



NAFO Northwest Atlantic
Fisheries Organization



The 2021 Overview of the Environmental indices for NAFO subareas 0 to 4

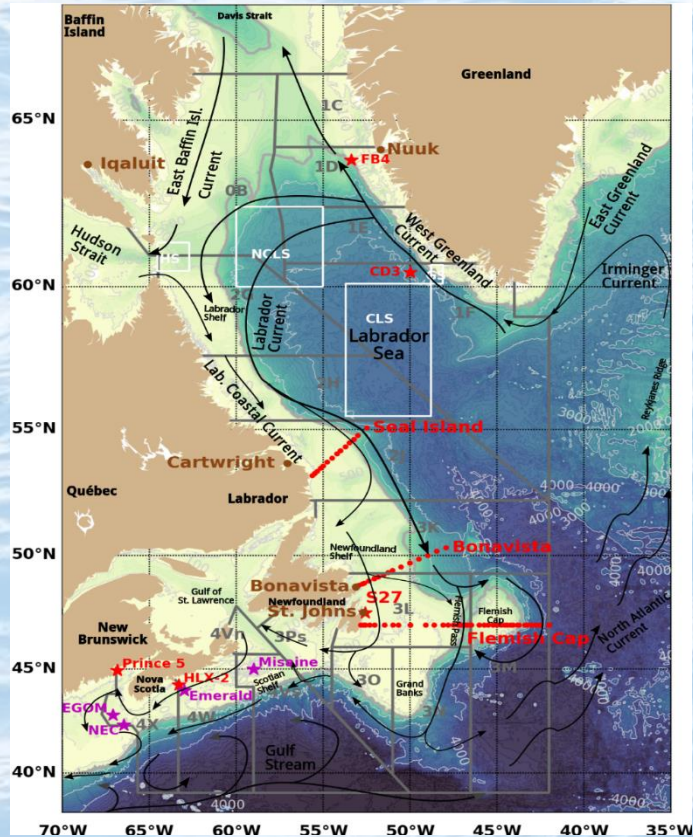


Fisheries and Oceans Pêches et Océans
Canada Canada

Atlantic Zone Monitoring Program (AZMP)
NAFC Oceanography Section

NAFO Subareas 0 & 1 – Greenland Shelf and Davis Strait

Climate Index

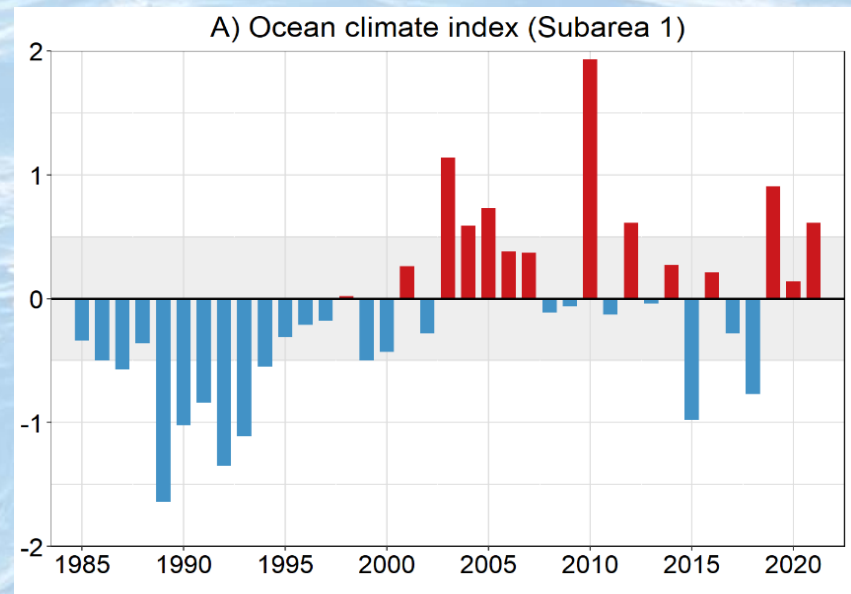


Climate index components for subareas 0 & 1

- Sea surface temperature (NLS, CLS, HS, GS)
- Integrated sea temperature (FB4, CD3, CLS)
- Air temperature (Nuuk, Iqaluit)

The ocean climate index in Subarea 0-1 was above normal in 2021.

