



NAFO Northwest Atlantic
Fisheries Organization



The 2022 Overview of the Biogeochemical Oceanographic Conditions in the Northwest Atlantic in NAFO Subareas 2-3-4

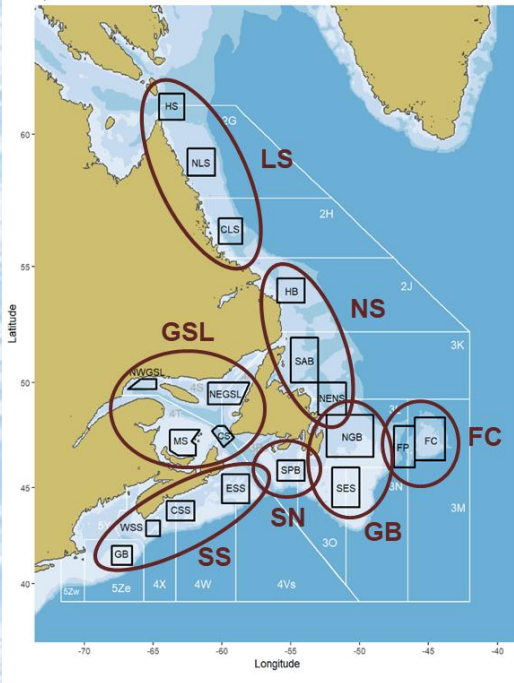


Fisheries and Oceans Pêches et Océans
Canada Canada

Atlantic Zone Monitoring Program (AZMP)
NAFC Oceanography Section

NAFO Subareas 2, 3 & 4 – Map of satellite boxes and AZMP oceanographic sections grouped by NAFO Ecosystem Production Units

A) Satellite ocean colour boxes



Oceanographic sections —

Sampled seasonally (spring, summer and fall)

High-frequency monitoring sites •

Sampled from weekly to bimonthly

Labrador Shelf (**LS**): 3 boxes, 2 sections

Newfoundland Shelf (**NS**): 3 boxes, 2 sections

Grand Bank (**GB**): 2 boxes, 2 sections, 1 site

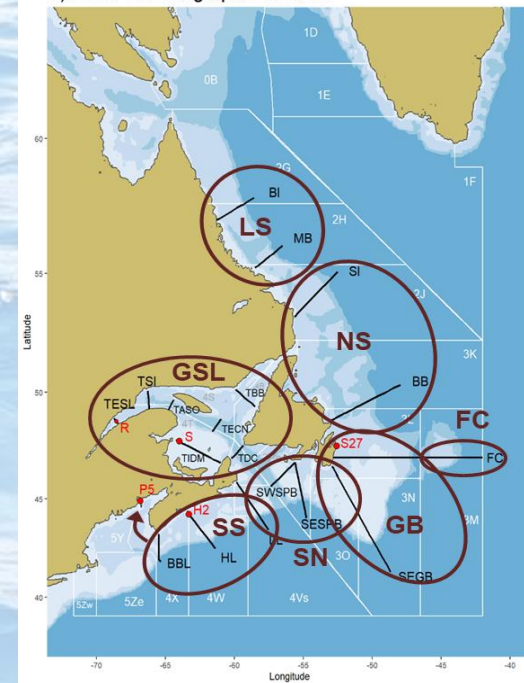
Flemish Cap (**FC**): 2 boxes, 3M part of FC section

