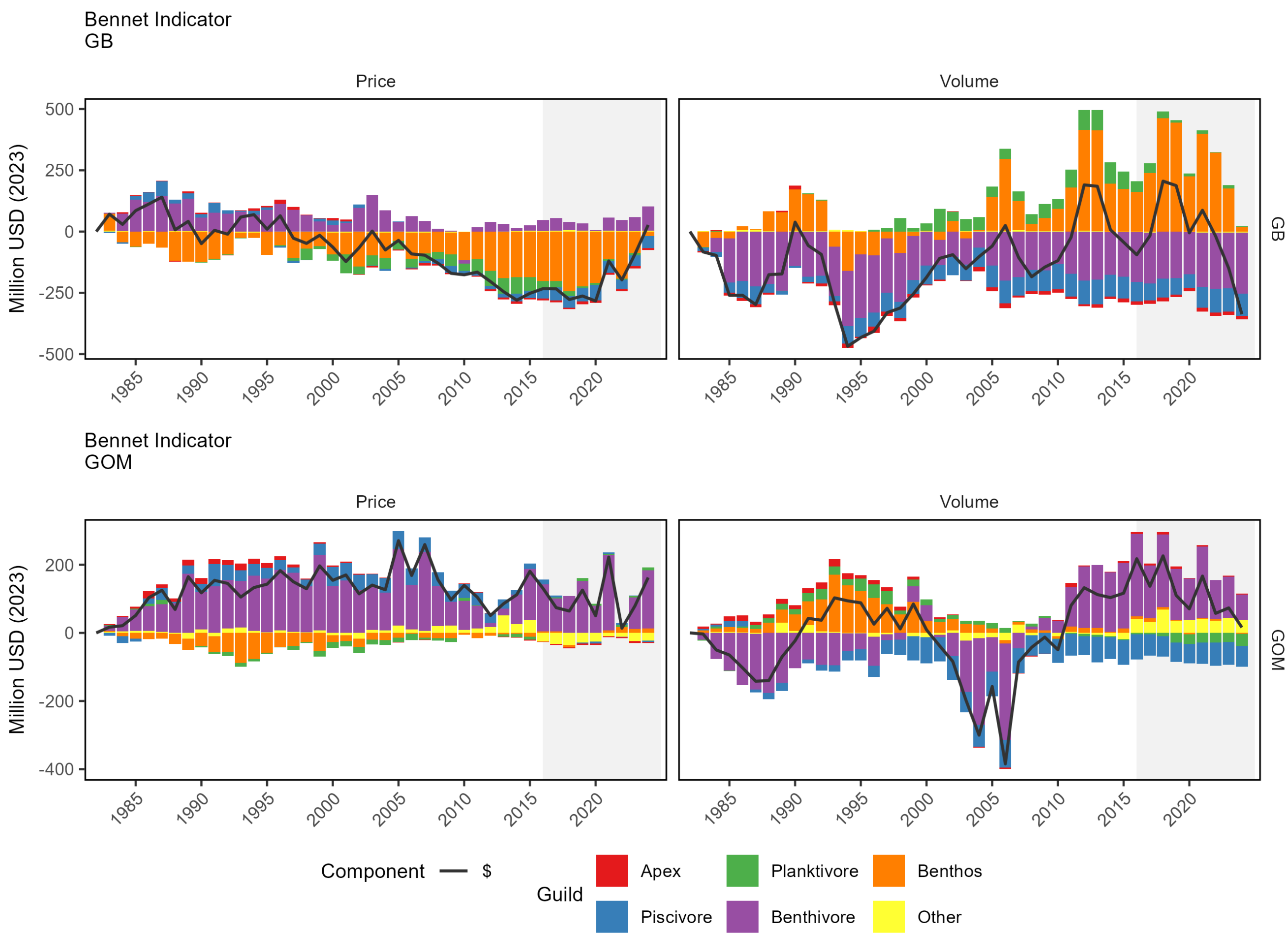

Figure 12: Total price and volume indicators in 2023 dollars (black) for commercial landings, and individual guild contributions to each indicator from Georges Bank (GB: top panels) and the Gulf of Maine (GOM: bottom panels)

This year, we present new indicators of profitability: indices of cost, revenue, and profit. In this index, costs pertain to trip costs, excluding labor, estimated for all federal trips in the region using methods described in Werner et al. 2020). Here the profit indicator is actually net-revenue–determined as the difference between trip revenue and trip costs. Trips were spatially allocated to compile regional indices. Indices are presented as values relative to those from 2000. the first year in the dataset.

In the GOM, the profit index closely follows the same trends as the revenue index with the exception of 2010 - 2013 where low costs created a surge in the profit index. In 2023, the GOM profit index dropped to its third lowest point in the time series due to both high costs and below average revenues. For trips in GB, the profit index is similarly low due to high costs, but a stronger cyclical cycle of revenue is present due, in part, to rotational scallop management.

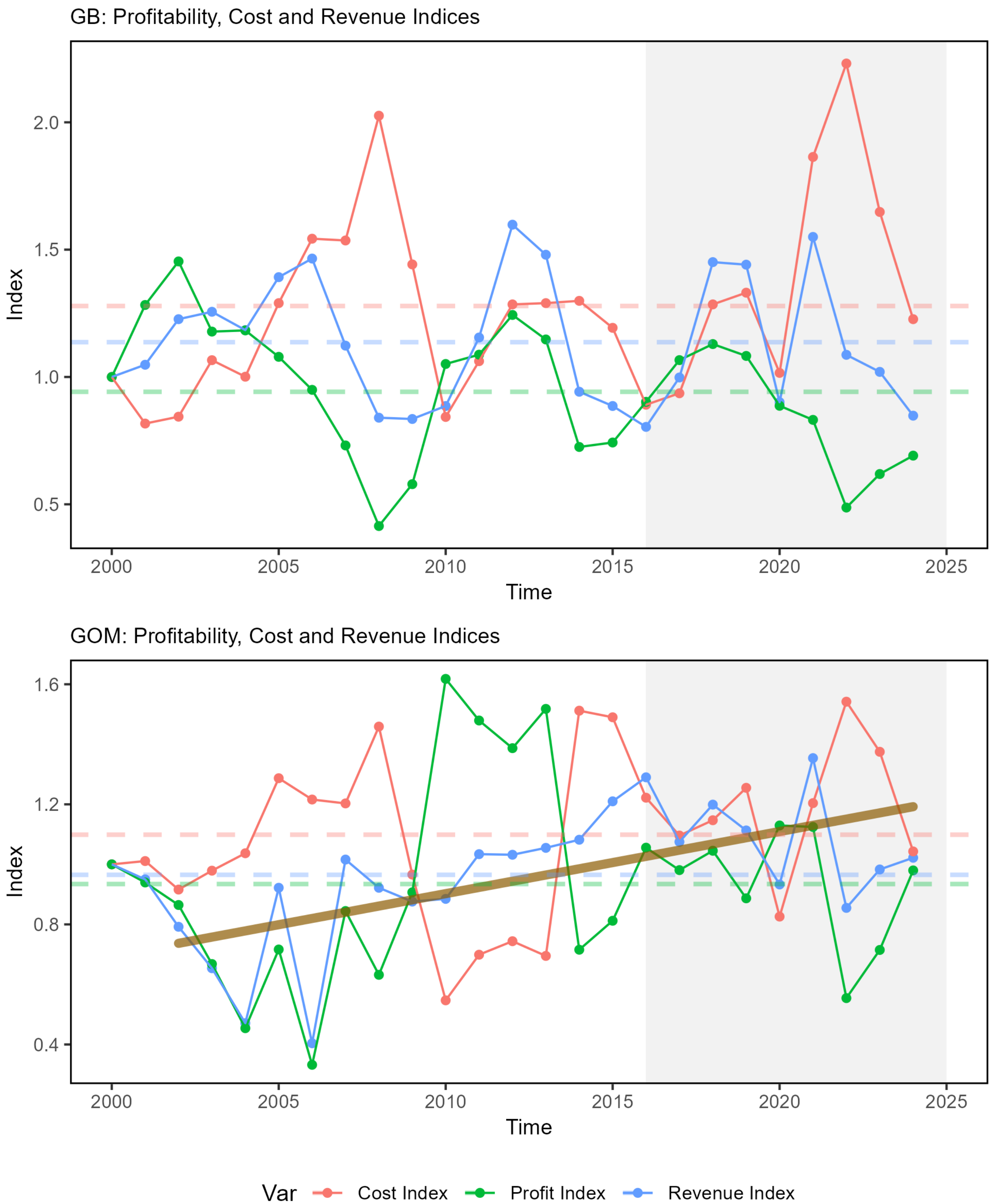

Figure 13: Profitability indices for GOM (top) and GB (bottom): cost index (red), profit index (green), and revenue index (blue). Dashed lines represent the long-term annual means for each index. Long-term increasing trend in the GOM associated with revenue index (blue).

Total vulnerability of revenue was moderate in 2022 with no long-term trend (Fig. 14). This suggests that while New England commercial fishing is moderately reliant on climate-sensitive species, this proportion has not significantly changed since 2000.

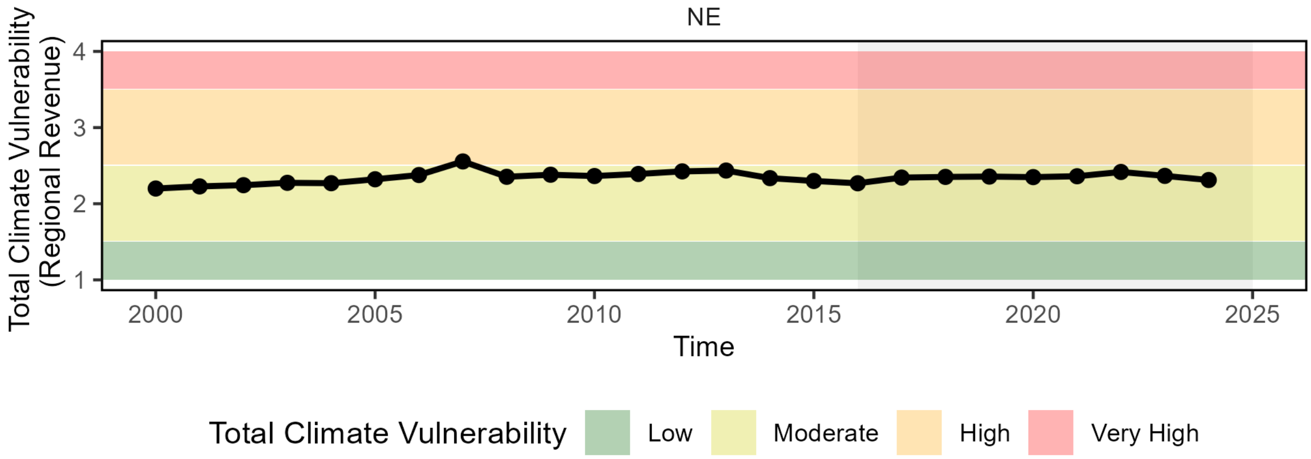

Figure 14: New England region total climate vulnerability of commercial revenue (sum of New England port revenue weighted by species climate vulnerability from Hare et al. 2016). Horizontal colored bars show different climate risk levels.

Implications

The overall volume of lobster and scallops, quahogs and surfclams dictates the revenue trends within the GB region. In the GOM, lobster prices are primarily responsible for relatively high revenues over the time series. Notably, both lobsters and scallops are sensitive to ocean warming and acidification and it is important to monitor the effects of these and other ecosystem drivers.

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Recreational Opportunities

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Indicators: Angler trips, fleet diversity

Recreational effort (angler trips) increased from 1982 to 2010, but has since declined to just below the long-term average (Fig. 15). Recreational fleets are defined as private vessels, shore-based fishing, or party-charter vessels. Recreational fleet diversity, or the relative importance of each fleet type, has remained relatively stable over the latter half of the time series (Fig. 16).

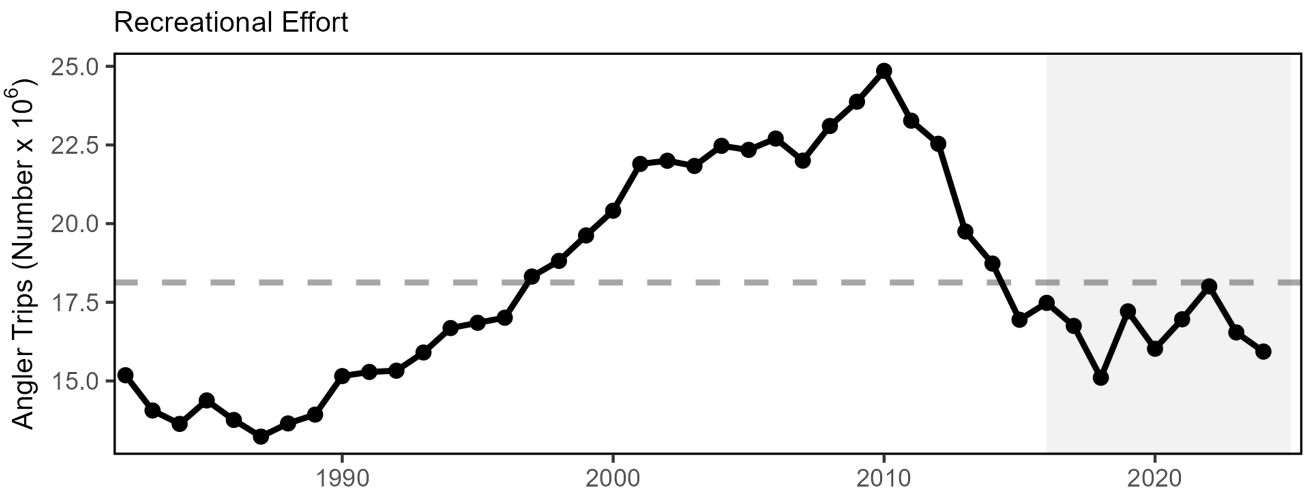

Figure 15: Recreational effort (total number of recreational angler trips from 1980-2023, black) in New England. Derived from MRIP's Effort Time Series Query.

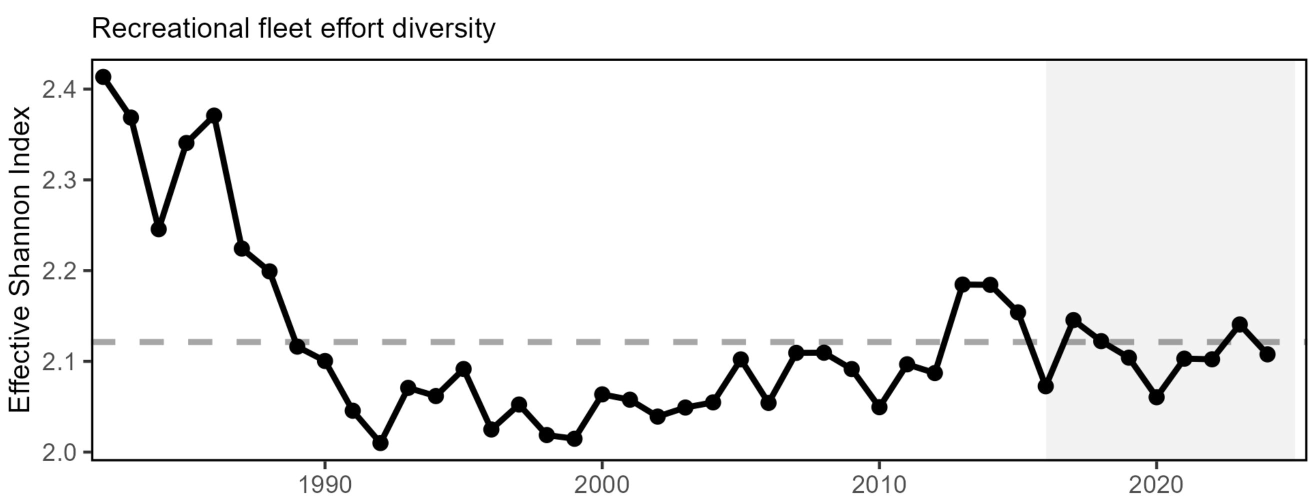

Figure 16: Recreational fleet effort diversity from 1980-2023 (black) in New England.

Implications

The absence of a long term trend in recreational angler trips and fleet effort diversity suggests relative stability in the overall number of recreational opportunities in the region.

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Community Social and Climate Vulnerability

Fisheries management seeks to provide for sustained participation of fishing communities and to avoid adverse economic impacts to fishing communities. A new composite indicator (Port Commercial Fishing Activity Indicator or PCFA) utilizes NOAA data on dealers, fish landings, and commercial permits to explore trends in commercial fishing activity over time in top ports. This information can be used to understand how changes in fish stocks, regulations, and other social-ecological factors may have disparately impacted ports throughout the Greater Atlantic region.

The recreational engagement index has not been updated from last year and will be updated with similar methods as PCFAI in future reports. The recreational engagement index demonstrates participation levels in recreational fishing in a given community relative to other coastal communities in a region.

The Community Social Vulnerability Indicators (CSVI) utilize U.S. Census American Community Survey data to describe social characteristics at the municipality level (i.e., not just the fishing community) and provide context for the municipalities utilized by commercial fishing industry participants. Fishing industry participants that live in and/or utilize resources in municipalities with relatively concerning socio-demographic conditions may be more vulnerable to changes. The personal disruption index addresses factors that reduce adaptability to change such as unemployment or educational level. The poverty index is a composite index that indicates a community's financial standing relative to other communities. The population composition index characterizes groups within communities that may be more vulnerable to change. CSVI information for communities highlighted in the PCFA and recreational engagement index have been updated with the most recent census data.

Coastal fishing communities worldwide have or are likely to experience social, economic, and cultural impacts from climate change, both negative (e.g., loss of infrastructure, fish stock decline) and positive (e.g., increased abundance of valuable species). Changes in marine fisheries as a consequence of climate change will require adaptation by coastal fishing communities and fisheries managers alike. The Community Environmental Variability Risk Indicators (CEVRI) were developed to help examine trends in risk related to dependence on species vulnerable to climate and environmental changes.

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Indicators: Port Commercial Fishing Activity and Community Social Vulnerability

The Port Commercial Fishing Activity Indicator (PCFA) highlights significant shifts in industry engagement across major regional ports. New Bedford and Boston, MA, have experienced fishing activity declines of over 20% compared to their 2007–2011 averages. Portland, ME, and Gloucester, MA, show even sharper downturns, with activity dropping 39% and 45%, respectively. Because New Bedford and Boston also rank medium-high for socio-demographic vulnerability, industry participants in these municipalities face a higher risk from these changing conditions.Conversely, several communities show substantial growth in fishing activity. Chatham, MA, along with Stonington and Harpswell, ME, are seeing positive trends. Friendship, ME, stands out with a 95% increase in its PCFA score over the same period.

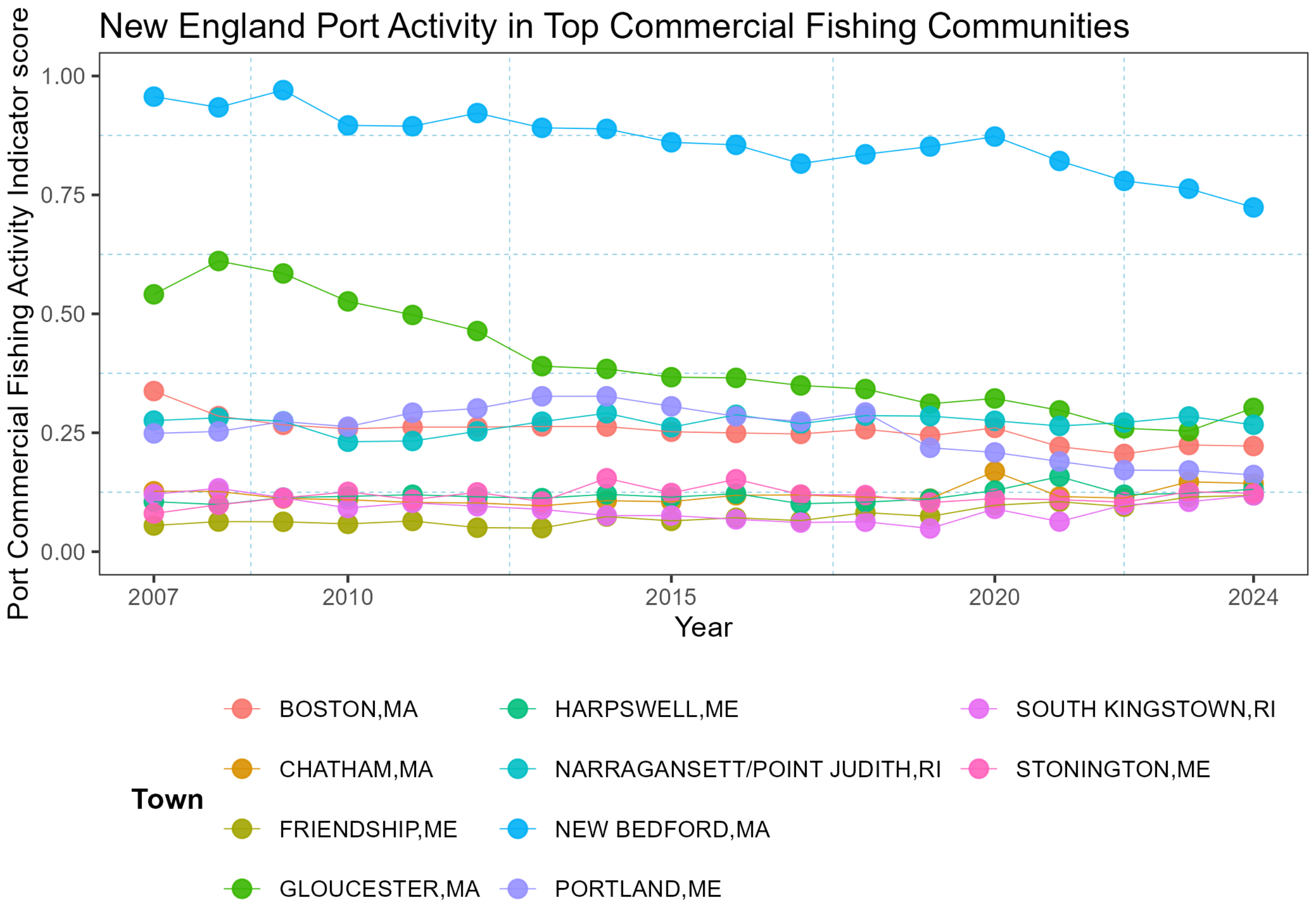

Figure 17: Port Commercial Fishing Activity Indicator scores over time for top commercially active fishing ports in New England.

Table 4: Socio-demographic indicator rankings (ranging from low = low vulnerability to high = high vulnerability) for New England communities most engaged in commercial fishing, 2022. Blank spaces indicate no data available.

Community	Personal Disruption	Population Composition	Poverty
New Bedford, MA	high	med high	med high
Boston, MA	med	med high	med high
Gloucester, MA	low	low	med
Chatham, MA	low	low	low
Portland, ME	low	low	low
Stonington, ME	low	low	low
Friendship, ME	low	low	low
Narragansett/Point Judith, RI	low	low	low

Of the top-ranked recreational communities, only Provincetown, MA and Falmouth, MA had medium or higher ranks for more than one socio-demographic indicator (Table **??**) examined here (poverty, personal disruption, population composition). This suggests that future changes to recreational fishing conditions may disproportionately impact Provincetown and Falmouth.

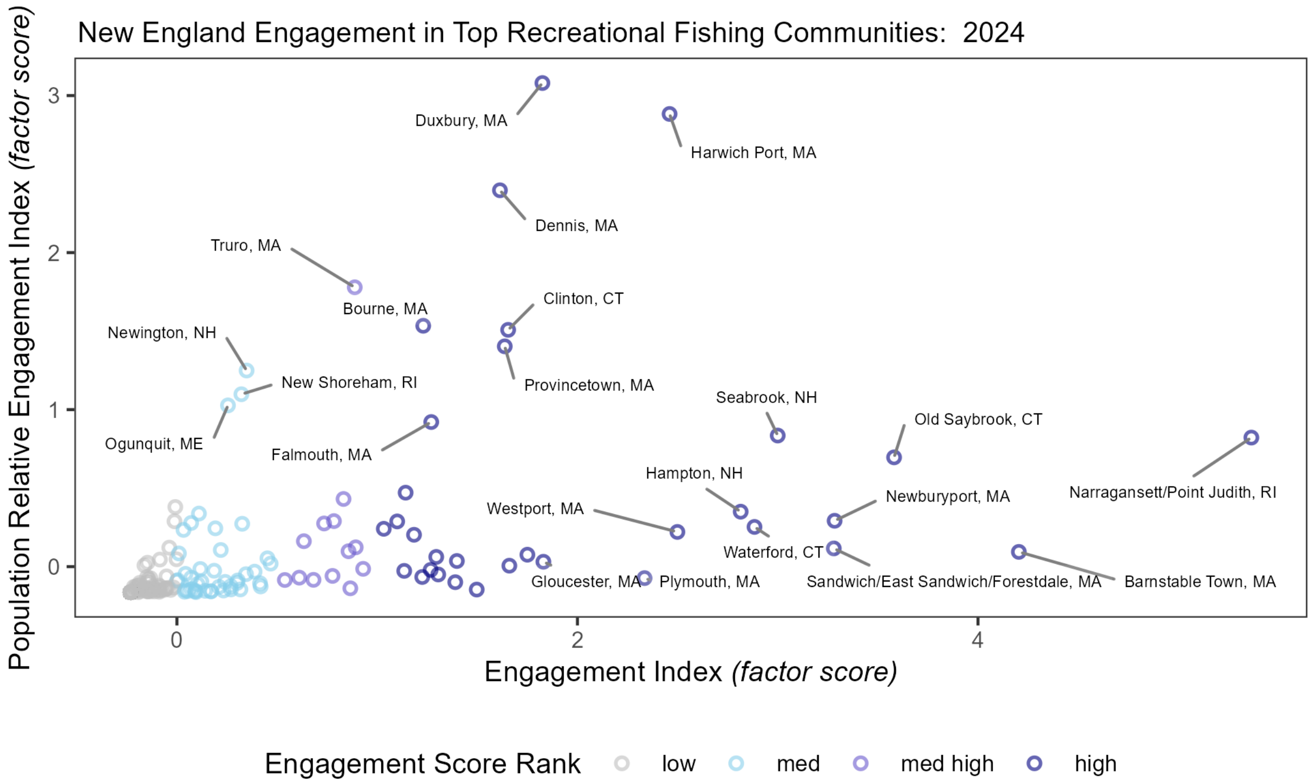

Figure 18: Recreational engagement and population relative engagement with labels for the top recreationally engaged fishing communities in New England (last updated 2023).

Table 5: Socio-demographic indicator rankings (ranging from low = low vulnerability to high = high vulnerability) for New England communities most engaged in recreational fishing, 2022. Blank spaces indicate no data available.

Community	Personal Disruption	Population Composition	Poverty
Seabrook, NH	med	low	med
Old Saybrook, CT	low	low	low
Waterford, CT	low	low	low
Harwich Port, MA	low	low	low
Newburyport, MA	low	low	low
Barnstable Town, MA	low	low	low
Sandwich/East Sandwich/Forestdale, MA	low	low	low
Westport, MA	low	low	low
Hampton, NH	low	low	low
Narragansett/Point Judith, RI	low	low	low

Indicators: Community Environmental Variability Risk in New England

Community Environmental Variability Risk Indicators (CEVRI) measure risk by linking commercial landings and revenue to specific climate sensitivity factors, including temperature, ocean acidification, and stock status using the Climate Vulnerability Assessment (CVA) scores (based on Hare et al. 2016). These indicators calculate total sensitivity and vulnerability scores based on a community's dependence on species vulnerable to climate change. Risk scores range from low (1) to high (4), increasing as a community relies more heavily on species at higher risk from environmental shifts.While there is no long-term trend in risk across New England communities, the proportion of communities with moderate risk is decreasing and shifting more towards high or very high risk scores (Fig. 19). This shift demonstrates that regional communities are increasing their dependence on species that are highly vulnerable to changing ocean conditions for their commercial revenue. Strategies for management should account for this increased reliance on climate-sensitive stocks.

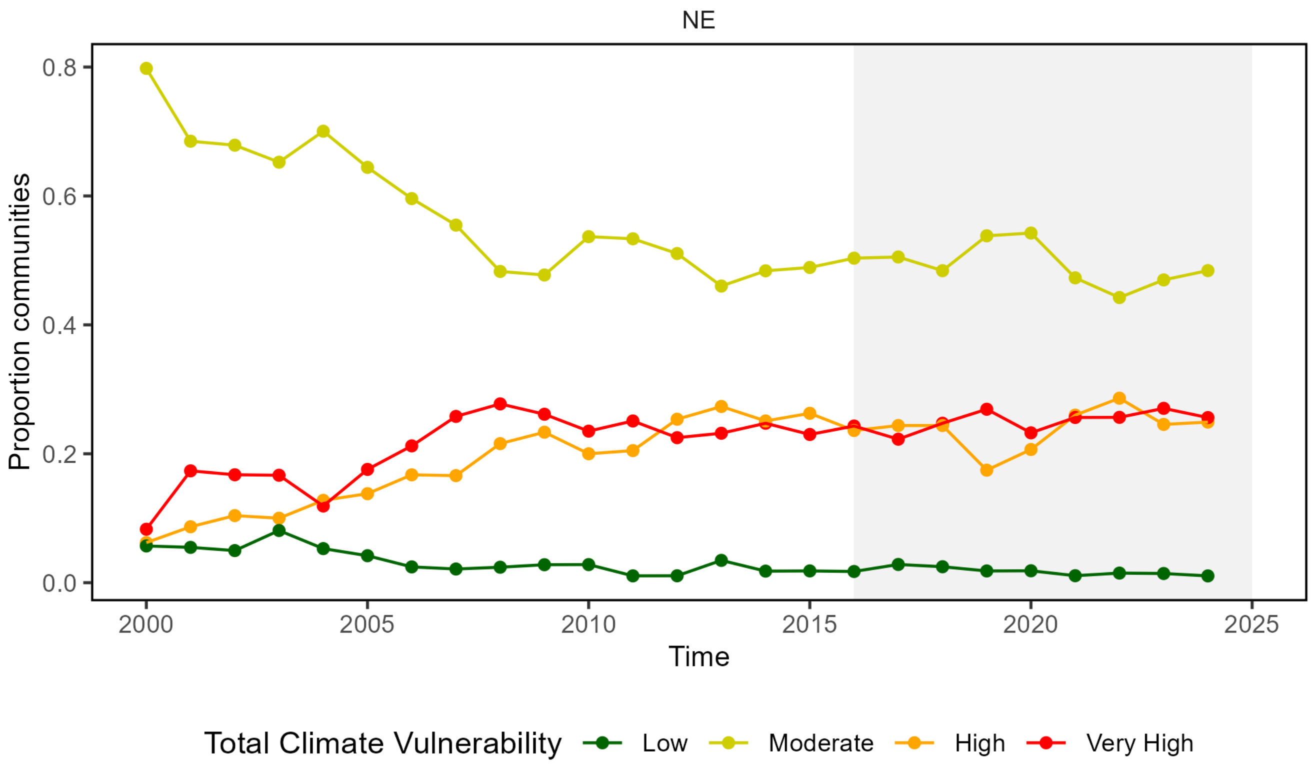

Figure 19: Proportion of New England communities at each revenue climate vulnerability level over time. Total climate vulnerability ranges from low (green), moderate (yellow), high (orange), to very high (red).

Implications

Social and demographic indicators highlight potential vulnerabilities in New England's most active commercial fishing ports. Industry participants in these locations face increased risk from shifting fishing patterns, whether driven by new regulations or broader ecosystem changes. Because many of these primary communities show medium to high socio-demographic risk, they may lack the necessary resources to adapt effectively to industry transitions

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Protected Species

Fishery management objectives for protected species generally focus on reducing threats and on habitat conservation/restoration. Protected species include marine mammals protected under the Marine Mammal Protection Act, endangered and threatened species protected under the Endangered Species Act, and migratory birds protected under the Migratory Bird Treaty Act. In the Northeast U.S., endangered/threatened species include Atlantic salmon, Atlantic and shortnose sturgeon, all sea turtle species, giant manta ray, oceanic whitetip shark, and five baleen whales. Protected species objectives include managing bycatch to remain below potential biological removal (PBR) thresholds, recovering endangered populations, and monitoring unusual mortality events (UMEs). Here we report on performance relative to these objectives with available indicator data, as well as indicating the potential for future interactions driven by observed and predicted ecosystem changes in the Northeast U.S.

