



Northwest Atlantic
Fisheries Organization

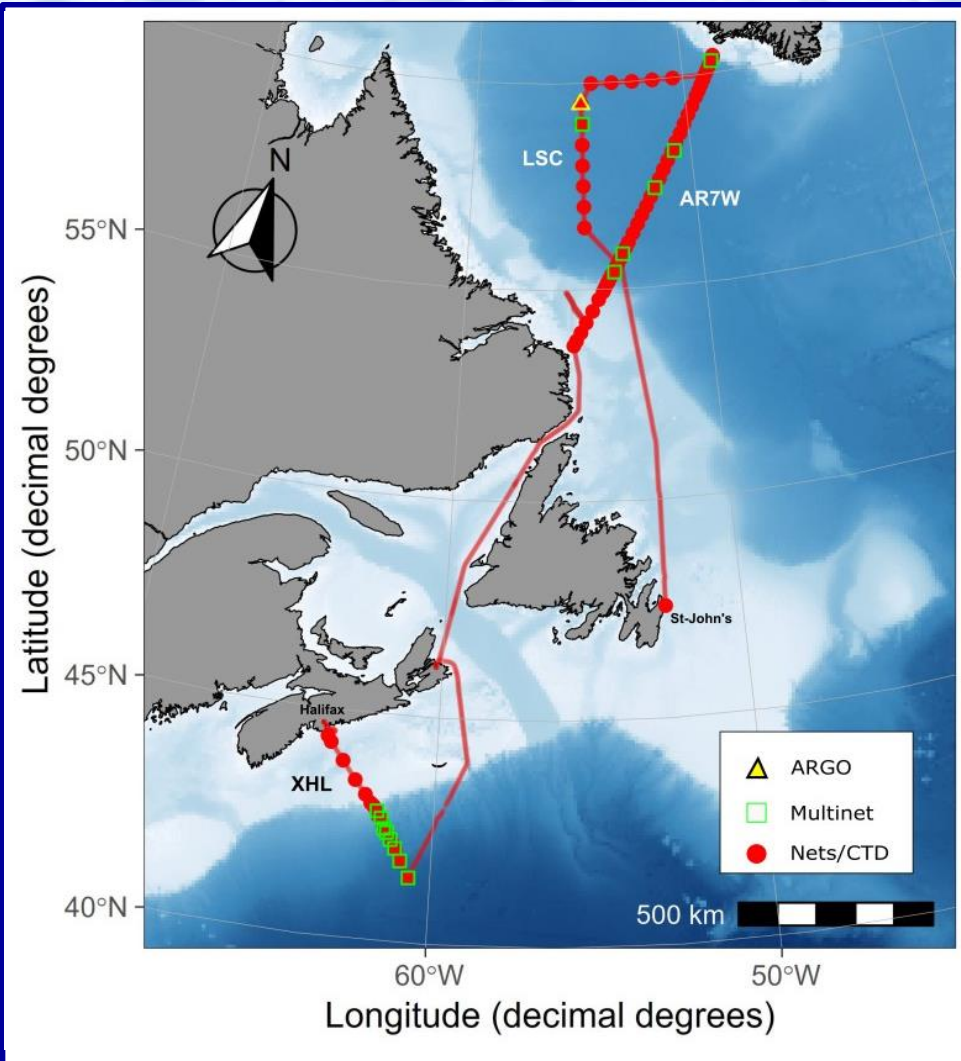
Physical conditions in the Labrador Sea in 2024



Fisheries and Oceans Canada Pêches et Océans Canada

Atlantic Zone Off-Shelf Monitoring Program (AZOMP)
Bedford Institute of Oceanography