Southern Newfoundland (**SN**): 1 box, 2 sections

Gulf of St. Lawrence (**GSL**): 4 boxes, 7 sections, 2 sites

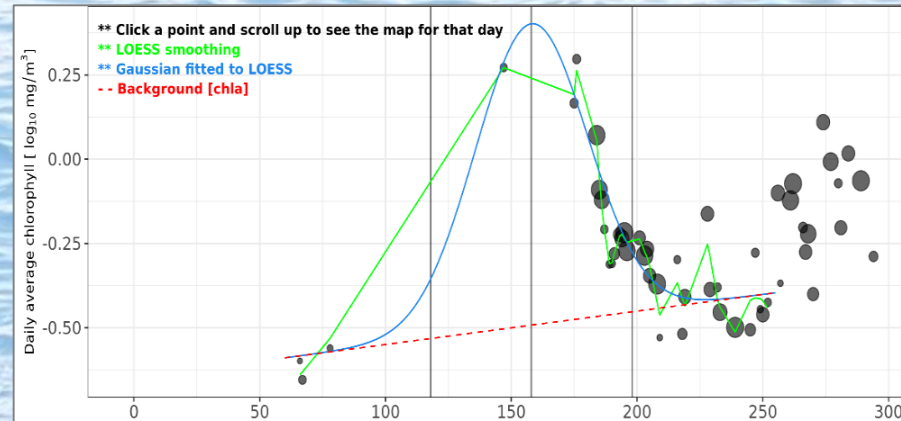
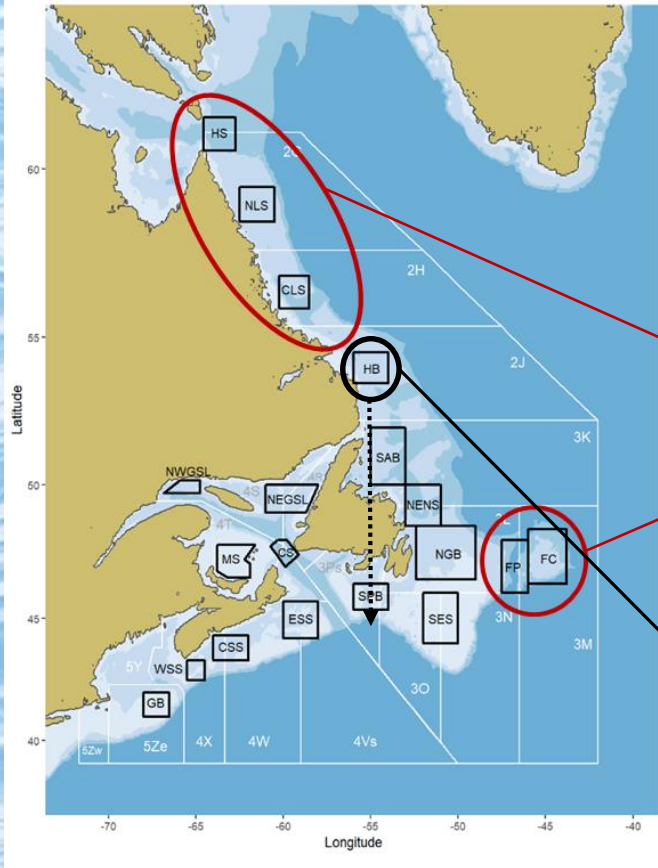
Scotian Shelf (**SS**): 4 boxes, 2 sections, 2 sites

B) AZMP oceanographic sections

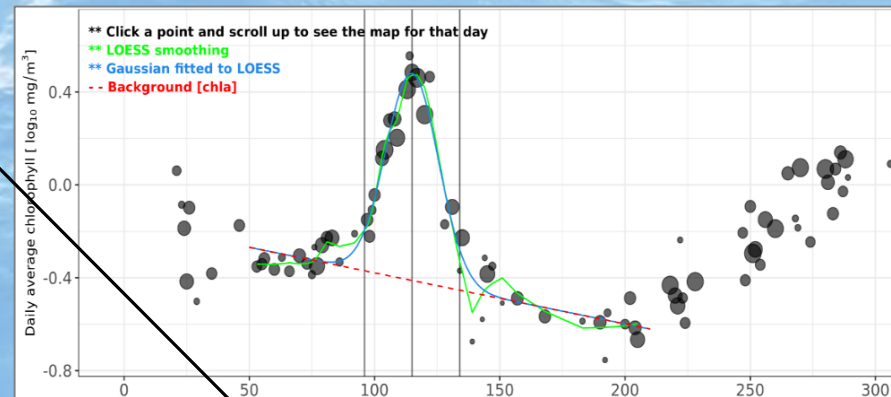


Spring Bloom Indices

A) Satellite ocean colour boxes



Higher uncertainty for Labrador Shelf and Flemish Cap
(red circles)