Indicators: bycatch, population (adult and juvenile) numbers, mortalities

The management objective for harbor porpoise has been met, as the average index (Fig. 20) remains below the current PBR threshold.

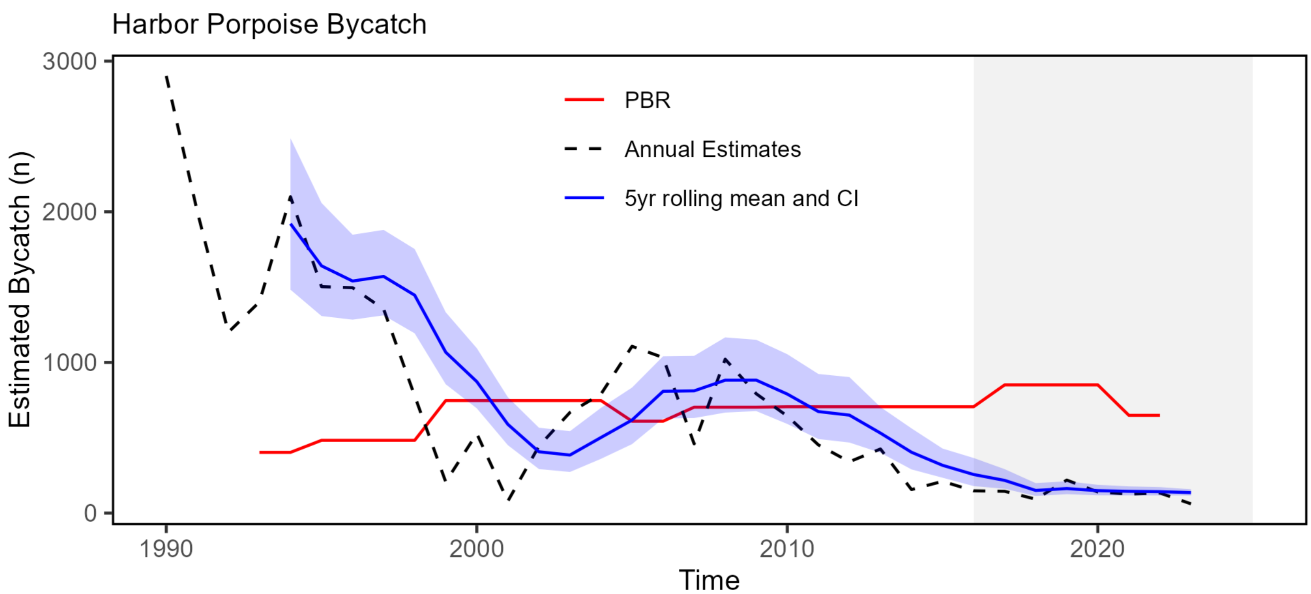

Figure 20: Harbor porpoise average bycatch estimate for Mid-Atlantic and New England gillnet fisheries (blue, confidence interval shaded) and the potential biological removal (red). The dashed line (black) represents the annual estimated bycatch.

The annual estimate for gray seal bycatch, most of which occurs in New England, has generally declined since 2019, in part driven by declining gillnet landings. In addition, estimates since 2019 have greater uncertainty stemming from low observer coverage in some times and areas. The U.S. and Canadian range-wide PBR for gray seals is 12,052. Despite the PBR for the portion of this stock in U.S. waters being reduced to 756 animals bycatch (Fig. 21) due to incomplete data on anthropogenic mortality and serious injury, the range-wide mortality and serious injuries are still considered unlikely to exceed the range-wide PBR and thus the management objective has been met.

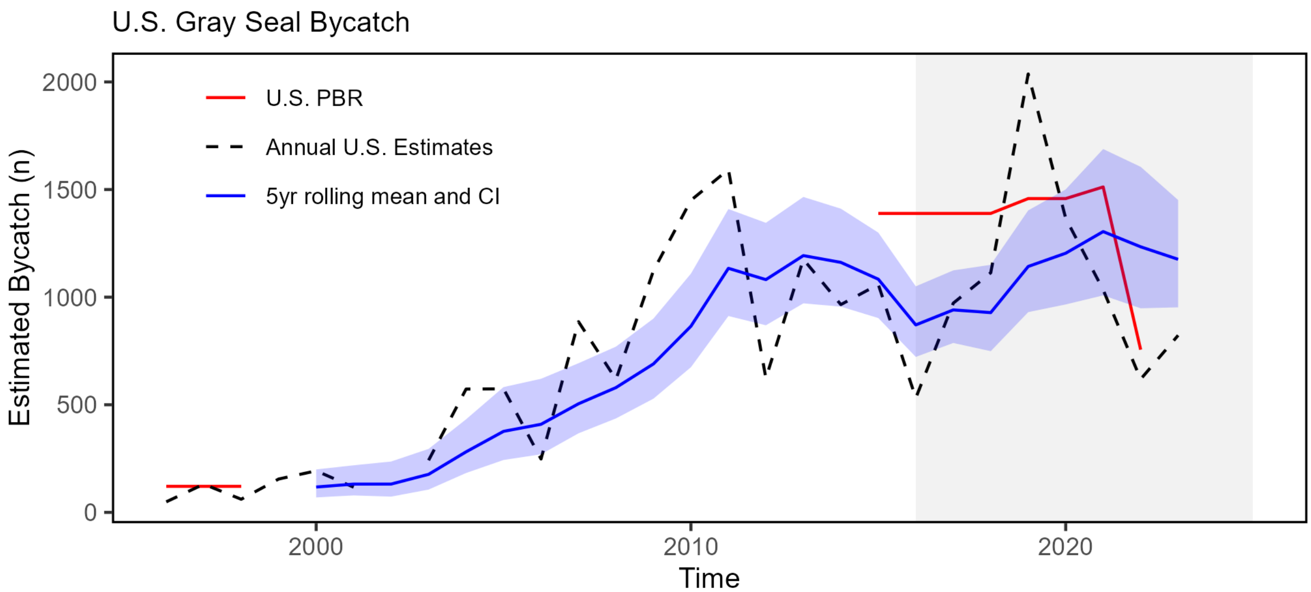

Figure 21: Gray seal five-year average bycatch estimate for New England and Mid-Atlantic U.S. gillnet fisheries (blue, with confidence interval shaded) and the potential U.S. biological removal (red). The range-wide PBR, including both U.S. and Canadian portions of the population, is 12,052 in the draft 2024 SAR.The dashed line (black) represents the annual estimated bycatch.

The North Atlantic right whale population was on a recovery trajectory until 2010, but has since declined (Fig. 22). The sharp decline observed from 2015-2020 appears to have slowed, although the right whale population continues to experience annual mortalities above recovery thresholds. Reduced survival rates of adult females lead to diverging abundance trends between sexes. It is estimated that there are fewer than 70 adult females remaining in the population.

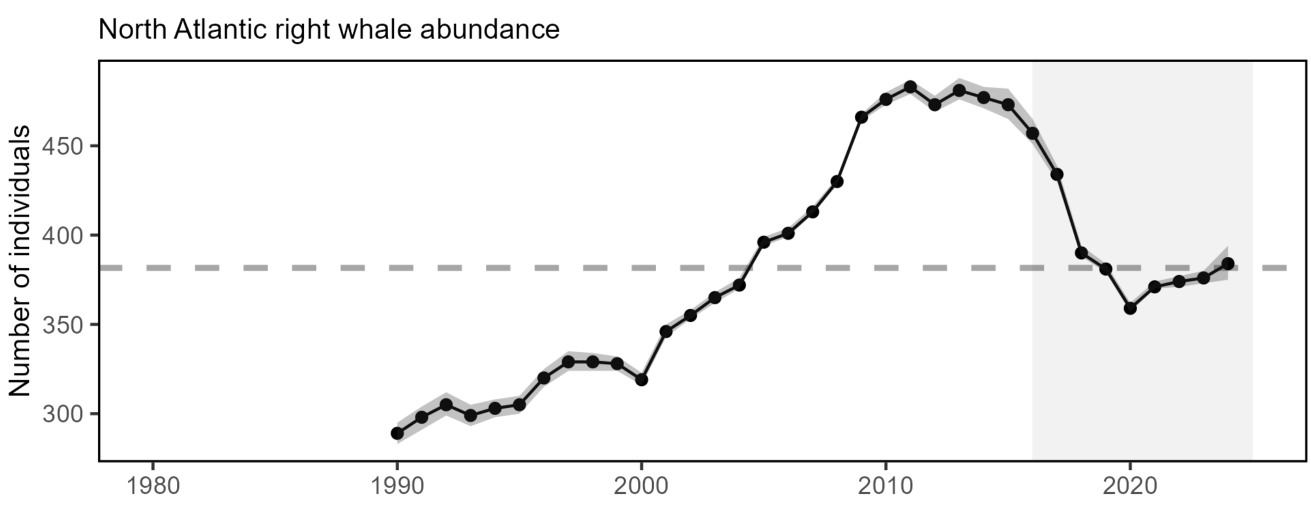

Figure 22: Estimated North Atlantic right whale abundance on the Northeast Shelf. 95% confidence interval shaded in gray around the line. Analysis is based on methods by Pace, Corkeron, and Kraus (2017), as documented most recently by Linden (2025).

North Atlantic right whale calf counts have generally declined after 2009 to the point of having zero new calves observed in 2018 (Fig. 23). However, since 2020, calf births have been closer to the long-term average, with 11 calves born in 2025.

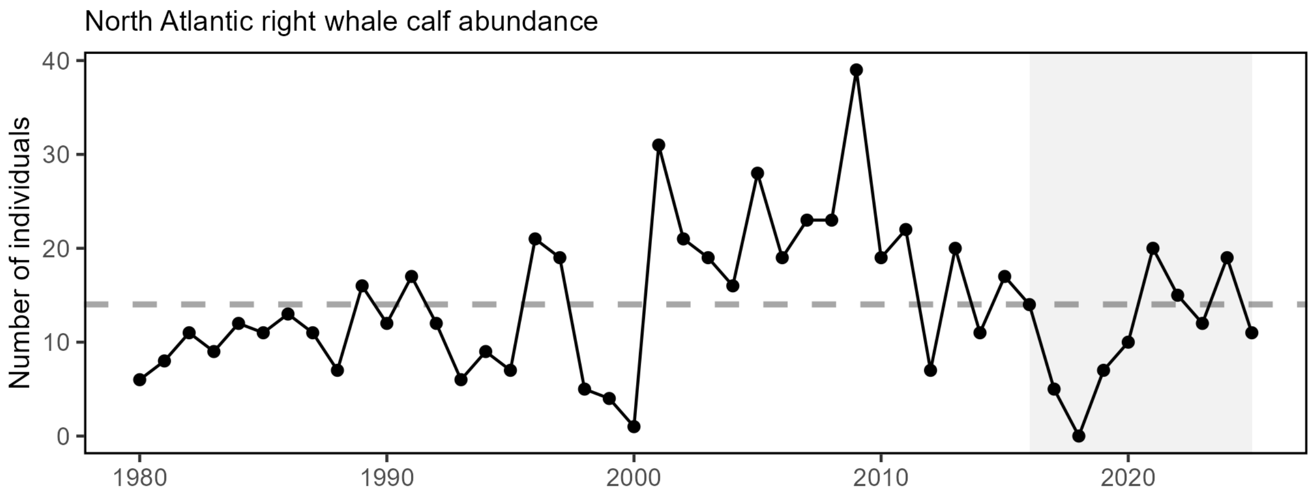

Figure 23: Number of North Atlantic right whale calf births since 1980. Calf birth estimates are available in Linden (2025).

This year, the Unusual Mortality Event (UME) for North Atlantic right whales continued. From 2017 through 5 January 2026, the total UME right whale mortalities includes 41 dead stranded whales, 19 in the US and 22 in Canada. When alive but seriously injured whales (40) and sublethal injuries or ill whales (87) are taken into account, 168 individual whales are included in the UME. Recent research suggests that many mortalities go unobserved and the true number of mortalities are about three times the count of the observed mortalities. The primary cause of death is "human interaction" from entanglements or vessel strikes.

A UME continues from previous years for humpback whales (2016-present) and Atlantic minke whales (2018-present); suspected causes include human interactions. A UME for Northeast pinnipeds that began in 2018 for infectious disease is non-active pending closure as of February 2026.

Implications

Bycatch management measures have been implemented to maintain bycatch below PBR thresholds. The downward trend in harbor porpoise bycatch could also be due to a decrease in harbor porpoise abundance in U.S. waters, reducing their overlap with fisheries, and a decrease in gillnet effort. The increasing trend in 5-year average gray seal bycatch may be related to an increase in the gray seal population (U.S. pup counts), supported by the dramatic rise over the last three decades in observed numbers of gray seal pups born at U.S. breeding sites plus an increase in adult seals at the breeding sites, some of which are supplemented by Canadian adults.

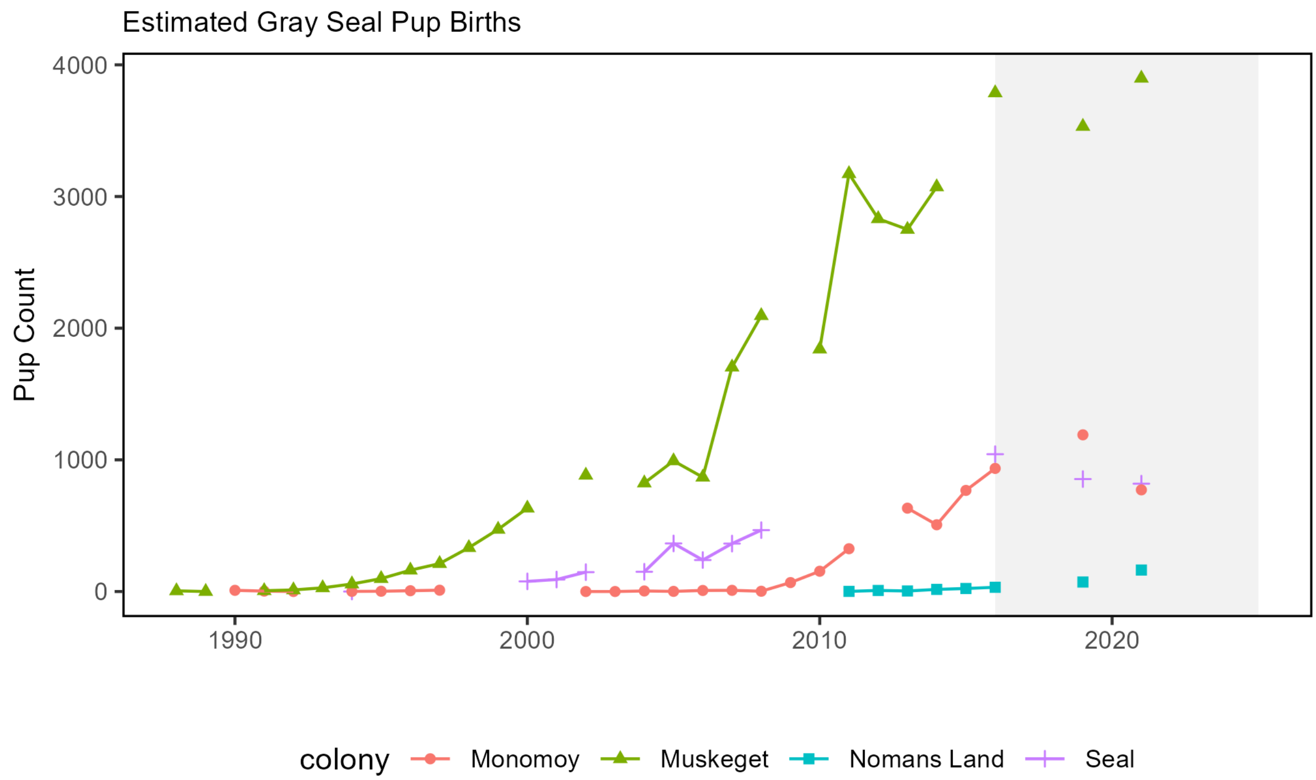

Figure 24: Estimated number of gray seal pups born at four United States pupping colonies at various times from 1988 to 2021. Recreated from Wood et al. 2022 (Figure 5).

Strong evidence exists to suggest that interactions between right whales and both the fixed gear fisheries in the U.S. and Canada and vessel strikes in the U.S. are contributing substantially to the decline of the species. Further, right whale distribution has changed since 2010. Recent research suggests that recent climate driven changes in ocean circulation have resulted in right whale distribution changes driven by increased warm water influx through the Northeast Channel, which has reduced the primary right whale prey (the copepod *Calanus finmarchicus*) in the central and eastern portions of the Gulf of Maine. 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. Additional information can be found in the offshore wind risks section.

The UMEs are under investigation and are likely the result of multiple drivers. For all large whale UMEs, human interaction appears to have contributed to increased mortalities, although investigations are not complete.

A climate vulnerability assessment is published for Atlantic and Gulf marine mammal populations.

Stability

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Fishery Stability Fisheries in Georges Bank and the Gulf of Maine are dominated by single species. Total landings are declining in both regions, although overall revenue does not have a long-term trend. Revenue from Council-managed fisheries in the GOM and GB have declined over time. However, revenue per unit effort remains steady or increasing over time for most gear types, indicating financial viability of current fishing operations. Although the effective number of species being landed in the commercial fleet rebounded slightly from the historical low of 2021, the diversity in catch is still well below the series average (Fig. **??**), indicating increasing reliance on a smaller number of species. Commercial fishery fleet count is also below the time series average due to varying barriers to enter and invest into the fleet. While some opportunity to diversify catch has allowed crew and vessel owners to continue at a sustainable rate, other barriers such as shifting species distribution and population shifts leave commercial crew and vessel owners in vulnerable positions to adapt to these changes. In Georges Bank, cyclic landings and revenue patterns are driven by scallops and decrease the predictability of earnings from year to year. In the Gulf of Maine, landings and revenue are driven by lobster. The increasing importance of lobster over time is mirrored in the decreasing contribution of Council-managed fisheries to Gulf of Maine total landings and revenue.

Results from the Crew Survey suggest many commercial fishing crews in New England are dissatisfied with the predictability of their earnings, the amount of time away from home, and the physical fatigue and personal health impacts from the job. Additionally, the survey results demonstrate evidence of aging or "graying" of the fleet in New England, which combined with a lack of new entrants to the industry suggests that participation in commercial fishing is declining across the region. Combined with the declining fleet count and declining overall landings, this suggests a reduced capacity for New England commercial fisheries to adapt to future change.

The number of recreational trips is below average, although there is no long-term trend, and recreational landings have been declining. Low recreational landings may also be driven by a shift to catch-and-release fishing and stricter shark and large sport fish regulations. Recreational effort diversity is near average with no trend and there has been no shift in angling modes, suggesting steady recreational fishing opportunities. Recreational species catch diversity has increased over time (Fig. 26), indicating that anglers are catching a more varied mix of species, likely due to shifting species distributions.

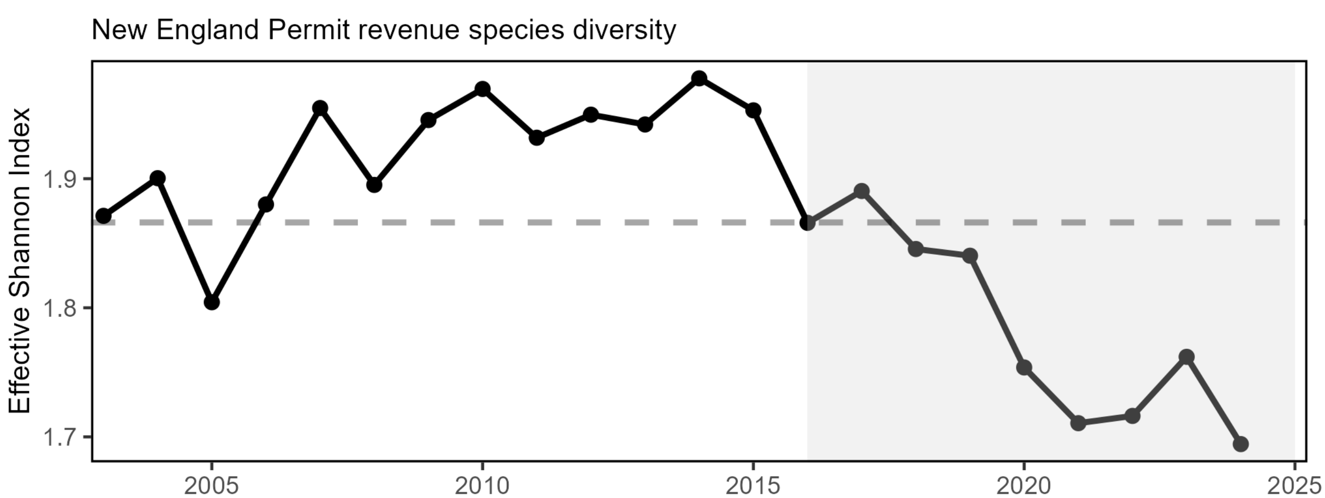


Figure 25: Species revenue diversity (permit-level species effective Shannon index) in New England.

As noted above, recreational fleet effort diversity is stable. However, recreational species catch diversity has been above the time series average since 2008 with a long-term positive trend (Fig. 26).

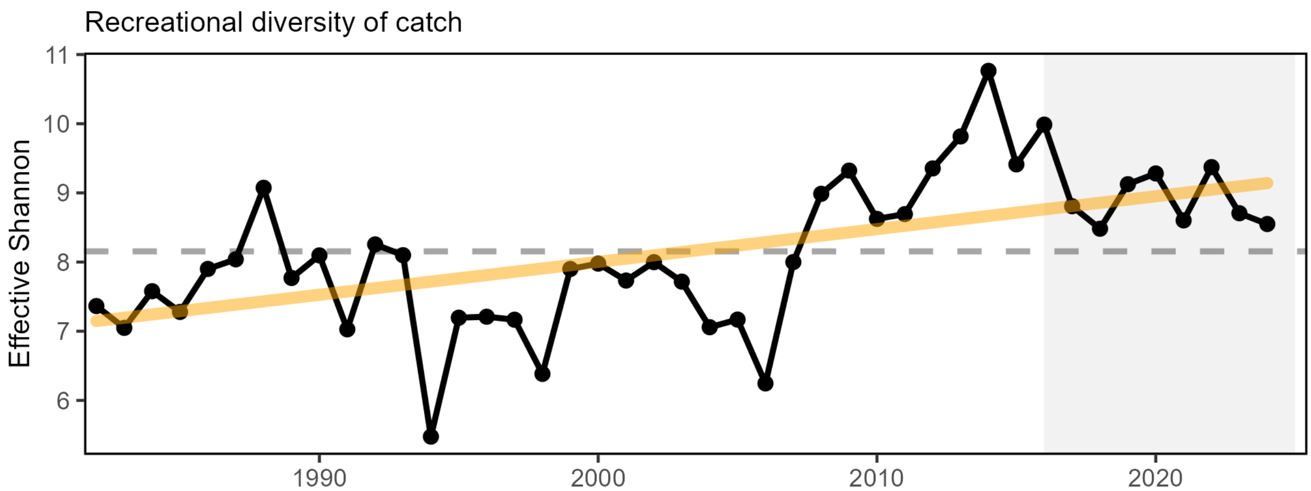


Figure 26: Diversity of recreational catch in New England, with long term increasing trend (orange). Derived from MRIP's Catch Time Series Query.

Ecological Stability Long-term changes in biological production suggest the Georges Bank ecosystem is experiencing a system-wide shift. Total annual primary production (TPP) is a measure of the total amount of carbon (i.e., energy) produced by phytoplankton per year and is variable over time. Zooplankton biomass and the biomass of some groups of fish are also increasing. However, the productivity of managed species has declined over time, suggesting that although the system remains productive, this productivity is driven by non-target species.

The Gulf of Maine has also experienced ecosystem change over time. Primary productivity has remained relatively constant over time, increases in planktivores and euphausiids suggest changing ecosystem dynamics and a possible trophic cascades. The zooplankton community displays distinct regime shifts in composition corresponding to approximately decadal time scales, with the most recent shift in community composition occurring in 2023. These shifts result in unpredictable ecosystem conditions. Productivity of managed species has declined, with current levels below average.

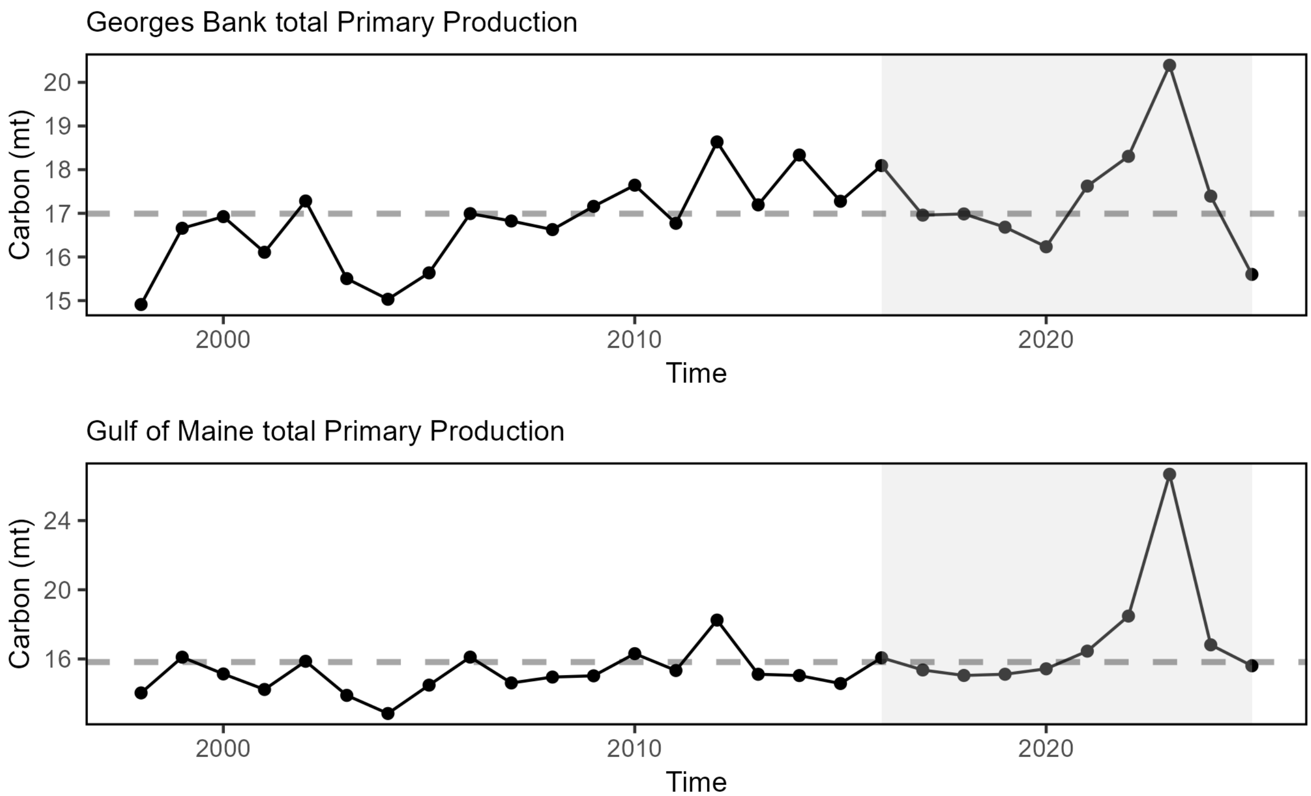


Figure 27: Total areal annual primary production by ecological production unit (Georges Bank, top; Gulf of Maine, bottom). The dashed line represents the long-term (1998-2023) annual mean.

Functional traits, such as length at maturity, maximum body size, or fecundity, serve to synthesize change in complex, diverse communities by looking beyond species-specific trends. Furthermore, shifts in functional trait distributions for the fish community can indicate changes in ecosystem-scale resilience. There is evidence for shifts in functional trait distributions in New England (Fig. 29) (Fig. 30). George's Bank (GB) displayed few long-term trends other than reductions in fecundity in both fall and spring. The Gulf of Maine (GOM) displayed long-term trends consistent with shifts towards faster life history strategies particularly in the spring finfish community, including younger age and shorter length at maturity, lower fecundity, and faster growth rate. Interestly, the spring finfish community in the GOM also displayed increases in trophic level.

Increasing Adult fish diversity (Fig. 28) and changes in functional traits such as the mean trophic level suggest that fish communities have changed from a historic baseline. Long-term trends in biomass and functional traits would not be expected in a stable system. However, because the biomass of functional groups of fish has remained relatively constant over time, the system appears able to adapt to change.