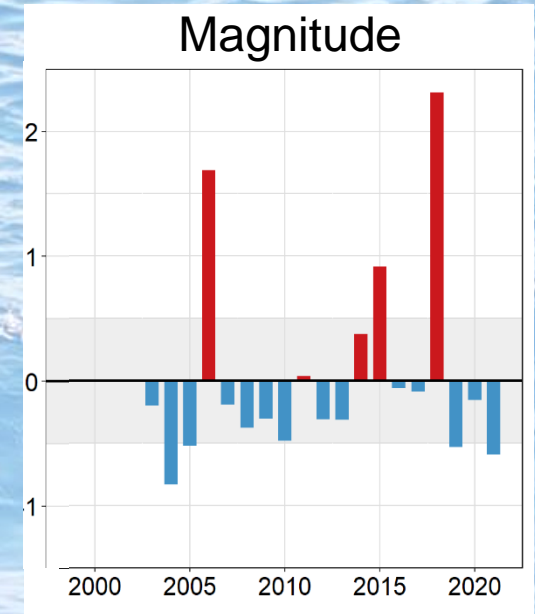
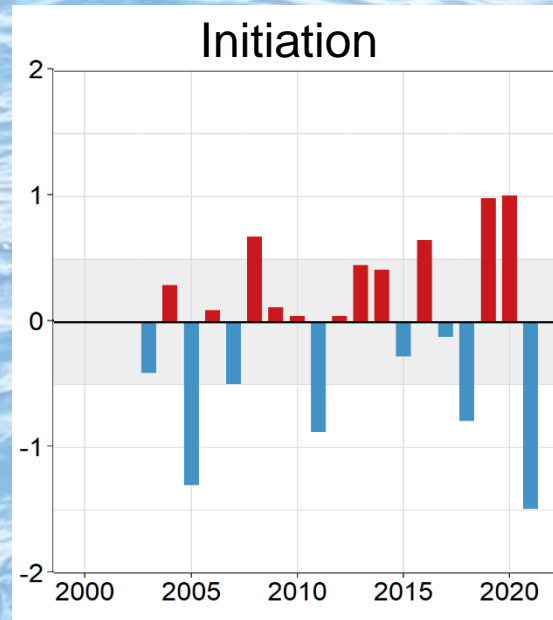
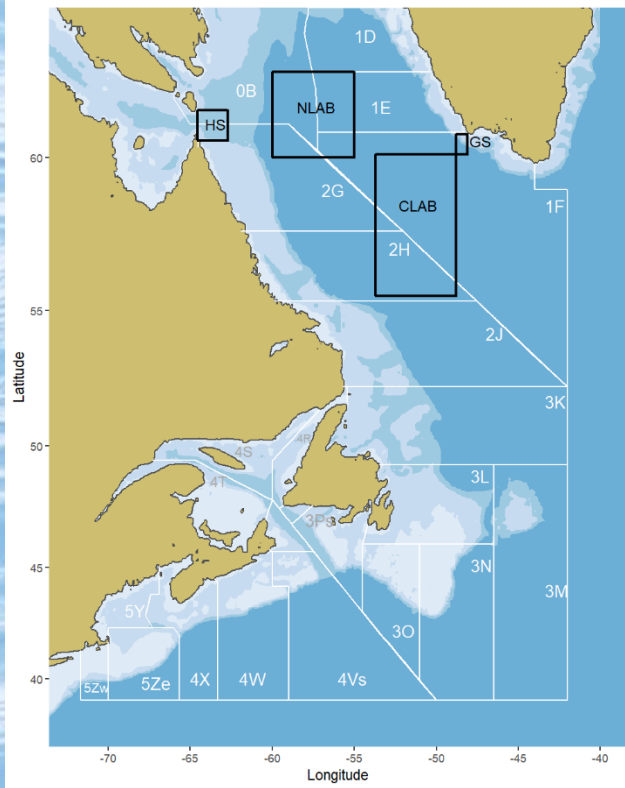
Positive anomalies for the past 3 years.



NAFO Subareas 0 & 1 – Greenland Shelf and Davis Strait

Spring Bloom

Ocean colour boxes - Subareas 0-1



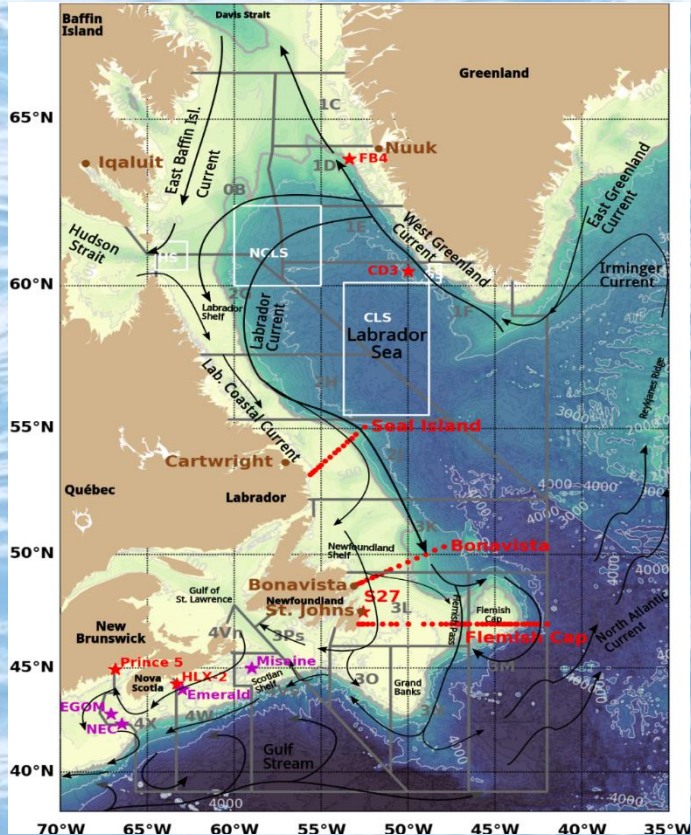
Mean initiation timing of the spring bloom in 2021 was the earliest of the time series.

Spring bloom magnitude - total production was slightly below normal in 2021.