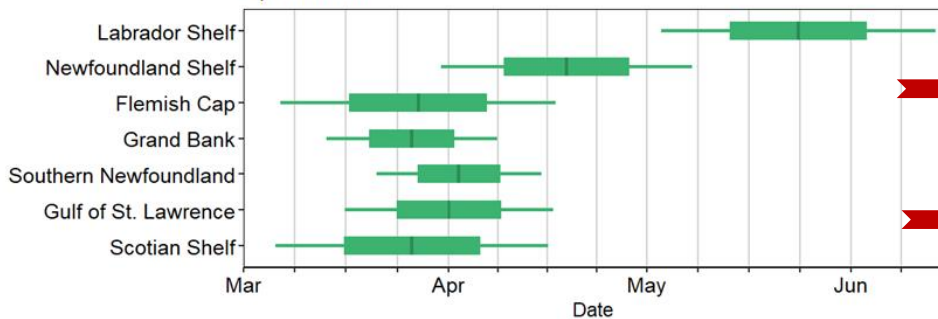


Chlorophyll a generally fits to the model from
subarea 2J to the South



Spring Bloom Phenology - 2022

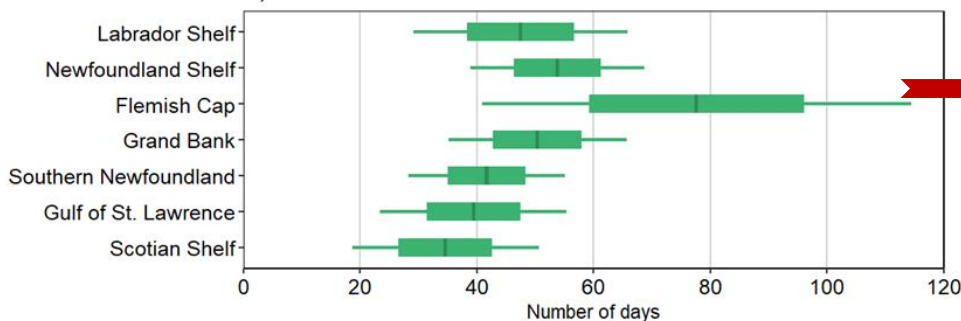
A) Initiation



Bloom initiation on the **Newfoundland** and **Labrador** shelves is delayed by sea ice.

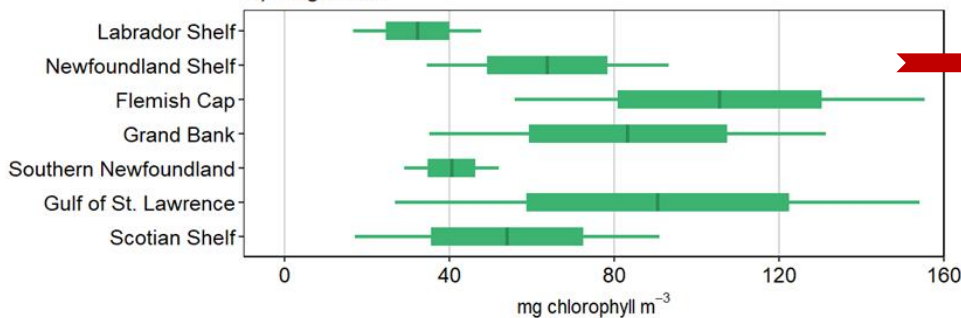
Initiation timing: mid-March to early April in the south (**Scotian Shelf to Flemish Cap**).

B) Duration



Bloom duration generally increase with latitude and is longest and most variable in the **Flemish Cap**.

