2025 Ecosystem Summary Report for NAFO 4X

Maritimes EBFM WG

2025-12-04

Contents

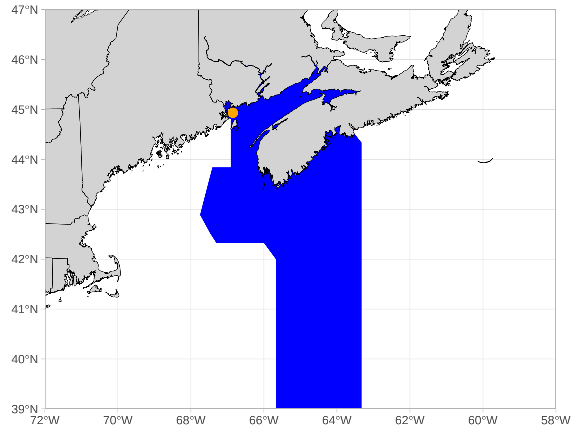

Figure 1: The NAFO 4X Management area in blue, the orange point is Prince 5 station.

Introduction

About this report

This Ecosystem Summary Report provides the ecosystem context to support Fisheries and Oceans Canada's Ecosystem Approach, which includes Ecosystem Approaches to Fisheries Management (EAFM 2019; Bill C-68) and Ecosystem-Based Fisheries Management (EBFM). It aligns objectives broadly to those of the Maritimes Ecosystem-Based Management Framework and regional/area-based objectives that contribute to Scientific Advice and Management Plans or other Harvest Strategies and uses a suite of indicators that are used to describe the ecosystem (Table 1). The trends and the status of ecosystem indicators are reported relative to a reference point (if available) or a long-term average. The results are synthesized to outline potential implications for the management area examined and not specifically related - but can be applied - to a focal stock or species.

Overview

- The North Atlantic as a whole is experiencing a warm phase, with SST and bottom temperature above the long-term means. There has been some recent cooling in the NAFO 4X region since 2022.
- Salinity has decreased since the 1990s and mean stratification has increased on the Scotian Shelf. Nutrient availability has decreased since 2010, the onset of the latest warming period.
- Although chlorophyll is within mean range, zooplankton biomass has been below the long-term mean in recent years.
- The Large Fish Indicator has been below the long term mean since 2014, indicating that structure and functioning of NAFO 4X ecosystem is more dominated by smaller fish and invertebrates. Species evenness has decreased, also indicating fewer, dominant species. Fish biomass is generally below long-term mean over the latest 5 years of data, although landings and fishing pressure have generally decreased in NAFO 4X over time.

Ecosystem Objectives

The Ecosystem objectives outline the ecosystem context and considerations for this management area.

Table 1: Ecosystem objectives related to EBM Framework Pillar, Management Components, and Indicators.

Pillar	Management Component	Ecosystem Objective	Indicators
A. Pressures and stressors	Climate and Oceanography	Monitor key signals within the environment and ecosystem	AMO,NAO, SST anomaly, Bottom Temp anomaly, SST, Bottom Temp, Stratification, Salinity, Ocean Acidification
A. Pressures and stressors	Longer-term Climate Change	Effective action and adaptation on climate change is taken	Future projection model outputs
B. Ecological	Commercial Fishery	Maintain fishing pressure consistent with the ecosystem's ability to recover	Fishing pressure, Commercial landings
B. Ecological	Habitat	Habitat and habitat features are conserved, protected, maintained, and restored	Cumulative impacts
B. Ecological	Productivity	Do not cause unacceptable reduction to productivity	Nitrate, Chlorophyll, Bloom statistic, C.finmarchicus, Zooplankton biomass
B. Ecological	Productivity	Ecosystem structure and functioning is promoted and conserved	Large Fish Indicator
B. Ecological	Biodiversity	Biodiversity is conserved, maintained, and restored to preserve the structure and natural resilience of aquatic ecosystems	Shannon Diversity Index, Margalef Richness, Heips Evenness, Guild-level biomass
B. Ecological	Non-Target species	Unintended or incidental mortality for all species is controlled	NA for this report
C. Economic	Commercial Fishery	Aquatic resources are managed to foster long term, viable, prosperous and sustainable livelihoods for all users	Landings values
D. Social-Cultural	NA for this report	NA for this report	NA for this report
E. Governance	NA for this report	NA for this report	NA for this report

A. Pressures and Stressors

Climate and oceanography

The management area is strongly influenced by natural variability of the climate system (e.g., Atlantic Multidecadal Oscillation, North Atlantic Oscillation) and, therefore, long-term monitoring is needed to determine how anthropogenic climate change is affecting ocean temperatures and other ocean properties.

Changes in climate can directly and indirectly impact stock status by affecting the distribution, seasonal timing, physiology, migration and spawning of marine species.

Atlantic Multidecadal Oscillation (AMO)

The AMO describes long-duration changes in the sea surface temperature of the North Atlantic Ocean, with cool and warm phases that may last for 20-40 years.

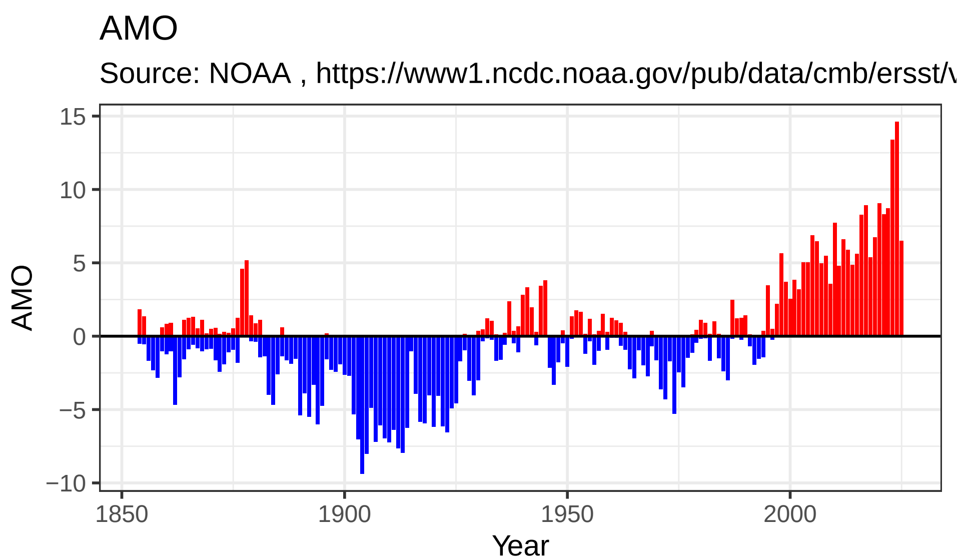

Figure 2: Atlantic Multidecdal Oscillation (AMO), the average anomalies of SST in the North Atlantic basin.

- The North Atlantic is currently in a warm phase, since the 1990s.

North Atlantic Oscillation Index

Layton et al. 2025 (see Section 2.1)

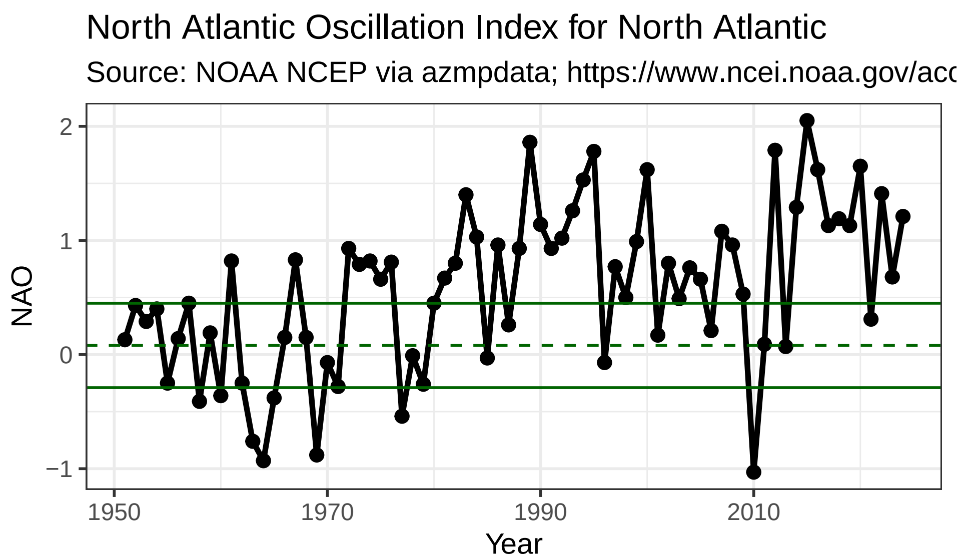

Figure 3: The North Atlantic Oscillation (NAO) index, defined as the winter (December, January, February, March) 500 mb pressure Principal Component Analysis which is representative of the difference between the Icelandic low and Azores high. Climatological mean is shown as the dashed line, solid lines are ± standard deviation (SD).

- The NAO has been above the 1991-2020 mean since 2014.
- A high NAO index corresponds to an intensification of the pressure difference between the Icelandic Low and the Azores High. Strong northwest winds, cold air and sea temperatures, and heavy ice in the Labrador Sea and on the NL shelf areas, are usually associated with a high positive NAO index (Colbourne et al. 1994; Drinkwater 1996). The opposite response (warm, salty conditions) occurs during years with a negative NAO index (Petrie 2007).
- The NAO has been shown to strongly affect bottom temperature distributions throughout the region from the Labrador Shelf to the Gulf of Maine (Petrie 2007). The response is bimodal, the product of direct and advective effects, with positive (negative) NAO generally corresponding to colder- (warmer-) than-normal bottom temperatures over the Labrador-Newfoundland Shelf, the Gulf of St. Lawrence, and the Eastern Scotian Shelf, and warmer- (colder-) than-normal conditions on the Central and Western Scotian Shelf and in the Gulf of Maine.

Sea Surface Temperature Anomaly

Temperature anomalies are the deviations from the long-term means, or as standardized anomalies they are the anomaly divided by the Standard Deviation (SD). If the data permit, the long-term means and SDs are calculated for the 30-year base period of 1991–2020. The use of standardized anomalies and the same base period allow direct comparison of anomalies among sites and variables.