NAFO Division 3M – Flemish Cap

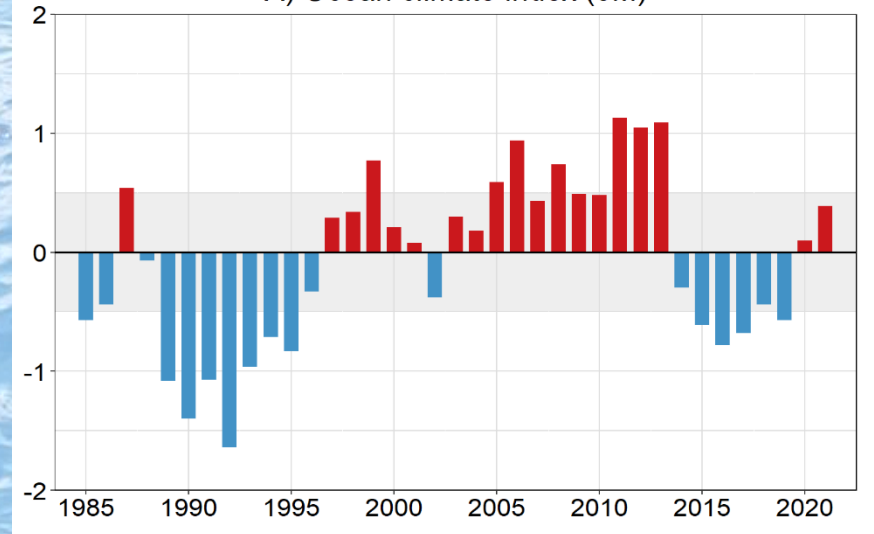
Climate Index



Climate index components for 3M

- Sea surface temperature (3M)
- Integrated sea temperature (Flemish Cap 3M)
- Mean summer bottom temperature on Flemish Cap

A) Ocean climate index (3M)



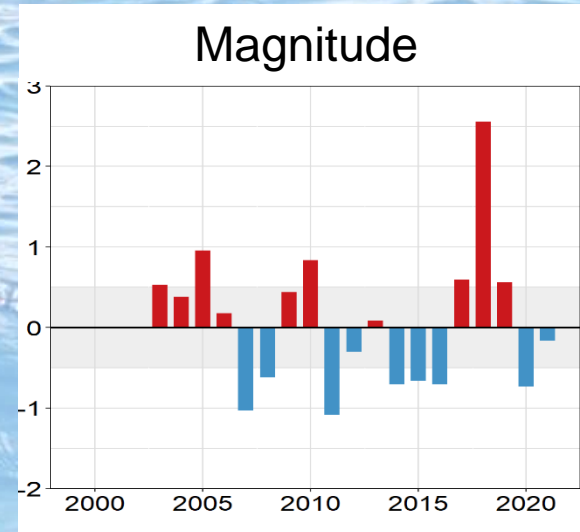
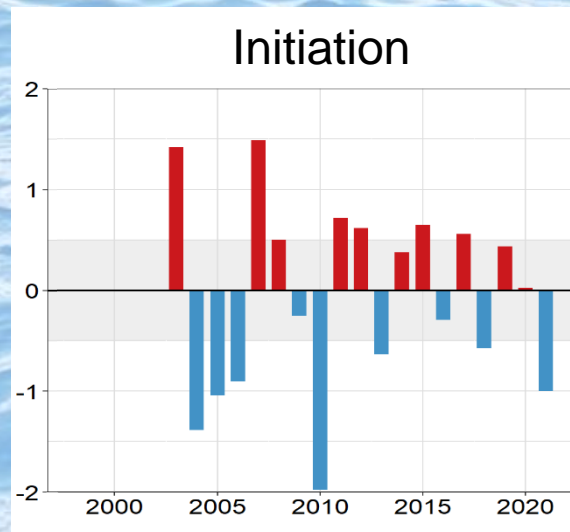
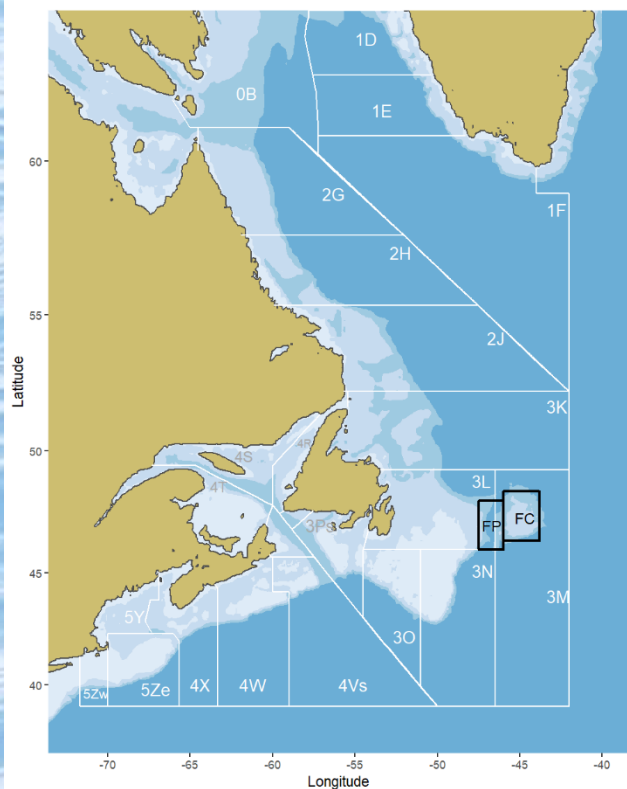
After being mostly below normal between 2015 and 2019 (except for 2018), the ocean climate index in 3M, has been normal in 2020 and 2021.