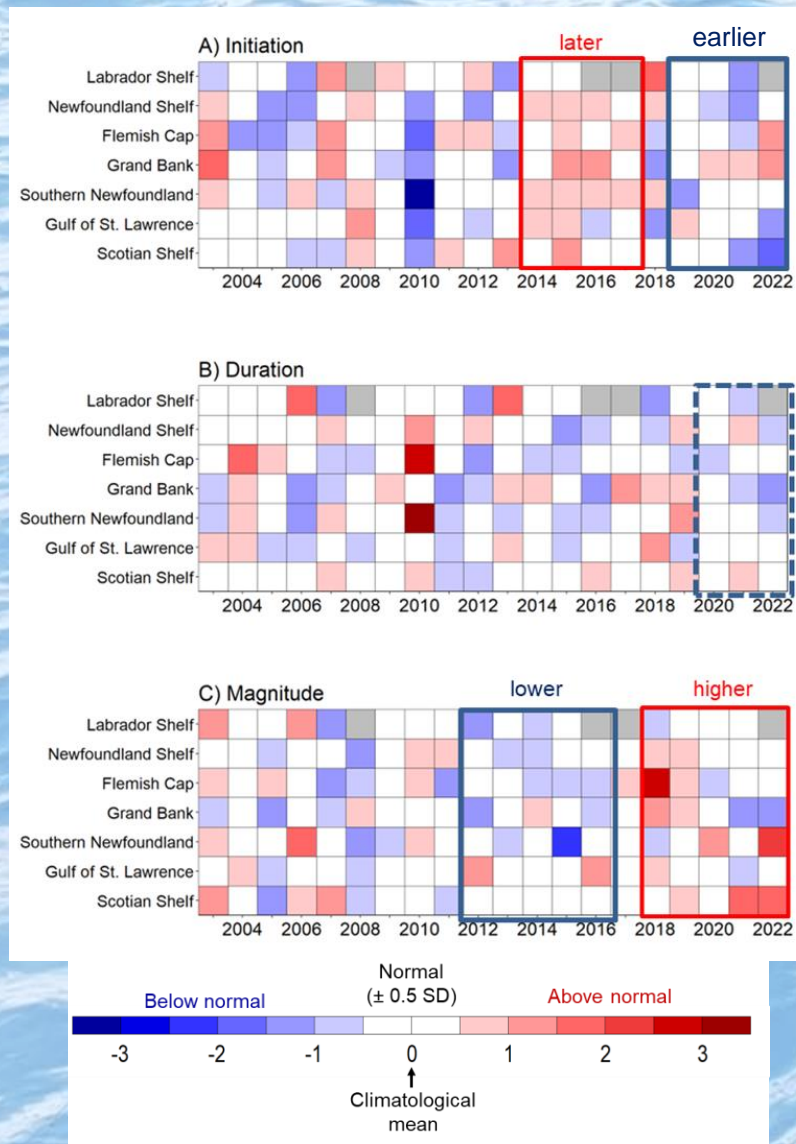
C) Magnitude



Bloom magnitude is variable but generally highest on the **Grand Bank**, the **Flemish Cap**, and on **Gulf of St. Lawrence** regions.



Spring Bloom Phenology – decadal variability



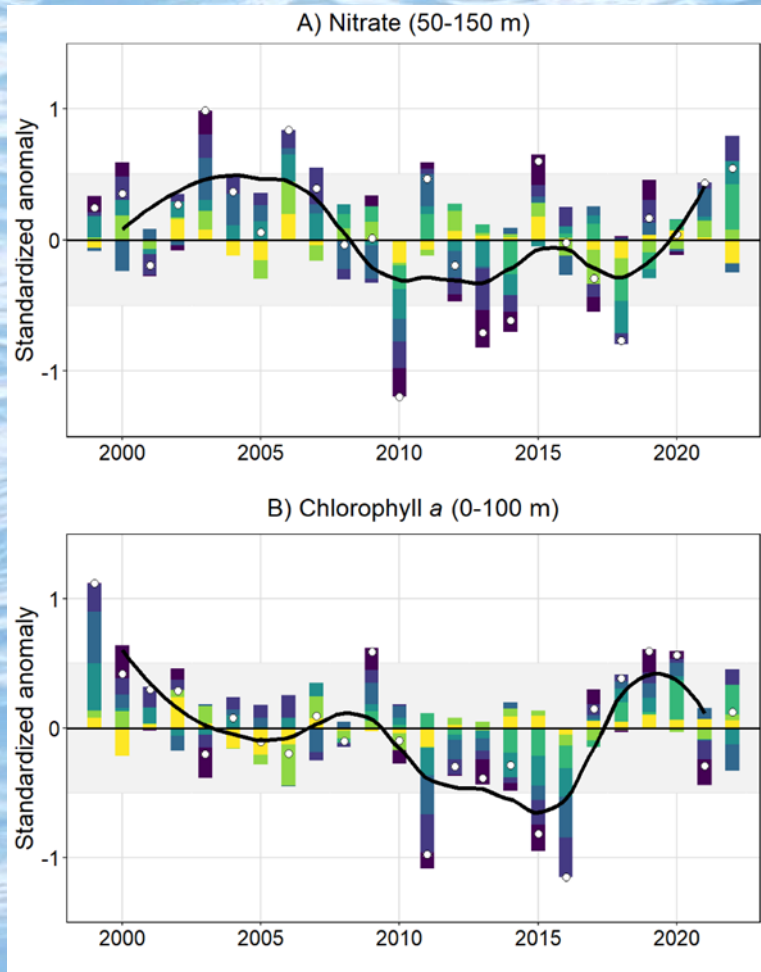
General trend of **earlier blooms** across the **NorthWest Atlantic** (NWA) since ~2019 after a period of late spring bloom onset from 2014-2017.