Layton et al. 2025 (see Section 3)

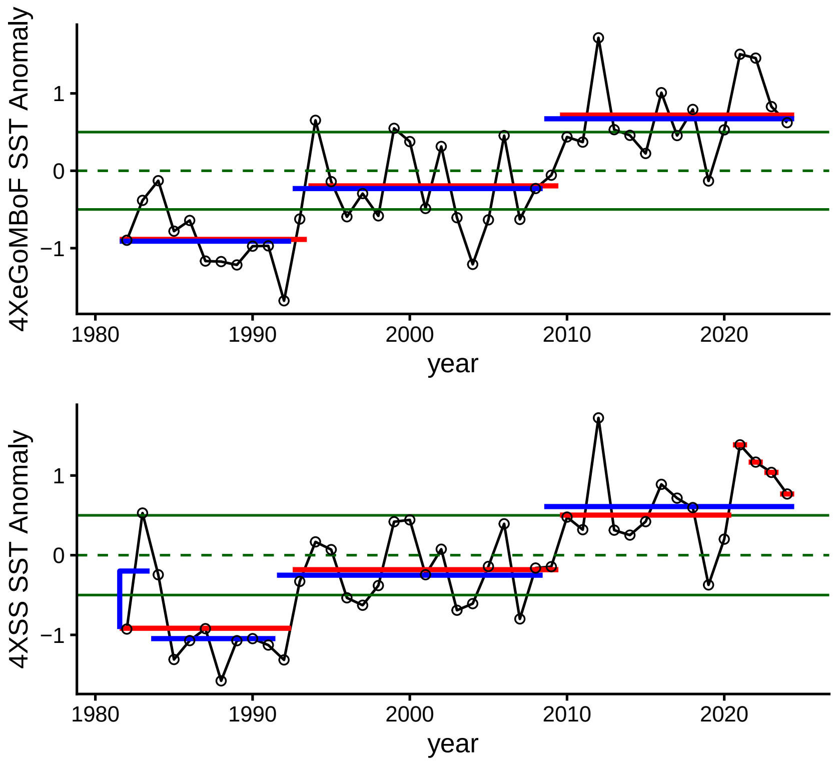

Figure 4: The annual sea-surface-temperature normalized anomaly for for management area derived from satellite imagery compared to their long-term monthly means. The dashed lines are the longterm mean, and solid lines represent plus or minus 0.5 SD for the 1991-2020 period. Regime shift analysis results from running the method forwards and backwards on the time series depicted by the blue and red horizontal lines, respectively.

- The annual anomaly during 2024 was 9.22 $\circ$ C in eastern Gulf of Maine/Bay of Fundy and 9.66 $\circ$ C in NAFO 4X on the Scotian Shelf. SST remained above normal, with the last three years being the three warmest years in 4XSS. `r(region)` eastern Gulf of Maine/Bay of Fundy remained above normal, but was cooler than the previous two years. A regime shift algorithm to detect a step change using mean levels was applied to the annual time-series (Rodionov 2004). Over the length of the record, the temperature has three distinct periods at all regions, a relatively cooler period from 1982 to 1993, near the climatological mean from 1994 to 2011, and a relatively warmer period from 2012 to present.

Bottom Temperature Anomaly

Layton et al. 2025 (see Section 8.2)

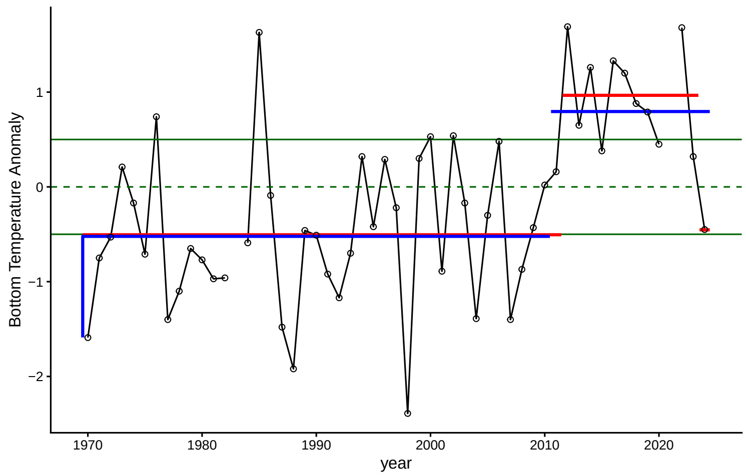

Figure 5: Time series of July bottom-temperature anomalies (thin lines with circles) and five-year-running-mean filtered series (heavy line). The dashed line is the 1991-2020 mean and solid lines represent ±0.5 SD. Regime shift analysis results from running the method forwards and backwards on the time series depicted by the blue and red horizontal lines, respectively.

- The near-bottom temperature anomalies for 2024 in NAFO 4X are in the mean range following an elevated period of bottom temperatures from years 2010-2021.

Sea Surface Temperature (SST), Bottom Temperature

Casault et al. 2020

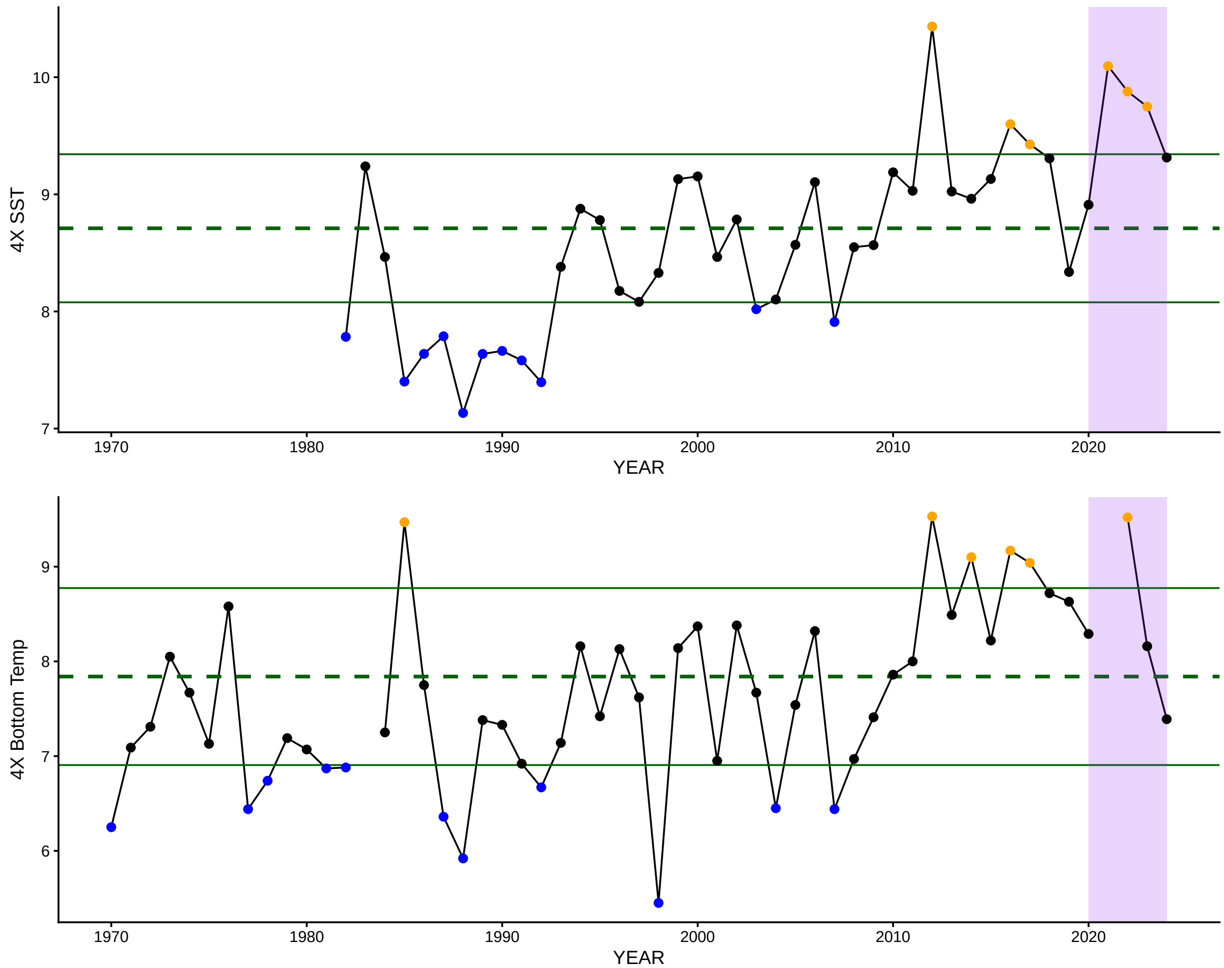

Figure 6: Sea Surface Temperature from satellite and Bottom temperature from fixed stations for NAFO 4X. Dashed lines denote climatological means from 1991-2020, solid green lines denote ± standard deviation (SD) from the available timeseries. Purple, shaded areas represent the latest 5 years of available, robust data. Yellow and blue dots are measurements above or below the long-term means ± SD , respectively.

- Over the past two decades, the Scotian Shelf has incurred rapid warming due to the increased dominance of Warm Slope Water.
- SST in NAFO 4X in 2024 is within the long-term mean range, indicating above average sea temperatures in the NAFO 4X over recent years.
- Bottom temperature in 2024 in NAFO 4X is near the long-term mean indicating a recent cooling period after record warm bottom temperatures from 2012-2020 in the management area.