NAFO Division 3M – Flemish Cap

Spring Bloom

Ocean colour boxes - NAFO Div. 3M



The initiation of the spring bloom was earlier than normal in 2021 after two consecutive years of near-normal timing.

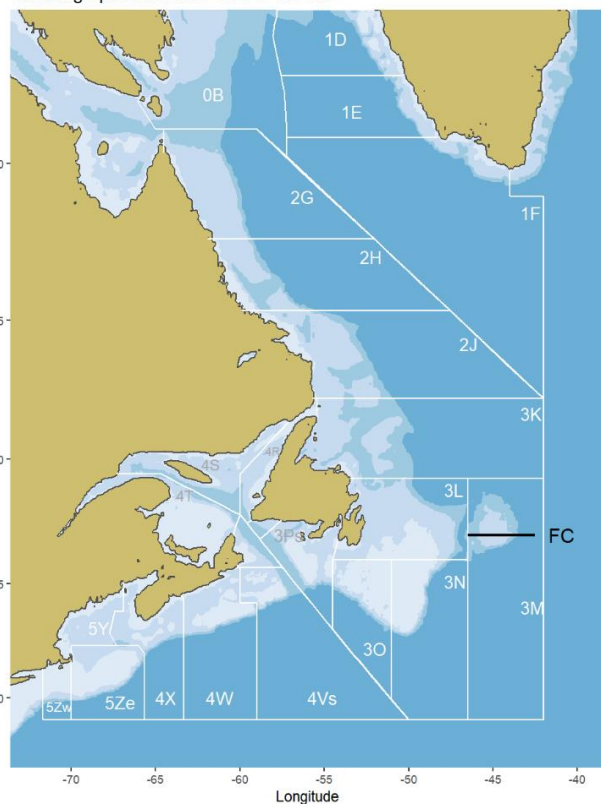
Spring bloom magnitude returned to near normal in 2021 after the low production spring of 2020.



NAFO Division 3M – Flemish Cap

Zooplankton

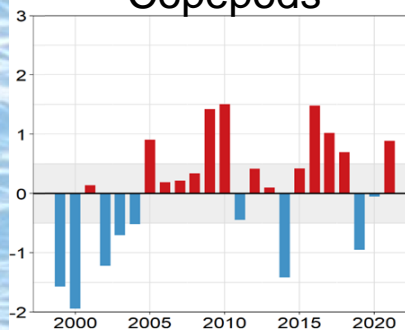
Oceanographic sections - NAFO Div 3M



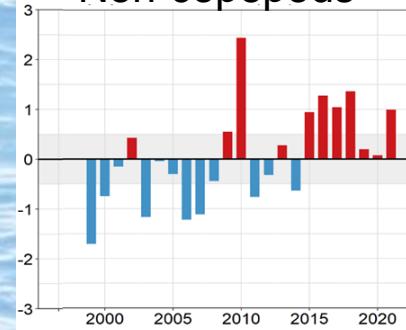
— AZMP oceanographic sections

● High-frequency monitoring sites

Copepods

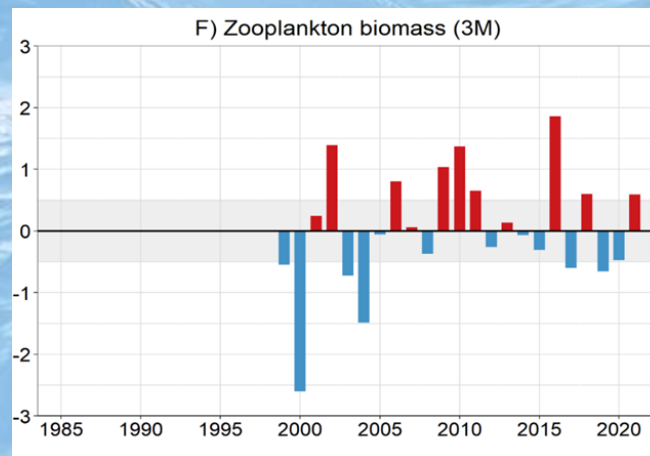


Non-copepods



The abundance of copepods and non-copepods was back to above-normal level in 2021 after two consecutive years of near or below-normal levels.

F) Zooplankton biomass (3M)