High **variability in spring bloom duration**. Bloom duration mainly near or slightly shorter the normal, across **NWA** since 2020.

Bloom magnitude generally higher since 2018 compared to the 2012-2016 period.



Nitrate & Chlorophyll-a Inventories

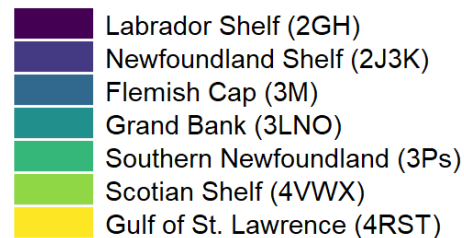


➤ Nitrate

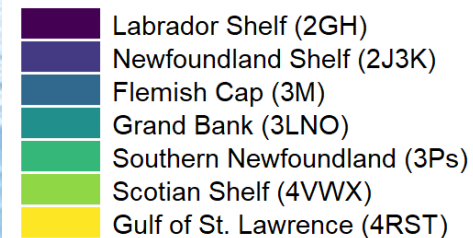
- General **decrease** in **nitrate** inventories during the 2010s compared to the 2000s.
- **Increase** in **nitrate inventories** over the past 4 years with above-normal mean inventory in 2022.

➤ Chlorophyll-a

- **Similar trend** to **nitrate**.
- **Near-normal inventories** for a 2nd consecutive year in 2022 after two years of above-normal level in 2019-2020.



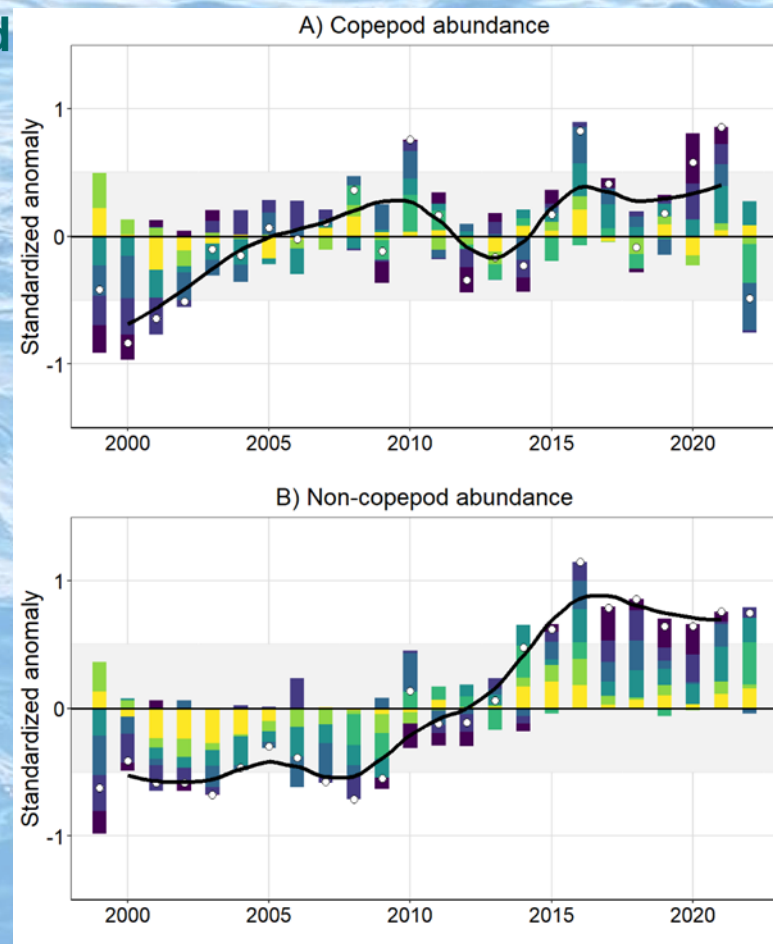
Zooplankton Abundance



Copepod

General **increase** across the zone since 1999 except for a slight decline during the 2010s.