NAFO Subareas : AZOMP – Atlantic Zone Offshore Monitoring Area



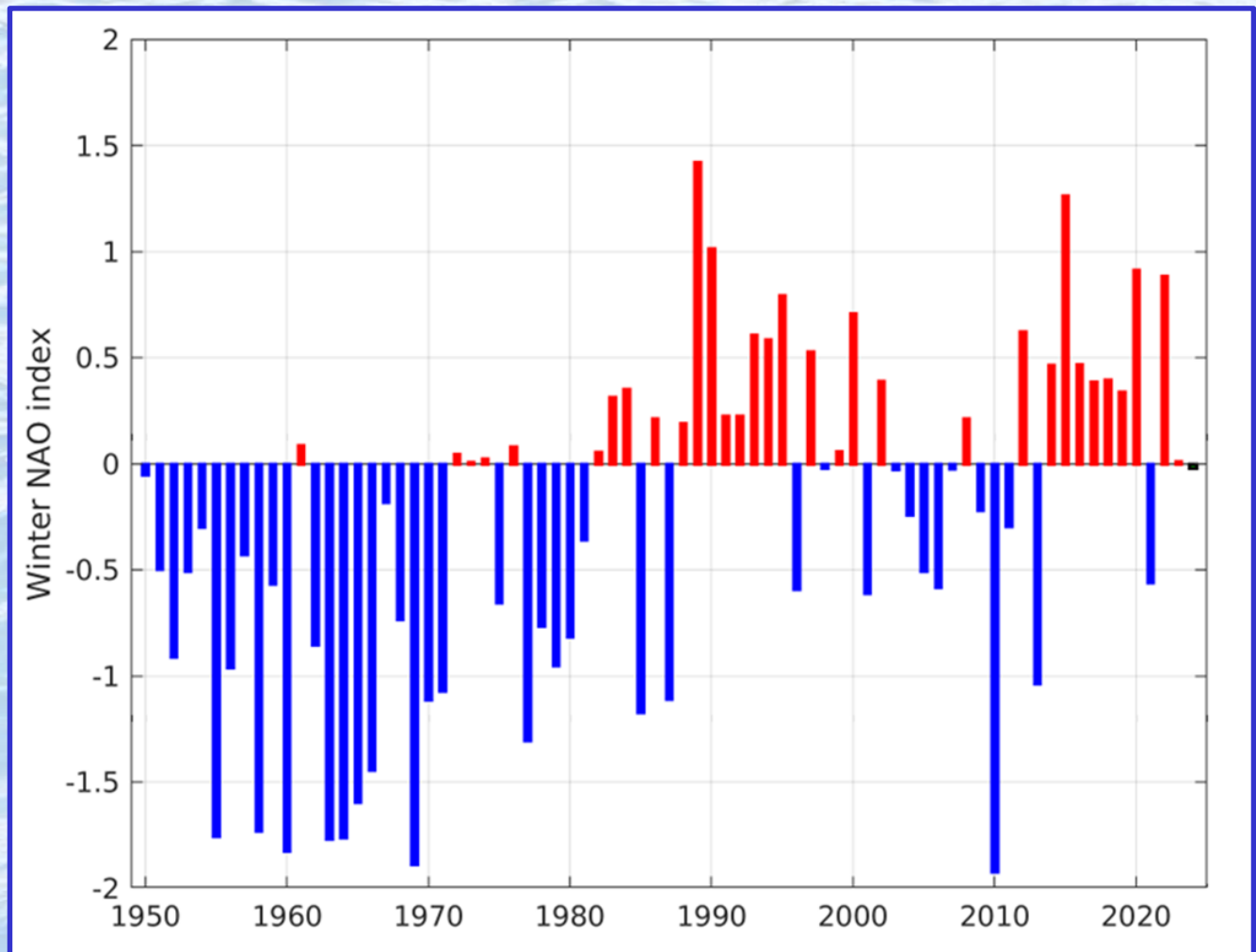
Cruise CAR2024-924: 24 May - 20 June

➤ Transepts/Stations:

- AR7W
- LSC
- XHL
- St. John's

- 87 CTD stations
- 6 Biological stations (200m)
- 72 Net operations
- 14 Multinet Stations
- 2 Argo floats
- Cover **NAFO subareas 1, 2, 3 & 4**

Oceanography: NAO

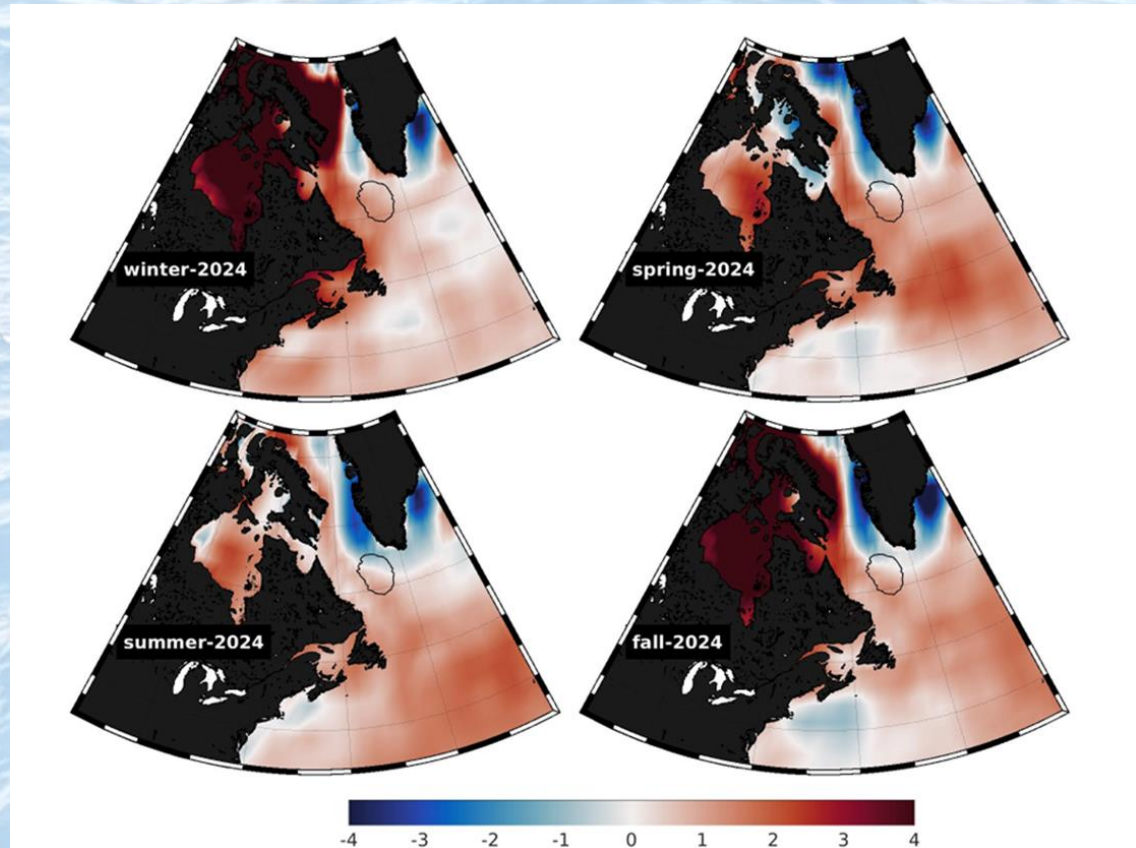


- Anomalies of the winter (JFM) North Atlantic Oscillation (NAO) index, relative to the 2001-2020 mean