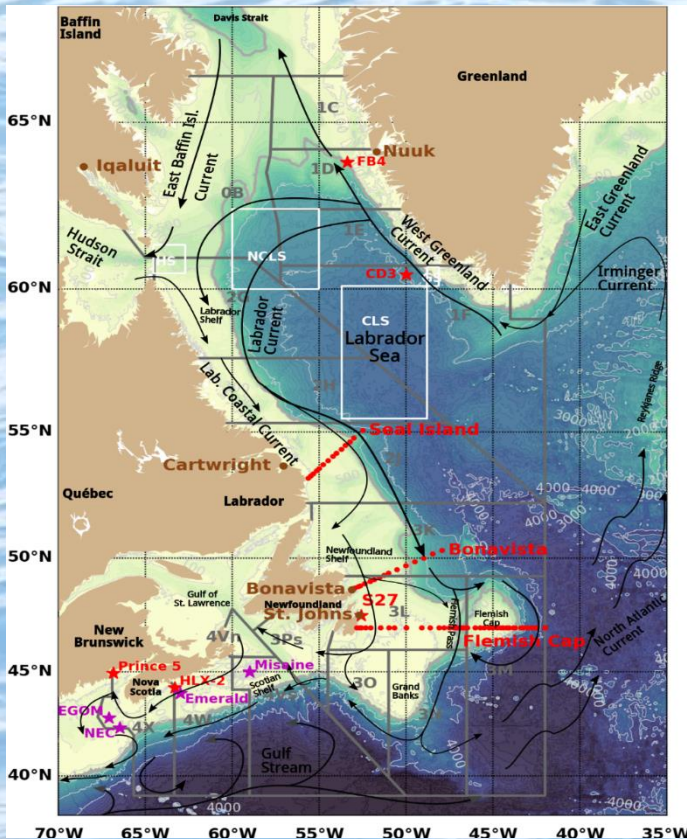


Total zooplankton biomass increased to above normal in 2021 after two consecutive years of near or below-normal levels.



NAFO Division 3LNO – Grand Bank

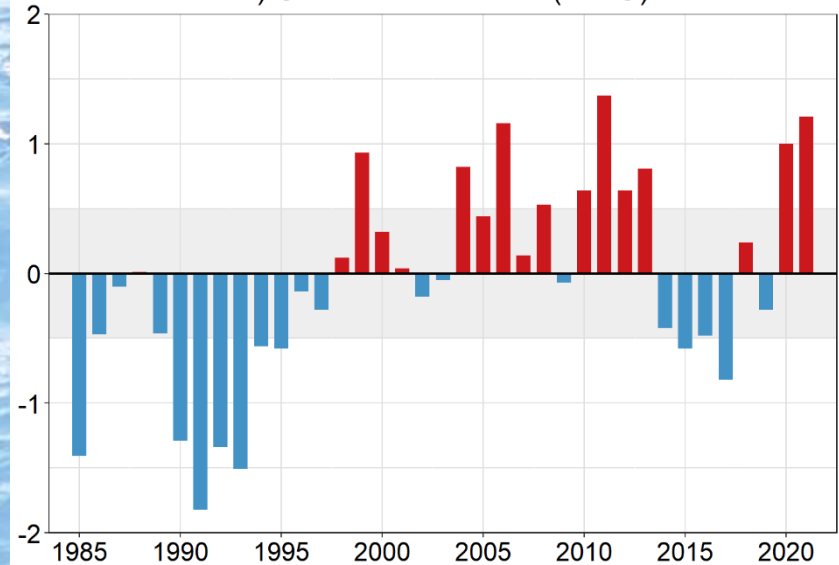
Climate Index



Climate index components for 3LNO

- Sea surface temperature (3L, 3N & 3O)
- Integrated sea temperature (S27)
- CIL volume (Seal Island, Bonavista, Flemish Cap 3L)
- Mean bottom temperature (3LNO spring and fall)

A) Ocean climate index (3LNO)



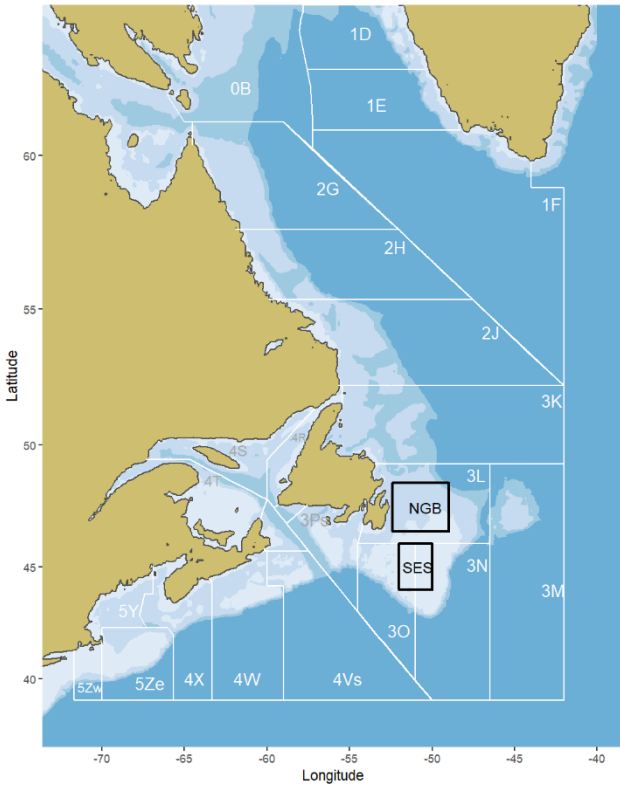
In 2021, the ocean climate in NAFO Divs. 3LNO - Grand Bank, was at its second warmest value of the entire time series started in 1975 (after the record high of 2011).