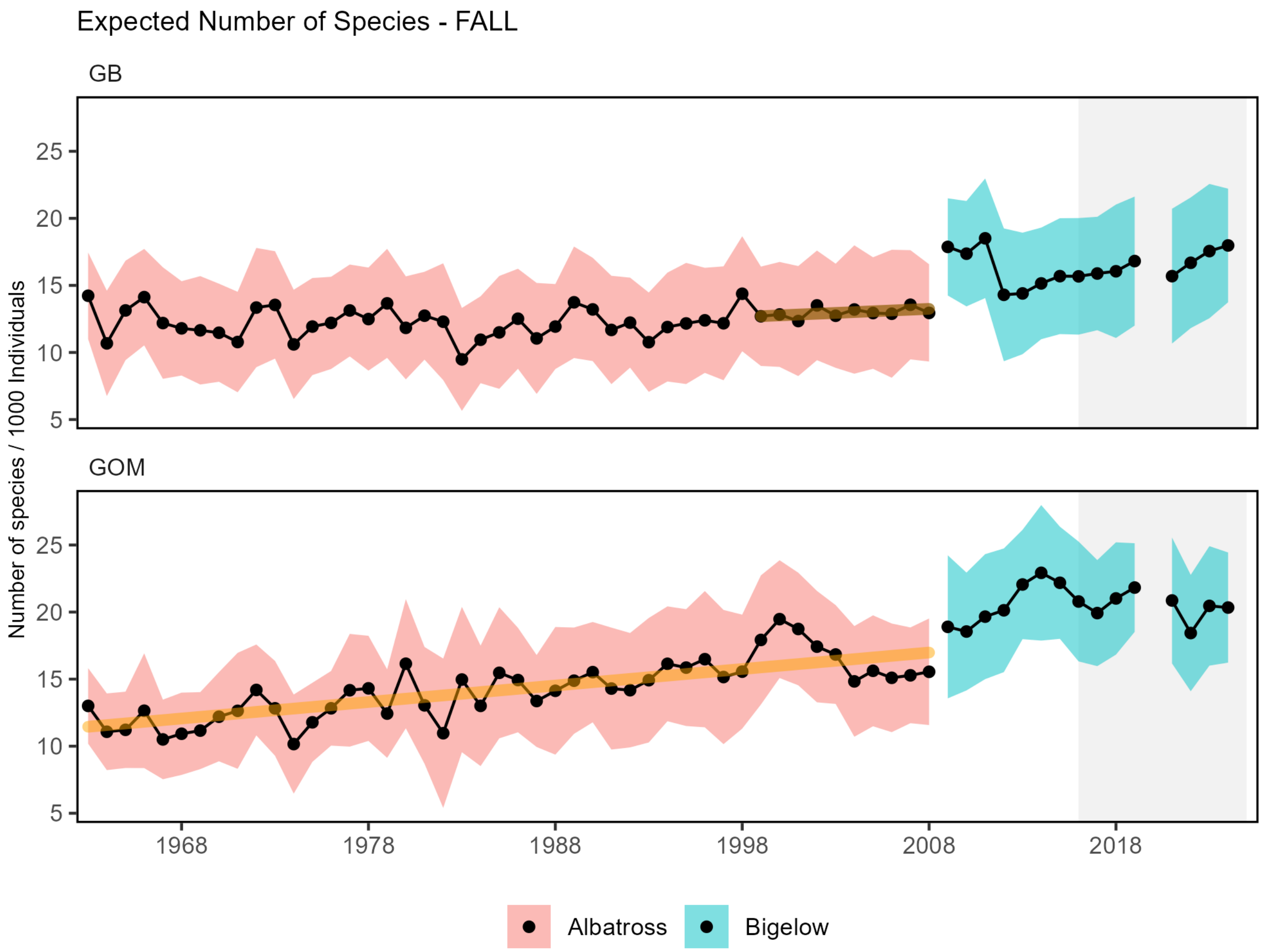
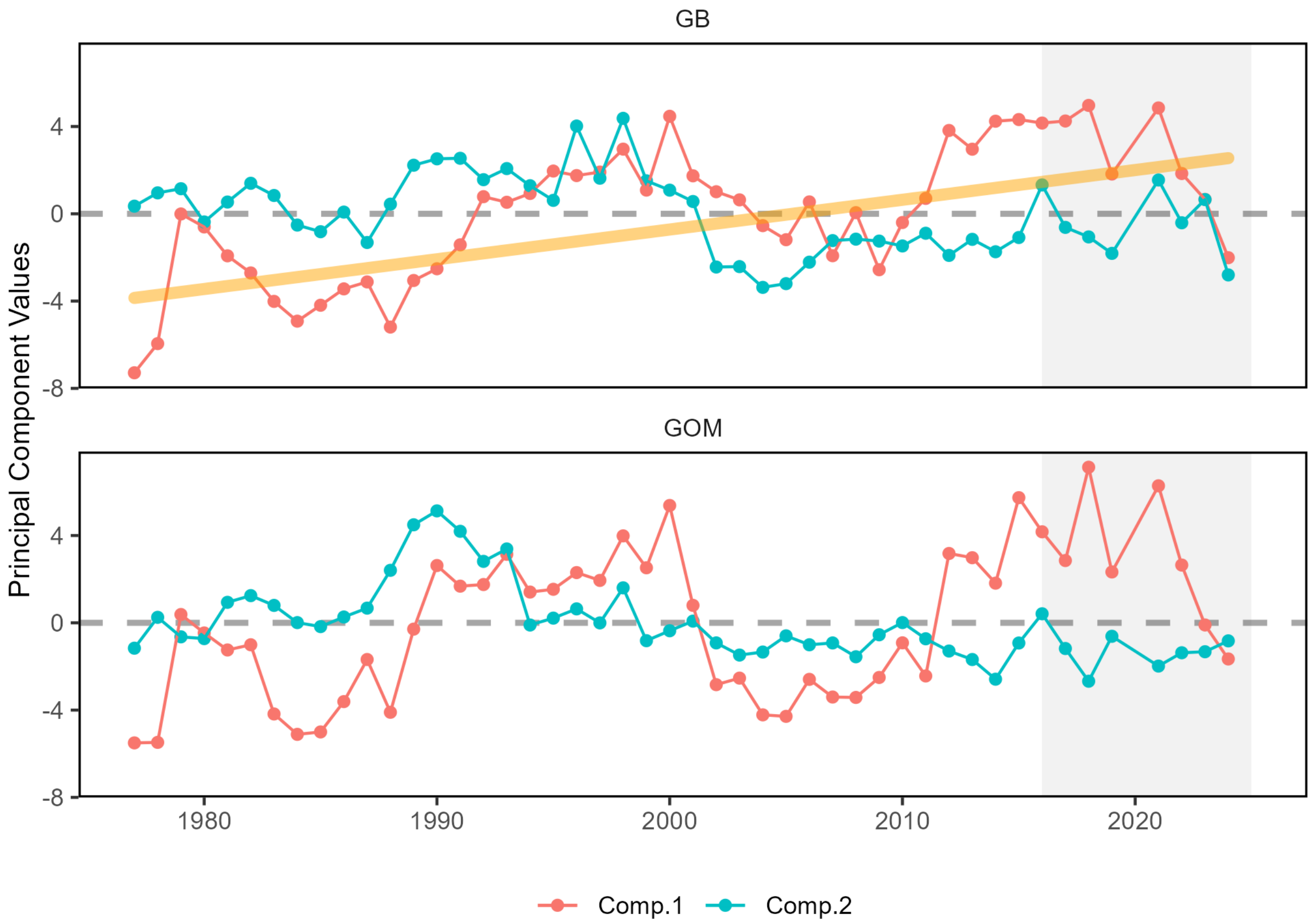


Figure 28: Adult fish diversity for Georges Bank (top) and in the Gulf of Maine (bottom) with long-term (light orange) and short-term (dark orange) increasing trends, based on expected number of species in a standard number of individuals. Results from survey vessels Albatross (red) and Bigelow (blue) are reported separately due to catchability differences.


GB
GOM
Principal Component Values
4
0
-4
-8
1980
1990
2000
2010
2020
Comp.1
Comp.2

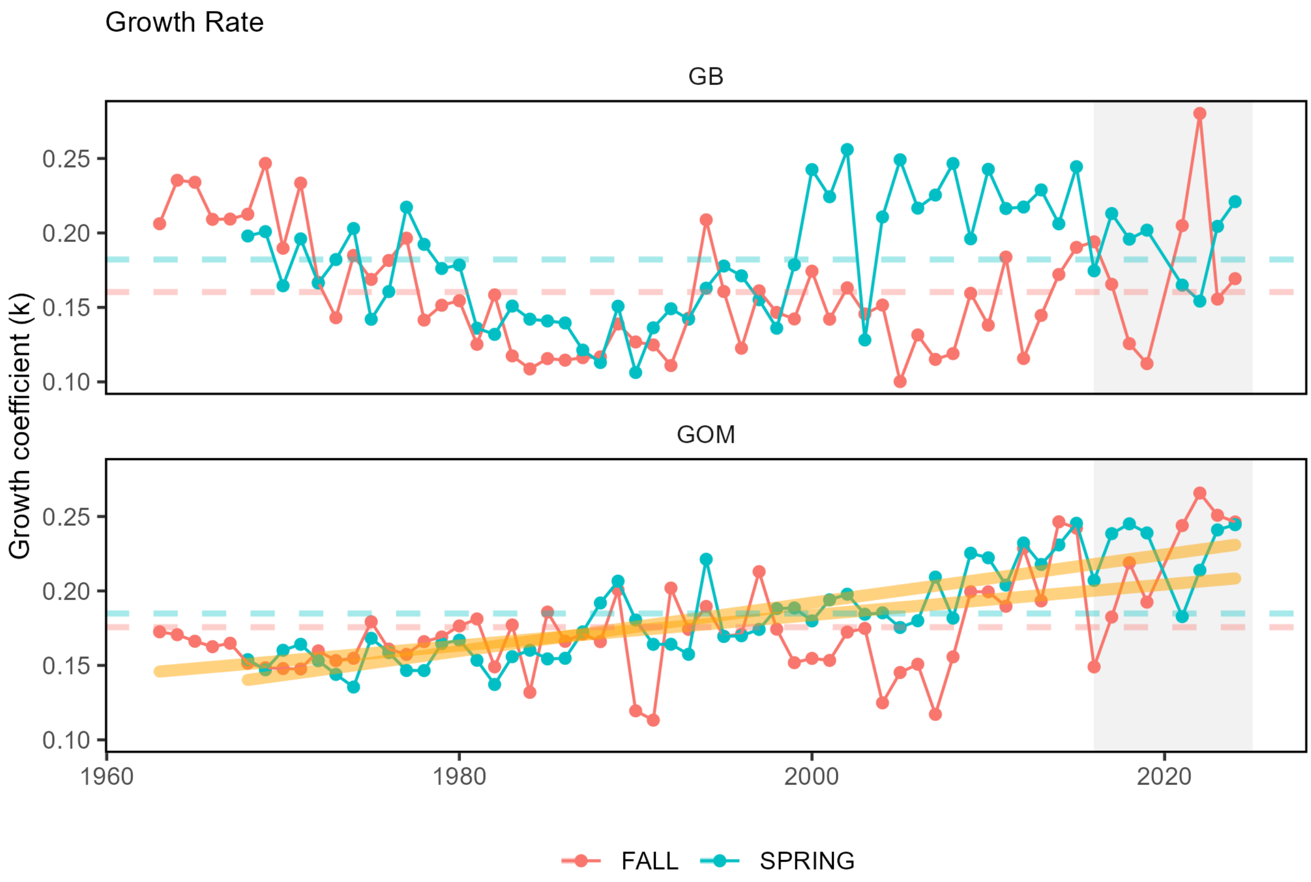


Figure 29: Fish community functional traits (growth rate) in New England based on Fall (red) and Spring (blue) survey data.

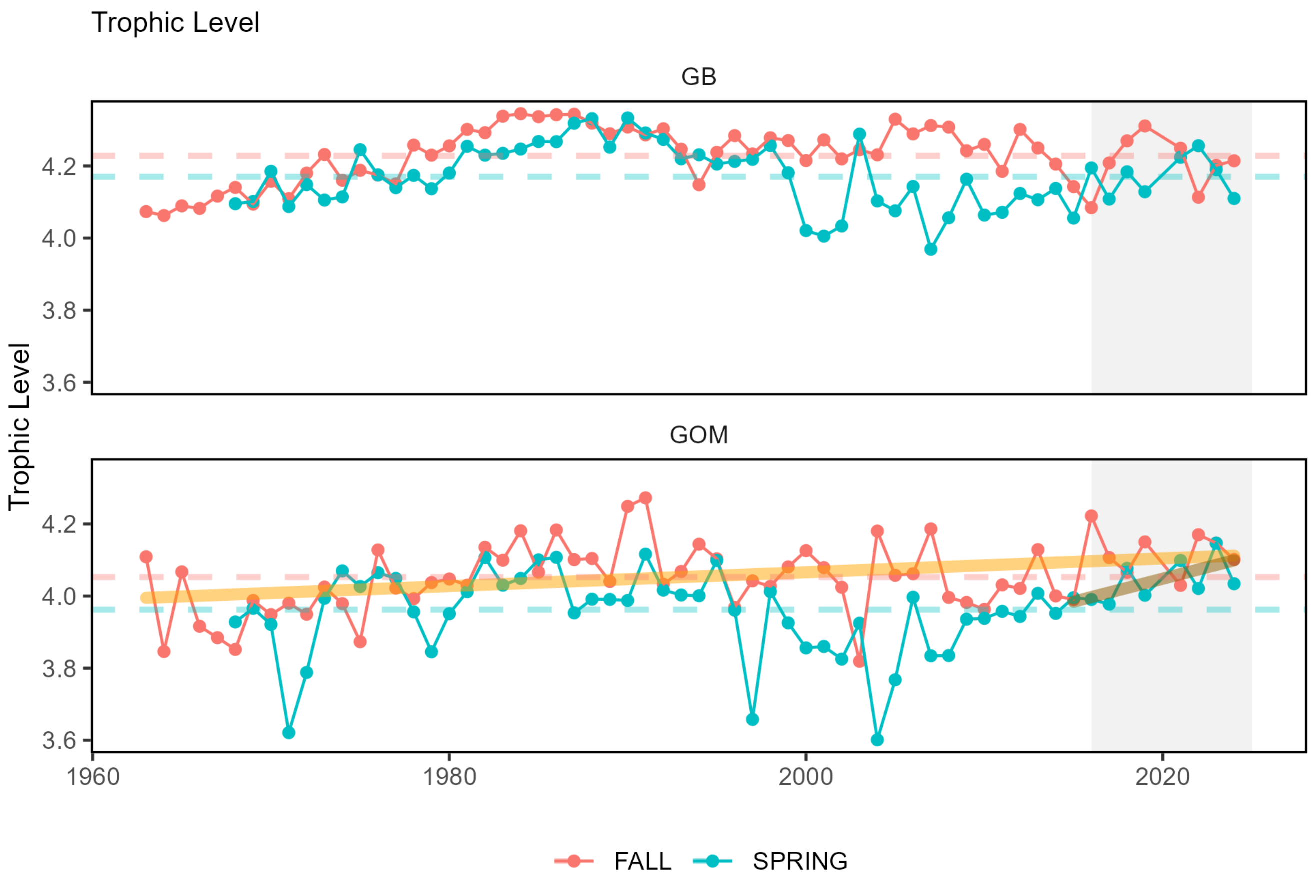


Figure 30: Fish community functional traits (trophic level) in New England based on Fall (red) and Spring (blue) survey data.

Implications

The long-term changes in GB suggest an increasingly productive ecosystem from the base of the food web to higher trophic levels, but this is occurring simultaneously with low productivity of managed species. Over the same time period, fisheries on GB have experienced cyclic changes in revenue and increased reliance on a single species, sea scallops. Coupled with demographic changes in fisher populations and a decline in the number of New England fleets, this indicates that fisheries utilizing GB may have a lower capacity to adapt to the changing ecosystem. This lower adaptive capacity with a significant shift from baseline conditions in the ecosystem indicate that both the fishery and ecosystem are currently not stable.

Within the GOM, managed species continue to have low productivity, while there are long-term increases in large zooplankton and planktivores. Cyclic changes in zooplankton communities may make the impact of these changes unpredictable. As these changes in the ecosystem occur, an increasing proportion of total revenue is generated by the lobster fishery. This increased reliance on a single species reduces the regions' ability to adapt to changes in resource availability and the environment. For these reasons both the GOM ecosystem and its fisheries are considered not stable.

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Risks to Meeting Fishery Management Objectives

Climate and Ecosystem Change

Risks to managing spatially

Shifting species distributions, or (changes in spatial extent or center of distribution), alter both species and fishery interactions. In particular, shifting species distributions can affect expected management outcomes when spatial allocations and bycatch measures are based on historical fish and protected species distributions. Species availability to surveys can also change as distributions shift within survey footprints, complicating the interpretation of survey trends.

Coastwide indicators are reviewed in this section to evaluate spatial change throughout the Northeast US shelf. Indicators are identical between the Mid-Atlantic and New England reports.

Indicators: Fish and protected species distribution shifts As noted in the Seafood Production Implications section, the combined center of distribution for 48 Northeast Shelf commercially or ecologically important fish species continues to show movement towards the northeast and generally into deeper water (Fig. 31). An analysis of recreational landings data from 2002 to 2019 found evidence of distribution shifts for several highly migratory species, including sharks, billfish and tunas.

Habitat model-based species richness suggests shifts of both cooler and warmer water species to the northeast. Similar patterns have been found for marine mammals, with multiple species shifting northeast between 2010 and 2017 in most seasons (Fig. 32).

Megabenthos center of gravity shows a short-term northward and eastward trend in spring (Fig. **??**). Megabenthos are large, non-federally-managed benthic invertebrates sampled by scallop dredge, otter trawl, and the Campbell grab. These include crabs, decapods, and sea stars, which are often prey for many managed species.

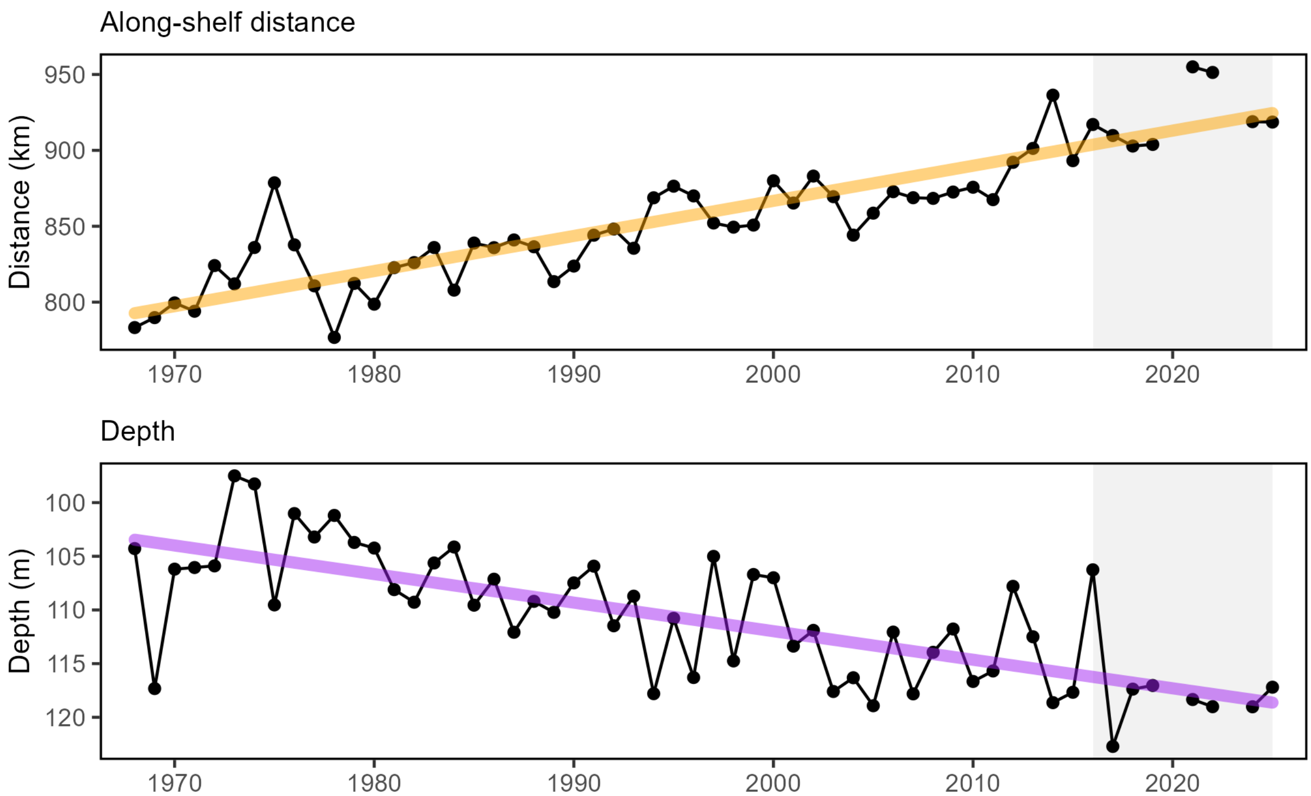


Figure 31: Aggregate species distribution metrics for species in the Northeast Large Marine Ecosystem: along shelf distance with increasing trend (orange), and depth with decreasing trend indicating deeper water (purple).

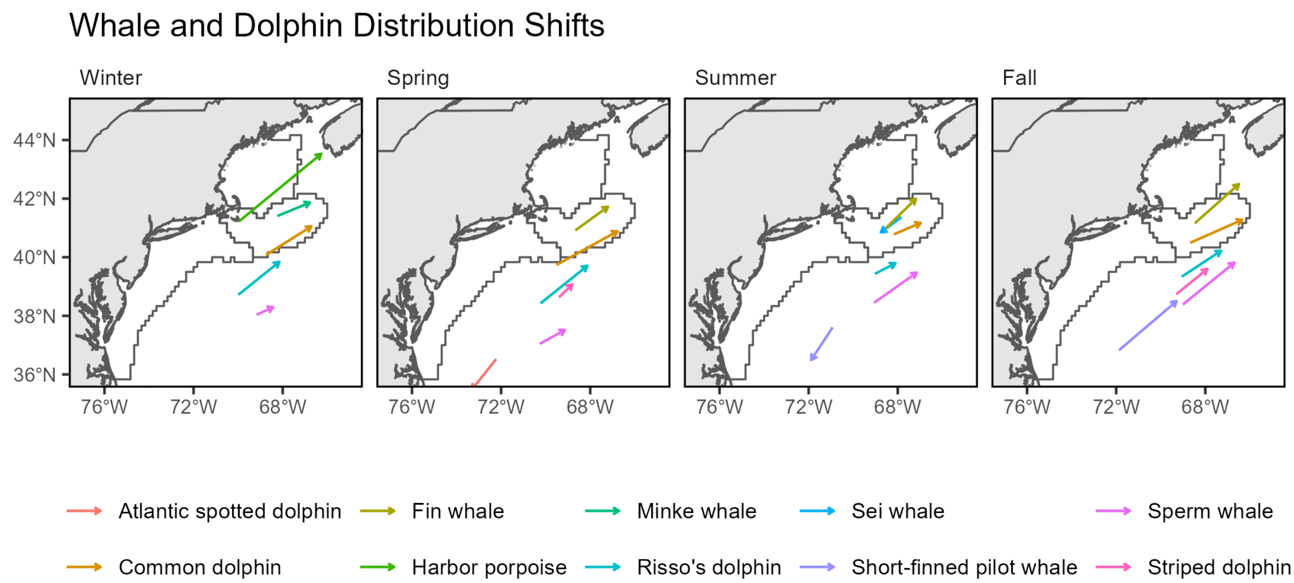
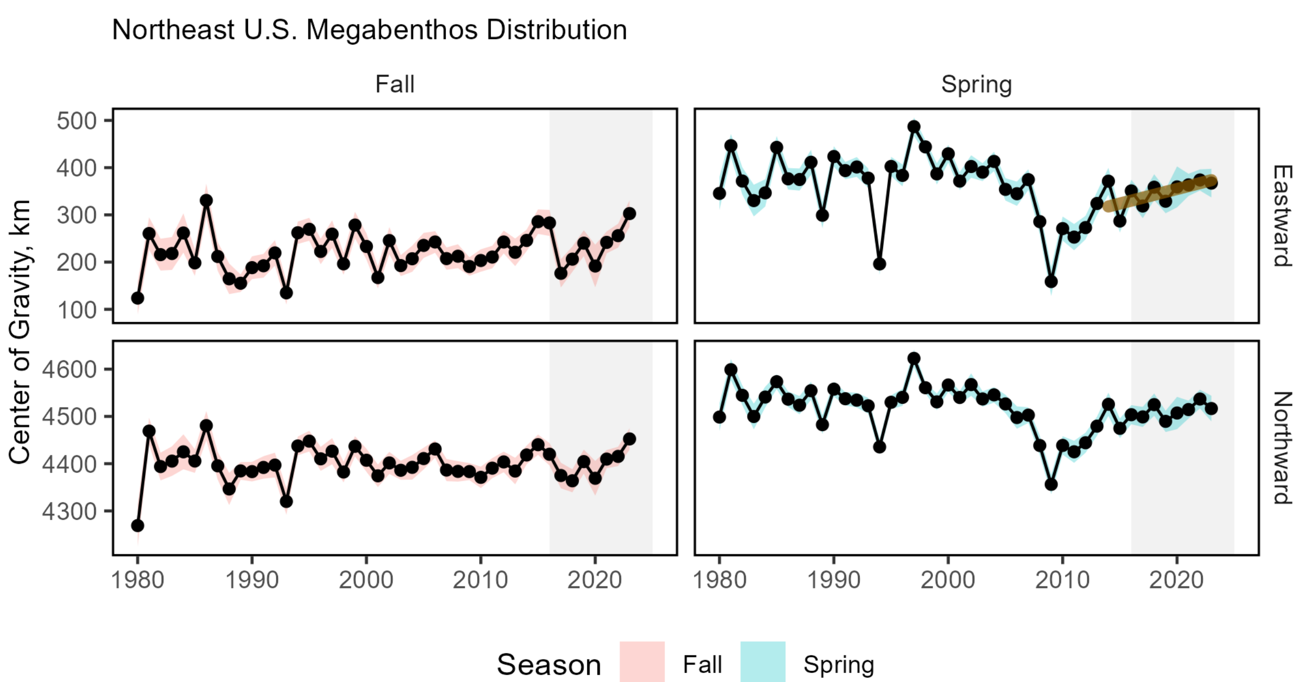


Figure 32: Direction and magnitude of core habitat shifts, represented by the length of the line of the seasonal weighted centroid for species with more than 70 km difference between 2010 and 2017 (tip of arrow).



Drivers: Mobile populations shift distributions to maintain suitable habitat and prey fields, possibly expanding ranges if new suitable habitat exists. Changes in managed species distribution is partially related to the distribution of forage biomass. Since 1982, the fall center of gravity of forage fish (20 species combined) has moved to the north and east (Fig. 34). Spring forage fish center of gravity has moved northward but without an eastward trend. Some of the whale and dolphin distribution shifts (Fig. 32) are likely in response to these forage fish shifts. Small copepods, widespread prey of many larval and juvenile fish, show a similar shift in center of gravity as forage fish, to the north and east in the fall, as well as northward in spring.

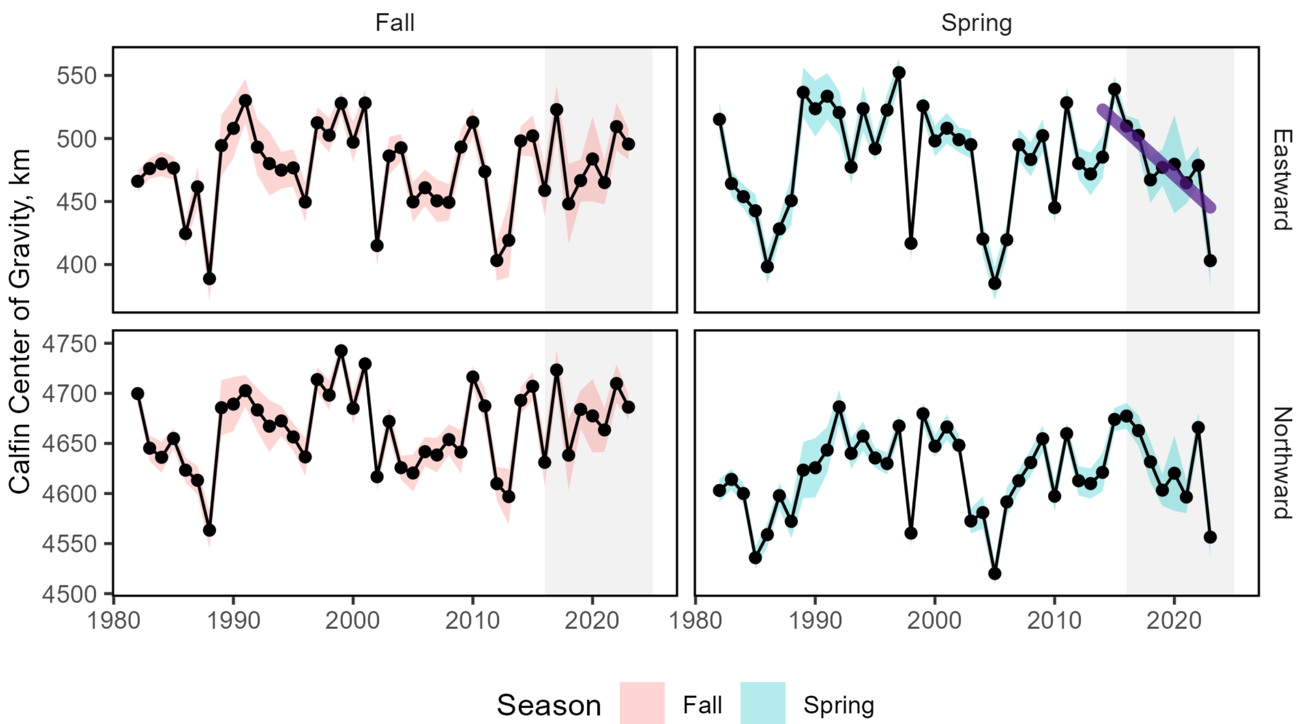


Figure 33: Eastward (left) and northward (right) shifts in the center of gravity for *Calanus finmarchicus* on the Northeast U.S. Shelf, with short-term decreasing trend (purple).

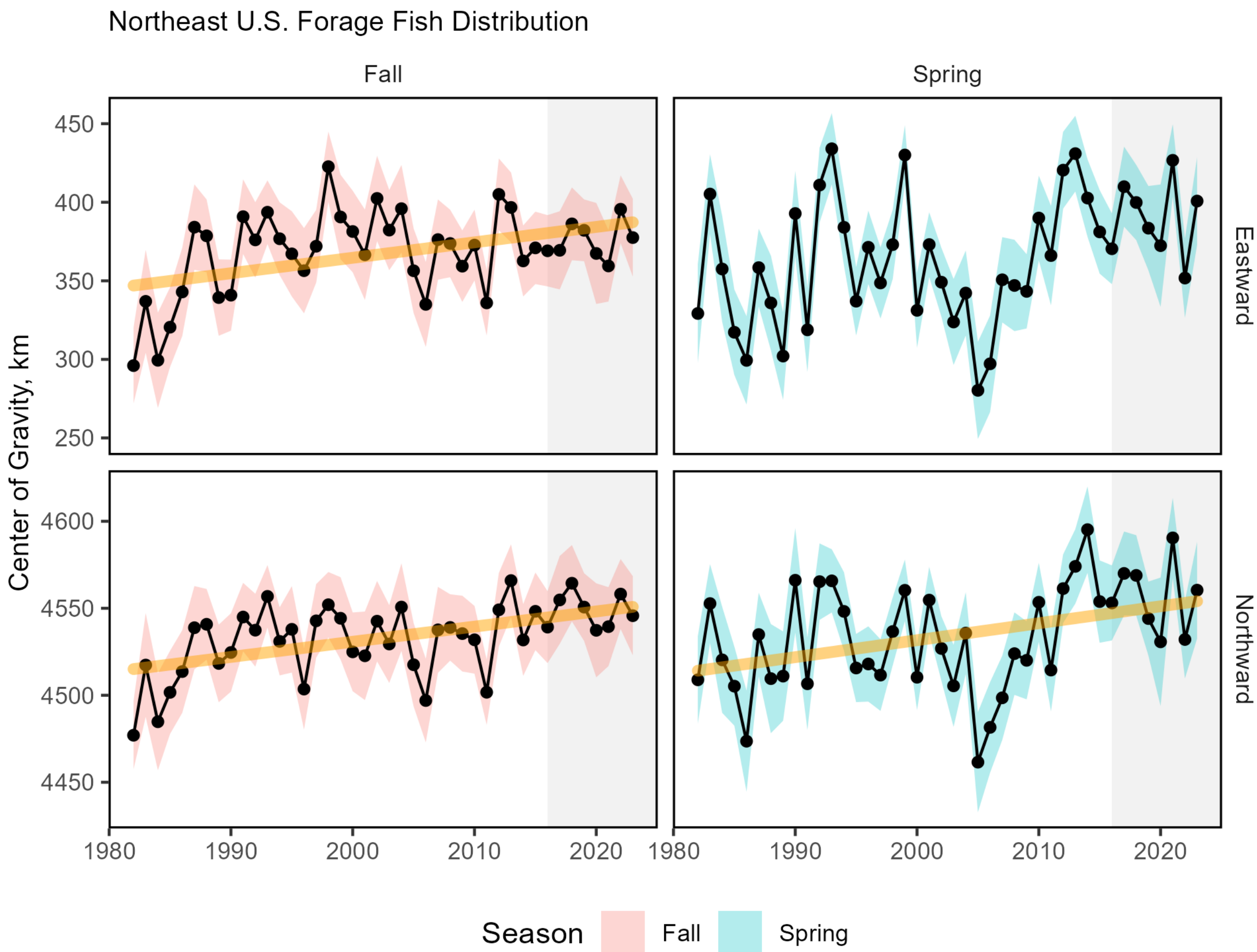


Figure 34: Eastward (top) and northward (bottom) shifts in the center of gravity for 20 forage fish species on the Northeast U.S. Shelf in fall (left) and spring (right), with increasing trend (orange) for fall eastward and northward and spring northward center of gravity.

In contrast, macrobenthos center of gravity has shifted west and south in the spring (Fig. 35). Macrobenthos are small bottom-dwelling invertebrates including polychaete worms, small crustaceans, bivalves (non-commercial), gastropods, nemerteans, tunicates, cnidarians, brittle stars, sea cucumbers, and sand dollars, and are prey for many managed species. Large copepods (including *Calanus finmarchicus*) and euphausiids do not have long-term trends in their centers of gravity (Fig. XX), but small copepods show shifts eastward and northward. Some targeted species distributions may shift in response to these shifts in forage, copepod, and macrobenthos distributions.