Oceanography: air temperature

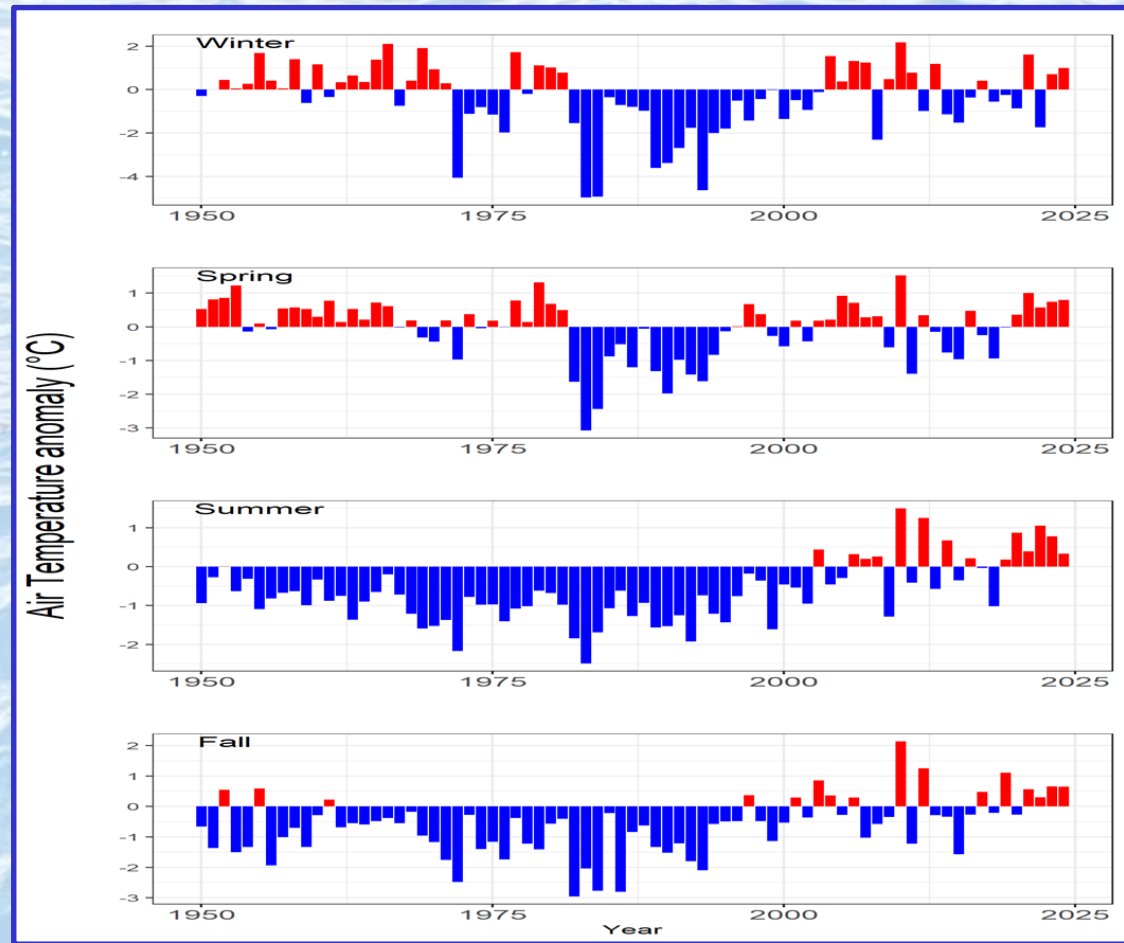
- **Positive** anomalies – **western Lab Sea, Hudson Bay**
- **Negative** anomalies – **eastern Lab Sea** (largest area in summer)
- Polygon – **Central Lab Sea** (depths ≥ 3300 m & within 150 km of **AR7W**)



- Surface air temperature anomaly (reference period 2001-2020) for winter, spring, summer and fall periods in 2024 as derived from NCEP/NCAR reanalysis.

Oceanography: air temperature

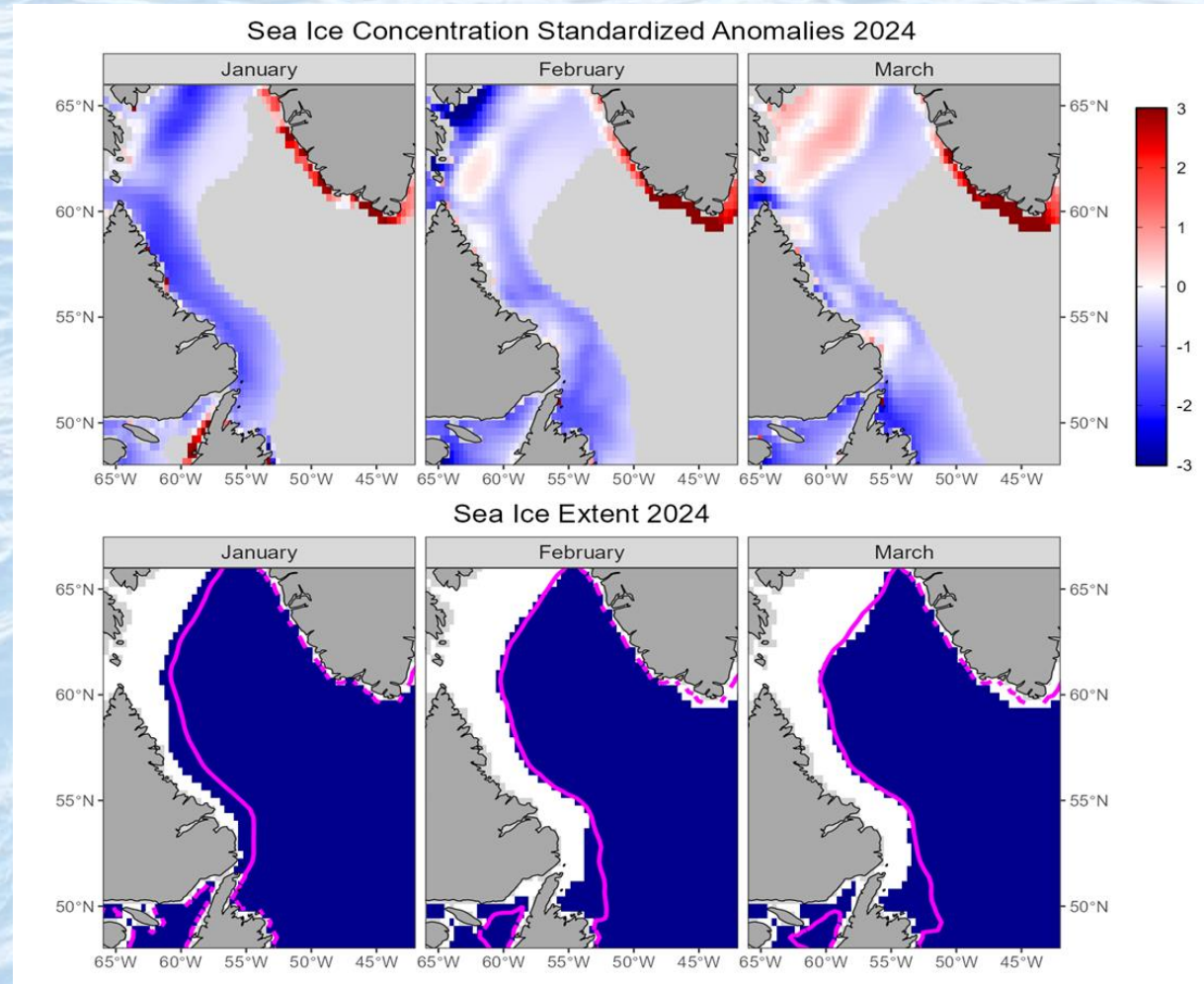
- Mid-1980s – **lowest** temperatures (all four seasons)
- Winter – **stronger** interannual variability
- 2024 – winter 1.0 °C **above** average, other seasons also have a **positive** anomaly



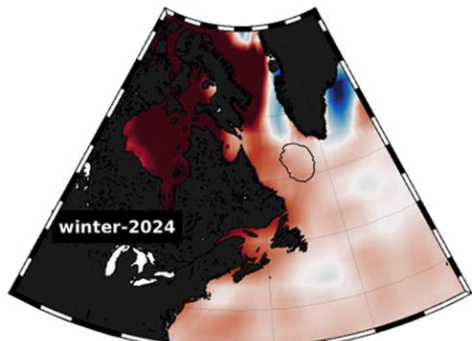
- Air temperature anomalies of **central Labrador** Sea winter, spring, summer and winter air temperature, relative to the 2001-2020 mean.