Salinity, Stratification

Layton et al. 2025 (see Section 9)

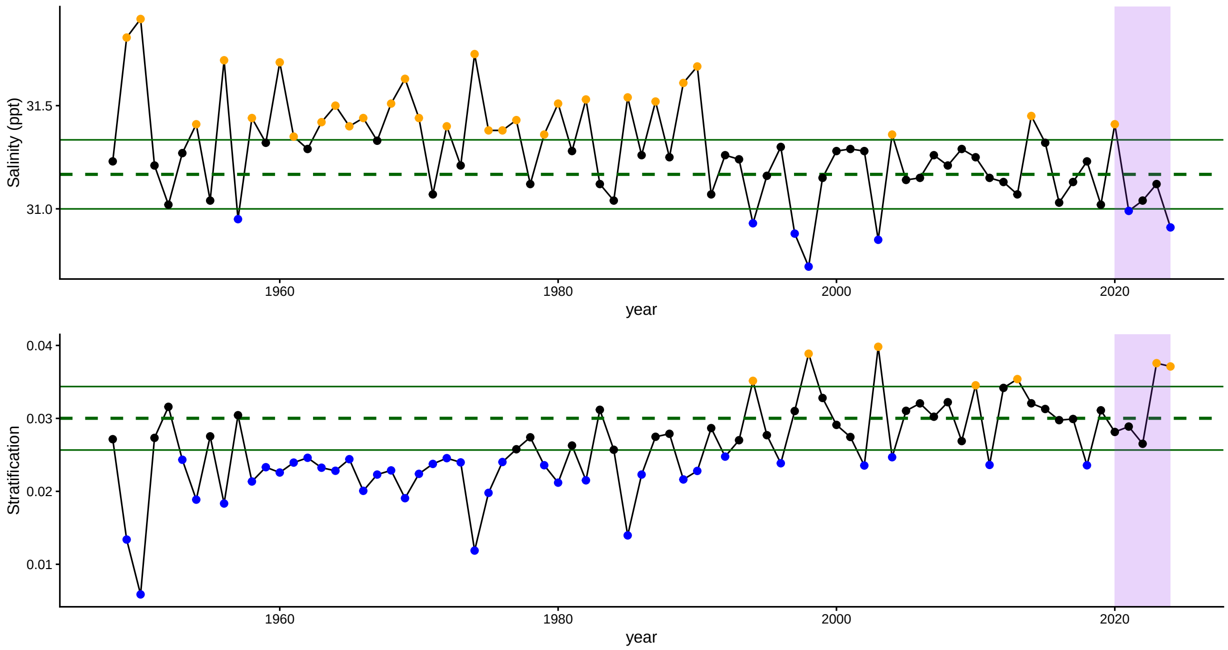

Figure 7: Stratification and salinity (ppt) for the Scotian Shelf from 1948-2024. Dashed lines denote climatological means from 1991-2020, solid green lines denote ± standard deviation (SD) from the available timeseries. Purple, shaded areas represent the latest 5 years of available, robust data. Yellow and blue dots are measurements above or below the long-term means ± SD, respectively.

- Salinity has decreased since the 1990s with the 2024 salinity value the lowest in the last 5 years.
- Since 1948, there has been an increase in the mean stratification on the Scotian Shelf, resulting in a change in the 0–50 m density difference of 0.38 kg m−3 over 50 years. It should be noted the change over time is not linear but could consist of two periods of constant stratification with a jump around 1990. This change in mean stratification is due mainly to a decrease in the surface density, composed equally of warming and freshening. Stratification in 2023 and 2024 was higher than in 2022 due to the surface becoming warmer and saltier.
- Under increased stratification there is a tendency for more primary production to be recycled within the upper mixed layer and hence less available for the deeper layers.

Oceanographic measures at Prince 5 station

Layton et al. 2025

Temperature and salinity measurements through the water column have been sampled monthly for the most part since 1924 at Prince 5, at the entrance to the Bay of Fundy (Figure 1).

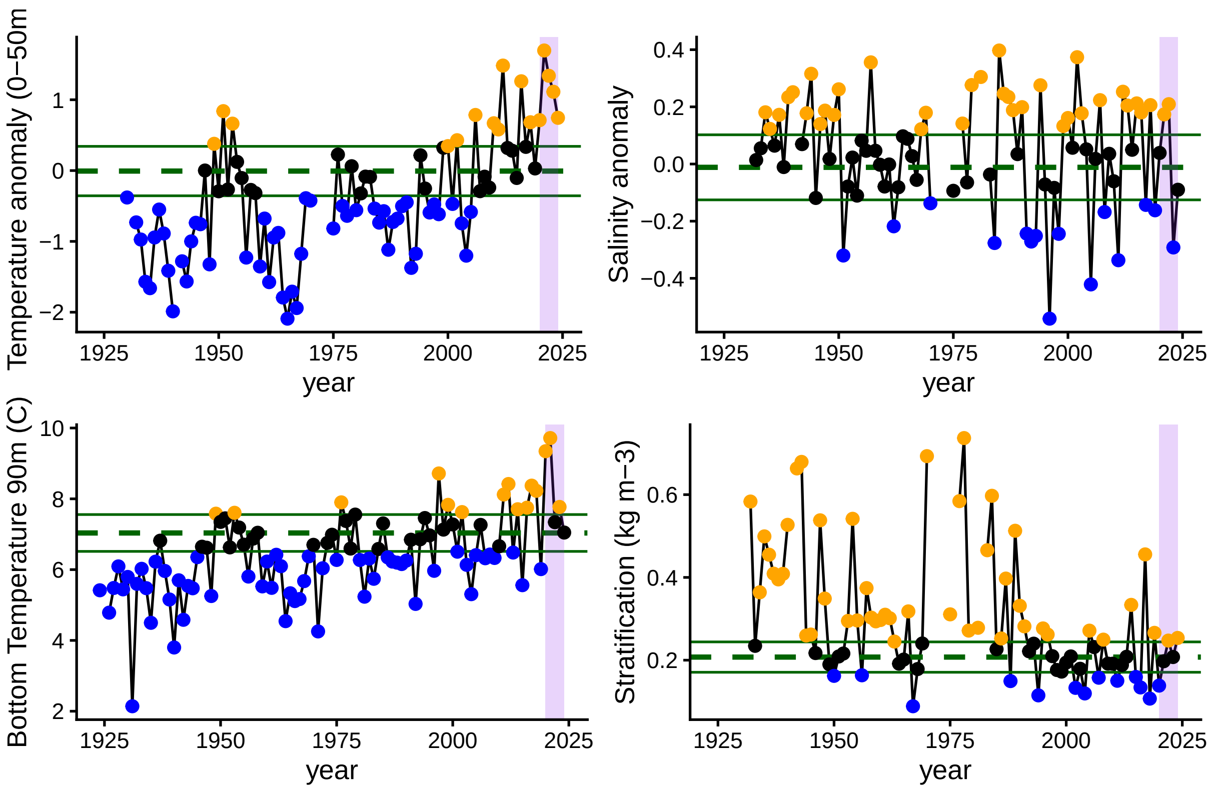

Figure 8: Prince 5 annual anomaly time series (circles connected by a thin black line) of temperature (top left) and salinity (top right) averaged from 0 to 50m, the bottom temperature (bottom left), and the stratification (bottom right) which is the density difference between 0 and 50m. The horizontal dashed green line represents the mean ± 0.5 SD (solid green line) for the 1991-2020 period.

- Annual near surface temperatures at Prince 5 in 2024 is above the climatological mean (2021 was the record high). While it remained above normal, temperatures have continued to decrease from the series record high in 2021.
- Bottom temperature was near the climatological mean in 2024 (2012 was the record high). Similar to near surface temperature, bottom conditions continue to cool from the second warmest year in 2021.
- Near surface salinity was near the climatological mean and stratification was just above the climatological mean.

Ocean Acidification

Ocean acidification is the reduction of seawater pH levels, caused by the increased rate of atmospheric carbon dioxide (CO2) release from post-industrial anthropogenic activities. In general, the ocean absorbs approximately 26% of total carbon emissions (Friedlingstein et al. 2025), thereby buffering the global climate. However the rate of CO2 release from human activities is unprecedented, leading to changes in seawater chemistry, resulting in reductions of seawater pH, increased levels of CO2 in the seawater (pCO2), and reducing the saturation state and therefore biological availability of important shell-forming calcium carbonate minerals (aragonite and calcite).

Galbraith *et al.* 2025

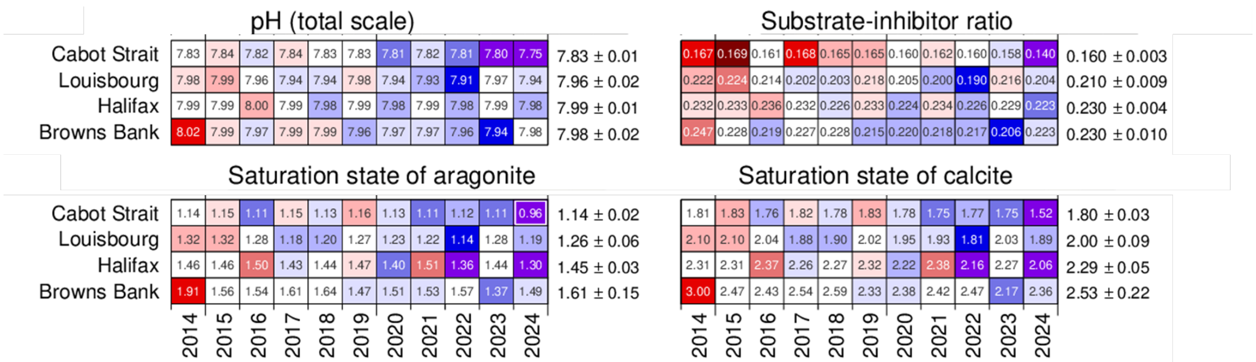

Figure 9: Time series of near-bottom water annual averages for: in situ pHT (pH on the total scale, upper left panel); substrate-inhibitor ratio (SIR in mol µmol-1, upper right panel); saturation state of aragonite (ΩA - unitless, lower left panel); and saturation state of calcite (ΩC - unitless, lower right panel) at stations 100 m in depth, at AZMP sections in the Maritimes regions from 2014 to 2024. A grey cell indicates missing data; a white cell is a value within 0.5 SD of the climatological mean based on data from 2014 to 2020 inclusively; a red cell indicates above normal values; a blue cell indicates below normal values. More intense colors indicate larger anomalies. Climatological means and standard deviations are shown on the right side of each panel. Boxes with borders (either dark grey or white) in the substrate-inhibitor ratio, saturation state of aragonite and saturation state of calcite panels correspond to values at or below the thresholds of 0.1, 1 and 1, respectively. Near-bottom values represent the deepest observations.