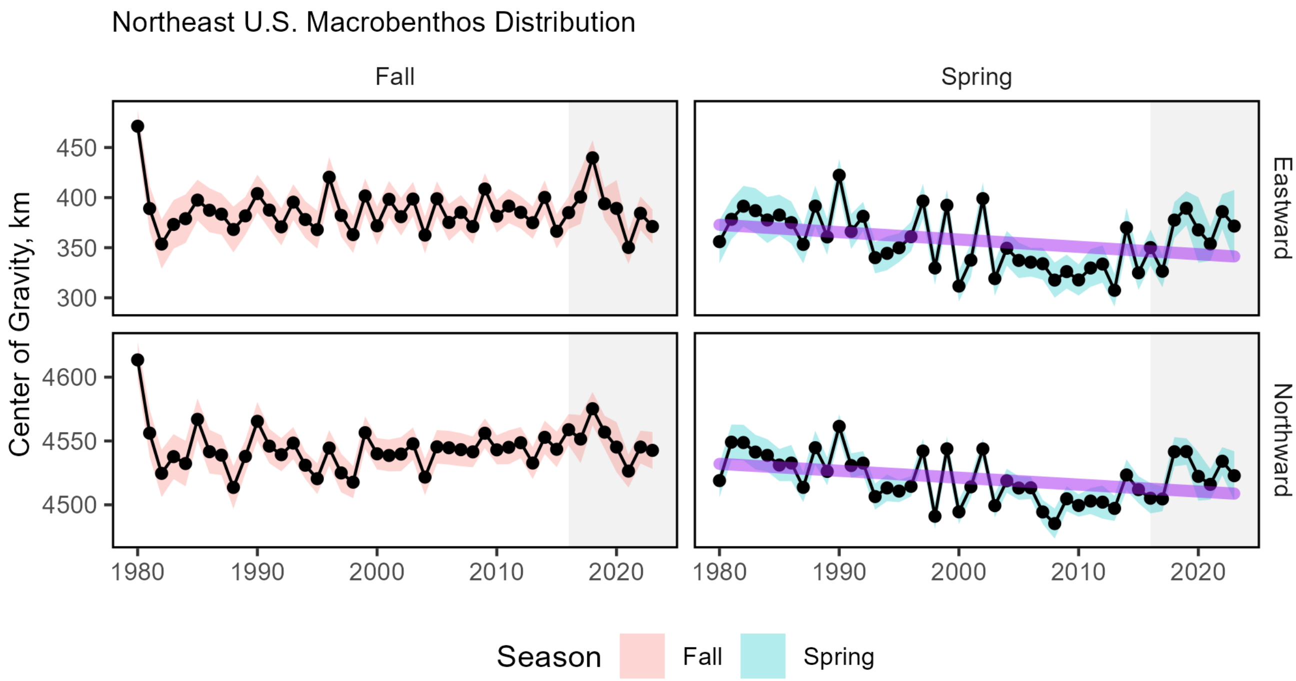
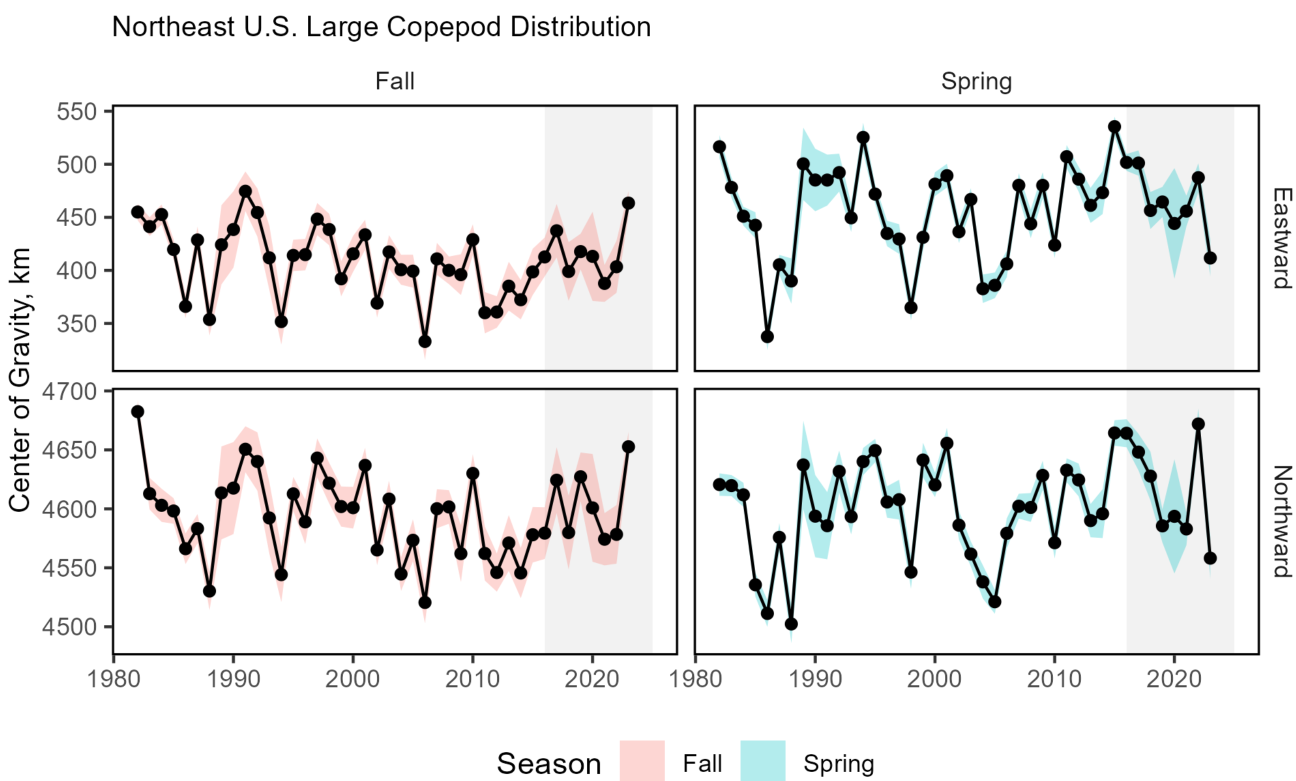
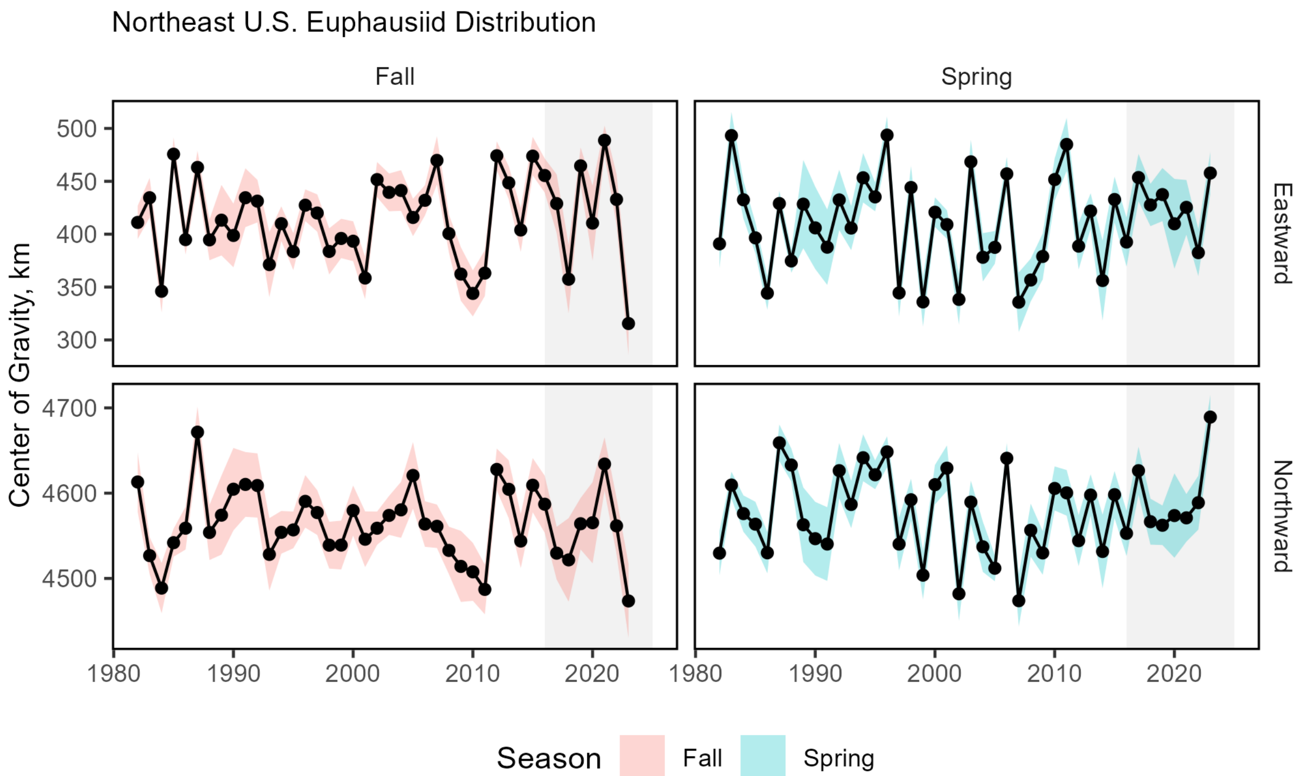


Figure 35: Eastward (top) and northward (bottom) shifts in the center of gravity for macrobenthos species on the Northeast U.S. Shelf in fall (left) and spring (right), with decreasing trend (purple) for spring eastward and northward center of gravity.





Ocean temperatures influence the distribution, seasonal timing, and productivity of managed species (see sections below). The Northeast US shelf, including the Mid-Atlantic, has experienced a continued warming trend for both the long term annual sea surface (Fig. 38) and seasonal surface and bottom temperature. However, 2025 surface and bottom temperatures were near normal to cooler than normal conditions in all seasons in the MAB (see also the 2025 Highlights section).

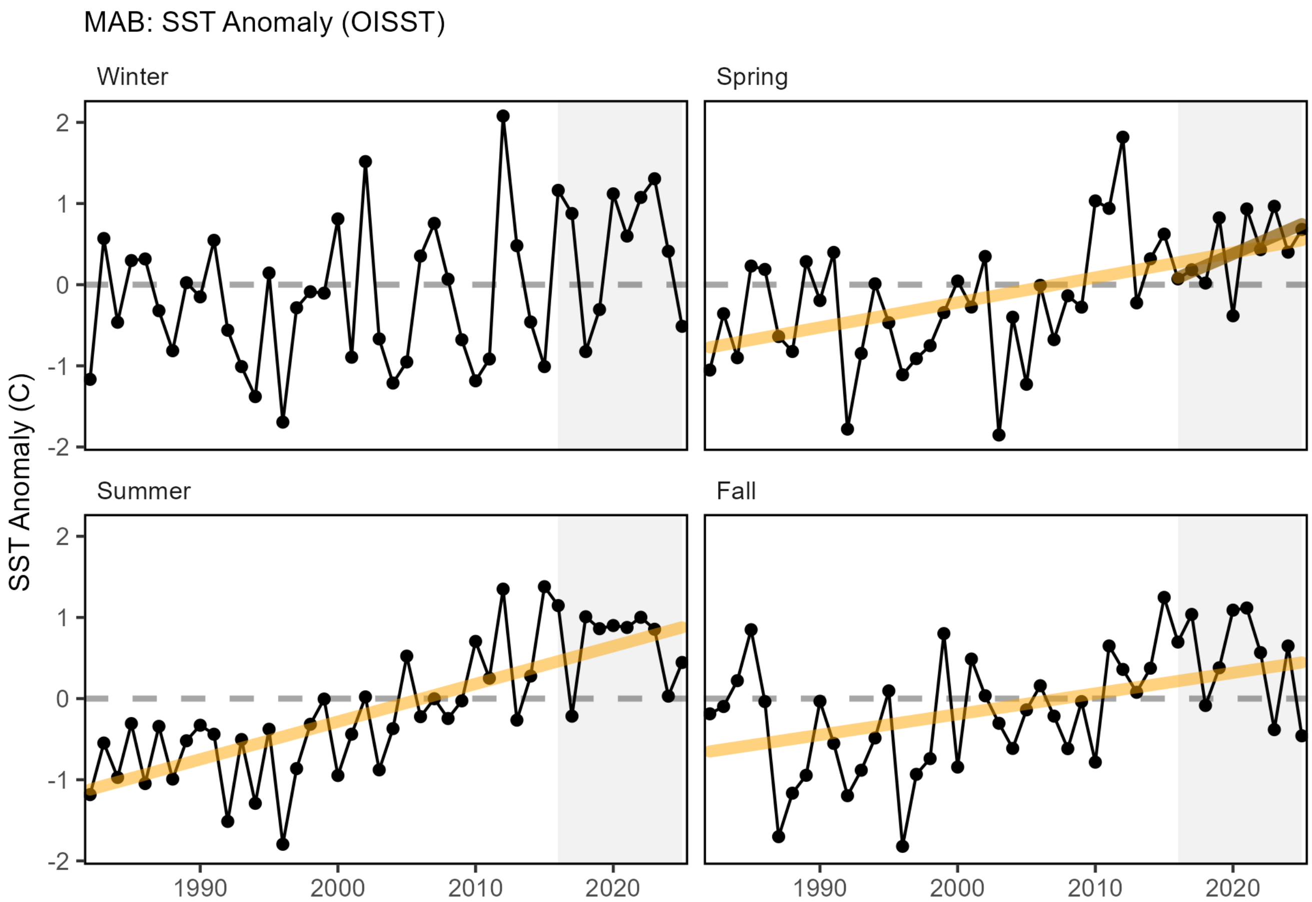


Figure 36: Seasonal OISST anomaly by season for the MAB

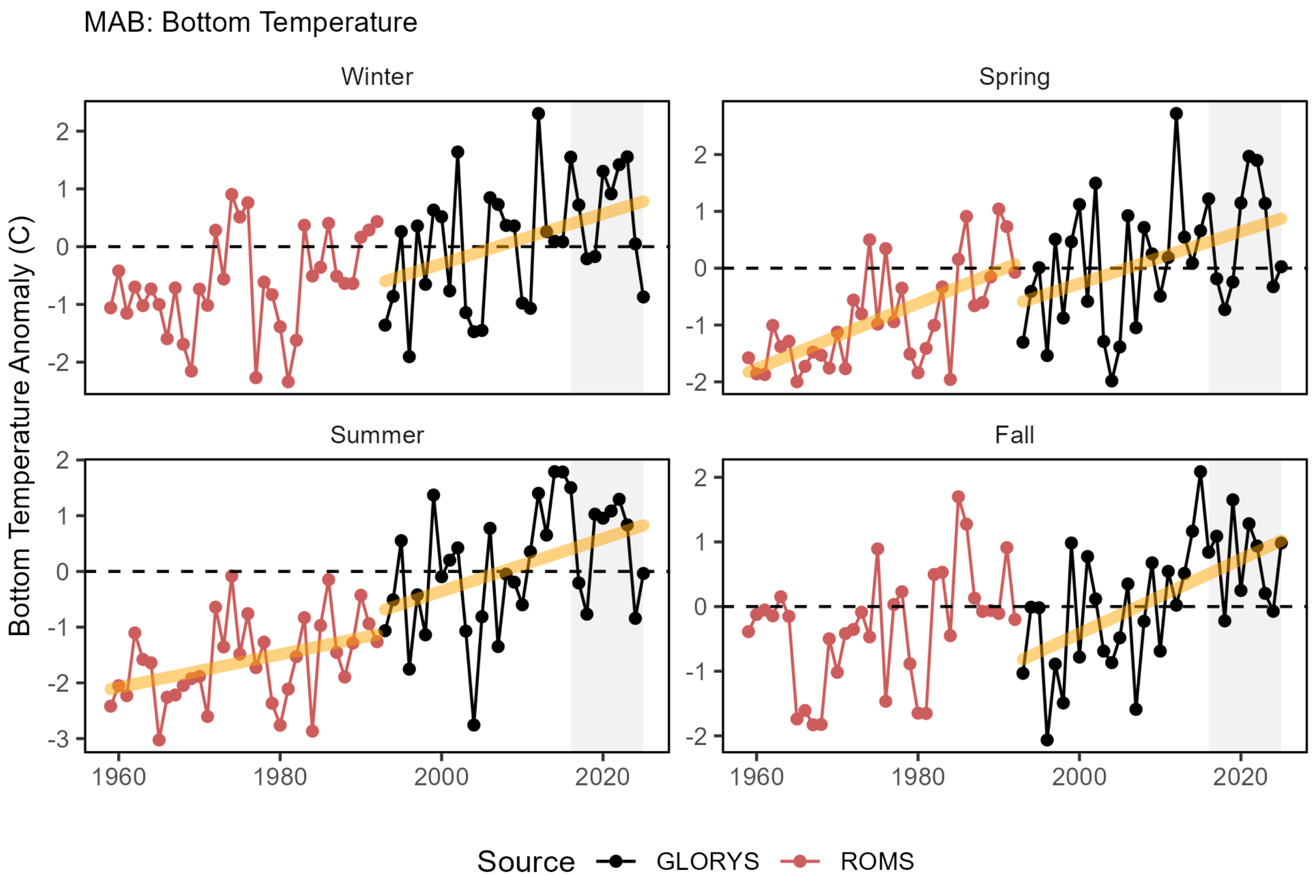


Figure 37: GLORYS (black) and debiased ROMS (red) seasonal bottom temperature anomaly in the MAB.

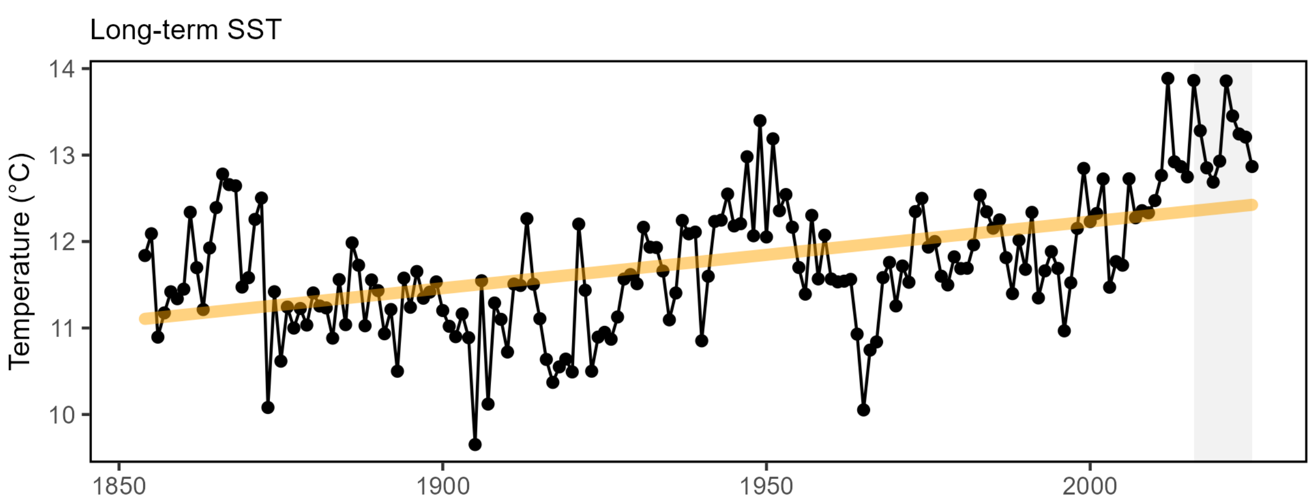


Figure 38: Northeast US annual sea surface temperature (SST, black), with increasing trend (orange).

Species suitable habitat can expand or contract when changes in temperature and major oceanographic conditions alter distinct water mass habitats.The variability of the Gulf Stream is a major driver of the predominant oceanographic conditions of the Northeast U.S. continental shelf. As the Gulf Stream had become less stable and was shifting northward until a recent shift in 2023. Since then, the Gulf Stream has been closer to the long-term average, and the supply of Labrador Slope Water to the Northwest Atlantic Shelf has increased. These changes are linked to some of the cooler water temperatures observed in 2024 and 2025 and the composition of the source water entering the Gulf of Maine through the Northeast Channel (see 2025 Highlights).

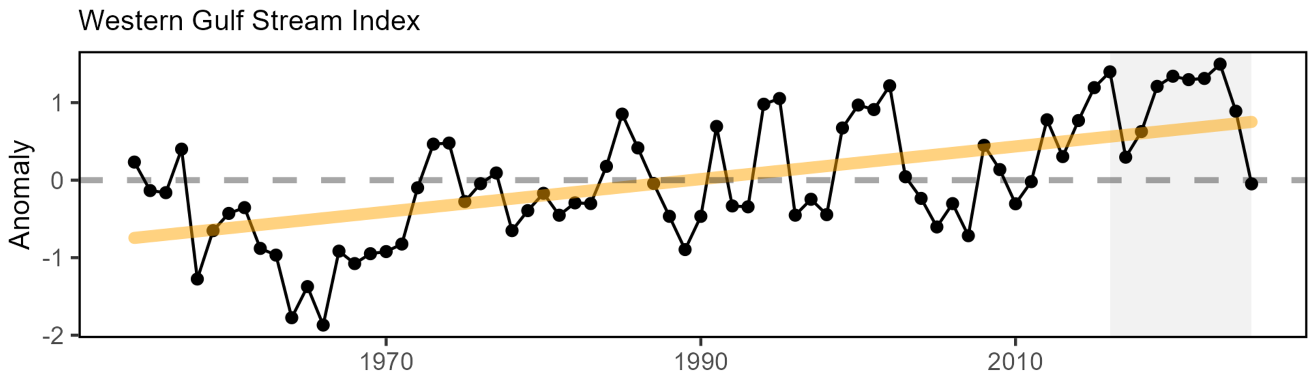


Figure 39: Index representing changes in the location of the western (between 64 and 55 degrees W) Gulf Stream north wall (black). Positive values represent a more northerly Gulf Stream position, with increasing trend (orange).

Changes in ocean temperature and circulation alter habitat features such as the Mid-Atlantic Bight Cold Pool, a band of relatively cold near-bottom water present from spring to fall over the northern MAB. The cold pool represents essential fish spawning and nursery habitat, and affects fish distribution and behavior. The cold pool has been getting warmer and its areal extent has been shrinking over time (Fig. 40). In 2025, however, the cold pool temperature index and extent were above the long-term average, likely due to the influx of Labrador Slope and Scotian Shelf waters into the system. Mobile target species that track a preferred temperature range can show increased interannual variability in their distributions as regional temperatures fluctuate from record warms to average over short periods of time.

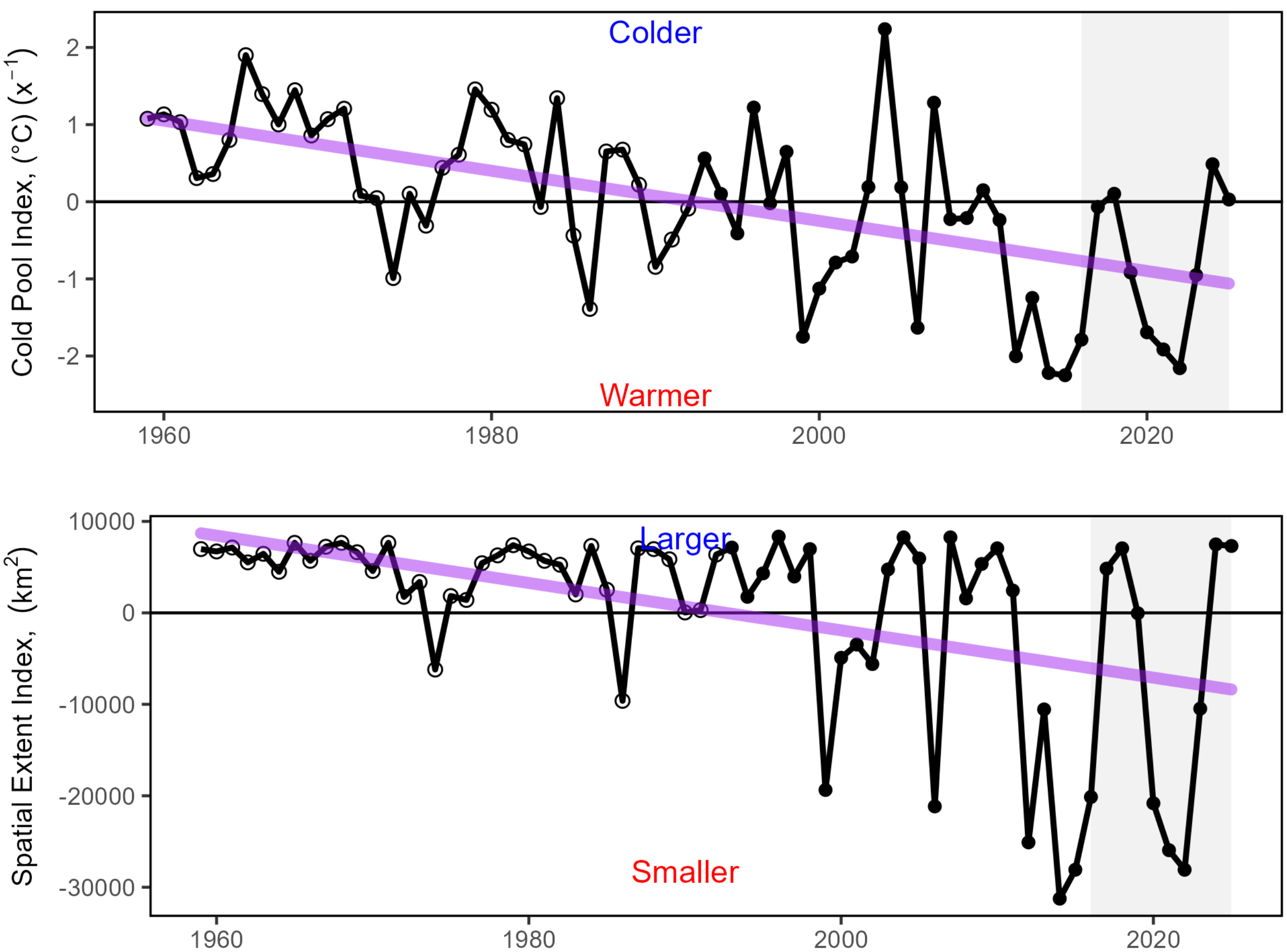


Figure 40: Seasonal cold pool mean temperature (top) and spatial extent index (bottom), based on bias-corrected ROMS-NWA (open circles) and GLORYS (closed circles), with declining trends (purple).

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 and 2025 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.

MOM6 decadal oceanographic forecasts suggest a tendency towards near-normal temperatures over the next decade due to decadal variability in regional circulation. 2026 seasonal forecasts show a high probability of below average surface and bottom temperatures in the winter months. Forecast uncertainty is higher during the spring and summer seasons, and above average conditions are predicted for the fall. These forecasts will continue to be 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 time while evaluating management measures against a range of possible future spatial distributions. The upcoming Climate Vulnerability Assessment 2.0 will also be incorporating MOM6 output and forecasts to help predict changes in species distributions and quantify species exposure to predicted future change. Processes like the East Coast Coordination Group and the HMS Climate Vulnerability Assessment can help coordinate management.

Risks to managing seasonally

The effectiveness of seasonal management actions (fishing seasons or area opening/closing periods) depends on a proper alignment with the seasonal life cycle events (phenology) of fish stocks (e.g., migration and spawning timing). If not accounted for, changes in the timing of these biological cycles can reduce the effectiveness of seasonal management measures. The timing of seasonal patterns can also change the interactions between fisheries and non-target species thus influencing bycatch and the availability of species to surveys.

Indicators: Timing shifts Indicators of phenological changes in fish populations require regular sampling and observations, and therefore a limited number of these indicators are currently available. One indicator shows shifts in spawning timing of haddock and yellowtail flounder. Spawning of both haddock stocks occurred earlier in the year, as indicated by more resting (post-spawning) stage fish in recent years compared to earlier in the time series (Fig. 41). The high percentage of northern stock (Cape Cod/GOM) yellowtail flounder females in the resting maturity stage shown earlier in the time series is reflective of spring surveys sampling them well before spawning, which peaks in June for the northern stock. More recently, the females are much closer to spawning, indicating that yellowtail flounder are spawning earlier in the year. Similarly, increased catch of post-spawning fish in Southern New England, indicates that the peak spawning of the southern stock has also shifted to earlier in the year. Yellowtail flounder spawning is related to bottom temperature, week of year, and decade sampled for each of the three stocks. Changes to spawning times could impact the survival of early life stages of fish, subsequently affecting the larger population size, health, and market value.

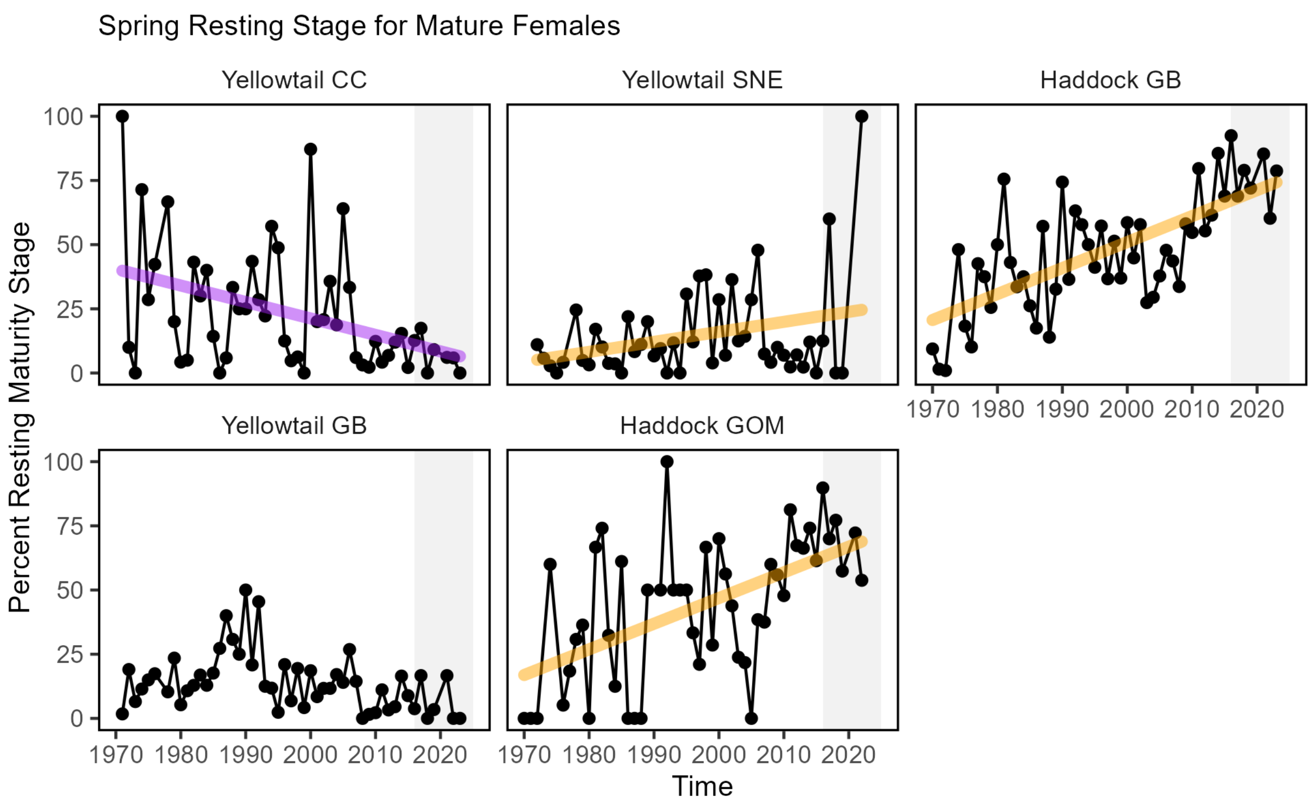


Figure 41: Percent resting stage (non-spawning) mature female fish (black) from spring NEFSC bottom trawl survey with significant increases (orange) and decreases (purple) from two haddock and three yellowtail flounder stocks: CC = Cape Cod Gulf of Maine, GOM = Gulf of Maine, GB = Georges Bank, SNE = Southern New England.

Migration timing of some tuna and large whale migrations has changed. An analysis of recreational fishing data between 2019 and 2022 identified multiple shifts in important HMS species. For example, Bigeye tuna were caught 50 days earlier; small and large bluefin tuna were caught 38 and 80 days earlier respectively in Massachusetts; and blue marlin in New York were caught 27 days earlier. A separate analysis of acoustic telemetry data predicted delayed departure of southward-migrating sharks from the northeast region under future sea surface temperatures. These results are further supported by the Atlantic Highly Migratory Species Climate Vulnerability Assessment, which found that 57 of 58 highly migratory species and stocks have high or very high potential to shift distributions. In Cape Cod Bay, peak spring habitat use by right and humpback whales has shifted 18-19 days later over time.