NAFO Division 3LNO – Grand Bank

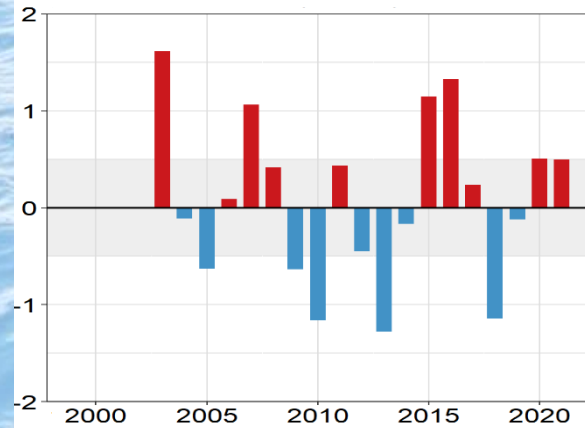
Spring Bloom

Ocean colour boxes - NAFO Div. 3LNO

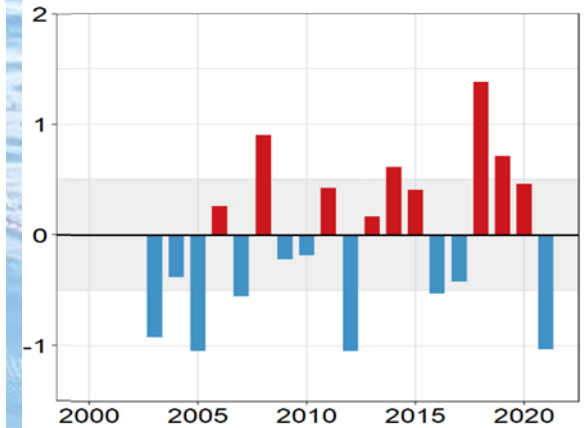


□ Satellite surface chl-a concentration

Initiation



Magnitude



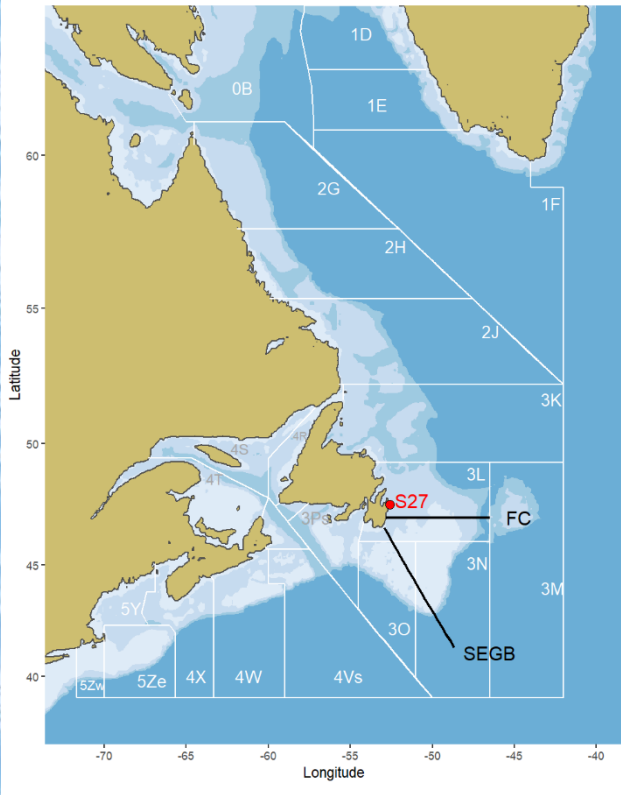
Spring bloom initiation was near normal in 2021 for a 3rd consecutive year.

Spring bloom magnitude decreased to below normal in 2021 and was among the lowest of the time series.

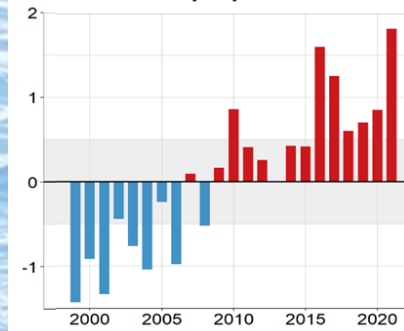




Oceanographic sections - NAFO Divs 3LNO



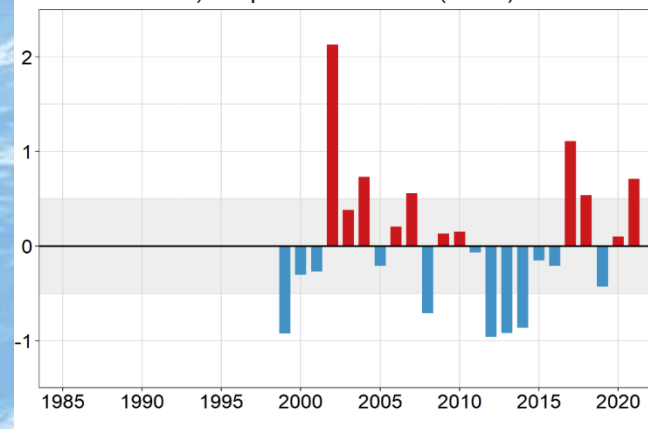
- ## Copepods



The bar chart displays the annual change in the number of people in the labor force from 2000 to 2022. The y-axis represents the change in millions, ranging from -1 to 2. The x-axis shows the years from 2000 to 2020, with data extending to 2022. The chart shows a significant increase in the number of people in the labor force starting around 2010, with a peak around 2018.