- The Atlantic Canadian surface seawater pH is declining faster than the global average by 0.03-0.04 units per decade compared to 0.017-0.027 (Bernier et al. 2023). The 2020-2024 period of AZMP data shows that the annual averages of near-bottom seawater pH has been mostly below normal to normal for the NAFO 4 region, with record lows of total pH (pHT), observed for the NAFO 4X (Browns Bank Line) region in 2023.
- Overall there is a trend of normal to deteriorating ocean acidification conditions in near-bottom waters in the Atlantic Zone since 2020 (as demonstrated by pHT, saturation states of calcium carbonate and substrate inhibitor ratios).
- For many invertebrates with shells that are predominantly composed of aragonite, may experience impacts to recruitment and growth rates if ocean acidification conditions continue to increase (Ω between 1.0-2.0). In this case, surface seawater pH monitoring would help assess larval exposure conditions.

Longer-term climate change

Ocean model long-term forecast and projections provide a general expectation of how the world may change. Ocean model projections use low and high emissions pathways as future scenarios to frame expectations of the future ocean climate.

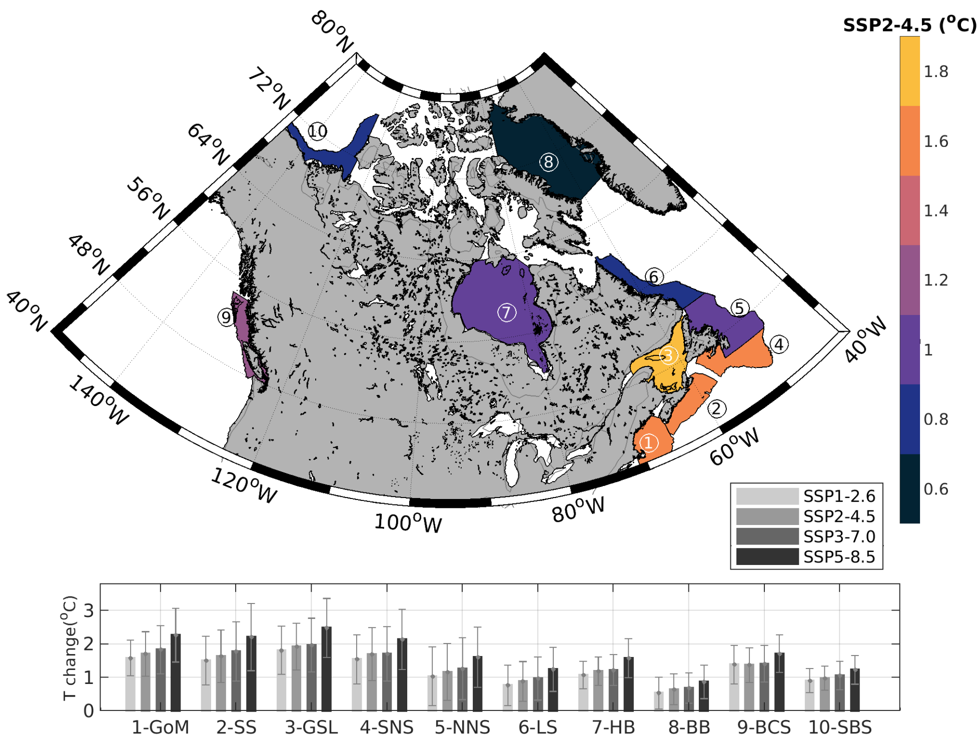

Figure 10: Future scenarios for sea surface temperature changes for ecoregions in Canada. Regions 1) Gulf of Maine and 2) Scotian Shelf are within the Maritimes Region.

- In the Scotian Shelf by 2050, the onset of spring is expected to occur 3-4 weeks earlier than present day and the growing season is expected to last 4-6 weeks longer (Brickman & Shackell, 2024)
- Projected changes in sea surface temperature (2040-2049 relative to present day) for the Scotian Shelf and Gulf of Maine range from approximately 1.5 to 2.5°C (based on IPCC scenarios SSP2-4.5 to SSP5-8.5) (Wang et al, 2024).
- With a rapidly changing ocean, we can expect shifts in productivity and distribution in the NAFO 4X, as well as shifts in the seasonal timing of fish and invertebrate reproductive cycles.
- By 2100, under both low and high emissions scenario, most marine species across the Canadian portion of the NW Atlantic are from moderate to high climate risk, and indeed, are at a lower risk compared to many areas around the globe, especially tropical ecosystems. While the NW Atlantic is warming rapidly, the resident species are, on average, widespread across the seascape, and are accustomed to a wider range of temperatures (Boyce et al. 2024).
- However, formerly commercial but now depleted species will be at much greater risk due to their low population sizes (Boyce et al. 2024, see Fig 5 for list).

B. Ecological

Commercial Fishery

Commercial fishing is an activity that impacts the ecology of a management area through removals of fish from the ecosystem.

Main Fisheries

NAFO STATLAN21A database with additional Canadian lobster landings from MARFIS.

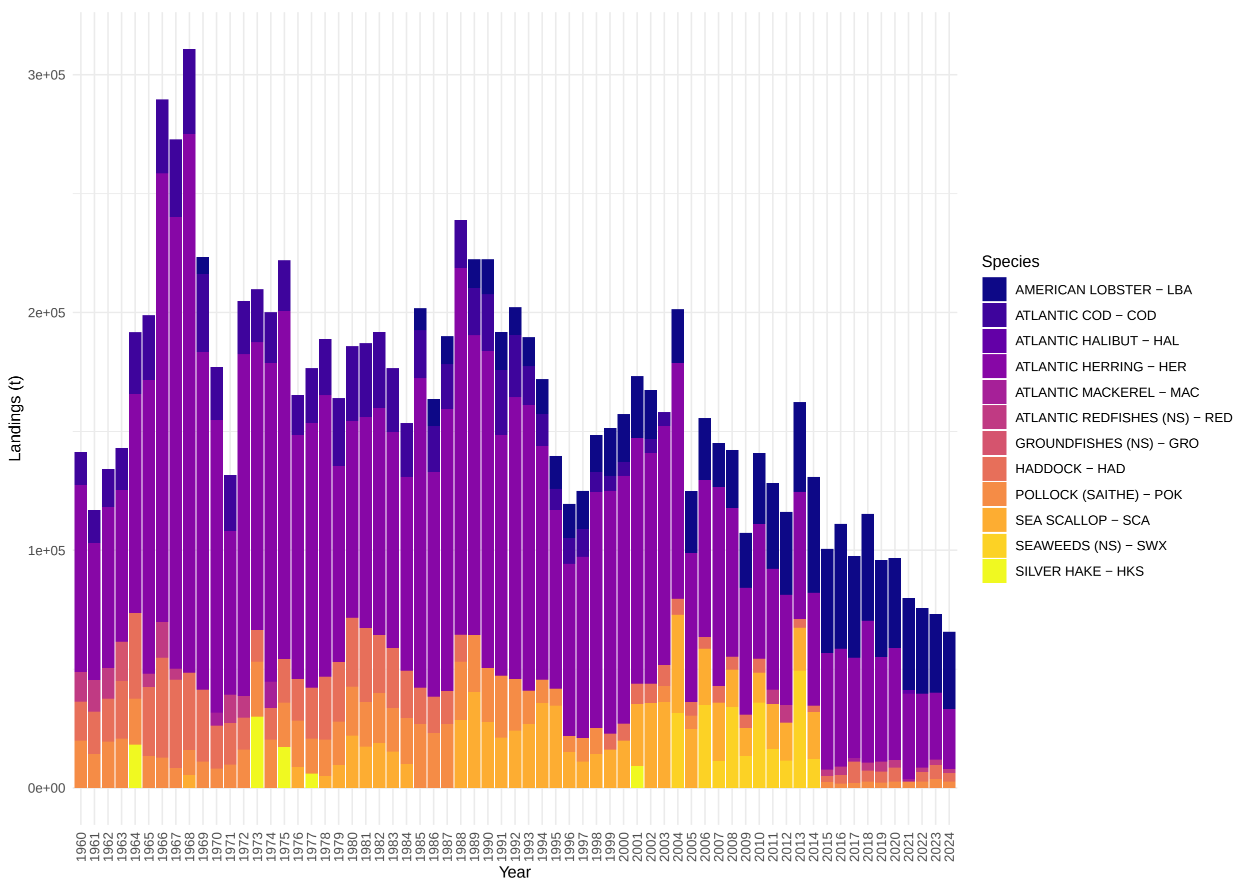

Figure 11: Main fisheries in the management area by landings from all countries from 1960-2023.

- The five main fisheries in the NAFO 4X area in 2024 are American lobster, Atlantic herring, haddock, pollock, Atlantic redfishes.

Fishing Pressure

Bundy et al. 2017 (see Table S4 for definitions, see Table S5 for species categories)

This indicator measures the level of exploitation or total fishing pressure at the ecosystem level (Landings/Biomass). Change in this indicator can result from change in biomass, landings or both.