Copepod abundance index for 2022 at its **lowest level** in **20 years** after 2 consecutive years of above-normal abundances.



Non-copepod

Increased from below normal during the 2000s to **above normal** from 2015 onward.

Mean abundance index has remained **above normal** since 2015.

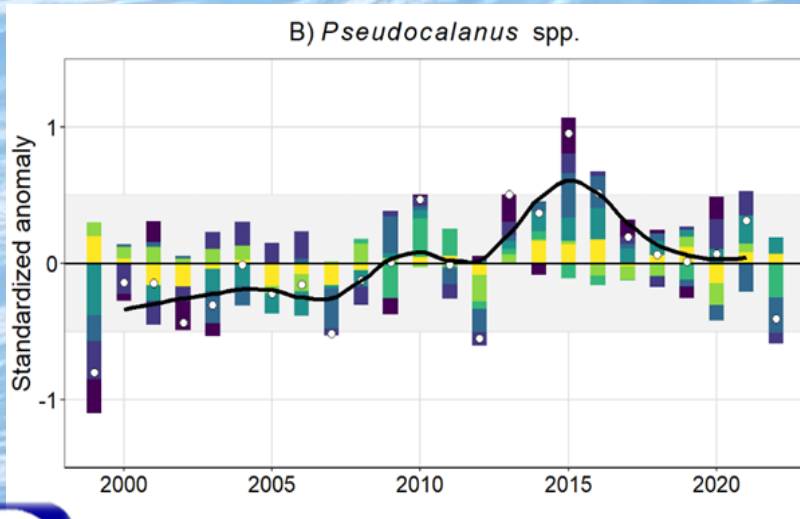
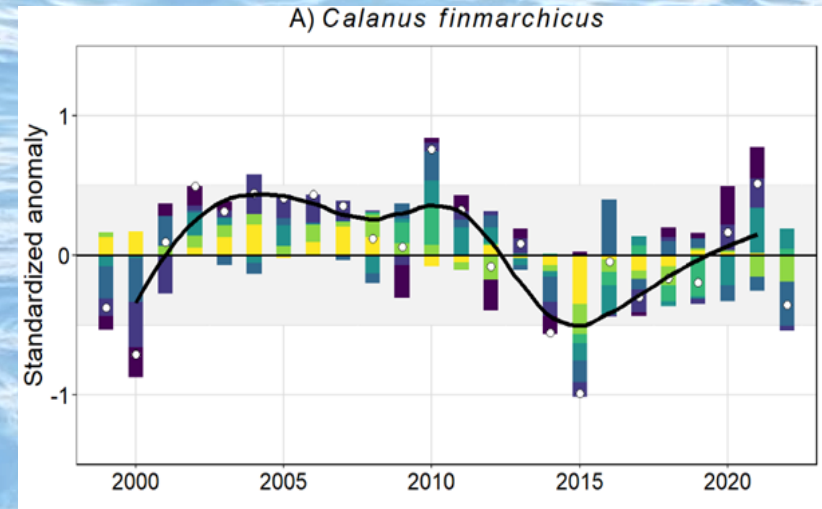
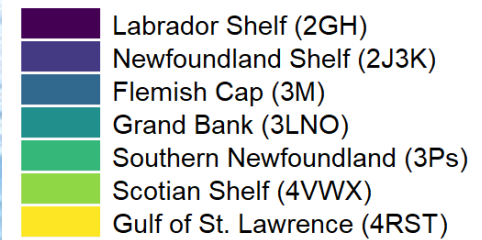


Zooplankton Taxa

Calanus finmarchicus

Large, energy-rich **copepods** that dominate **zooplankton** biomass in the **NWA**.