Year	Change (millions)
2000	-0.8
2001	-0.6
2002	-0.4
2003	-0.7
2004	-1.1
2005	-0.4
2006	-1.1
2007	-0.8
2008	-1.0
2009	-0.1
2010	0.0
2011	0.6
2012	0.5
2013	1.1
2014	0.3
2015	1.6
2016	0.8
2017	1.6
2018	1.0
2019	1.0
2020	1.6
2021	1.6
2022	1.6

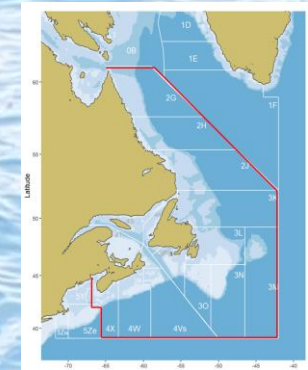
F) Zooplankton biomass (3LNO)



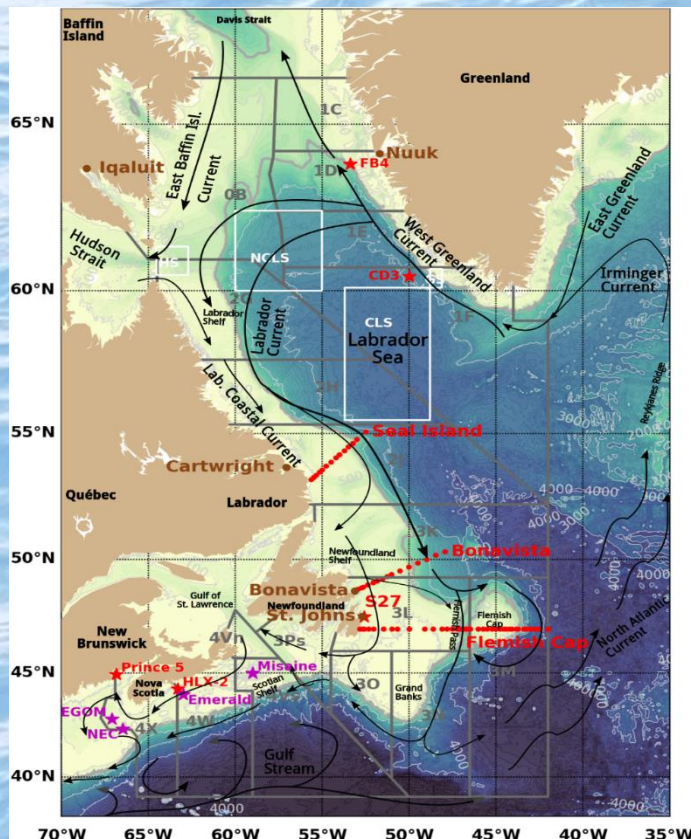
Zooplankton biomass was above normal in 2021 for the third time over the past five years.

NAFO Subareas 2-3-4

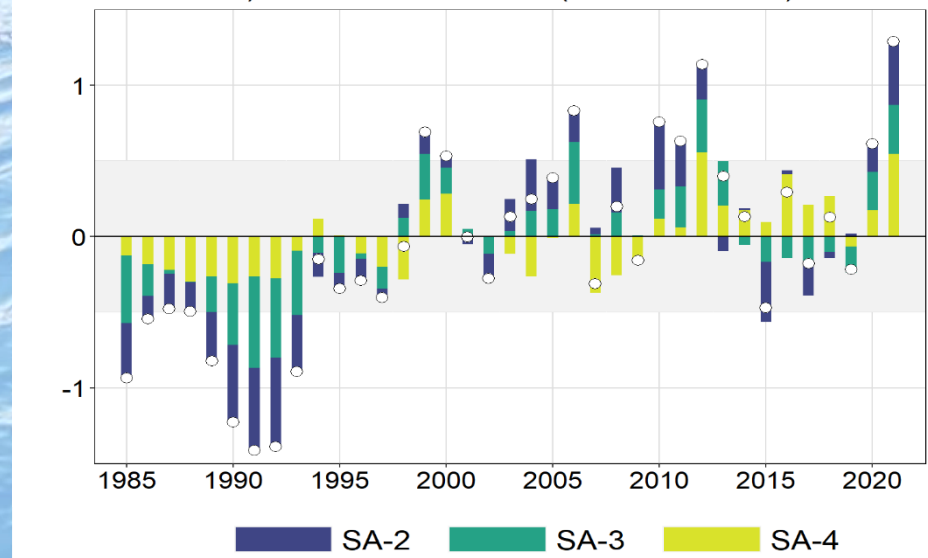
– NL Shelf, Scotian Shelf and GSL



Climate Index



A) Ocean climate index (Subareas 2-3-4)