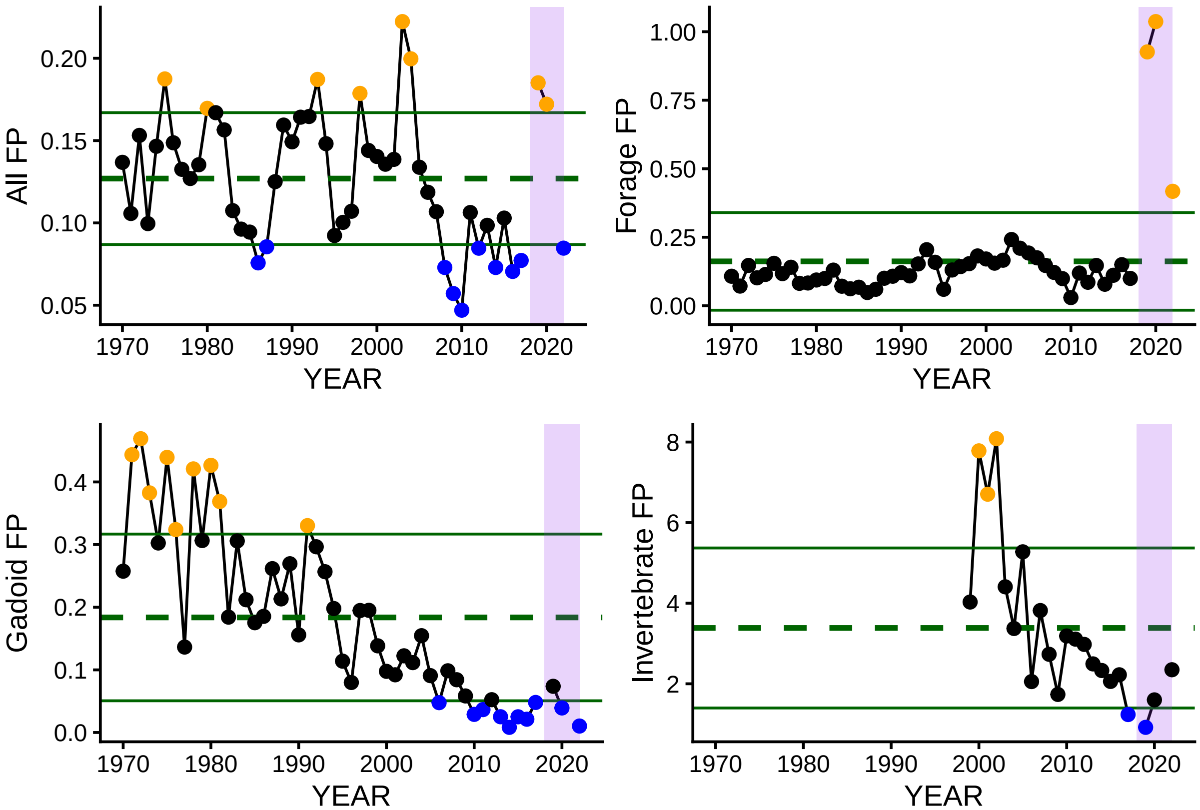

Figure 12: Fishing Pressure (FP) calculated from commercial catch data and biomass estimates from the DFO Summer Research Vessel survey. RV biomass data have been corrected for catchability with the exception of invertebrates. Dashed lines denote long-term means, solid green lines denote ± standard deviation (SD) from the available timeseries. Purple, shaded areas represent the latest 5 years of available, robust data. Yellow and blue dots are measurements above or below the long-term means ± SD, respectively.

- The 2018 and 2021 fishing pressures (removed to better reflect the long-term means) are artificially high due to the lack of Summer Research Vessel survey in NAFO 4X for that year, while landings remained stable.
- The latest robust estimates of overall fishing pressure in NAFO 4X (2022) is below the long-term mean, but in 2019-2020 the fishing pressure was high due to low biomass estimates for forage fish species in those years.
- Fishing pressure on gadoids and forage fish in NAFO 4X have been generally below the long-term mean since 2005. In contrast, fishing pressure on invertebrates has been close to the long-term average in recent years.

Commercial Landings

Bundy et al. 2017 (see Table S4 for definitions, see Table S5 for species categories)

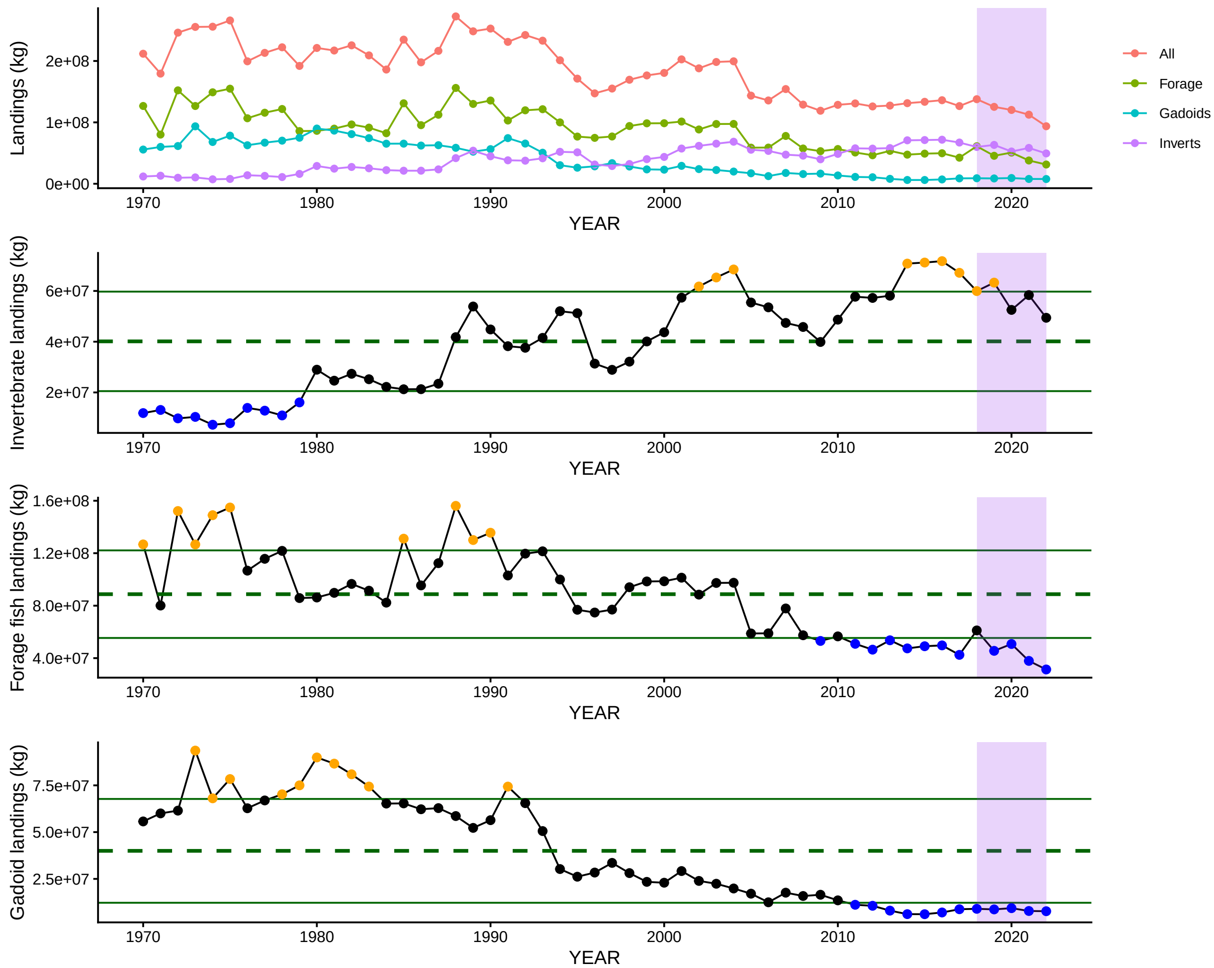

Figure 13: Commercial landings (kg) collected from NAFO, ZIF and MARFIS databases for species categories. Dashed lines represent the mean, solid green lines denote ± standard deviation (SD). Purple, shaded areas are the latest 5 years of available data. Yellow and blue dots are measurements above or below the long-term means ± SD, respectively.

- Commercial fisheries landings for forage fish and gadoids have generally been below the long-term average since the 2000s.
- Invertebrates landings have been increasing over time, but have been in decreasing over the last 5 years (yet remain above the long-term mean). These trends coincide with shifting availability of species in the region.