Oceanography: Sea Ice cover

- 2024 – **positive** anomalies along the **southern Greenland** coast



Winter air temperature

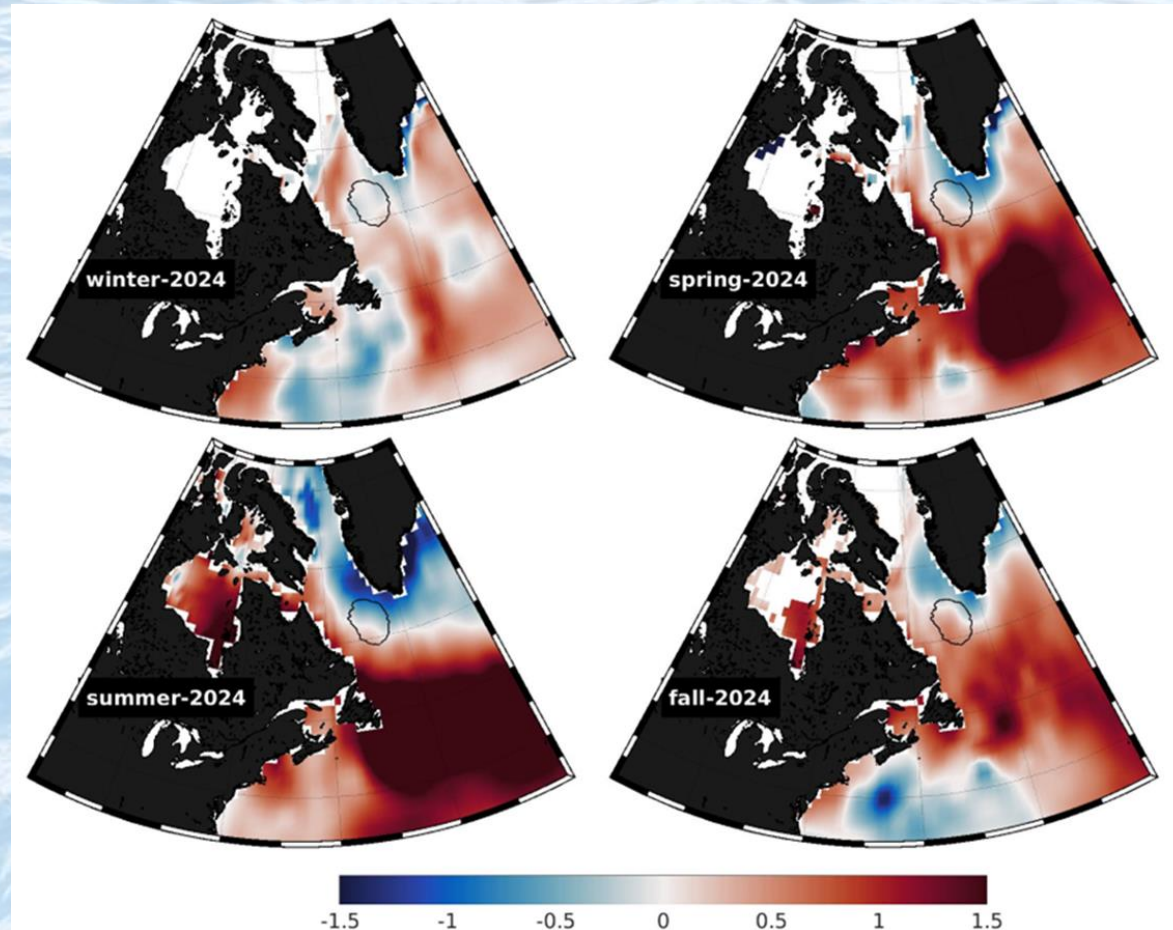
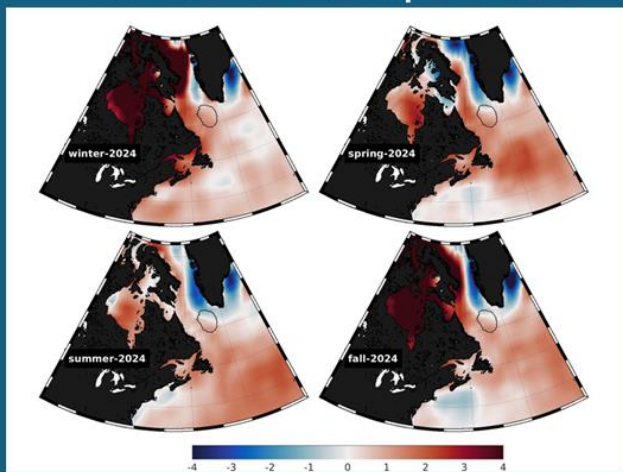


- Sea ice concentration anomalies and ice extent for Jan-Mar 2024 as derived by the US National Snow and Ice Data Center <https://nsidc.org/data/bist>

Oceanography: Sea surface temperature

- Winter – **complex** pattern of anomalies
- Summer – **largest** anomalies ($>1.5^{\circ}\text{C}$ in SE & about -1.0°C around **Greenland**)
- Polygon – **Central Lab Sea** (depths ≥ 3300 m & within 150 km of **AR7W**)