Understanding whether seasonal patterns are changing for stocks requires regular observations throughout the year. For example, baseline work on cetacean presence in Southern New England shows different seasonal use patterns for whale and dolphin species. Despite the importance of understanding seasonal patterns, we have few indicators that directly assess timing shifts of species. We plan on incorporating more indicators of timing shifts and phenology in future reports.

Drivers: The drivers of timing shifts in managed stocks are generally coupled to shifts in environmental or biological conditions, since these can result in changes in habitat quality or food availability within the year. Changes in the timing of fall phytoplankton blooms and seasonal shifts in zooplankton communities are indicators of changes in seasonal food availability to stocks.

Along with the overall warming trends in New England, ocean summer conditions have been lasting longer (Fig. 42) due to the later transition from warm summer conditions to cooler fall temperatures. These transition dates relate how daily temperatures compare to the seasonal norm. Changes in the timing of seasonal environmental cycles can alter biological processes (migrations, spawning, etc.) that are triggered by seasonal events.

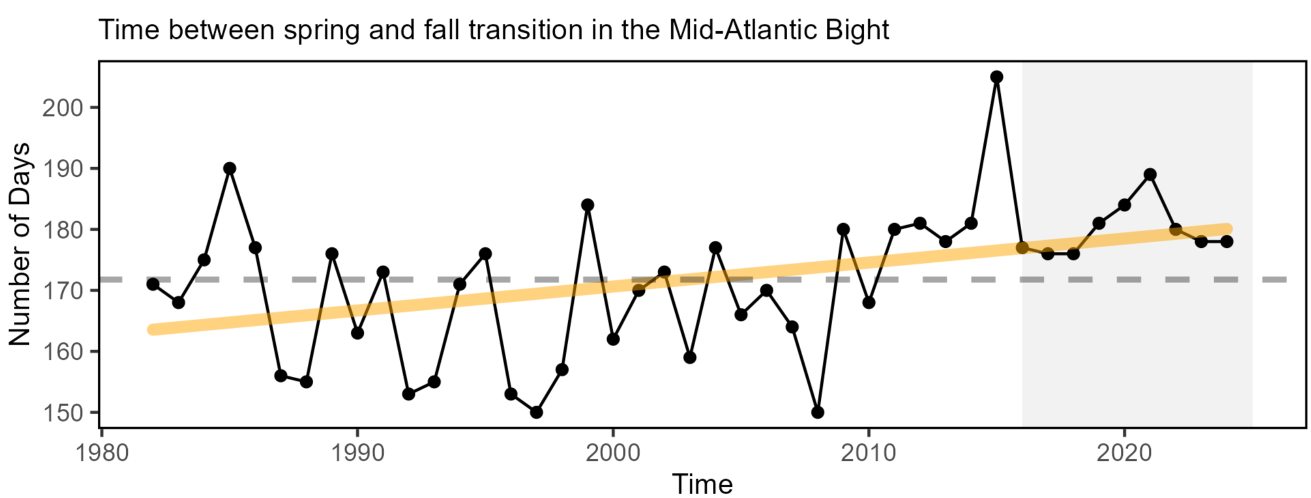


Figure 42: Ocean summer length in the MAB: the annual total number of days between the spring thermal transition date and the fall thermal transition date (black), with an increasing trend (orange). Transition dates are based on sea surface temperatures.

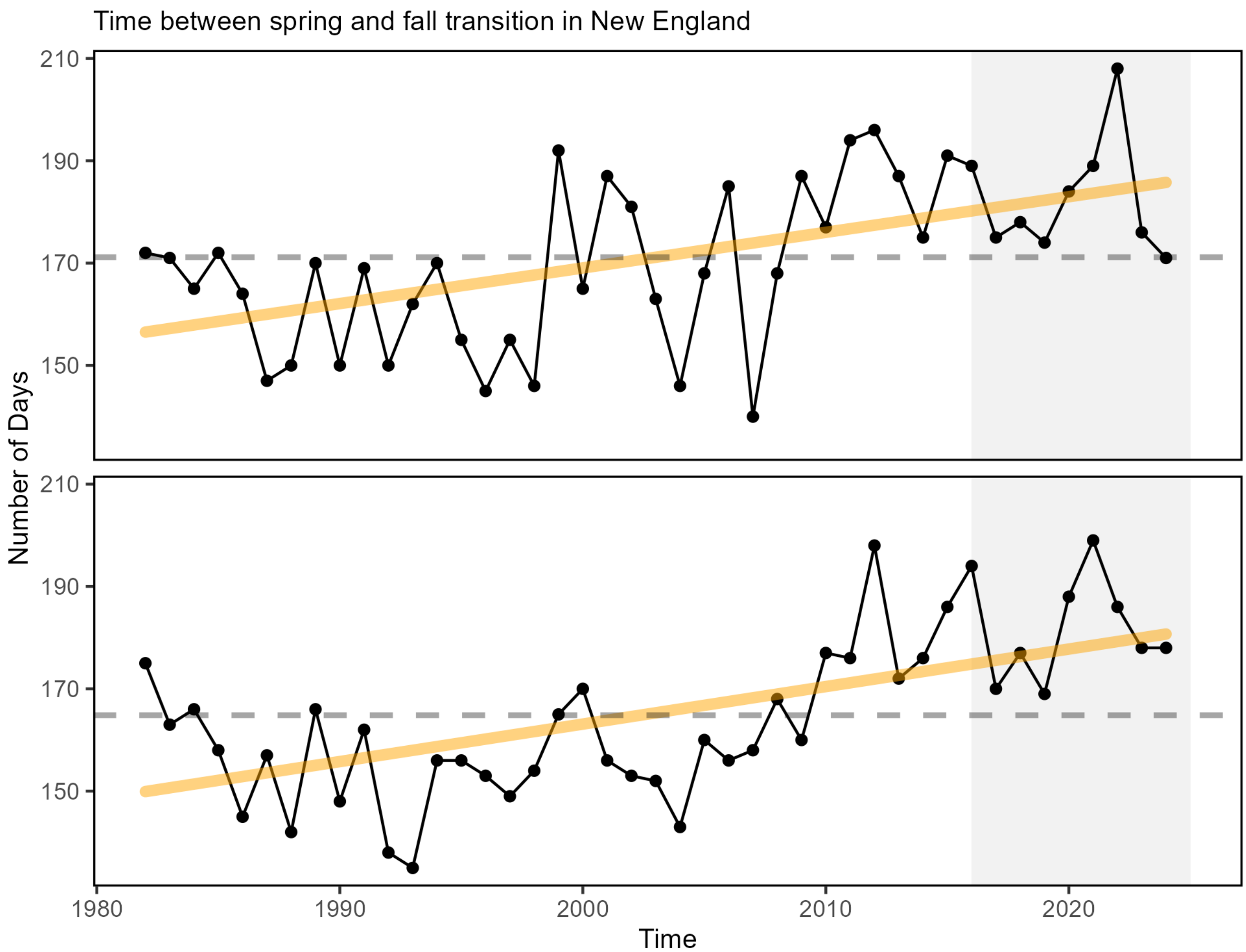


Figure 43: Ocean summer length in New England (Georges Bank, top; Gulf of Maine, bottom): the annual total number of days between the spring thermal transition date and the fall thermal transition date (black), with an increasing trend (orange). Transition dates are based on sea surface temperatures.

06_risk_seasonal_newengland.Rmd

The Mid-Atlantic Bight Cold Pool is a summer to early fall feature that creates seasonally suitable habitat for many species, including some managed by the NEFMC. Cold pool persistence has decreased, indicating that the duration of the cold pool habitat is shorter compared to the 1960s (Fig. 44). However, all cold pool indices were near or above the long-term average in 2025 and likely related to the influx of northern waters into the system (see 2024 Highlights). A change in the timing of the autumn breakdown of the Cold Pool may impact the recruitment of species that rely on it for seasonal cues and habitat. Southern New England-Mid Atlantic yellowtail flounder recruitment and settlement are related to the strength of the Cold Pool (a factor of extent and persistence). The correlation of pre-recruit settlers to the Cold Pool is thought to represent a bottleneck in yellowtail flounder life history, whereby a local and temporary increase in bottom temperature can negatively impact the survival of settlers. Including the effect of Cold Pool variations on yellowtail recruitment reduced retrospective patterns and improved predictive skill in a stock assessment model. This connection is especially important given the long-term decline in the duration of the Cold Pool.

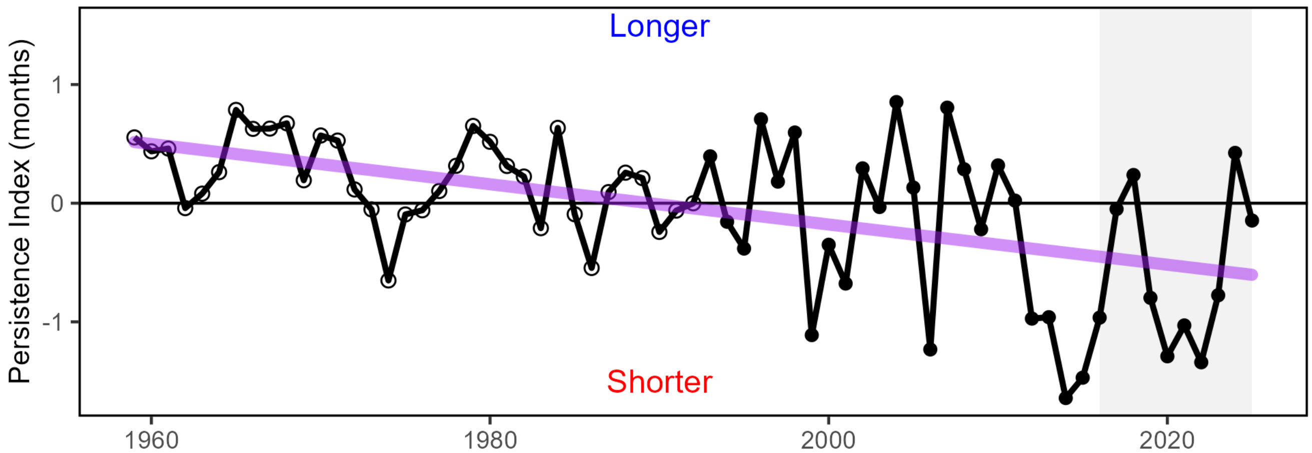


Figure 44: The Mid Atlantic Bight Cold Pool persistence index based on bias-corrected ROMS-NWA (open circles) and GLORYS (closed circles), with significant long-term decline (purple).

The seasonal timing of phytoplankton blooms shows a tendency towards an increased fall bloom over time in the GOM and GB, with chlorophyll concentrations significantly increasing in October and November (GB) and January and October (GOM) (Fig. 45). This increased production at the base of the food web may increase prey availability, and fall blooms in particular have been associated with increased recruitment for species such as haddock.

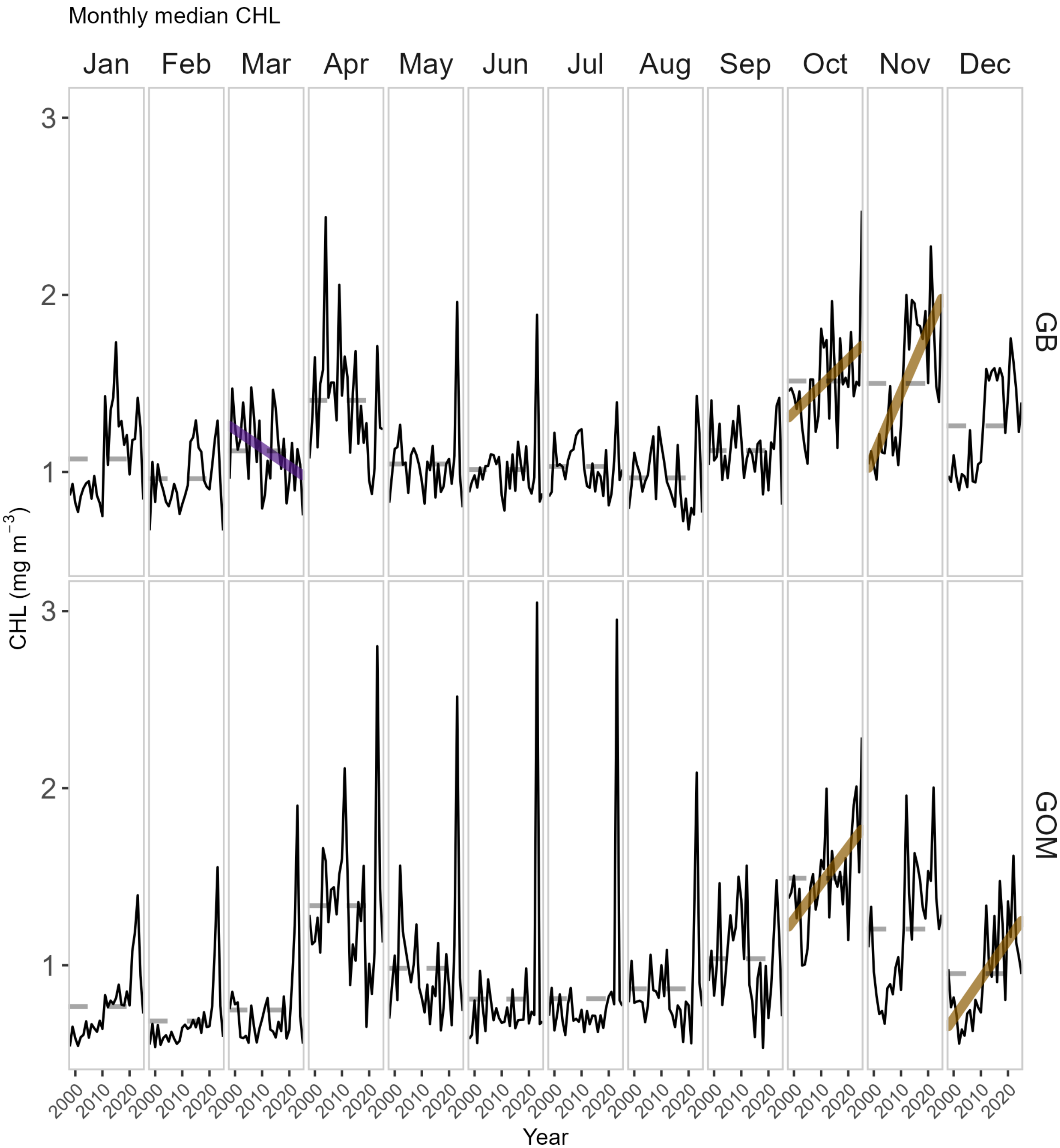


Figure 45: Monthly median chlorophyll a concentration time series for Georges Bank (top) and Gulf of Maine (bottom).

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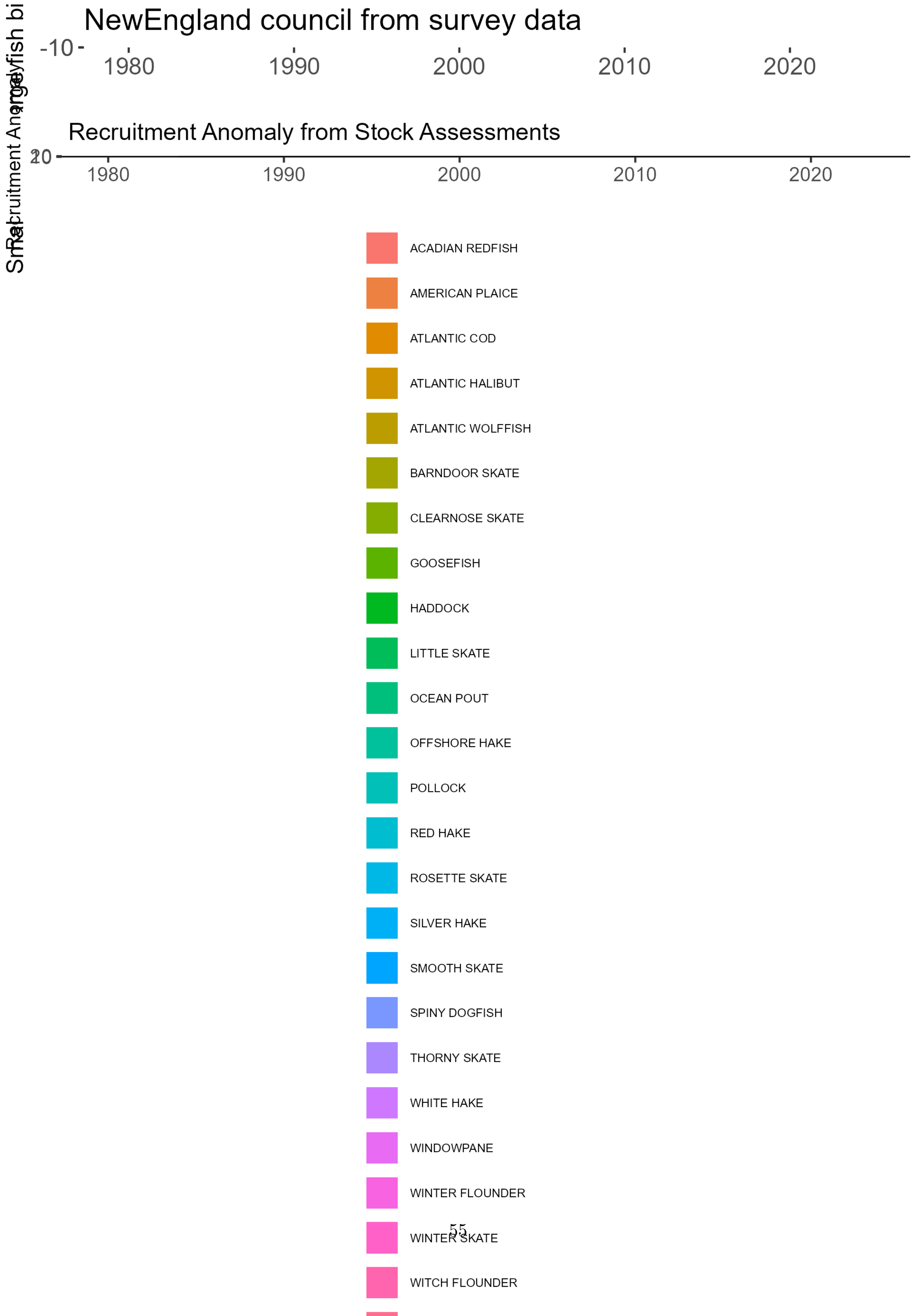
Future Considerations Species are reliant on environmental processes to dictate the timing of their behavior (e.g., phytoplankton bloom timing, thermal transition, or the duration of the cold pool). Some changes are episodic and have interannual variability, while others may be shifting away from a historic baseline on the scales of years to decades. Other species may rely on the general seasonal succession of environmental drivers (e.g., the timing of the fall turnover) to cue biological processes, and long-term trends in seasonal transitions are unlikely to reverse in coming years. Thus, timing shifts in migration or spawning may continue. 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, and new indicators should be developed to monitor timing shifts for stocks.

Risks to setting catch limits

The efficacy of short-term stock projections and rebuilding plans rely on accurate understanding of processes affecting stock growth, reproduction, and natural mortality. These biological processes are often driven by underlying environmental change. If ignored, environmental change may increase the risk that established stock-level biological reference points no longer reflect the current population and increase projection uncertainty, both of which can contribute to quota misspecification.

07_risk_setting_catch_limits_newengland.Rmd

Indicators: Fish productivity and condition shifts Indicators of fish productivity derived from observations (surveys) or models (stock assessments) show variability over the time series. Since 2020, fish productivity has been below the long-term average productivity (derived from NEFSC bottom trawl survey), and 2025 was below average for all managed species (Fig. 46). A similar analysis based on stock assessment model outputs shows a decline in productivity over the time series with relatively high productivity in the 1990's and relatively low productivity in the 2000's (recruitment per spawning stock biomass anomaly). Fish productivity can be affected by parental condition, environmental conditions, timing and availability of prey for recruits, as well as retention of recruits within favorable habitat. In years where offshore advection is high in a depth range and month when a fish species spawns, fish productivity and recruitment may be reduced. Other signs of changing productivity in New England are the declines in common tern chicks per nest (Fig. 47) and continued low overall Atlantic salmon abundance (Fig. 48) despite short-term increases in return rates and salmon numbers.


NewEngland council from survey data
-10
1980
1990
2000
2010
2020
Recruitment Anomaly from Stock Assessments
1980
1990
2000
2010
2020
ACADIAN REDFISH
AMERICAN PLAICE
ATLANTIC COD
ATLANTIC HALIBUT
ATLANTIC WOLFFISH
BARNDOOR SKATE
CLEARNOSE SKATE
GOOSEFISH
HADDOCK
LITTLE SKATE
OCEAN POUT
OFFSHORE HAKE
POLLOCK
RED HAKE
ROSETTE SKATE
SILVER HAKE
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WINTER SKATE
WITCH FLOUNDER

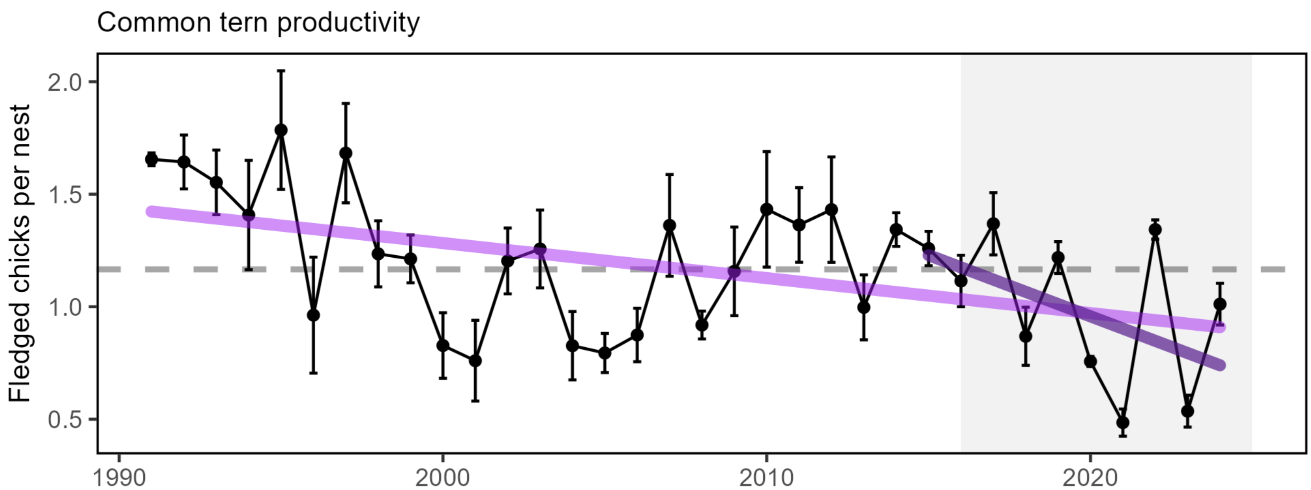


Figure 47: Common tern productivity - the number of fledged chicks per nest - at seven Gulf of Maine colonies managed by the National Audubon Society's Seabird Restoration Program, with significant short-term (dark purple) and long-term (purple) declines.

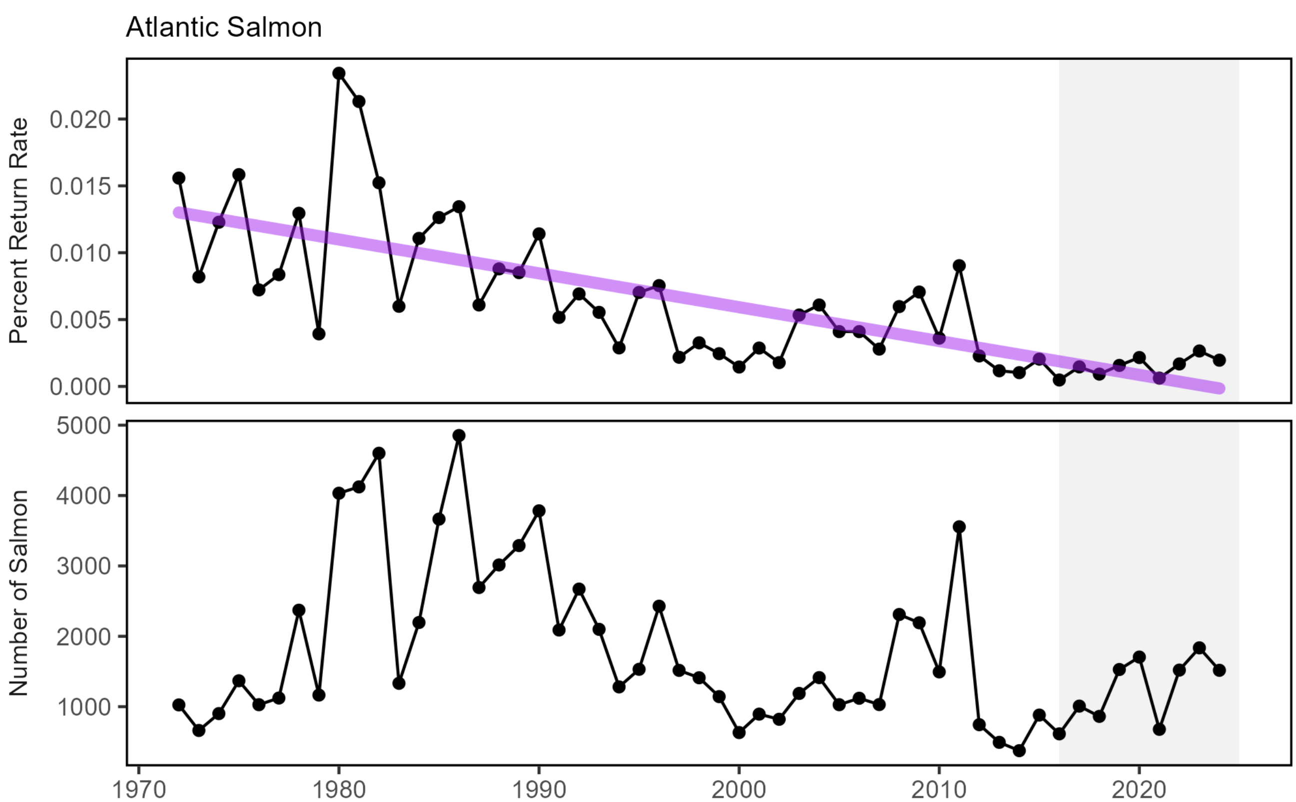
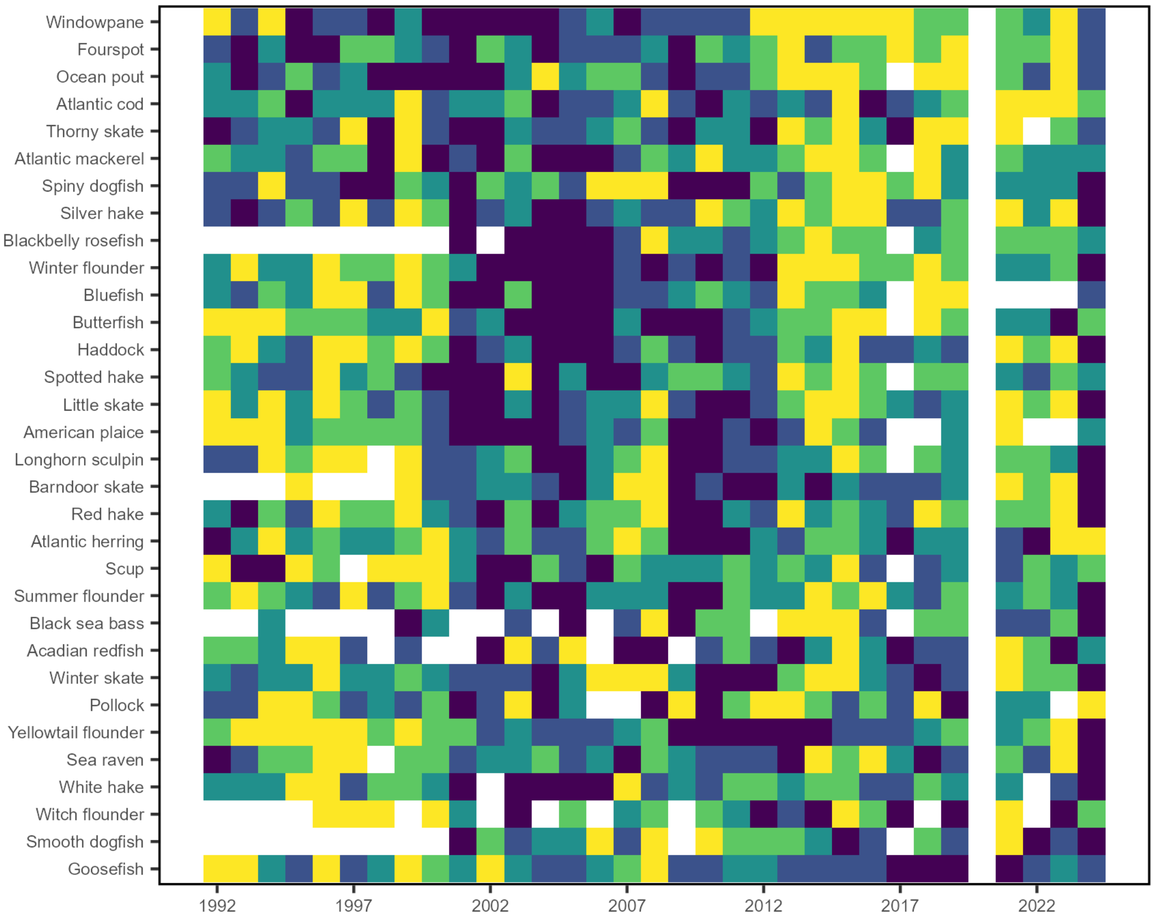


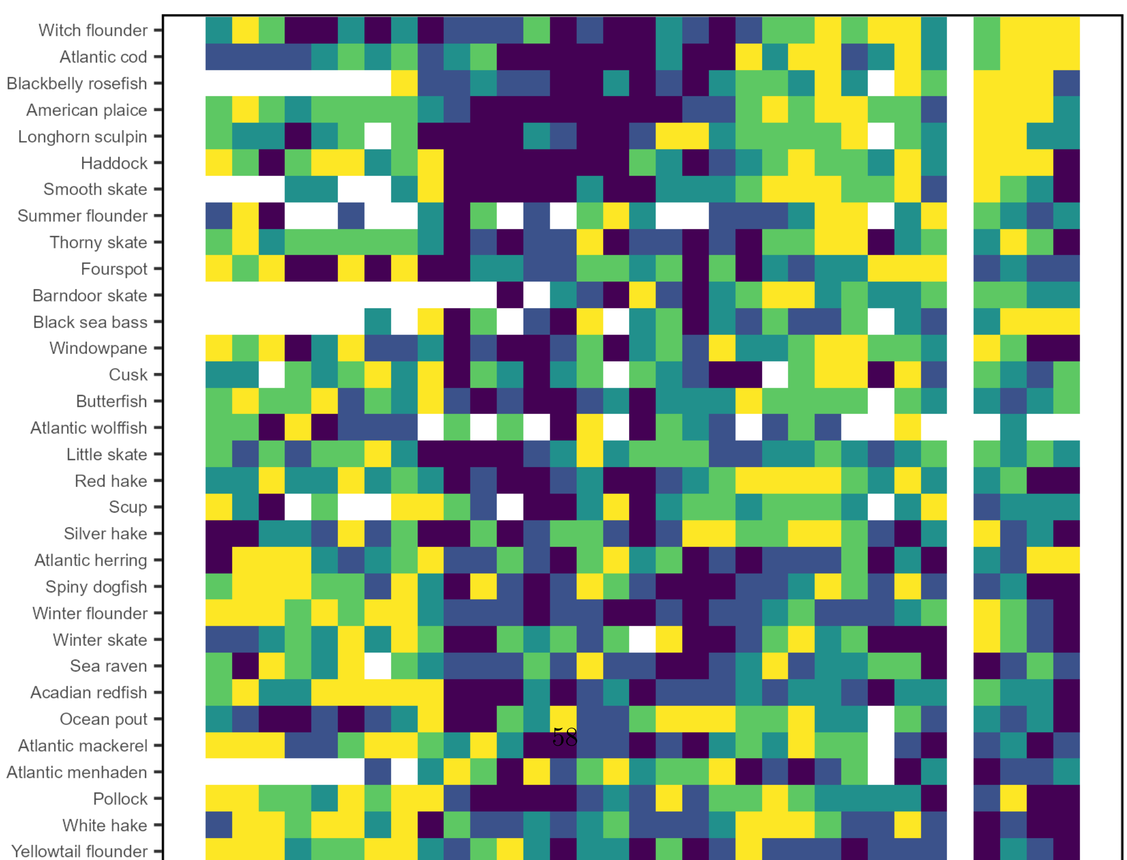
Figure 48: Percent return rate (top) and abundance (bottom) of Atlantic salmon returns to Gulf of Maine rivers since 1972 and return rates for two sea winter returns from hatchery smolt stocking in the Penobscot River. Long-term decreasing trend for percent return rate in purple.