Habitat

Murphy et al. 2024 for methodology and details

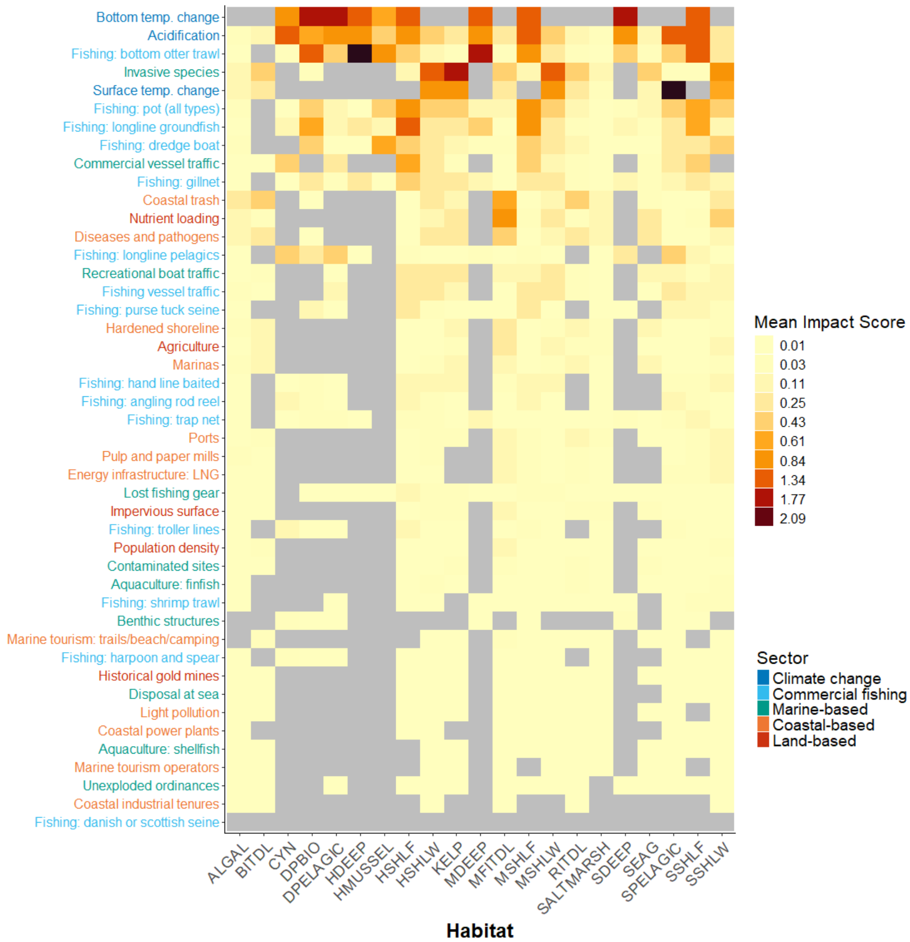

Figure 14: Mean impact scores in NAFO 4X of 45 individual stressors to 21 habitats. Stressors are ranked from highest mean cumulative impact score across all habitats (top) to lowest (bottom) and colored based on sector. Mean impact score color gradient is based on 10 Jenks natural breaks. Gray cells indicate an impact score of zero, indicating either no spatial overlap for the habitat–stressor combination or a vulnerability score of zero for the habitat–stressor combination. Symbols represent habitat zones. Habitat abbreviations: ALGAL, algal zone; BITDL, beach; CYN, canyon; DPBIO, deep biogenic; DPELAGIC, deep pelagic; HDEEP, hard bottom bathyal; HMUSSEL, horse mussel bioherm; HSHLF, hard bottom shelf; HSHLW, nearshore hard bottom; KELP, kelp forest; MDEEP, mixed bottom bathyal; MFITDL, mudflat intertidal; MSHLF, mixed bottom shelf; MSHLW, nearshore mixed bottom; RITDL, rocky intertidal; SALTMARSH, saltmarsh; SDEEP, soft bottom bathyal; SEAG, seagrass; SPELAGIC, shallow pelagic; SSHLF, soft bottom shelf; SSHLW, nearshore soft bottom.

- Of the 45 stressors in NAFO 4X, the highest mean impact scores across habitats are: Bottom Temp Change, Acidification, Commercial Fishing: Bottom Otter Trawl, Invasive Species, and Surface Temperature Change. All stressors have at least some impact except for Danish or Scottish seine.
- The Shelf habitats and Shallow Pelagic habitat have the highest cumulative impact (i.e. sum of all individual stressor impact scores) scores in NAFO 4X

- The high impact scores in shelf and deep-water habitats are primarily driven by climate change and commercial fishing stressors, while the coastal habitats are influenced by activities from all 5 sectors.

Productivity

Productivity relates to the amount of energy or biomass generated in an ecosystem, providing energy to consumers. A number of factors play a role in primary and secondary production including nitrate, chlorophyll, bloom statistics, *Calanus finmarchicus* biomass, and meso-zooplankton biomass.

Such indicators are generally coupled to timing shifts in managed stocks since these can result in changes in habitat quality or food availability within the year. Changes in the timing phytoplankton blooms and shifts in zooplankton communities are thought to be critical indicators of changes in ecosystem productivity.

Nitrate, Chlorophyll

Casault et al. 2024

The amount of available nutrient supply for phytoplankton production is represented by surface (0-50 m) and subsurface (50-150 m) nutrient concentrations

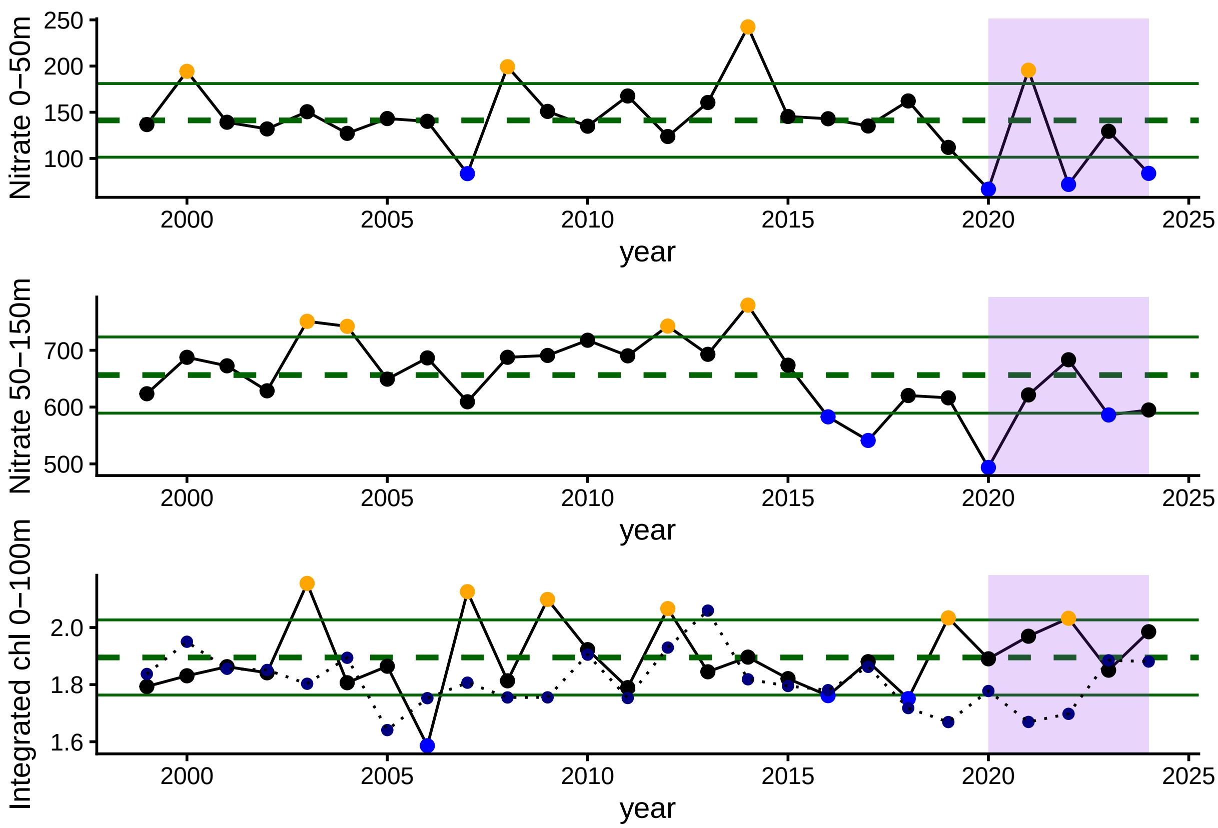

Figure 15: Nitrate 0-50m, Nitrate 50-150, integrated chlorophyll 1-100m from Browns Bank Line and Prince 5 (dotted) that occurs within NAFO 4X, from 1999-2023. Dashed lines represent the mean, solid green lines denote ± standard deviation (SD). Purple, shaded areas are the latest 5 years of available data. Yellow and blue dots are measurements above or below the long-term means ± SD, respectively.

- The latest year (2024) of nitrate values in NAFO 4X (Browns Bank Line) show a decrease from the previous year in surface nitrate (0-50), but only a slight increase in nitrate at 50-100m.
- Integrated chlorophyll has increased in 2024 in NAFO 4X, and also remains within the mean range.
- Although recent warming would suggest a shift to higher nutrient concentrations across the Scotian Shelf (SS) region, recent evaluation of the long-term trends in nutrient availability across the SS has actually shown a decrease in nutrient availability since 2010, the onset of this warming period.

Bloom statistics

Casault et al. 2022

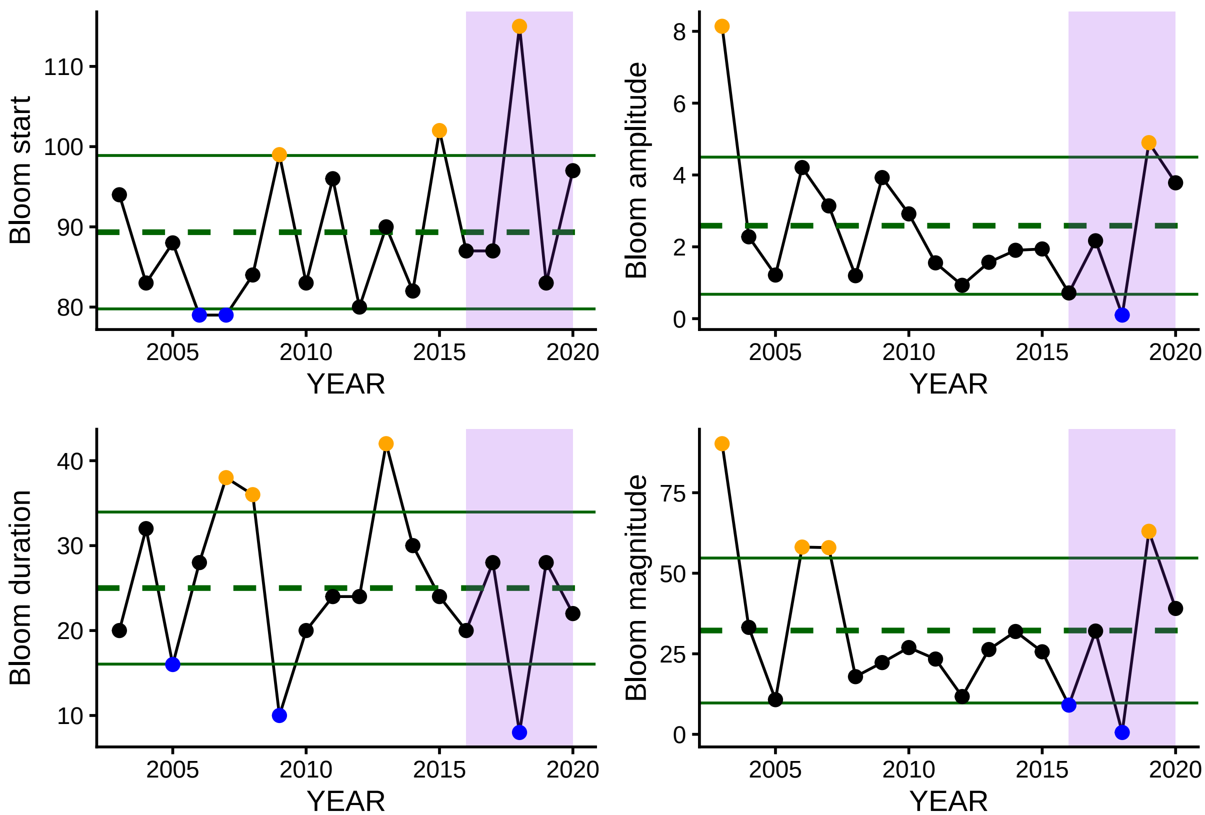

Figure 16: Bloom statistics,for NAFO 4X subregion (see Casault et al. 2022, Figure 4). Dashed lines representent the mean, solid green lines denote ± standard deviation (SD) . Purple, shaded areas are the latest 5 years of available data. Yellow and blue dots are measurements above or below the long-term means ± SD, respectively.