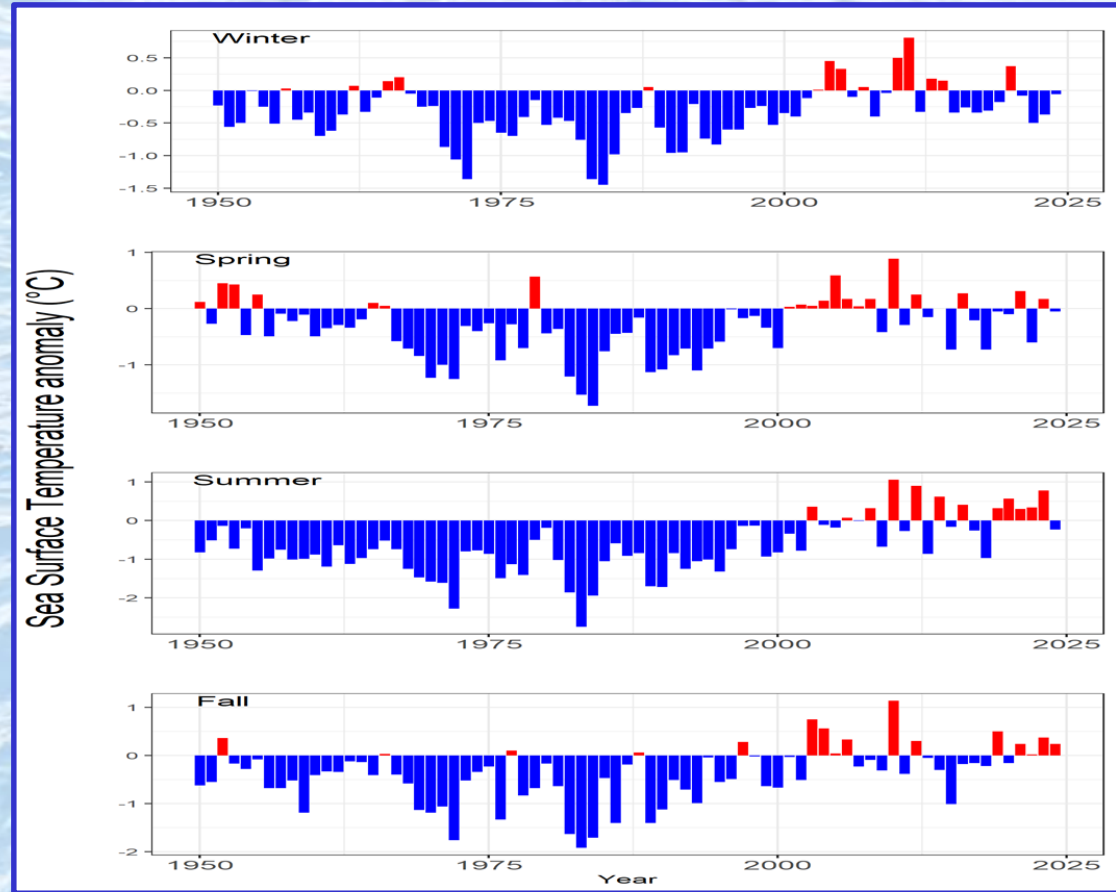
Winter air temperature



- Sea surface temperature anomaly (reference period 2001-2020) for winter, spring, summer and fall periods in 2024 as derived from HadISST

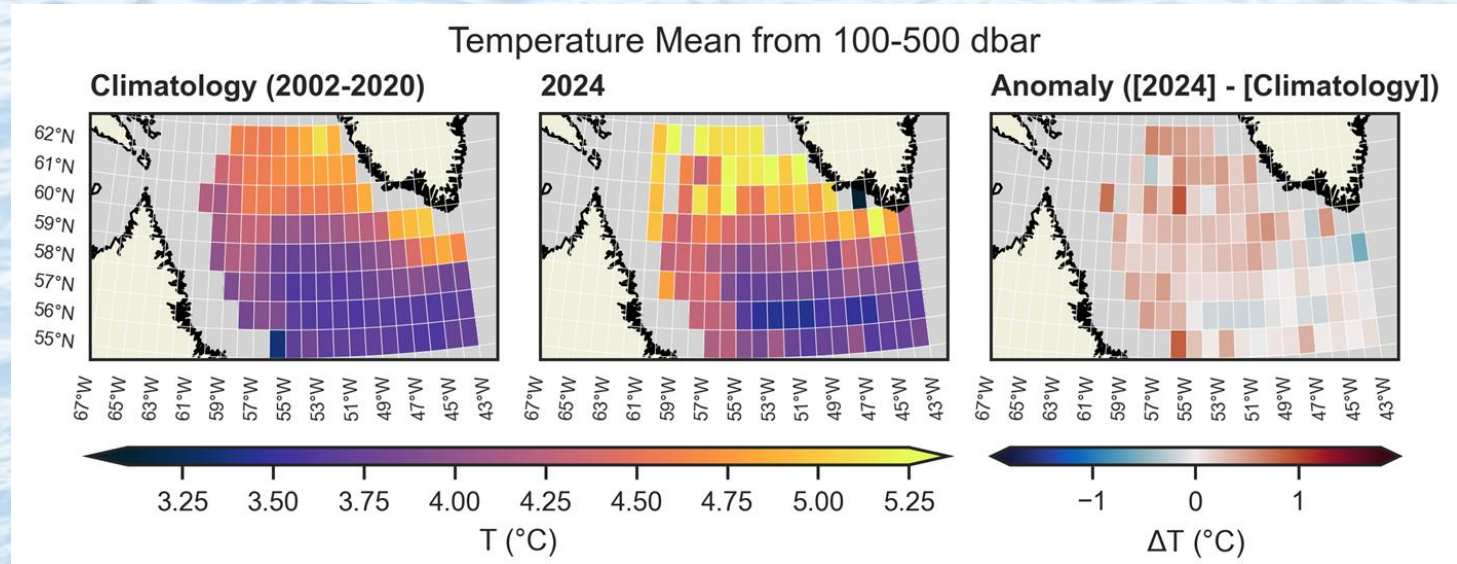
Oceanography: Sea surface temperature-SST

- Mid-1980s – **lowest** SST (all four seasons) - consistent with air temperature
- Long-term **increasing** trend since the 1980s in all seasons
- 2024 – winter/spring **near normal**, summer **below normal**, fall **above normal**. Cold SST anomalies closely mirrored cold air temperature around **Greenland**.