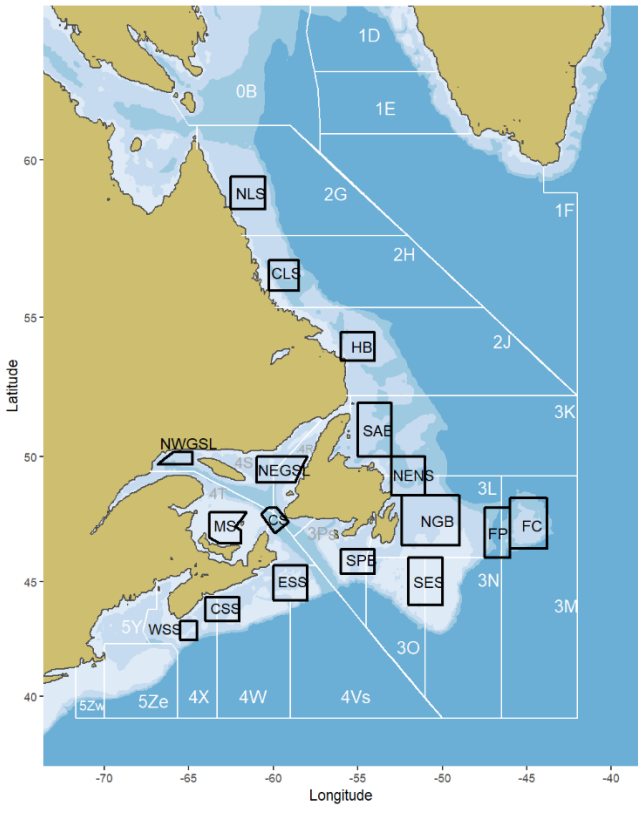
In 2021, mean climate index in subareas 2, 3 and 4 was the highest on record with positive anomalies in all subareas for a second consecutive year.



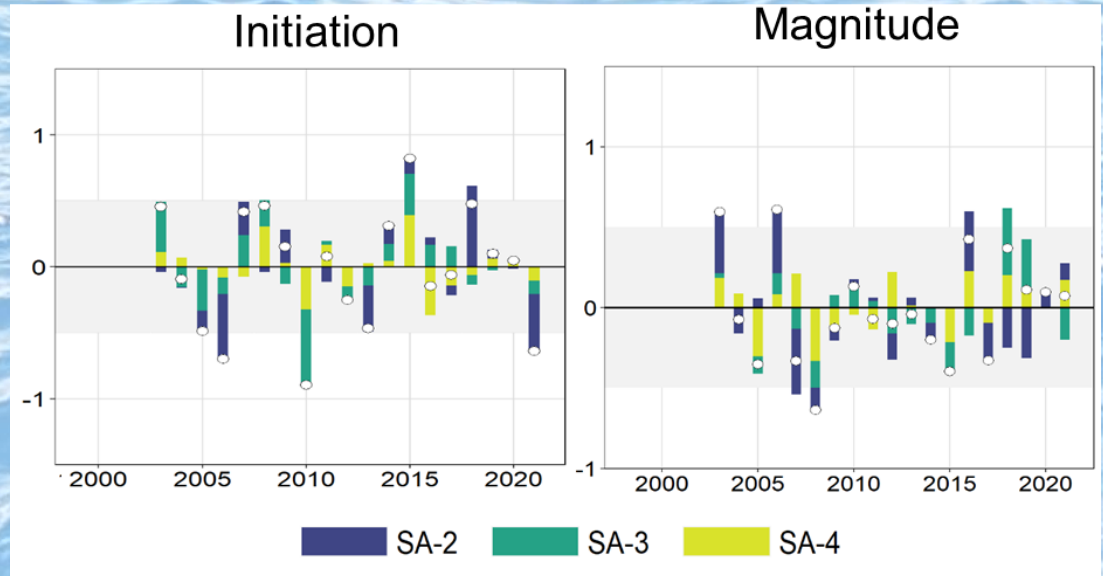
NAFO Subareas 2-3-4 – NL Shelf, Scotian Shelf and GSL

Spring Bloom

Ocean colour boxes - NAFO subareas 2-3-4



□ Satellite surface chl-a concentration

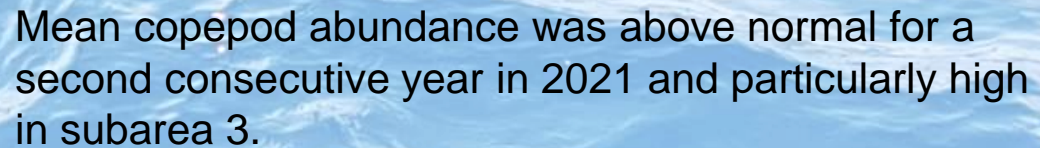


Spring bloom initiation was, on average, earlier than normal in subareas 2-3-4 in 2021, mostly because of the early bloom onsets on the Labrador Shelf (SA-2).

Total spring production (bloom magnitude) was near normal in 2021 in subareas 2, 3 and 4.




Zooplankton Abundance



Non-copepod abundance was near-normal in 2021 after five consecutive years of above-normal observations. Abundances in subareas 3 and 4 were comparable to those observed in recent years there was a decrease in subarea 2.






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Source:

Bélanger, D., Cyr, F. (2022). Environmental indices for NAFO subareas 0 to 4 in support of the Standing Committee on Fisheries Science (STACFIS), NAFO SCR Doc. 22/021.



Additional information:

Bélanger, D., Maillet G and Pépin P (2022). Biogeochemical oceanographic conditions in the Northwest Atlantic during 2021, NAFO SCR Doc. 22/019.

Cyr, F., P. S. Galbraith, C. Layton, D. Hebert, N. Chen and G. Han. (2022). Environmental and Physical Oceanographic Conditions on the Eastern Canadian shelves (NAFO Sub-areas 2, 3 and 4) during 2021. NAFO SCR Doc. 22/020.