- In the NAFO 4X area bloom statistics are within the long-term mean range for the latest year (2020), and show no long-term or short term (5 year) trend over time.

***Calanus finmarchicus*, meso-zooplankton Biomass**

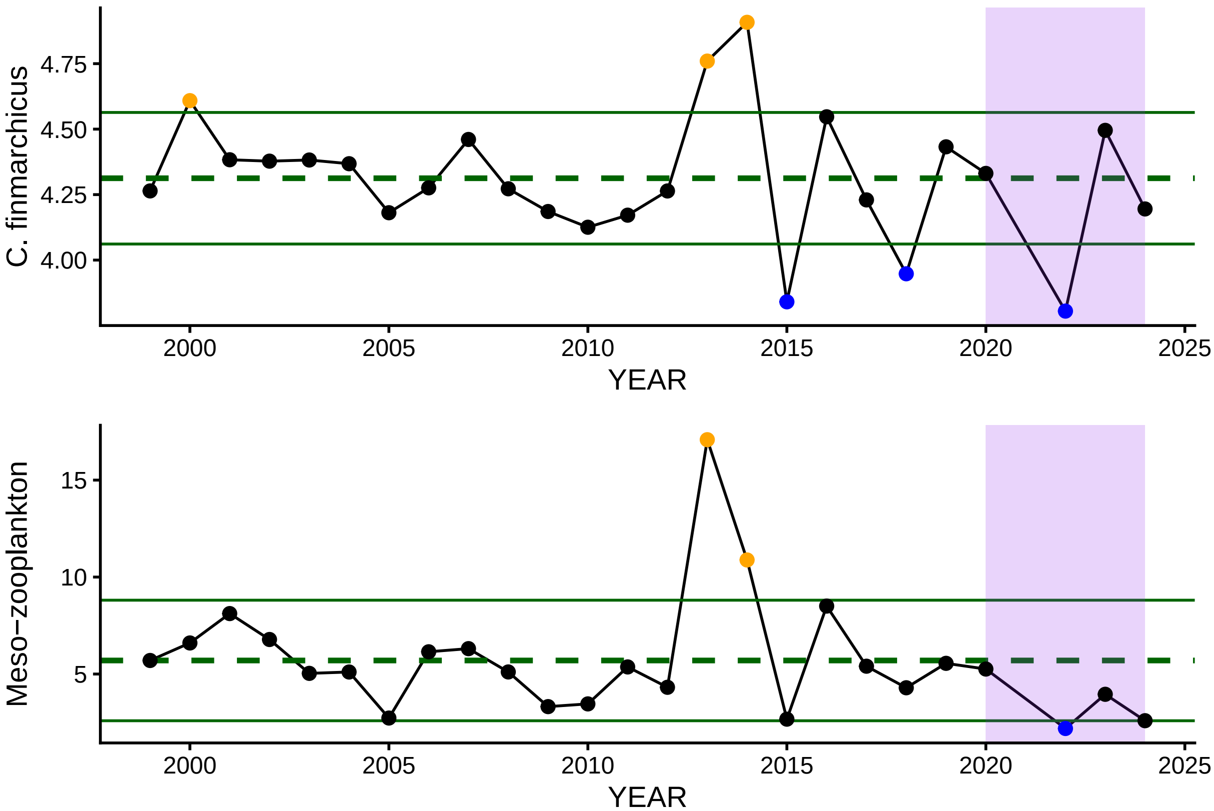

Figure 17: Zooplankton biomass (dry weight). Dashed lines represent the mean, solid green lines denote ± standard deviation (SD). Purple, shaded areas are the latest 5 years of available data.Yellow and blue dots are measurements above or below the long-term means ± SD, respectively.

- The most recent estimates (2024) *C. finmarchicus* biomass in NAFO 4X has been lower than the previous year. There has been more years of lower than average *C.finmarchicus* biomass since 2015.
- Most recent 5 year estimates of meso-zooplankton biomass have been decreasing and in 2024 are at the lower end of the long-term mean.

Large Fish Indicator (LFI)

Bundy et al. 2017 (see Table S4 for definitions and details)

LFI is an estimate of the proportion of large fish in the community or proportion of biomass occupying the top predator trophic-level (Greenstreet and Rogers 2006).

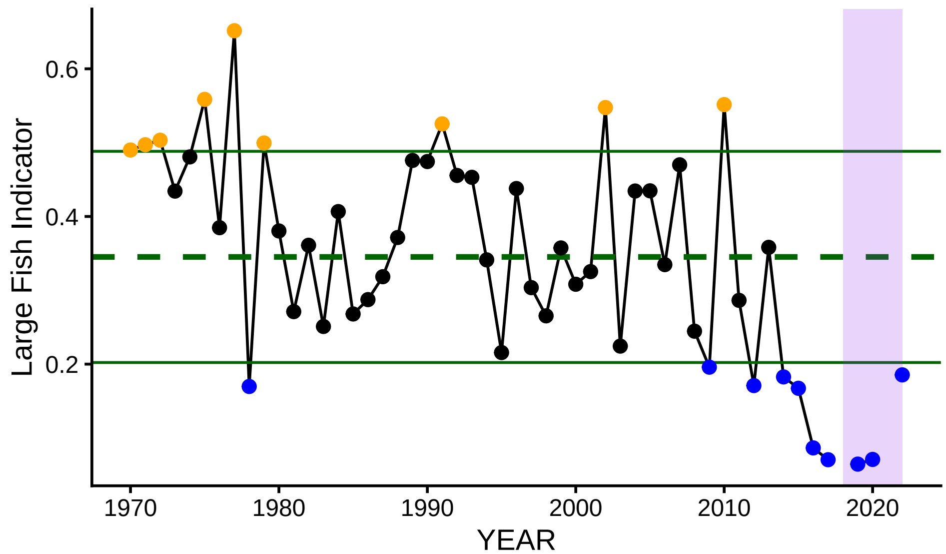

Figure 18: Large fish indicator from RV survey data that has been corrected for catchability. Dashed lines represent the mean, solid green lines denote ± standard deviation (SD). Purple, shaded areas are the latest 5 years of available data. Yellow and blue dots are measurements above or below the long-term means ± SD, respectively.

- Data for 2018 and 2021 not shown due to lack of RV survey data for the NAFO 4X area.
- LFI in the NAFO 4X area has varied over time. Latest 10 years indicate that LFI is below the long-term mean and indicate that structure and functioning of NAFO 4X ecosystem may currently be more dominated by smaller fish and invertebrates in the ecological community.

Predator index

in development

Biodiversity

Biodiversity is described as the variety and variability among living organisms from all sources (CBD). It is linked to ecosystem resilience and plays an important role in maintaining functionality and productivity of ecosystems. Biodiversity can relate to genetic, species, guild and ecosystem diversity.

Shannon Diversity Index, Margalef Richness, Heip's Evenness

Bundy et al. 2017 (see Table S4)

Shannon Diversity Index accounts for both abundance and evenness of species present in a community. Margalef Richness measures the number of species present accounting for sampling effects. Heips Evenness measures how equally the species richness contributes to the total abundance or biomass of the community. Due to improvements in species identification over time, long-term Shannon Diversity and Margalef richness can be misleading, only years 2000-2020 were used here.

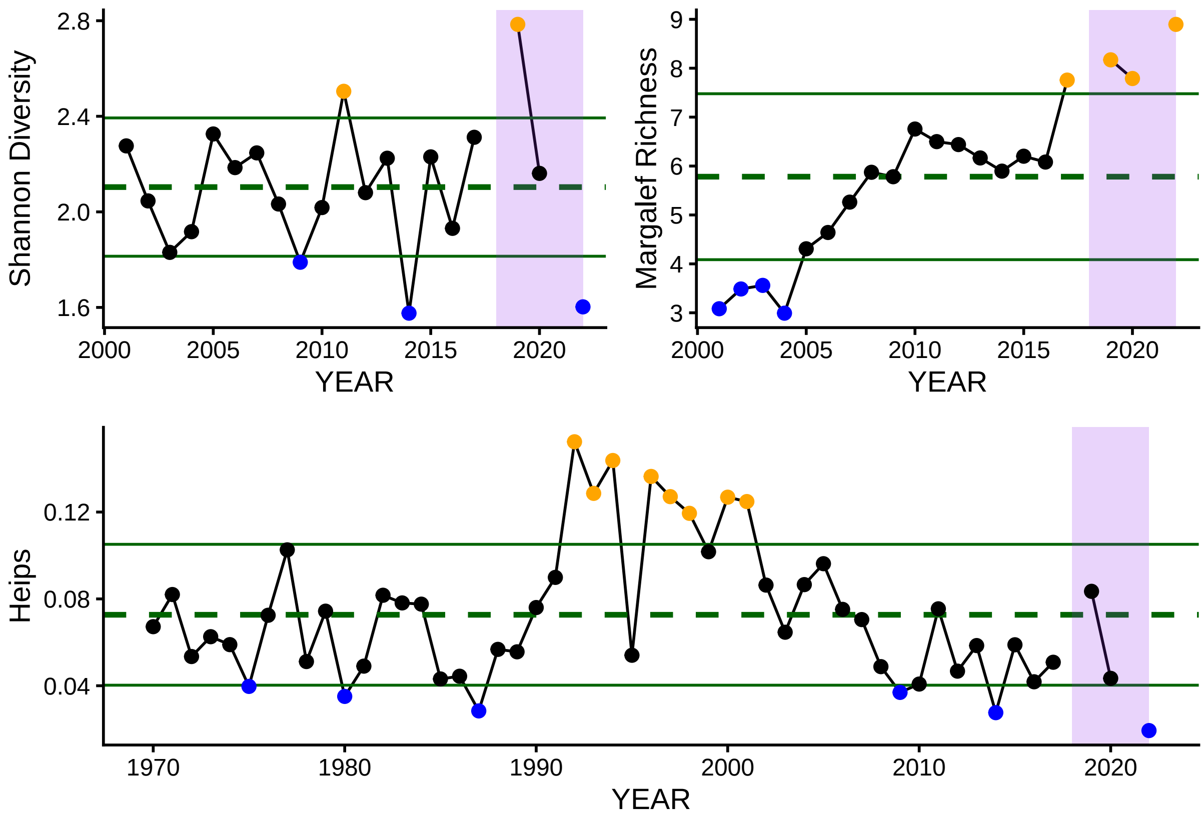

Figure 19: Shannon diversity Index, Margalef Richness, Hieps Evenness measured from data collected from DFO's Summer RV survey and has been corrected for catchability.Dashed lines represent the mean, solid green lines denote ± standard deviation (SD). Purple, shaded areas are the latest 5 years of available data. Yellow and blue dots are measurements above or below the long-term means ± SD, respectively.