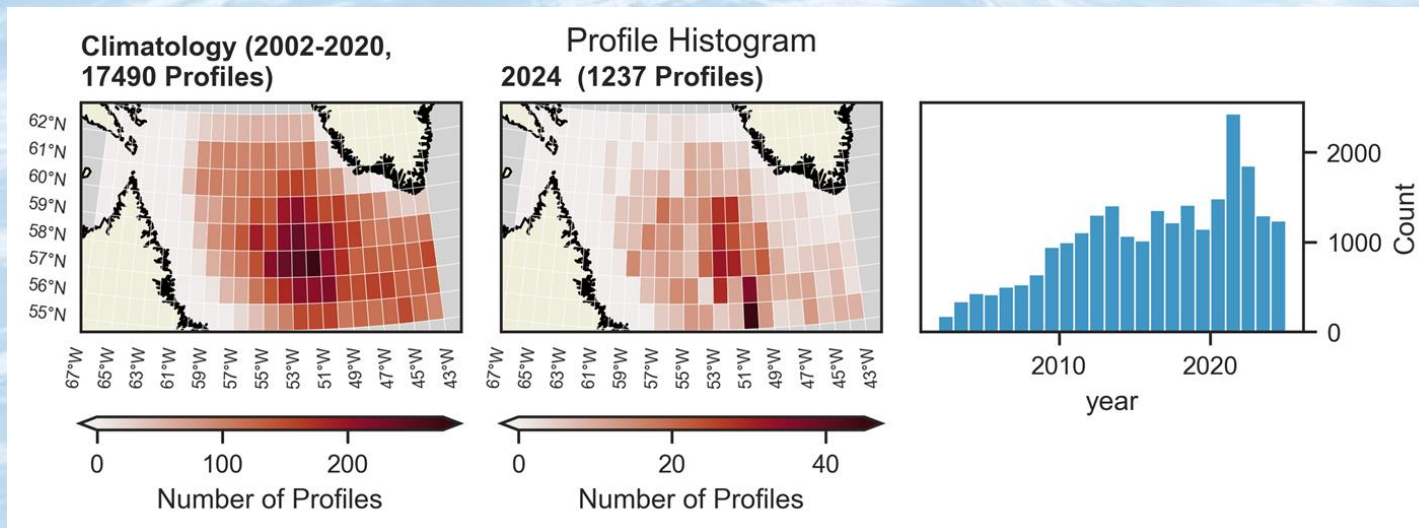


- SST anomalies of central **Labrador Sea** winter, spring, summer and fall sea surface temperature, relative to the 2001-2020 mean

Gridded Argo Plots



- 1 deg x 1 deg boxes
- Means within depth ranges of 100-500 m, 500-1000 m and 1000-2000 m
- ~24000 profiles since 2002; ~17500 within climatology range; 2002 is earliest profile



Gridded Argo Plots

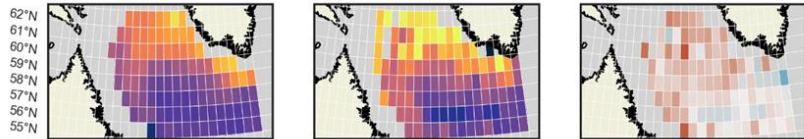
Temperature Mean from 100-500 dbar

Climatology (2002-2020)

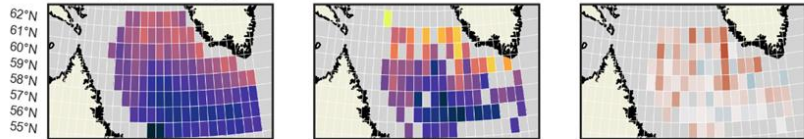
Full Year

2024

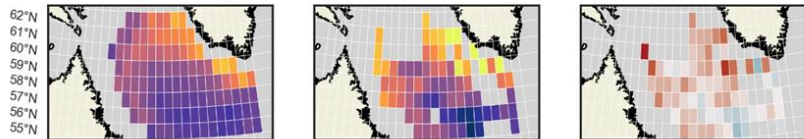
Anomaly ([2024] - [Climatology])



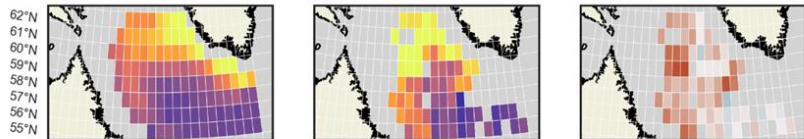
Spring (March-May)



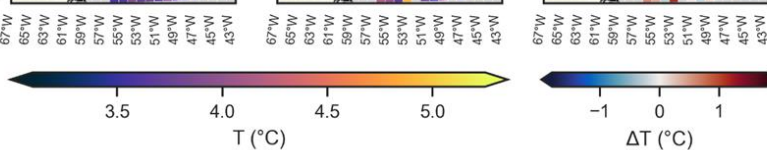
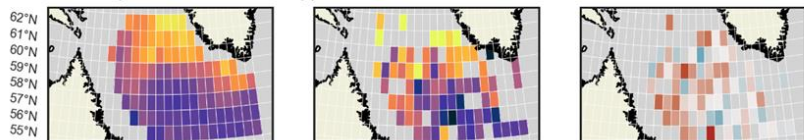
Summer (June-August)



Autumn (September-November)



Winter (December-February)



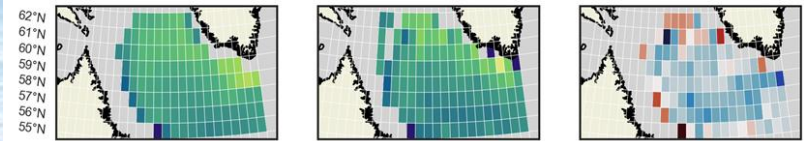
Practical Salinity Mean from 100-500 dbar

Climatology (2002-2020)

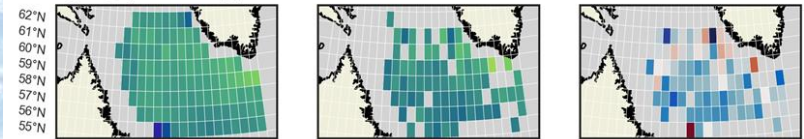
Full Year

2024

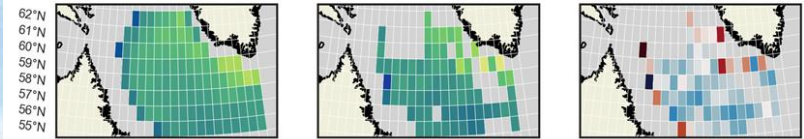
Anomaly ([2024] - [Climatology])