The health of individual fish (i.e., fish condition) can contribute to population productivity through improved growth, reproduction, and survival. Fish condition in the Gulf of Maine and Georges Bank regions were generally high to very high prior to 2000, low to very low from 2001-2010 (concurrent with declines in fish productivity, Fig. 46), and mixed since 2011. In 2025, fish condition was below or close to average for most species on both Georges Bank and in the Gulf of Maine (Fig. 49). Preliminary analyses show that years dominated by small copepods and warmer spring temperatures may improve fish condition for Atlantic mackerel and butterfish. Similar environmental drivers may be important to other species.

Relative condition for species sampled in GB



Relative condition for species sampled in GOM



Drivers Fish productivity and condition are the cumulative effects of physiological, ecological, and environmental factors. Major factors include increased metabolic demands from increasing temperature and changes in the availability and quality of prey. Long-term environmental trends and episodic extreme temperatures, ocean acidification, and low oxygen events represent multiple stressors that can affect growth rates, reproductive success, recruitment, and cause mortality.

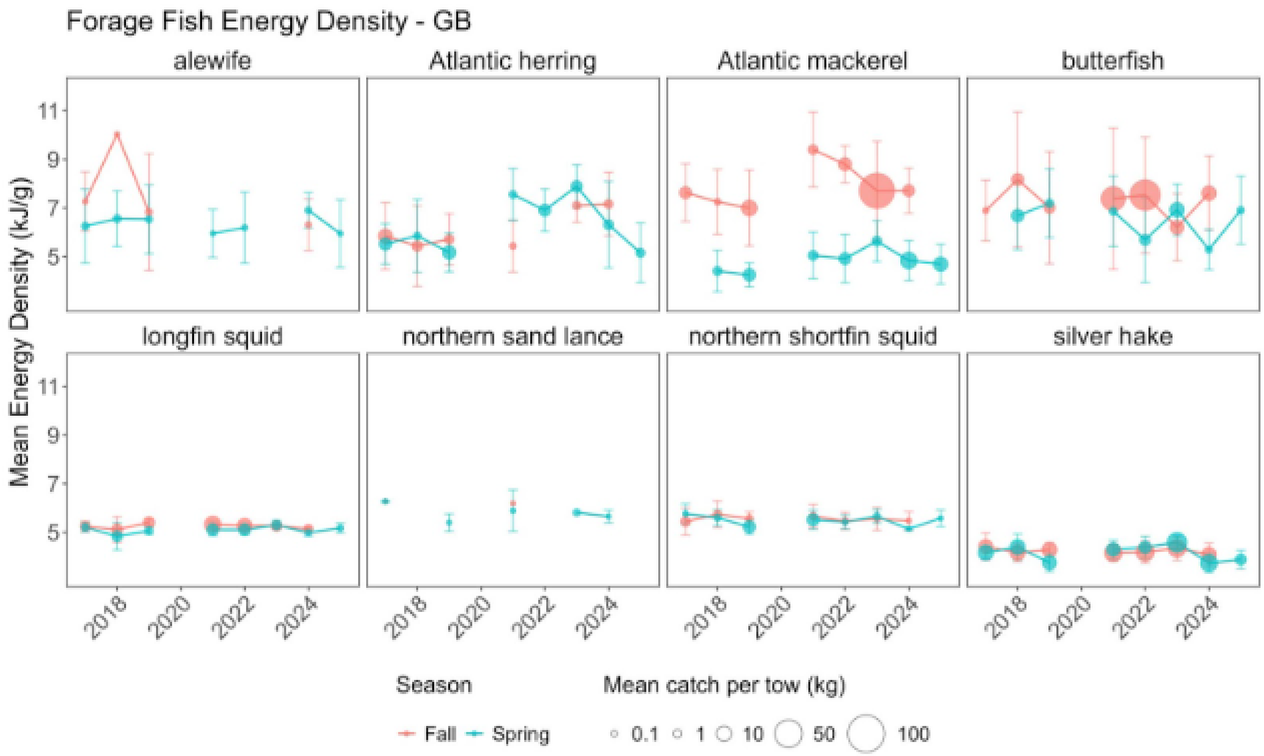
Biological Drivers: Forage quality and abundance Management should account for energetic links between prey and predators, as shifts in forage quality and abundance directly alter the health, productivity, and movement of managed and protected species. The total energy available to higher trophic level predators is determined by the mass and energy density (ED) of prey. Protecting this forage base is essential for maintaining overall ecosystem function and continued stock productivity and condition.

Forage energy content fluctuates based on growth, reproduction, and environmental productivity. High-energy New England species include alewife, Atlantic mackerel, and Atlantic herring. Alewife provide the highest ED in the GOM during the fall. Atlantic mackerel show higher abundance and ED in the GOM than on GB during fall. Atlantic herring offer a consistent year-round energy source, though values vary between spring and fall spawning groups. Butterfish abundance has increased over the last five years in both regions during the fall, providing an additional high-energy prey option.

Moderate-energy species, including longfin squid, shortfin squid, and silver hake, provide a stable but lower ED food supply. Squid abundance is generally lower in the GOM than on GB. Silver hake remain highly abundant in the GOM with stable ED across spring and fall. Northern sand lance offer intermediate energy but are only available in the spring before burying in the seafloor to overwinter.

Declining prey energy density creates significant risks for both forage and predator stocks. In prey species like silver hake, lower energy reserves can reduce spawning success and recruitment. For predators, including managed species such as goosefish and spiny dogfish, lower-quality prey leads to poorer physical health and reduced reproductive output.

Shifts in forage abundance directly influence managed species productivity. While New England fall forage biomass remains stable, long-term increases are observed in the spring GOM. Biomass peaked during the 1980s in the fall. Increased spring GOM (Fig. \ref{fig:energy-density-ne}) forage biomass may improve fish health and reproductive output during spawning seasons when energy reserves are typically low. However, this benefit may be offset by lower prey energy densities, particularly during periods of higher water temperatures when predator metabolic demands increase.



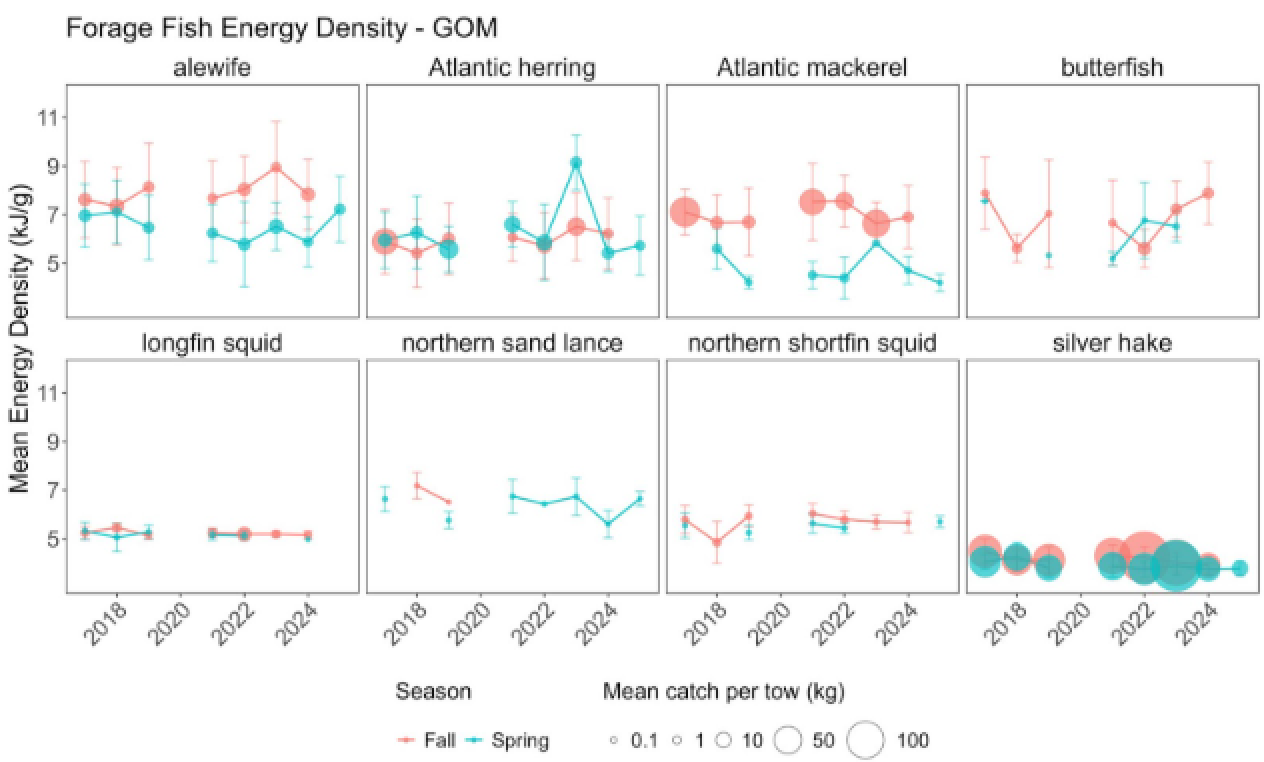


Figure 50: Energy density (mean and standard deviation) of eight forage species from NEFSC bottom trawl surveys by season and year for the GOM. Symbol size represents abundance (mean kg/tow) estimated from bottom trawl survey tows in the GOM.

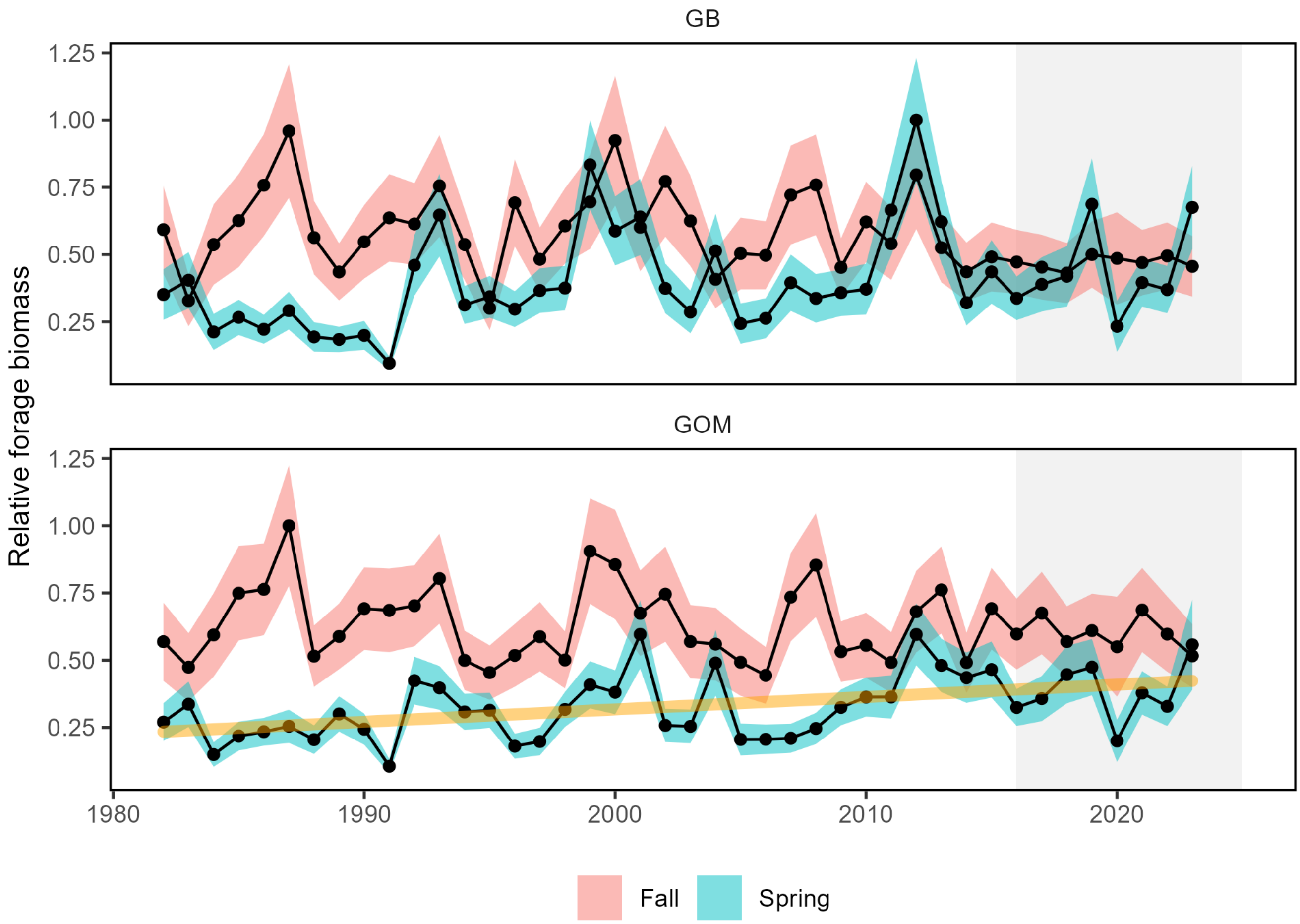


Figure 51: Forage fish index in GB (top) and GOM (bottom, significant long-term increase in orange) for spring (blue) and fall (red) surveys. Index values are relative to the maximum observation within a region across surveys.

Benthic invertebrates are extremely important forage for some managed species (e.g., flatfish, juvenile cod and haddock) Macrobenthos indices show long term declines in spring. In contrast, megabenthos indices show long-term increases during the fall in both GB and GOM (Fig. 52). Fish productivity may be negatively impacted in recent years for fish such as flounders and juvenile fish that target macrobenthos such as small crustaceans and polychaetes in the spring, and positively impacted for fish such as larger skates, hakes and gadids that target megabenthos such as crabs.

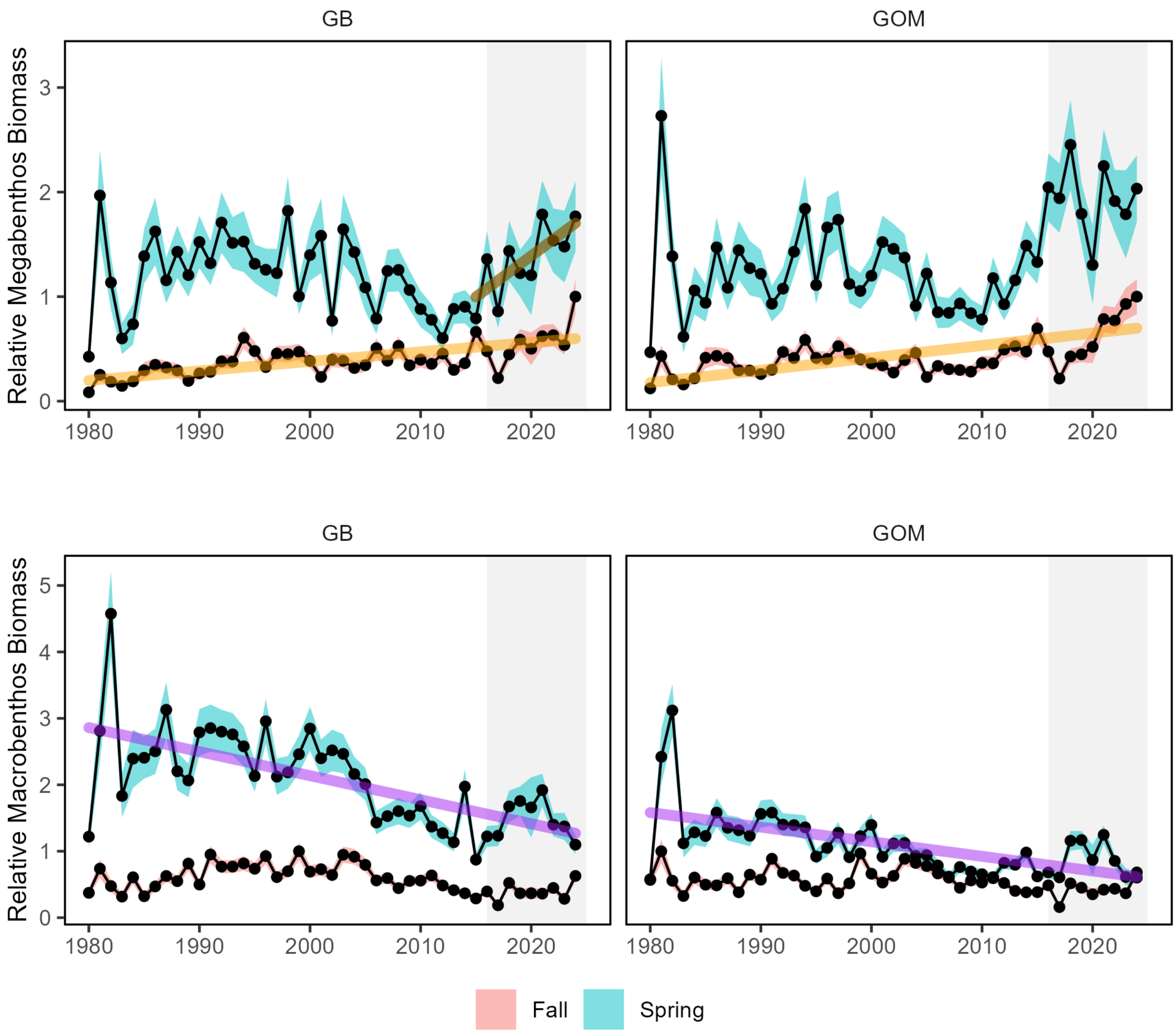


Figure 52: Changes in spring (blue) and fall (red) benthos abundance in New England for megabenthos (top) and macrobenthos (bottom), with significant long-term increasing (orange), short-term increasing (dark orange), and long-term decreasing (purple) trends.

Biological Drivers: Lower trophic levels Phytoplankton are the foundation of the marine food web and are the primary food source for zooplankton and filter feeders such as shellfish. Multiple environmental and oceanographic drivers affect the abundance, composition, spatial distribution, and productivity of phytoplankton. While changes in phytoplankton productivity could affect fish productivity (including forage), there is no clear long-term trend in New England total primary production (Fig. 27).

New England Zooplankton abundance is shifting in ways that could impact fish condition and marine mammal prey availability. In the Gulf of Maine (GOM), increased small-bodied copepods and euphausiids are linked to improved condition in species like Atlantic mackerel, and baleen whales (humpback, sei, and fin) may benefit from long-term increases in prey availability, although euphausiid biomass has been recently high variable (Fig. 83). Conversely, large-bodied copepods in Georges Bank (GB) have declined recently. Zooplankton energy density varies by season and location, with high-energy large copepods peaking from April through June. Since 2023, zooplankton communities have reverted to compositions similar to pre-1990 and 2000-2011 periods; research is currently underway to determine the drivers and management implications of these shifts.

Calanus finmarchicus abundance has declined in the GOM following a 2008 shift in oceanographic conditions, which poses a risk to the critically endangered North Atlantic right whale and key energy link in subarctic ecosystems. This lipid-rich copepod can comprise 71% of the total zooplankton biomass. Observations in the Wilkinson Basin indicate that the spring and summer abundance and biomass of Calanus in 2024 was comparable to 2005. However, late-stage abundance has declined 64% in fall and 71% in winter. Consequently, overall mesozooplankton biomass in 2024 was only 27% of 2005 levels (Fig. **??**).

The seasonal differences in *Calanus* are driven by five factors: 1. Late winter and early spring phytoplankton levels control reproductive output. 2. Source water origin determines supply, with higher concentrations in Scotian/Labrador shelf water than in warm slope water. 3. Variable currents dictate how *Calanus* is transported and retained in deep basins. 4. Invertebrate predator populations fluctuate based on spring *Calanus* abundance. 5. Higher summer and fall temperatures increase predator metabolic demands and predation pressure.

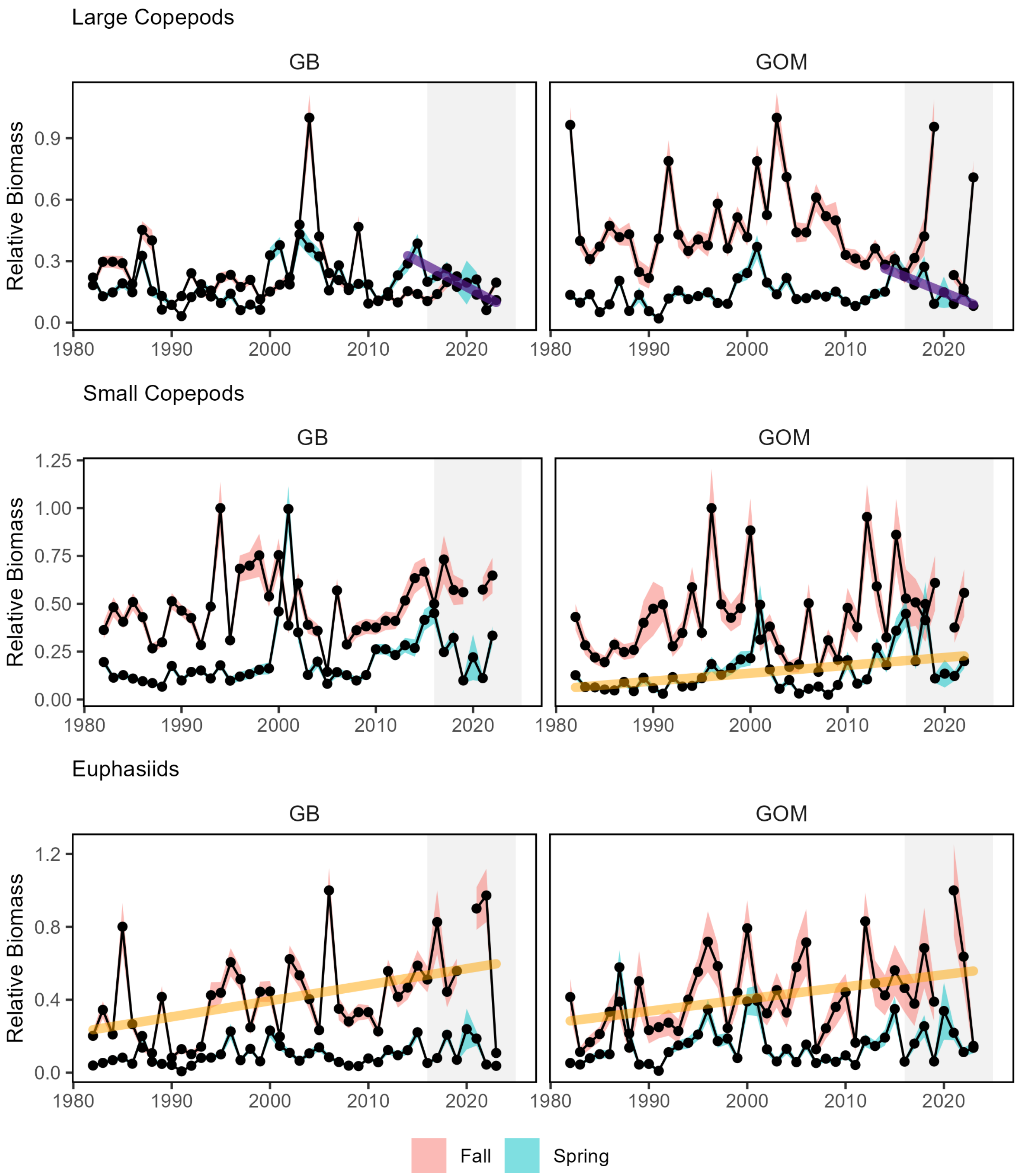


Figure 53: Changes in three dominant zooplankton ((*Calanus finmarchicus*, *Calanus typicus*, and *Pseudocalanus spp*) abundance anomalies for in New England for large (top) and small (middle) copepods, and Euphausiids (bottom), with significant decreases (short-term, dark purple; long-term, light purple) in small copepods and and long-term increases (orange) in Euphausiids.

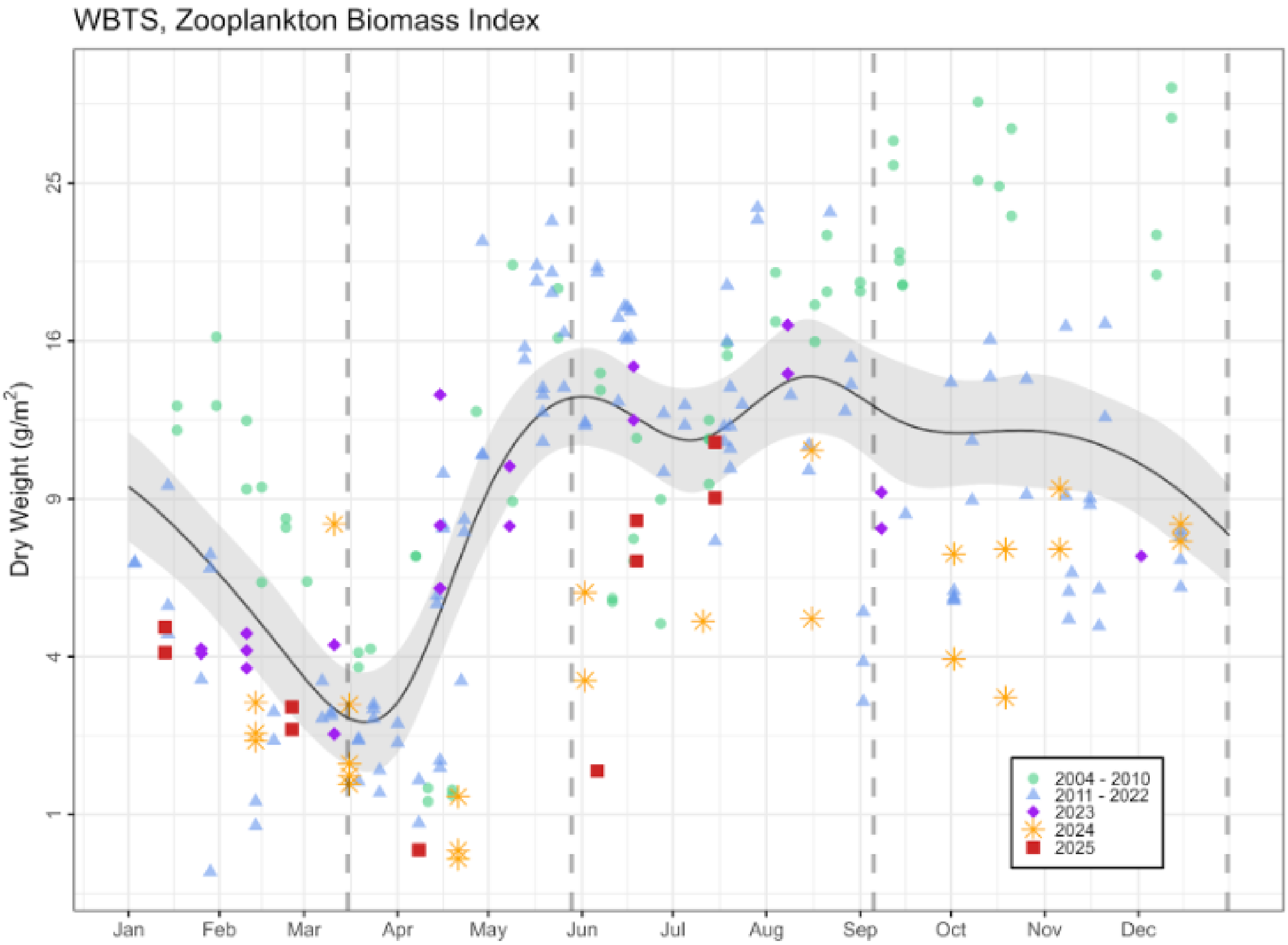


Figure 54: Mesozooplankton biomass phenology at Wilkinson Basin Time Series station: 2005 to 2025. Total dry weight from 200m mesh vertical ring net tows. Fitted line shows GAM predictions with 95% confidence interval (shaded). Circles: 2004 to 2010; triangles: 2011 to 2022; 2023, 2024, and 2025 shown as separate symbols (see legend). Vertical lines denote season boundaries. Data for 2025 incomplete. Climatology GAM prediction calculated with a year of 2012; prediction is significantly different from random pattern.

Environmental Drivers Fish production can also be directly related to the prevailing environmental conditions by altering metabolic (growth) and reproductive processes. Many species possess thermal tolerances and can experience stressful or lethal conditions if temperatures exceed certain levels. Extreme temperature at both the surface (Fig. 38) and bottom can exceed thermal tolerance limits for some fish. For example, 2012 had among the warmest surface and bottom temperatures (GB) in New England. A large proportion of the Georges Bank and Mid-Atlantic regions had bottom temperatures above the 15℃ thermal tolerance for most groundfish, with some days in the Mid-Atlantic exceeding the 24℃ potential mortality limit (Fig. 55).

Cooler ocean temperatures prevented marine heatwaves in the Gulf of Maine and Georges Bank during 2025. Instead, Georges Bank experienced three surface and two bottom marine cold spells, which are extreme cooling events below the 90th percentile. The location, duration, and timing of cold spells can affect the productivity of temperature-sensitive species. The most significant surface event occurred in November, ranking as the 11th strongest on record, while a notable bottom cold spell beginning August 11th reached peak intensity on September 15th and may be ongoing. Another bottom cold spell on the Bank persisted for 71 days starting in early February.

The Gulf of Maine recorded five surface and three bottom marine cold spells in 2025. A major surface event began February 6th and lasted 42 days, with sea surface temperatures averaging 4.50 °C—nearly 1 °C below the 2016-2025 average. Additionally, the seventh strongest surface cold spell on record occurred in April, lasting 37 days. Bottom conditions in the Gulf of Maine were similarly impacted by three cold spells, including the fifth strongest on record. This event began in December 2024 and lasted 83 days, with bottom temperatures averaging 7.5 °C. This represented a cooling of more than 1 °C compared to the 2016-2025 average.

Lower ocean temperatures near long-term averages will affect species differently across the region. While cold-water species like cod may benefit from these conditions, warm-water species such as black sea bass are unlikely to see positive effects. This variability in regional cooling highlights the need for management to account for shifting species distributions and productivity.

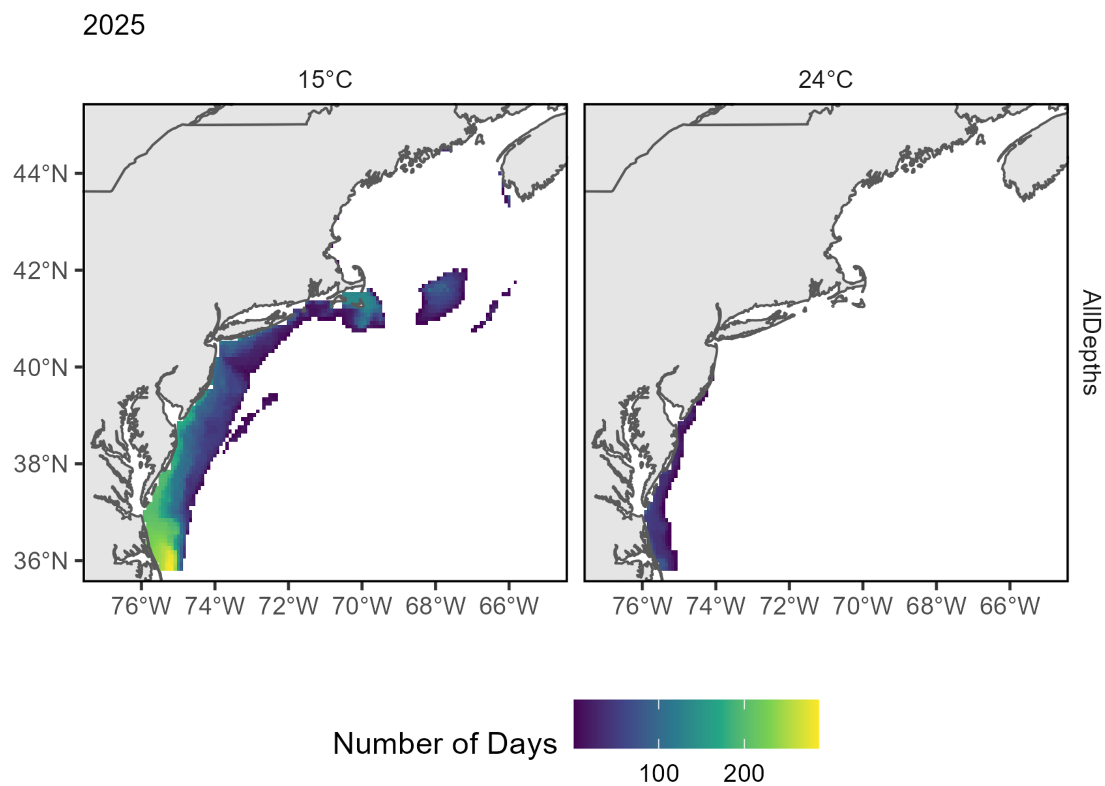


Figure 55: The number of days in 2024 where bottom temperature exceeds 15 degrees (left) and 24 degrees (right) based on the GLORYS 1/12 degree grid.