Mean *C. finmarchicus* abundance **decrease** in 2022 compared to the **above-normal level** of 2021. Lowest abundance since 2015.



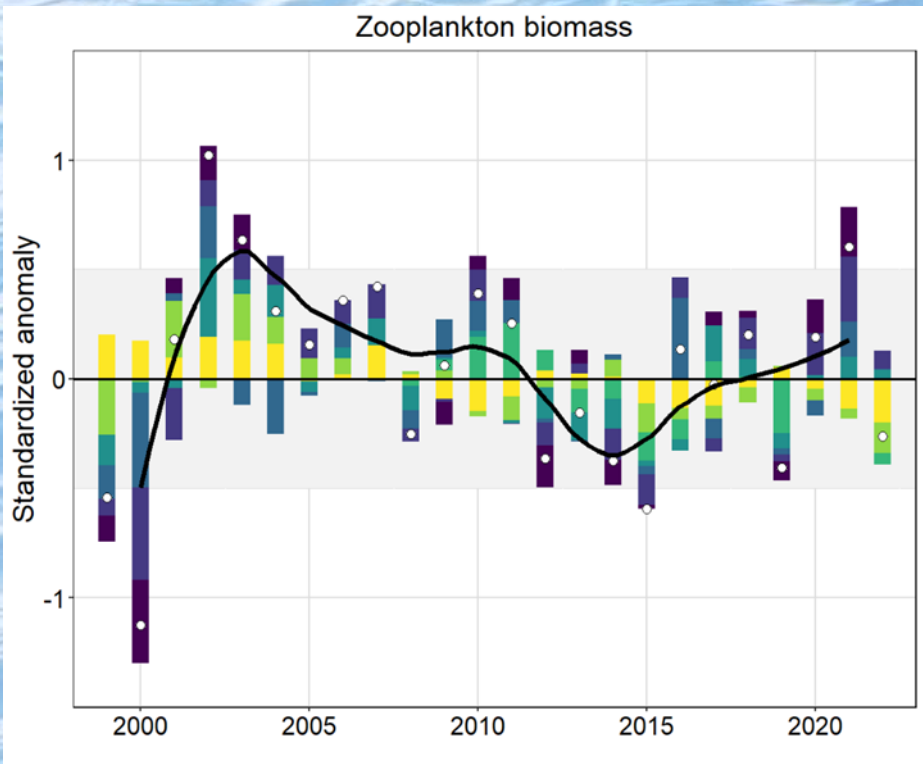
Pseudocalanus spp.

Small copepod, important **driver** of total copepod abundance.

General **decrease** since the record-high abundance of 2015. Mean **abundance** in **2022** was at its **lowest** in 10 years.



Zooplankton Biomass



General **increase** in zooplankton biomass from the early 2000s to 2015 followed by a general **increase** until 2021.

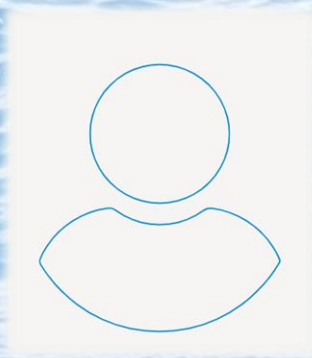
Decrease to near-normal biomass in 2022 compared to the above-normal level of the 2021.



Highlights

- **Increased nitrate** inventories **favor** primary production (chlorophyll-a biomass).
- **Earlier bloom initiation across** the **NAFO subareas 2, 3 and 4** since 2019 compared to the late blooms during 2014-2017.
- General increase of *Calanus finmarchicus* abundance since 2015, with a **positive impact** of total zooplankton biomass.
- Copepod **abundance indices** (total copepods, *C. finmarchicus* and *Pseudocalanus spp.*) in 2022 **lowest levels** in several years.
- The 2022 **decline** in copepod **abundance** and zooplankton **biomass** may be partly attributable to a limited sampling in the summer survey although **low biomass** was observed in the **Gulf of St. Lawrence**.





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Source:

Bélanger, D., G. Maillet, P. Pepin. (2023). Biogeochemical oceanographic conditions in the Northwest Atlantic (NAFO subareas 2-3-4) during 2022, NAFO SCR Doc. 23/017.