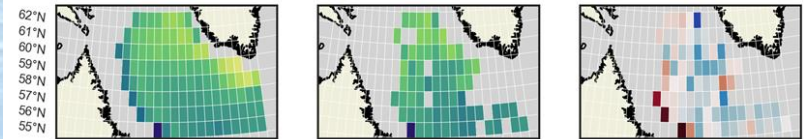
Spring (March-May)



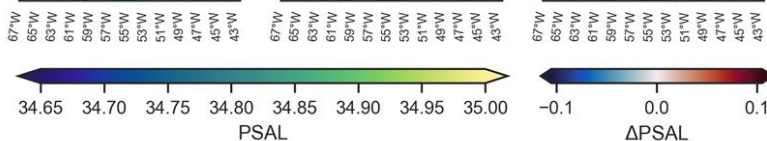
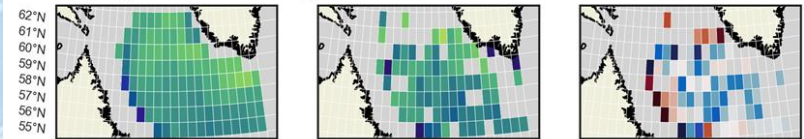
Summer (June-August)



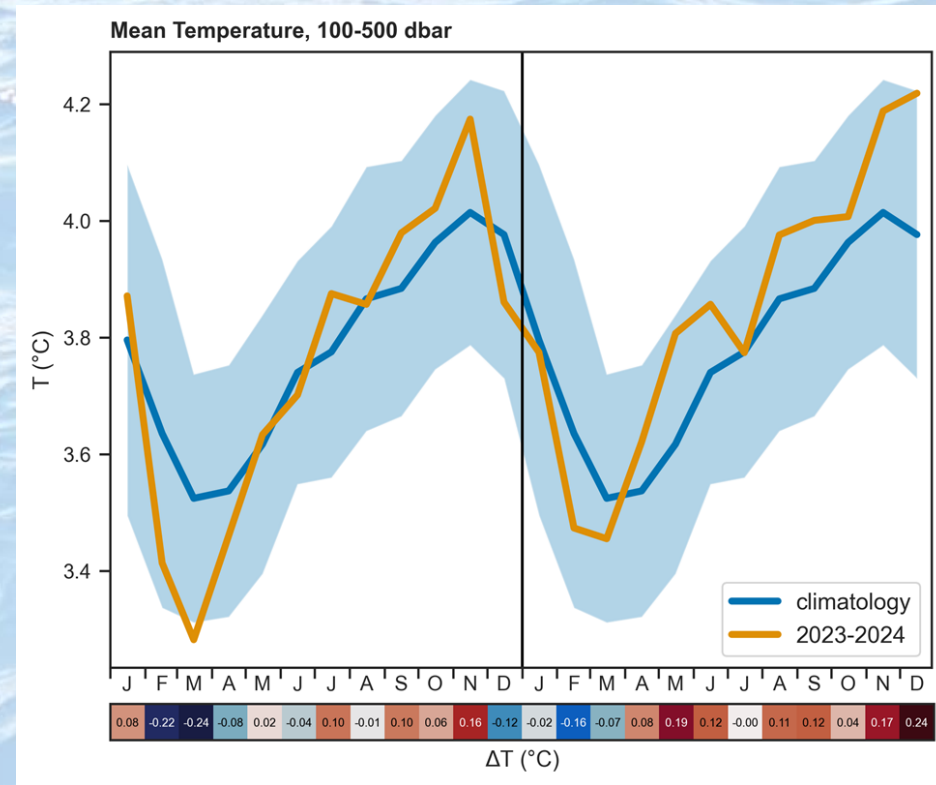
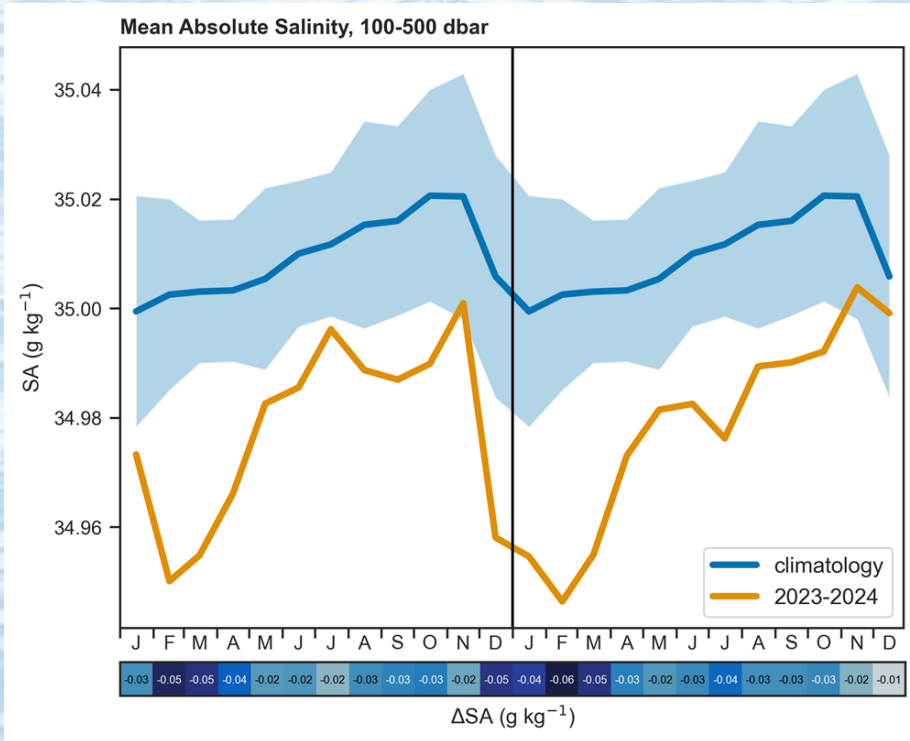
Autumn (September-November)