The newly-developed advection index (Fig. 56) shows total transport of water onto and off the continental shelf and can be linked to the survival of early life stages of fish and invertebrates. Long-term trends in New England show increased onshelf movement of mid-layer and bottom waters in June, which could increase retention of some species. Further study is needed on the species level to link spawning timing and larval periods to the advection index at the corresponding depth and month.

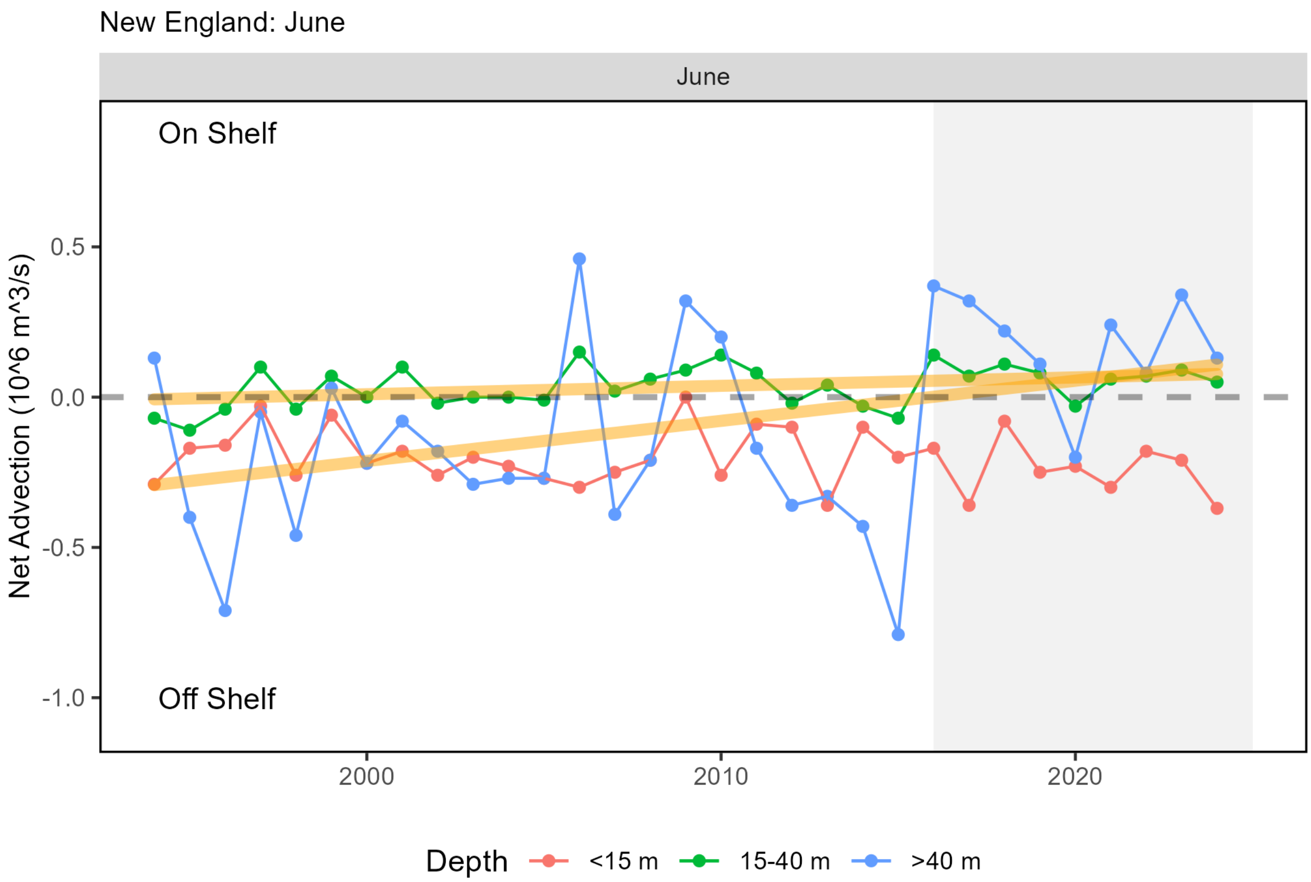


Figure 56: Net advection in June across the Southern New England and Georges Bank continental shelf break within 3 depth bands.

Ocean acidification risks vary among species and include reduced survival, growth, reproduction, and productivity,reached record levels in 2024, though were moderated in 2025. Atlantic sea scallop and longfin squid faced high OA risk in Long Island Sound and the New Jersey shelf during the summers of 2016, 2018, 2019, 2023, and 2024, with 2024 marking the highest risk recorded since 2007. By 2025, risk levels decreased but still exceeded biological sensitivity limits for scallops on the New Jersey outer shelf in spring (not shown) and reached sensitivity limits for longfin squid in nearshore New Jersey waters during summer. These risks are heightened by cold-water CO2 absorption and the movement of high-CO2 water masses. While 2025 bottom temperatures remained as cool as 2024, higher salinity indicated a shift in water mass composition that resulted in lower overall OA risk compared to the previous two years.

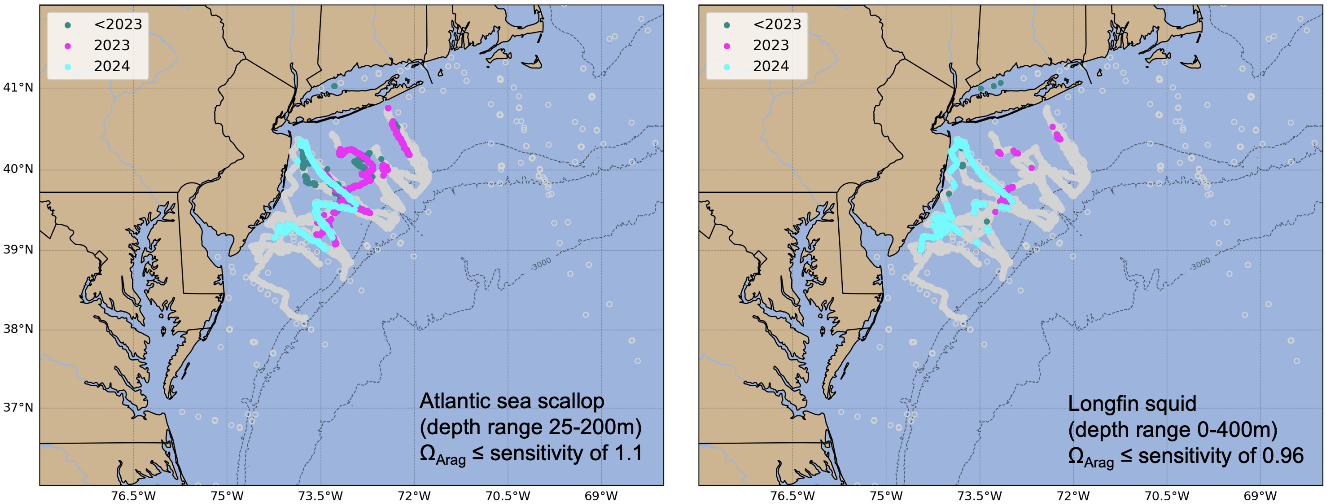


Figure 57: Locations where bottom aragonite saturation state (Ω_{Arag}; summer only: June-August) were at or below the laboratory-derived sensitivity level for Atlantic sea scallop (left panel) and longfin squid (right panel) for the time periods 2007-2022 (dark cyan), 2023 only (magenta) and 2024 only (cyan). Gray circles indicate locations where bottom Ω_{Arag} values were above the species specific sensitivity values..

Biological and oceanographic processes can affect the amount of oxygen present in the water column. During low oxygen (hypoxic) events, species' growth is negatively affected and very low oxygen can result in mortality. In 2025, aggregated demersal DO observations collected by a variety of programs were examined simultaneously. These programs include glider deployments, fishery-independent surveys, and cooperative ocean observing efforts aboard commercial fishing vessels. Coastal hypoxia was observed in Narragansett Bay in September and October where water temperatures were warm and stagnant. There were no reports of mass mortality events from the fishing industry. The duration and extent of hypoxic events is being monitored, but long-term shelf-wide observations are not yet available. However, hypoxic events were detected off the coast of New Jersey in 2023 and were potentially responsible for fish, lobster, and crab mortalities. No hypoxic events were observed on the NE shelf in 2024.

Drivers: Predation The abundance and distribution of predators can affect both the productivity and mortality rates on managed stocks. Predators can consume managed species or compete for the same resources resulting in increased natural mortality or declining productivity, respectively. The northeast shift in some highly migratory species (Fig. 32) indicates a change in the overlap between predators and prey. Since we also observe distribution shifts in both managed and forage species, the effect of changing predator distributions alone is difficult to quantify.

Gray seals are fish predators with increasing populations in New England,Recent white shark aggregations have been observed near Cape Cod, however, both gray seals and white sharks are broad generalist feeders that do not generally target commercially-sized managed species. Stock status is mixed for Atlantic Highly Migratory Species (HMS) stocks (including sharks, swordfish, billfish, and tunas) occurring throughout the Northeast U.S. shelf. While there are several HMS species considered to be overfished or that have unknown stock status, the population status for some managed Atlantic sharks and tunas is at or above the biomass target, suggesting the potential for robust (or rebuilt) predator populations among these managed species. Stable predator populations suggest stable predation pressure on managed species, but increasing predator populations may reflect increasing predation pressure.

Future Considerations The processes that control fish productivity and mortality are dynamic, complex, and the result of the interactions between multiple 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 ecological and environmental process changes documented throughout the report. 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

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Future Considerations The processes that control fish productivity and mortality are dynamic and complex, and are the result of the interactions between multiple system drivers. If the observed changes to these processes outlined in this report are not considered when managing fisheries, there is an increased risk that short-term stock projections and rebuilding plans will be more uncertain and will not reflect the current stock productivity. To mitigate this risk, time series of stock productivity and ecosystem conditions are regularly reviewed and are used to select appropriate reference periods that inform projections and reference point estimation. Next generation stock assessment models have also expanded the capacity to incorporate ecosystem changes into scientific products that support fishery management. Increasingly, NEFSC stock assessments model time-varying processes and in some cases environmental time series are used directly to describe changing stock dynamics. Research efforts to understand system drivers, identify change points, and develop paths to use this information more effectively in stock assessment and management are ongoing.

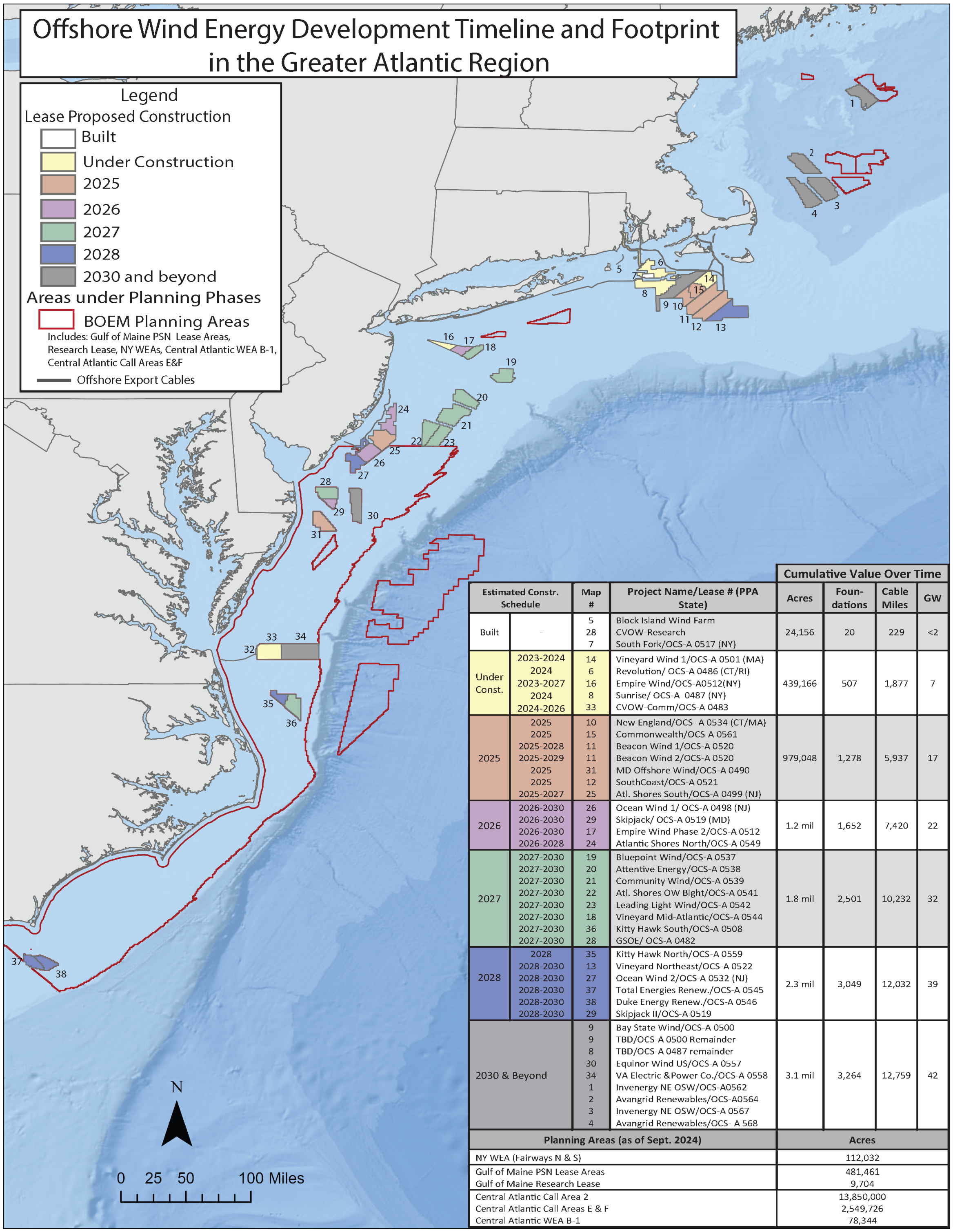
Other Ocean Uses: Offshore Wind

Indicators: development timeline, revenue in lease areas, coastal community vulnerability

All reported potential offshore wind development status and data are based on BOEM's Offshore Renewable Activities page and projects' Final Environmental Impact Statements. In 2025, the Presidential Memorandum 90 FR 8363 removed existing planning areas and excluded the establishment of additional lease areas.

As of January 2026, 38 offshore wind development leases are under different stages of development in the Northeast (Fig. 58). One project (South Fork Wind Farm) is fully operational and another (Vineyard Wind 1) is partly operational while construction finishes. The southern New England region has two other projects currently under construction (Revolution Wind and Sunrise Wind). Empire Wind and Coastal Virginia Offshore Wind (CVOW) are currently under construction in the New York Bight and Mid-Atlantic Region, respectively, with CVOW expected to start generating power in early 2026.

Construction of these projects during 2025 affected fisheries managed by the [Mid-Atlantic] [New England] Fishery Management Council. There are eight additional projects that have Construction and Operations Plan (COP) approvals (three in Southern New England and five in the Mid-Atlantic/New York Bight) that could begin construction in 2026, however, construction schedules are highly uncertain at this time. Seven additional projects have submitted COPs and are pending approval, while the remaining projects are under the site assessment phase and have not submitted COPs to date (Fig. 58).



Estimated Constr. Schedule		Map #	Project Name/Lease # (PPA State)	Cumulative Value Over Time: Acres	Foun-dations	Cable Miles	GW
Built	-	5	Block Island Wind Farm	24,156	20	229	<2
		28	CVOW-Research				
		7	South Fork/OCS-A 0517 (NY)				
Under Const.	2023-2024	14	Vineyard Wind 1/OCS-A 0501 (MA)	439,166	507	1,877	7
	2024	6	Revolution/ OCS-A 0486 (CT/RI)				
	2023-2027	16	Empire Wind/OCS-A0512(NY)				
	2024	8	Sunrise/ OCS-A 0487 (NY)				
	2024-2026	33	CVOW-Comm/OCS-A 0483				
2025	2025	10	New England/OCS- A 0534 (CT/MA)	979,048	1,278	5,937	17
	2025	15	Commonwealth/OCS-A 0561				
	2025-2028	11	Beacon Wind 1/OCS-A 0520				
	2025-2029	11	Beacon Wind 2/OCS-A 0520				
	2025	31	MD Offshore Wind/OCS-A 0490				
	2025	12	SouthCoast/OCS-A 0521				
	2025-2027	25	Atl. Shores South/OCS-A 0499 (NJ)				
2026	2026-2030	26	Ocean Wind 1/ OCS-A 0498 (NJ)	1.2 mil	1,652	7,420	22
	2026-2030	29	Skipjack/ OCS-A 0519 (MD)				
	2026-2030	17	Empire Wind Phase 2/OCS-A 0512				
	2026-2028	24	Atlantic Shores North/OCS-A 0549				
2027	2027-2030	19	Bluepoint Wind/OCS-A 0537	1.8 mil	2,501	10,232	32
	2027-2030	20	Attentive Energy/OCS-A 0538				
	2027-2030	21	Community Wind/OCS-A 0539				
	2027-2030	22	Atl. Shores OW Bight/OCS-A 0541				
	2027-2030	23	Leading Light Wind/OCS-A 0542				
	2027-2030	18	Vineyard Mid-Atlantic/OCS-A 0544				
	2027-2030	36	Kitty Hawk South/OCS-A 0508				
	2027-2030	28	GSOE/ OCS-A 0482				
2028	2028	35	Kitty Hawk North/OCS-A 0559	2.3 mil	3,049	12,032	39
	2028-2030	13	Vineyard Northeast/OCS-A 0522				
	2028-2030	27	Ocean Wind 2/OCS-A 0532 (NJ)				
	2028-2030	37	Total Energies Renew./OCS-A 0545				
	2028-2030	38	Duke Energy Renew./OCS-A 0546				
	2028-2030	29	Skipjack II/OCS-A 0519				
2030 & Beyond		9	Bay State Wind/OCS-A 0500	3.1 mil	3,264	12,759	42
		9	TBD/OCS-A 0500 Remainder				
		8	TBD/OCS-A 0487 remainder				
		30	Equinor Wind US/OCS-A 0557				
		34	VA Electric &Power Co./OCS-A 0558				
		1	Invenergy NE OSW/OCS-A0562				
		2	Avangrid Renewables/OCS-A0564				
		3	Invenergy NE OSW/OCS-A 0567				
		4	Avangrid Renewables/OCS- A 568				

Planning Areas (as of Sept. 2024)	Acres
NY WEA (Fairways N & S)	112,032
Gulf of Maine PSN Lease Areas	481,461
Gulf of Maine Research Lease	9,704
Central Atlantic Call Area 2	13,850,000
Central Atlantic Call Areas E & F	2,549,726
Central Atlantic WEA B-1	78,344

Map data as of February 2025

Figure 58: All Northeast Project areas by year construction ends (each project has a 2 year construction period).

With the first offshore wind energy projects now under construction and operation, all indicator analyses in this section follow a different reporting format than in previous years. Where previous years reported data for all lease areas, this year we investigate impacts of the six commercial scale projects currently under construction or operation, (i.e., Active Projects: South Fork Wind Farm, Revolution Wind, Sunrise Wind, Empire Wind 1, Vineyard Wind 1, and CVOW-Commercial).

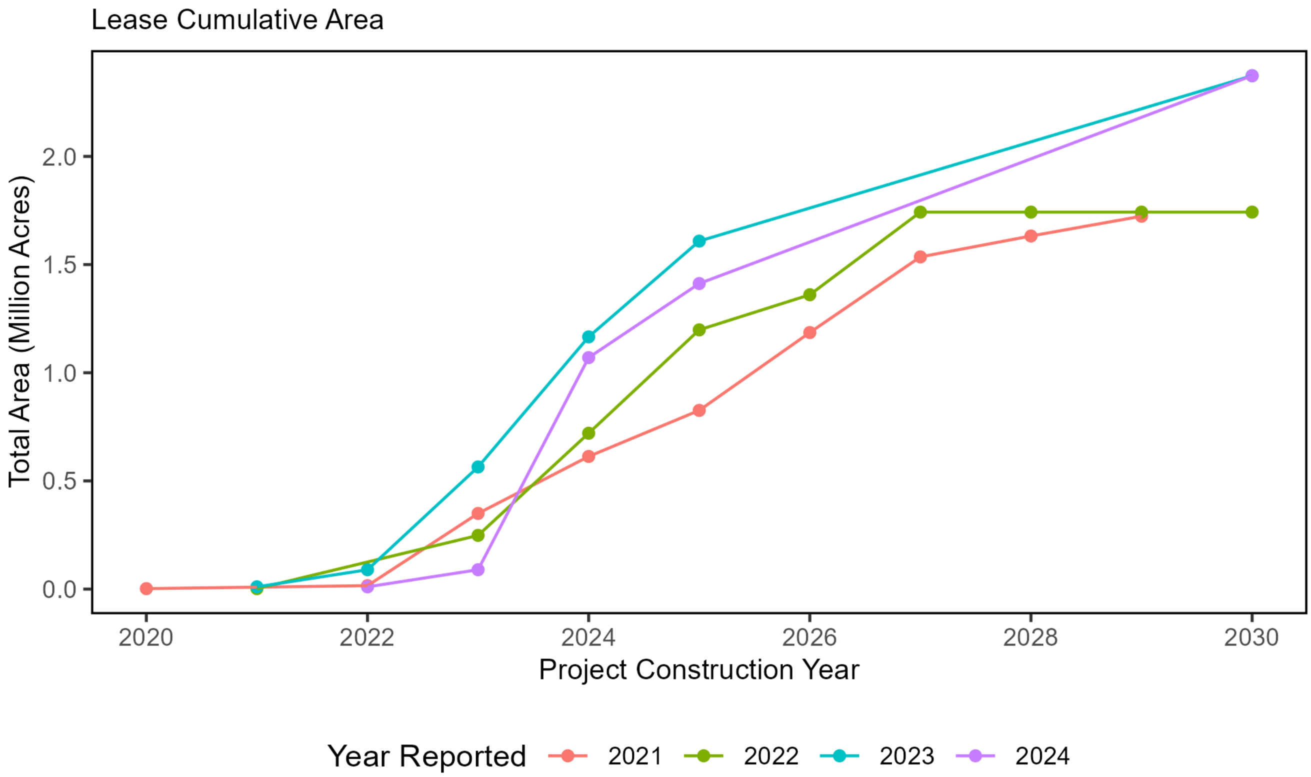


Figure 59: Total area proposed for wind development on the Northeast Shelf through 2030.

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With the first offshore wind energy projects now under construction and operation, all indicator analyses in this section follow a different reporting format than in previous years. Where previous years reported data for all lease areas, this year we investigate impacts of the six commercial-scale projects currently under construction or operation (i.e., Active Projects: South Fork Wind Farm, Revolution Wind, Sunrise Wind, Empire Wind 1, Vineyard Wind 1, and CVOW-Commercial).

Offshore wind indicators are based on federal logbook data and do not include all data for all fisheries; therefore a complete evaluation of potential offshore wind energy development impacts would need to be supplemented by other data sources. For further information on the utility of the data, see the socioeconomic impacts of offshore wind development data reports page.

Based on federal vessel logbook data, commercial fishery revenue from trips within Active Projects varied annually from 2008-2024. Maximum annual revenue for the fisheries with the most overlap with Active Projects peaked at over $8.7 million for the sea scallop fishery, $1.1 million for monkfish, $477,000 for skates, $377,000 for yellowtail flounder, and $344,000 for Atlantic herring (Fig. 92). Individual groundfish species are more affected on a percentage basis, with up to 13% of historical annual revenues overlapping with Active Projects for species such as little skate (13%), barndoor skate (11%), yellowtail flounder (10%), and 6% each for red hake, clearnose skate, and winter skate, respectively (Table 6). Future fishery resource overlap with wind leases, especially scallops, may change due to species distribution shifts attributable to climate change and recruitment and larval dispersion pattern changes caused by hydrodynamic flow disruptions from turbine foundations, which could also affect fishery landings/revenue.

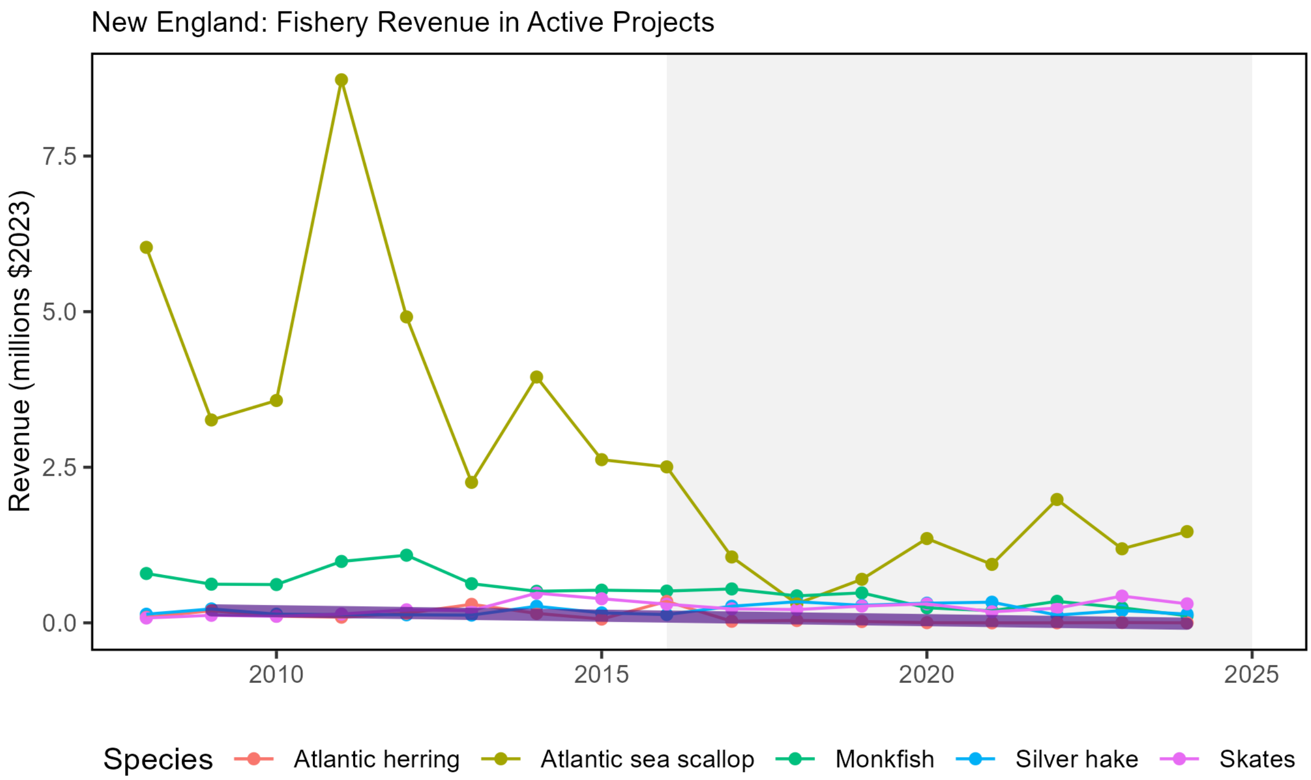

Figure 60: Revenue of species managed by the New England Fishery Management Council within existing offshore wind lease areas.

Table 6: New England managed species Landings and Revenue from Wind Energy Areas. Skates includes barndoor, winter, clearnose, smooth, little, and general skates reported in logbooks. *Less than a maximum of 50,000 lb was reported landed annually in wind energy lease areas for these species..

NEFMC, MAFMC, and ASMFC Managed Species	Maximum Percent Total Annual Regional Species Landings	Maximum Percent Total Annual Regional Species Revenue
Atlantic Sea Scallop	1.22	1.19
Monkfish	4.66	3.23
Winter Skate	6.39	6.05
Yellowtail Flounder	9.01	9.61
Atlantic Herring	1.53	0.94
Winter Flounder	3.14	3.23
Little Skate	7.42	12.94
Atlantic Cod	1.29	1.51
Spiny Dogfish	1.66	1.77
Clearnose Skate	5.21	5.82
Red Hake	8.64	5.57
Haddock	0.11	0.10
Barndoor Skate	11.45	11.07
Smooth Skate	9.31	5.04
Witch Flounder	0.13	0.11
American Plaice	0.08	0.06
Windowpane Flounder	3.07	2.66
Redfish	0.03	0.03

Table 6: New England managed species Landings and Revenue from Wind Energy Areas. Skates includes barndoor, winter, clearnose, smooth, little, and general skates reported in logbooks. *Less than a maximum of 50,000 lb was reported landed annually in wind energy lease areas for these species..

NEFMC, MAFMC, and ASMFC Managed Species	Maximum Percent Total Annual Regional Species Landings	Maximum Percent Total Annual Regional Species Revenue
Pollock	0.00	0.00
Atlantic Halibut	0.22	0.25
White Hake	0.50	0.00
Offshore Hake	3.54	0.98
Thorny Skate	0.10	0.10

The socio-demographic conditions, and resultant vulnerabilities, of some communities may further exacerbate the impacts of offshore wind development in the Northeast such that the impacts of offshore wind development are expected to differentially impact specific coastal communities (Fig. 61)

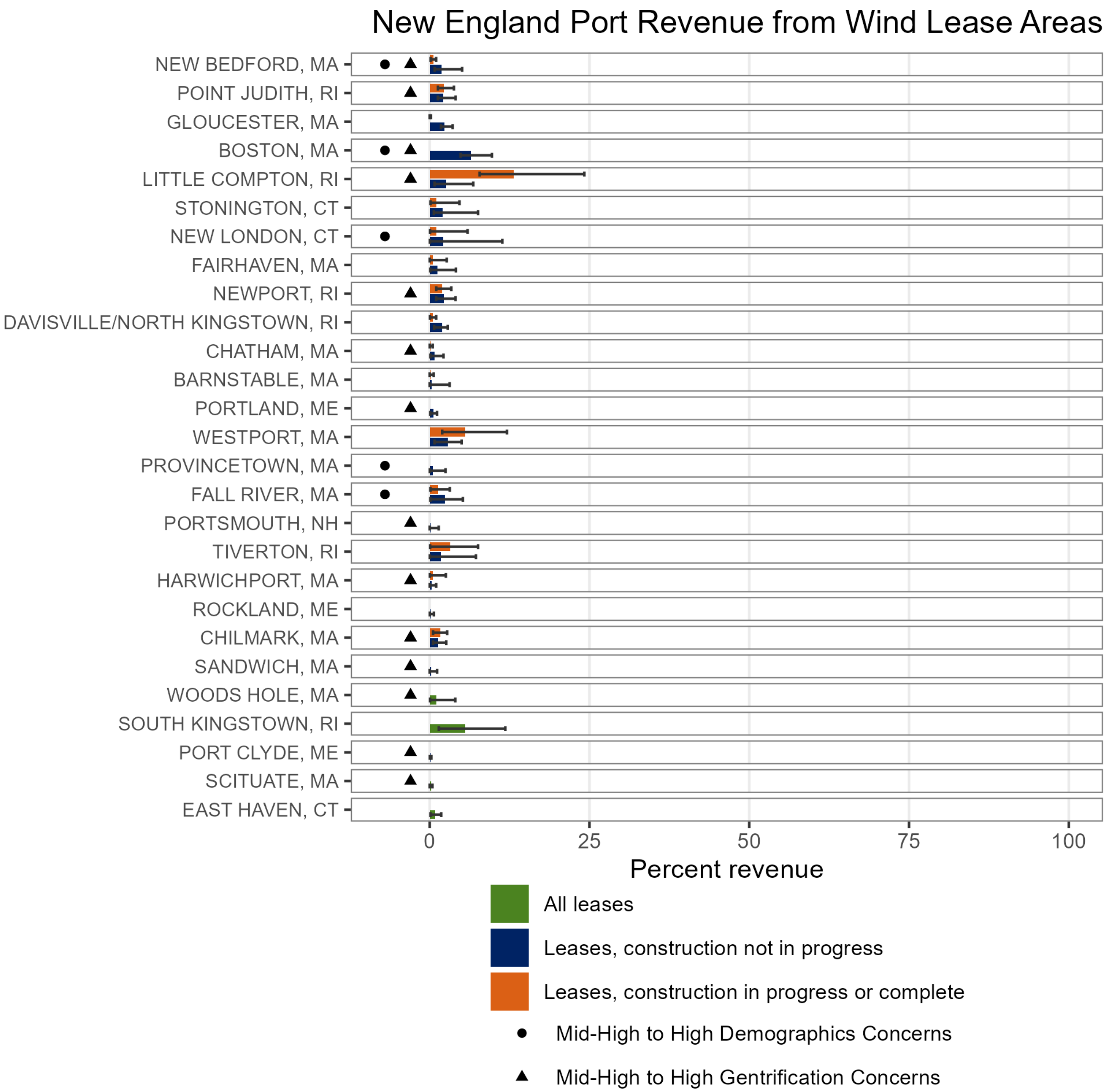

Figure 61: Percent of New England port fisheries revenue from Wind Energy Areas (WEA) from all leases (active + non-active; green), non-active leases (blue), and active leases (orange).