- Data for 2018 and 2021 not shown due to lack of RV survey data for the NAFO 4X area
- Biodiversity measures through time in the NAFO 4X area indicate that NAFO 4X is currently generally composed of fewer dominant species. While improving sampling protocols in the RV surveys have increased Margalef Richness over the last 5 years, the species diversity has been lower (lower mean

range) in the last 5 years. Heips evenness has been low since the 2000s, the low values (<0.2) is consistent with a community with generally fewer, species that are highly abundant.

Guild-level Biomass

Bundy et al. 2017 (see Table S4 for definitions, see Table S5 for species categories)

Guild-level biomasses address structural attributes of food webs, and can also serve as proxies for ecosystem functioning (Tam et al. 2017). This indicator includes multiple guilds for fish and invertebrates from the RV Survey.

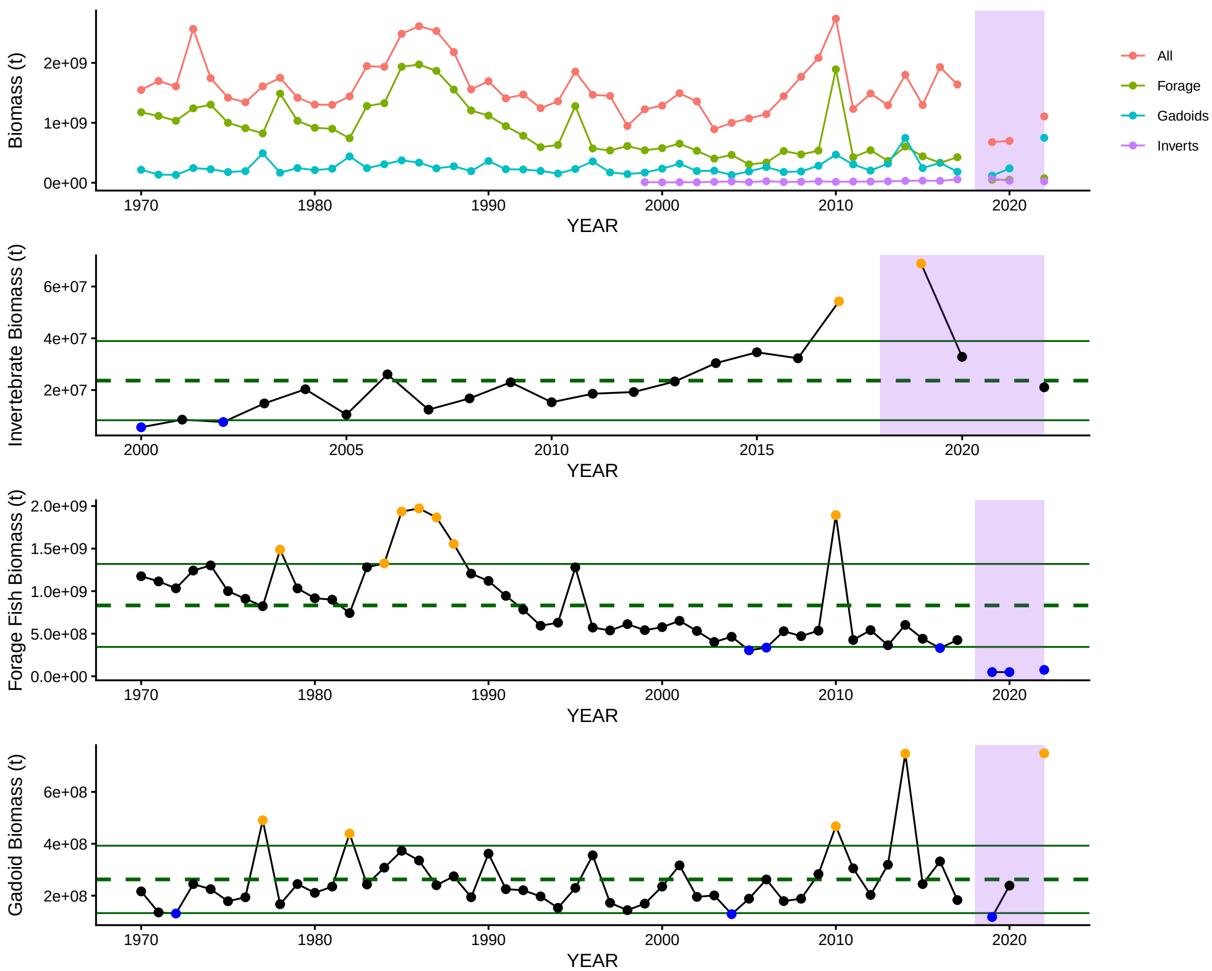

Figure 20: Total biomass and guild-level biomasses for fish catagories from DFO's Summer RV survey which have been corrected for catchability. Invertebrate estimates are not corrected for catchability. Dashed lines represent the mean, solid green lines denote ± standard deviation (SD). Purple, shaded areas are the latest 5 years of available data.Yellow and blue dots are measurements above or below the long-term means ± SD, respectively.

- Data for 2018 and 2021 not shown due to lack of RV survey data for the NAFO 4X area.
- Generally, due to low catchability of invertebrates in the RV survey, invertebrates are likely underestimated, but trends are considered reliable.

- Total biomass of all fish species combined are at a historical low over the last 5 years, with both invertebrates and forage fish experiencing decreases in the most recent year.
- Gadoids have remained relatively stable since the 1970s in NAFO 4X, with the most recent value (2022) well above the long-term mean.
- Forage fish in NAFO 4X have been generally decreasing since the 1990s, with values below the long-term average over the lastest 5 years.

Non-Target Species

In development

C. Economic

Commercial Fishery

Commercial fishing is an important activity in the Maritimes Region that provides both cultural and economic value to coastal communities.

Landed value (CAD) by species catagory

This is the landed value of groups of species for the NAFO 4X region. Exploration of this data was based on published overviews of Canadian Seafisheries landings.

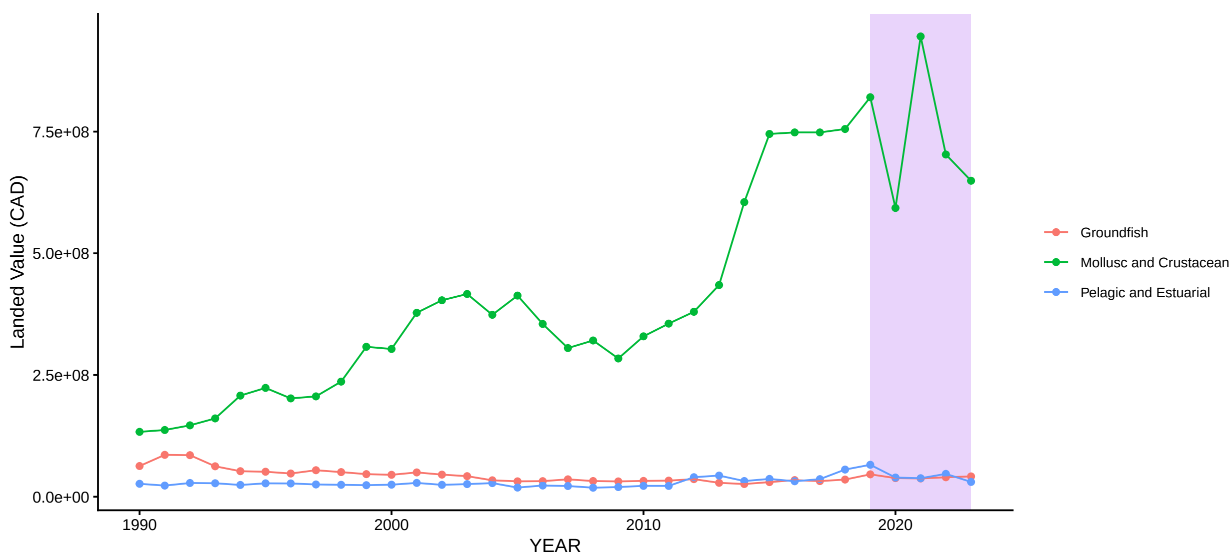

Figure 21: Landed value of species categories since 1990 for NAFO 4X. Area in purple is preliminary data and subject to change.

- Historical trends indicate that molluscs and crustaceans have had higher landed values since the 1990s than groundfish or pelagic and estuarial fish in the NAFO 4X region.

- In the last 5 years, the landed value of mollusc and crustaceans in NAFO 4X have fluctuated while still remaining high. Although conservation concerns for many invertebrate species is low, variability in landed value could have impacts to coastal communities. In contrast, recent 5 year landed values of groundfish and pelagic groups have remained stable in the NAFO 4X.

D. Social-Cultural

currently unavailable

E. Governance

currently unavailable