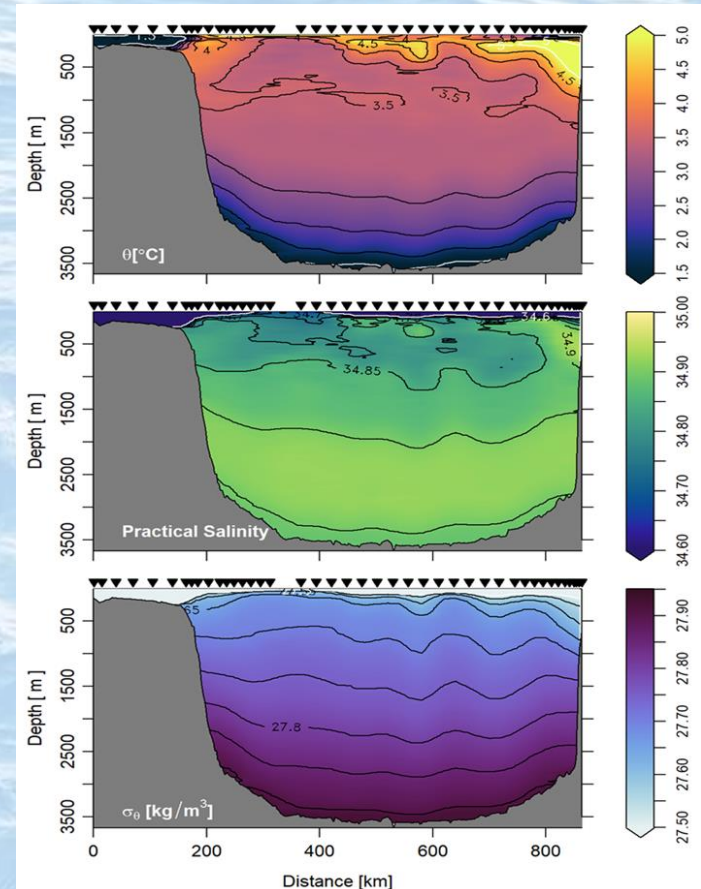
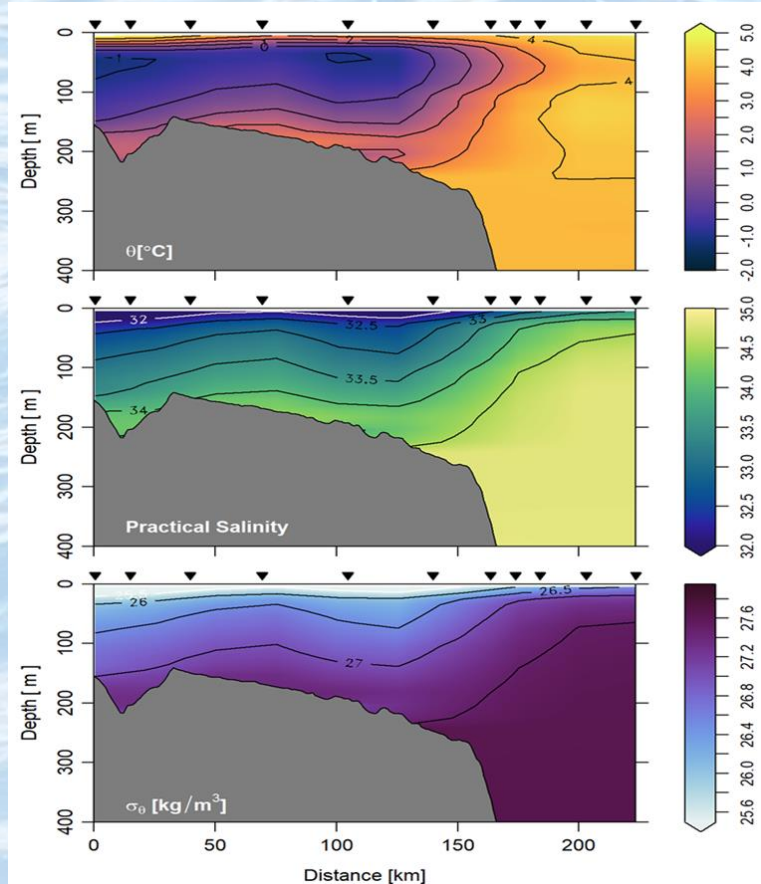
Winter (December-February)



100 to 500 db salinity and temperature, 2023-24



Temperature (top), salinity (middle) and density (bottom) distribution along the Labrador Shelf (right) and AR7W line (Left) from the 2024 cruise CTD data.



- 2024 Winter Convection Depth estimated using two methods:
- Mixed Layer Depth (~900 m)
- Vertical Temperature Gradient Maximum (~700 m)

Highlights

- In the **central Labrador Sea**, 2024 winter had the **largest** air temperature anomaly (1.0°C **above normal**), and 2024 summer had the smallest (0.3°C **above normal**).
- **Central Labrador Sea** SST - 2024 winter and spring SST anomalies were **close to normal**, summer anomalies were **below normal** (-0.23°C) and fall anomalies were **above normal** (0.24°C).
- Sea ice concentration anomalies in the winter of 2024 were **positive** on the **Greenland** side of **AR7W**.
- In 2024, Argo data analyses demonstrate that the temperature anomaly in the **Labrador Sea** relative to the 2002-2020 period were mostly **positive** (warm), particularly in the **northern** and **western areas**, and the salinity anomalies were mostly **negative** (fresh).
- The analysis of the **AR7W** temperature and salinity data from 2024 ship survey indicate that the winter convection in the **Labrador Sea** was relatively **shallow** ($\sim 700\text{-}900\text{ m}$).





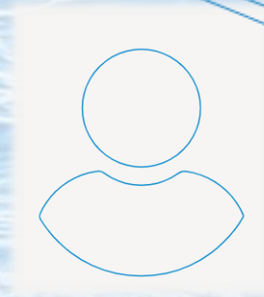
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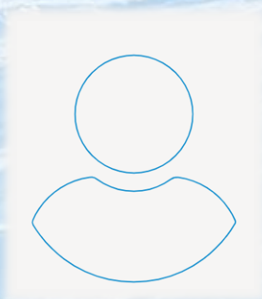
Z. Wang



C. Gordon



Stefanie Clay



B. DeTracey



B. Greenan



Fisheries and Oceans
Canada
Pêches et Océans
Canada

Fisheries and Oceans Canada,
Bedford Institute of Oceanography,
P.O. Box 1006, Dartmouth, N.S, B2Y 4A2,
Canada

Source:

Clay, S., **Ringuette, M.**, Devred, E., Azetsu-Scott, K., Wang, Z., Greenan, B., Gordon, C., Childs, D., & Layton, C. 2025. Physical, Chemical, and Biological Oceanographic Conditions in the Labrador Sea in 2024, SCR Doc. 25/014: 1-50.