Based on federal vessel logbook data, Little Compton, RI (13% average and 24% maximum) and Westport, MA (6% average and 12% maximum) have the highest potential revenue loss from Active Projects based on 2008-2024 total port fisheries revenue, with all other New England communities having less than 5% (Fig. 61). Additional fishing revenue may be lost as more areas historically used for fishing are developed for offshore wind energy. In seven Mid-Atlantic ports, New England managed species account for at least 50% of landings from the Active Project areas by value or weight (Fig. 62). Furthermore, impacts of offshore wind development may unevenly affect individual operators, with some permit holders deriving a much higher proportion of revenue from wind areas than the port-based mean.

BOEM reports that cumulative offshore wind development (if all proposed projects are developed) could have moderate impacts on low-income members of vulnerable communities who work in the commercial fishing and for-hire fishing industry due to disruptions to fish populations, restrictions on navigation, and increased vessel traffic as well as existing vulnerabilities of low-income workers to economic impacts.

Top fishing communities with high socio-demographic and/or gentrification concerns such as Little Compton, RI, New Bedford, MA and New London, CT should be recognized as having potential additional vulnerability of the Active Projects and considered in decision making to reduce the social and economic impacts and aid in the resilience and adaptive capacity of these communities. In addition to fisheries landing overlaps, New Bedford, MA and New London, CT also support significant offshore wind port infrastructure needs for the Active Projects. Historically, the introduction of new industries can trigger industrial and socioeconomic gentrification of fishing ports. Competition for port space and potential pivoting of space use for offshore wind development should be monitored closely to ensure fishing communities are not adversely impacted. Additionally, offshore wind could increase recreational fishing opportunities at the turbines, potentially creating a demand for additional tourism, recreational fishing and boating port space in communities already balancing these uses with commercial fishing infrastructure, for example Point Judith, RI, and Newport, RI, and Gloucester, MA. Socio-demographic concerns also highlight communities where further resources are needed to reach underserved and underrepresented groups and create opportunities for, and directly involve, these groups in the decision-making process.

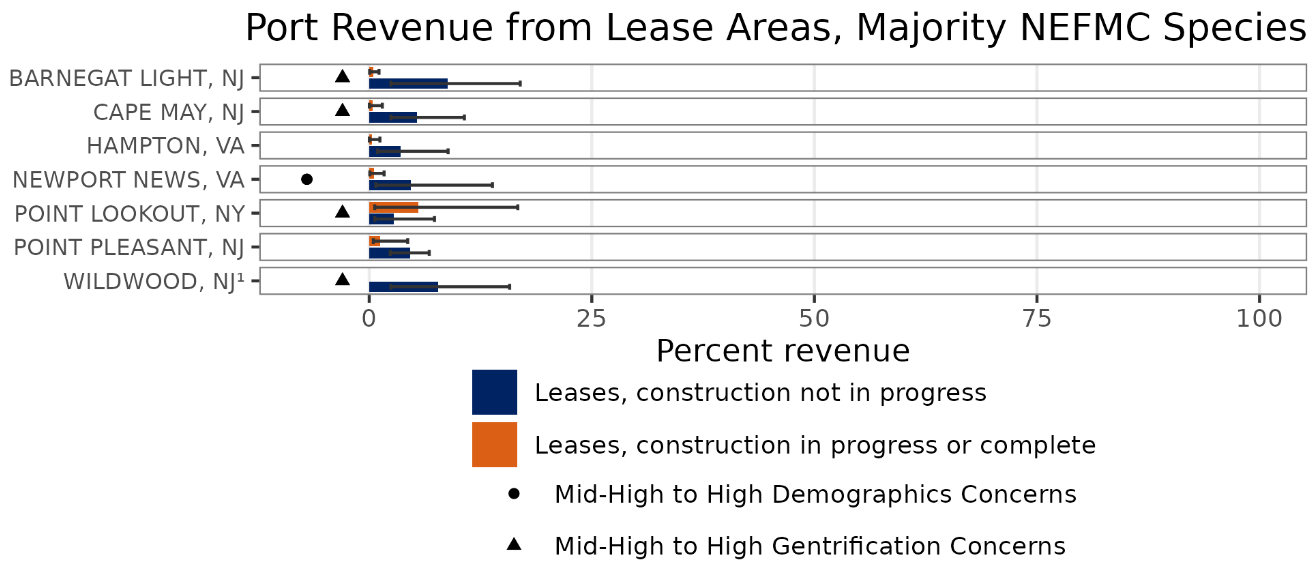

Figure 62: Percent of New England port revenue with majority MAFMC landings from Wind Energy Areas (WEA) from all leases (green), leases not under construction (blue), and active leases (orange).

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Implications

Current plans for buildout of offshore wind in a patchwork of areas spreads the impacts differentially throughout the region (Fig. 58). Up to 13% of total average revenue for major New England commercial species in lease areas could be forgone or reduced and associated effort displaced if all sites are developed. Displaced fishing effort can alter historic fishing area, timing, and method patterns, which can in turn change habitat, species (managed and protected), and fleet interactions. Several factors, including fishery regulations, fishery availability, and user conflicts affect where, when, and how fishing effort may be displaced, along with impacts to and responses of affected fish species.

Planned development overlaps NARW mother and calf migration corridors and a significant foraging habitat that is used throughout the year (Fig. 63). Turbine presence and extraction of energy from the system could alter local oceanography and may affect right whale prey availability. For example, persistent foraging hotspots of right whales and seabirds overlap on Nantucket Shoals, where unique hydrography aggregates enhanced prey densities. Wind leases (OCS-A 0521 and OCS-A 0522) currently intersect these hotspots on the southwestern corner of Nantucket

Shoals and a prominent tidal front associated with invertebrate prey swarms important to seabirds and possibly right whales. Proposed wind development areas also bring increased vessel strike risk from construction and operation vessels. In addition, there are a number of potential impacts to whales from pile driving and operational noise such as displacement, increased levels of communication masking, and elevated stress hormones.

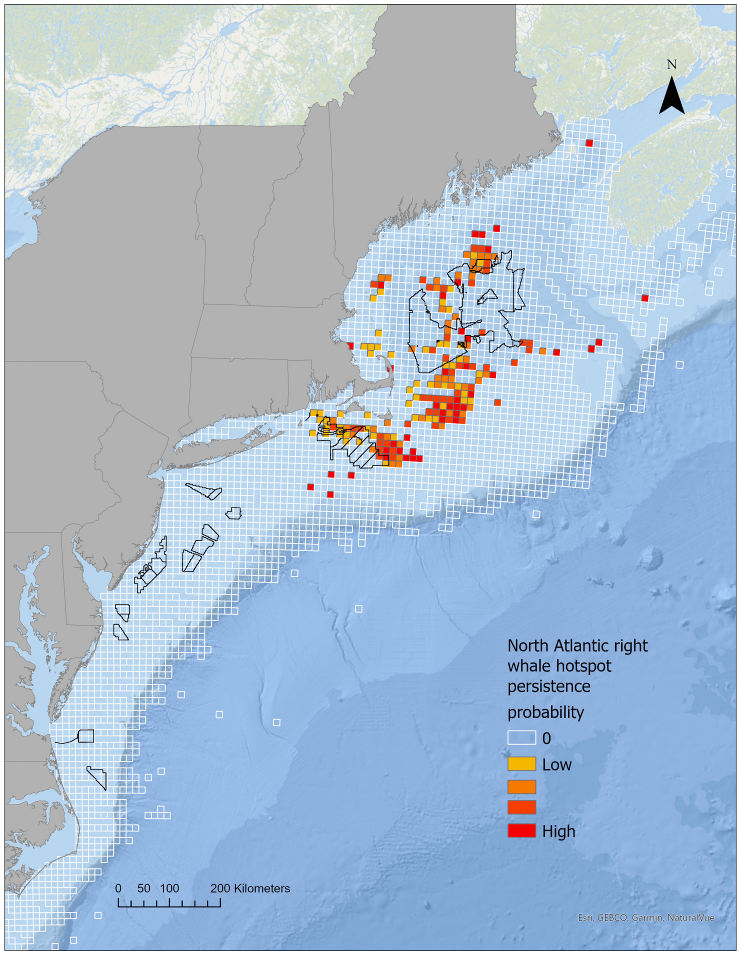

Figure 63: Northern Right Whale persistent hotspots (red shading) and Wind Energy Areas (black outlines).

Scientific data collection surveys for ocean and ecosystem conditions, fish, and protected species will be altered, potentially increasing uncertainty for stock assessments and associated management decision making. Increased vessel transit between stations may decrease data collections that are already limited by annual days-at-sea day allocations.

The increase of offshore wind development can have both positive (e.g., employment opportunities) and negative (e.g., space-use conflicts) effects. Continued increase in coastal development and gentrification pressure has resulted in loss of fishing infrastructure space within ports. Understanding these existing pressures can allow for avoiding and mitigating negative impacts to our shore support industry and communities dependent on fishing. Some of the communities with the highest fisheries revenue overlap with offshore wind development areas that are also vulnerable to gentrification pressure are Point Judith and Newport, RI; and Boston and New Bedford, MA.

Marine Aquaculture Aquaculture fisheries and federally-managed fisheries could both compete or benefit each other with spatial access, shoreside infrastructure, or the supply of seafood. Unlike offshore wind, offshore aquaculture is not regulated by any federal leasing program but is permitted via the U.S. Army Corps of Engineers and the U.S. EPA. Currently, there are no federally-permitted aquaculture projects in the Northeast U.S. The marine aquaculture industry of the Northeast currently occurs in nearshore waters which are regulated by state leasing and permitting processes and federal permitting processes, as applicable. Analyses are needed to quantify the nearshore spatial distribution of aquaculture in the Northeast.

2025 Highlights

This section intends to provide a record of noteworthy observations reported in 2025 across the Northeast U.S. region. The full ecosystem and fisheries impacts of many of these observations are still to be determined. They should, however, be noted and considered in future analyses and management decisions.

The Northeast U.S. region experienced colder than average ocean temperatures, despite record warm global ocean and air temperatures. Similar to 2024, oceanographic and ecological conditions reflected cooler water and changing species abundance, distribution, and timing.

Northwest Atlantic Phenomena The below average temperatures observed in 2024 persisted into 2025, although there are seasonal and local exceptions to this pattern. Anomalously cold surface conditions (Fig. 96a) were recorded throughout the Northeast Shelf and were widespread across the Slope Sea for much of the year, however the waters were not as fresh as recorded in 2024. Winter bottom temperatures were also below average across much of the Northeast Shelf (Fig. 96b). Multiple oceanographic and atmospheric factors can contribute to these cooler conditions including a more southerly Gulf Stream and higher proportions of Labrador Slope and Scotian Shelf water entering the system.

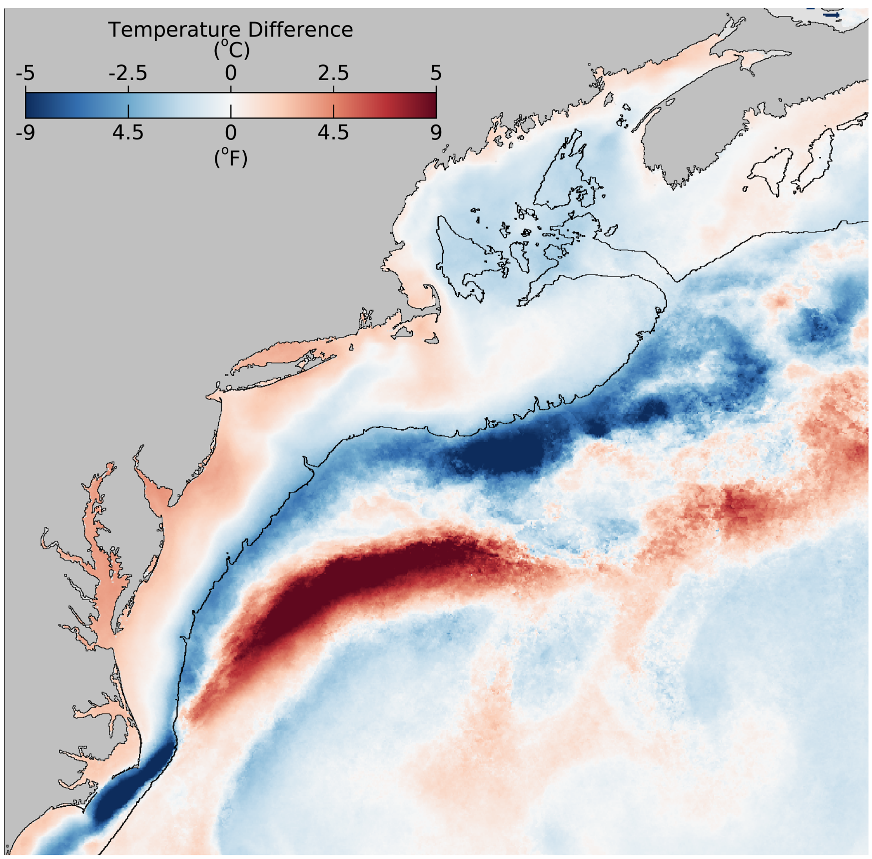

Figure 64: February 2024 sea surface temperature difference compared to the February 2000-2020 long-term mean from the NOAA Advanced Clear-Sky Processor for Ocean (ACSPO) Super-collated SST.

In 2023, Labrador Slope water accounted for more than 50% of the source water entering the Gulf of Maine through the Northeast Channel (Fig. 65); data are still being processed for 2024. Colder, fresher water detected deep in the Jordan Basin for the first half of 2024 suggests an increased influx of Labrador Slope and Scotian Shelf water, which resulted in colder and fresher conditions throughout the Northwest Atlantic and contributed to the increased size and colder temperatures of the Mid-Atlantic Cold Pool.

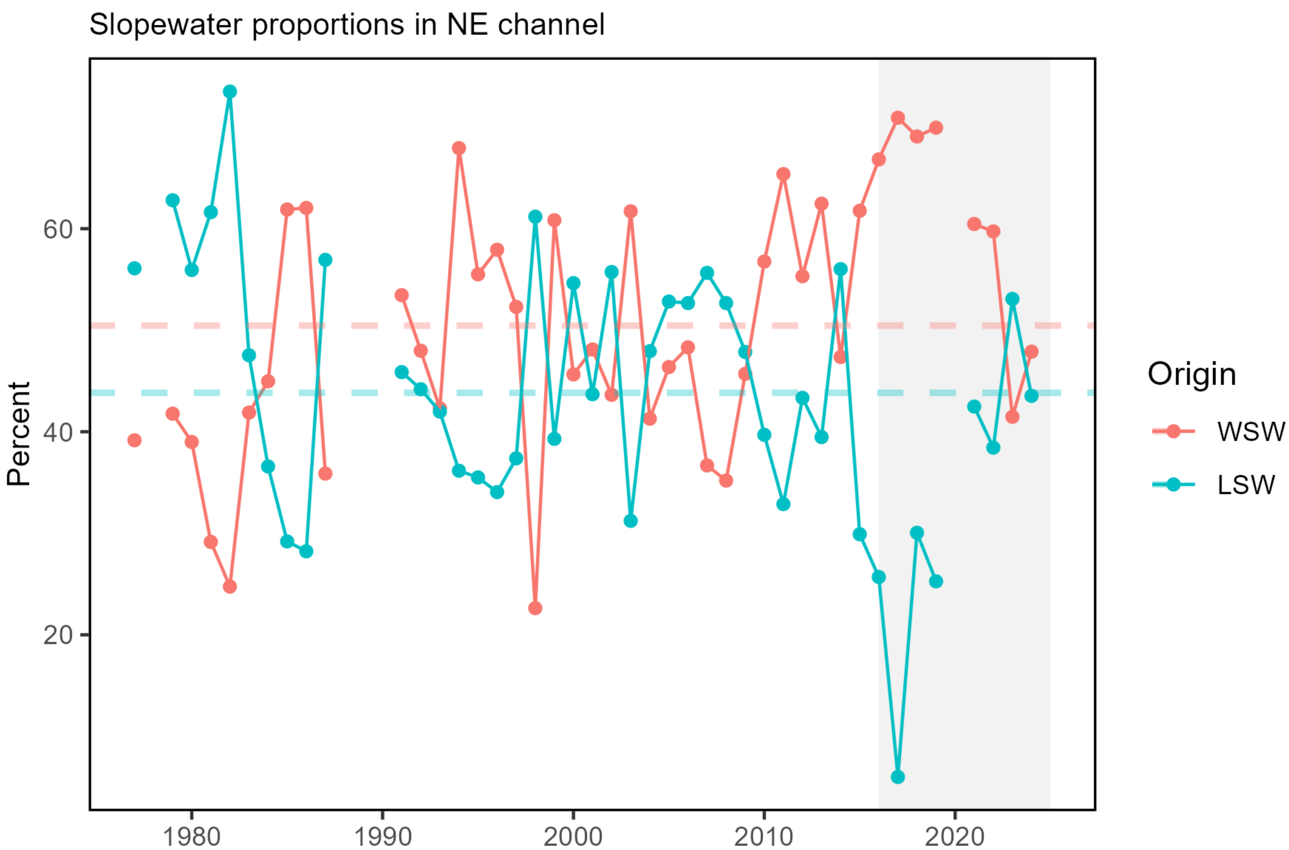

Figure 65: The proportion of Warm Slope Water (WSW) and Labrador Slope Water (LSW) enter the Gulf of Maine through the Northeast Channel from 1977 to 2023. The red and teal dashed lines represent the long-term proportion averages for the WSW and LSW respectively.

Northeast Shelf and Local Phenomena The influx of the northern waters is likely linked to multiple observations across the Northeast Shelf including the uncommon presence of Arctic *Calanus* zooplankton species in the Gulf of Maine, delayed migration of many species, and redistribution of some species. Several members of the fishing community noted delayed migration of species into typical fishing grounds. In particular, they attributed the delayed migration of longfin squid, black sea bass, and haddock to the cooler water temperatures. Many also reported redistribution of some species. Specifically, pollock, bluefin tuna, Atlantic mackerel, longfin squid, bluefish, and bonito were observed in surprising or unusual locations. Some species, such as Atlantic mackerel, were reported outside of typical fishing grounds and in higher abundance compared to recent years. Anglers also reported good catches of red drum in Chesapeake Bay and record high (since 1995) numbers were observed at Poplar Island survey location.

In the summer, Chesapeake Bay recorded warm temperatures and low bottom water dissolved oxygen that resulted in less than suitable habitat for species such as striped bass and blue crabs. These poor conditions can affect their distribution, growth, and survival. Additionally, lower than average spring and summer salinity negatively impacted oyster hatchery operations and increased the area of available habitat for invasive blue catfish, potentially increasing predation on blue crabs and other important finfish species.

During the summer months there were multiple prolonged upwelling events that brought cold water to the surface off the New Jersey coast. There was also an atypical phytoplankton bloom south of Long Island in late June to early July 2024, possibly linked to an upwelling event (Fig. 66). The bloom was dominated by coccolithophores, which have an exoskeleton made up of calcium carbonate plates that can turn the water an opaque turquoise color. Large blooms of coccolithophores are unusual in this region, but they are not considered harmful and are grazed by zooplankton. Additionally, there were observations of multiple whale species aggregating near the Hudson Canyon between May and August.

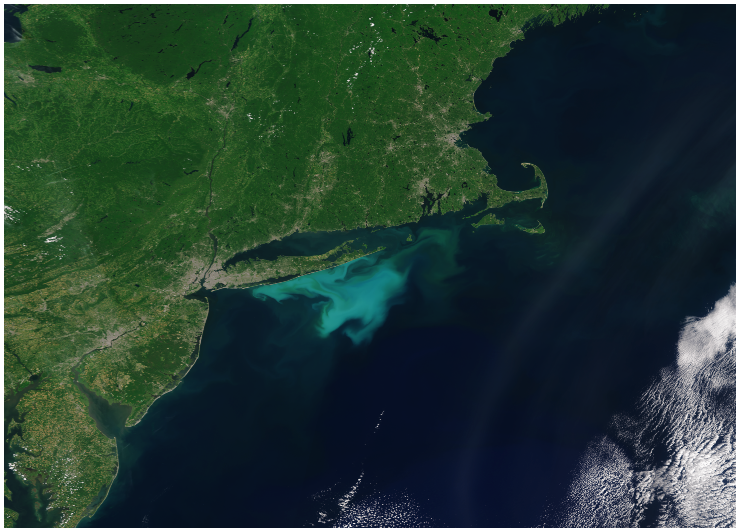

Figure 66: An OLCI Sentinel 3A true color image with enhanced contrast captured on July 2, 2024. Coccolithophores shed their coccolith plates during the later stages of the bloom cycle, which results in the milky turquoise water color (Image credit: NOAA STAR, OCView and Ocean Color Science Team).

Summer bottom ocean acidification (OA) risk in the Mid-Atlantic was the highest recorded since sampling began in 2007. High OA risk is measured as low aragonite saturation state(Ω). Similarly, the winter/early spring Gulf of Maine surface OA risk was significantly above the climatological average and near the sensitivity levels for cod (Ω<1.19) and lobster (Ω<1.09) (Fig.67). These observations were likely driven by the greater volume of fresher, less-buffered Labrador Slope water entering the Gulf of Maine and Mid-Atlantic, as well as cooler conditions. The 2023 and 2024 high summer OA risk has increased the extent of potentially unfavorable habitat for Atlantic sea scallops (Ω<1.1) and longfin squid (Ω<0.96). Additionally, for the first time, high OA risk conditions were observed outside of summer (fall for both species and spring for Atlantic sea scallops).

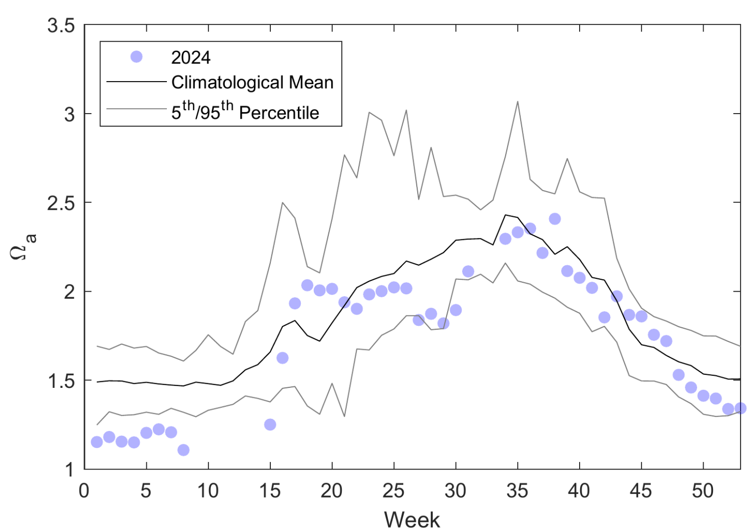

Figure 67: Weekly average surface aragonite saturation state measured at the long-term buoy location in the Gulf of Maine at 43.02 N and 70.54 W

In contrast to the documented die-off of scallops in the Mid-Atlantic Elephant Trunk region between the 2022 and 2023 surveys, in 2024 there was strong scallop recruitment in the southeastern portion of the Nantucket Lightship Area.

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Document Orientation

The figure format is illustrated in Fig 68a. Trend lines are shown when slope is significantly different from 0 at the $p < 0.05$ level. An orange line signifies an overall positive trend, and purple signifies a negative trend. To minimize bias introduced by small sample size, no trend is fit for < 30 year time series. Dashed lines represent mean values of time series unless the indicator is an anomaly, in which case the dashed line is equal to 0. Shaded regions indicate the past ten years. If there are no new data for 2022, the shaded region will still cover this time period. The spatial scale of indicators is either coastwide, Mid-Atlantic states (New York, New Jersey, Delaware, Maryland, Virginia, North Carolina), or at the Mid-Atlantic Bight (MAB) Ecosystem Production Unit (EPU, Fig. 68b) level.

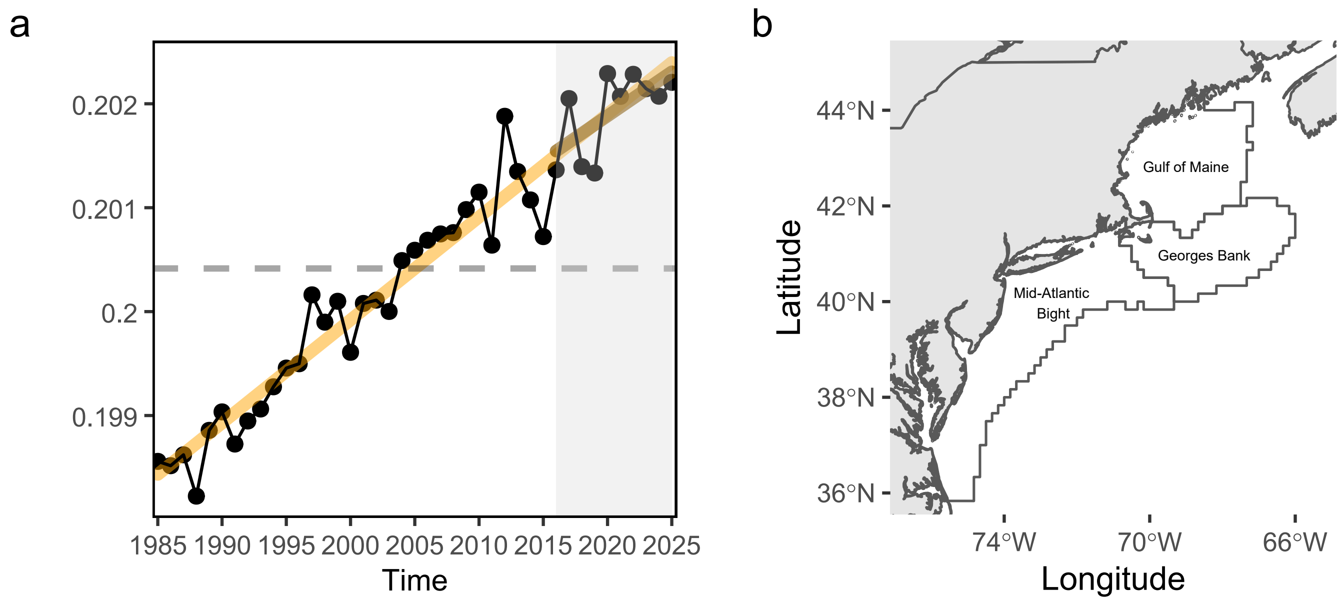

Figure 68: Document orientation. a. Key to figures. b.The Northeast Large Marine Ecosystem.

Fish and invertebrates are aggregated into similar feeding categories (Table 7) to evaluate ecosystem level trends in predators and prey.

Table 7: Feeding guilds and management bodies.

Guild	MAFMC	Joint	NEFMC	State or Other
Apex Predator				shark uncl, swordfish, yellowfin tuna, bluefin tuna
Piscivore	summer flounder, bluefish, northern shortfin squid, longfin squid	spiny dogfish, goosefish	winter skate, clearnose skate, thorny skate, offshore hake, silver hake, atlantic cod, pollock, white hake, red hake, atlantic halibut, windowpane, acadian redfish	sea lamprey, sandbar shark, atlantic angel shark, atlantic torpedo, conger eel, spotted hake, cusk, fourspot flounder, john dory, atlantic cutlassfish, blue runner, striped bass, weakfish, sea raven, northern stargazer, banded rudderfish, atlantic sharpnose shark, inshore lizardfish, atlantic brief squid, northern sennet, king mackerel, spanish mackerel
Planktivore	atlantic mackerel, chub mackerel, butterfish		atlantic herring	harvestfishes, smelts, round herring, alewife, blueback herring, american shad, menhaden, bay anchovy, striped anchovy, rainbow smelt, atlantic argentine, slender snipe eel, atlantic silverside, northern pipefish, atlantic moonfish, lookdown, blackbelly rosefish, lumpfish, northern sand lance, atlantic saury, mackerel scad, bigeye scad, round scad, rough scad, silver rag, weitzmans pearlsides, atlantic soft pout, sevenspine bay shrimp, pink glass shrimp, polar lebbeid, friendly blade shrimp, bristled longbeak, aesop shrimp, norwegian shrimp, northern shrimp, brown rock shrimp, atlantic thread herring, spanish sardine, atlantic bumper, harvestfish, striated argentine, silver anchovy

Table 7: Feeding guilds and management bodies.

Guild	MAFMC	Joint	NEFMC	State or Other
Benthivore	black sea bass, scup, tilefish		barndoor skate, rosette skate, little skate, smooth skate, haddock, american plaice, yellowtail flounder, winter flounder, witch flounder, atlantic wolffish, ocean pout, crab,red deepsea	crab,unc, hagfish, porgy,red, sea bass,nk, atlantic hagfish, roughtail stingray, smooth dogfish, chain dogfish, bluntnose stingray, bullnose ray, southern stingray, longfin hake, fourbeard rockling, marlin-spike, gulf stream flounder, longspine snipefish, blackmouth bass, threespine stickleback, smallmouth flounder, hogchoker, bigeye, atlantic croaker, pigfish, northern kingfish, silver perch, spot, deepbody boarfish, sculpin uncl, moustache sculpin, longhorn sculpin, alligatorfish, grubby, atlantic seasnail, northern searobin, striped searobin, armored searobin, cunner, tautog, snakeblenny, daubed shanny, radiated shanny, red goatfish, striped cusk-eel, wolf eelpout, wrymouth, fawn cusk-eel, northern puffer, striped burrfish, planehead filefish, gray triggerfish, shortnose greeneye, beardfish, cownose ray, american lobster, cancer crab uncl, jonah crab, atlantic rock crab, blue crab, spider crab uncl, horseshoe crab, coarsehand lady crab, lady crab, northern stone crab, snow crab, spiny butterfly ray, smooth butterfly ray, snakefish, atlantic midshipman, bank cusk-eel, red cornetfish, squid cuttlefish and octopod uncl, spoonarm octopus, bank sea bass, rock sea bass, sand perch, cobia, crevalle jack, vermilion snapper, tomtate, jolthead porgy, saucereye porgy, whitebone porgy, knobbed porgy, sheepshead porgy, littlehead porgy, silver porgy, pinfish, red porgy, porgy and pinfish uncl, banded drum, southern kingfish, atlantic spadefish, leopard searobin, dusky flounder, triggerfish filefish uncl, blackcheek tonguefish, orange filefish, queen triggerfish, ocean triggerfish
Benthos	atlantic surfclam, ocean quahog		sea scallop	sea cucumber, sea urchins, snails(conchs), sea urchin and sand dollar uncl, channeled whelk, blue mussel