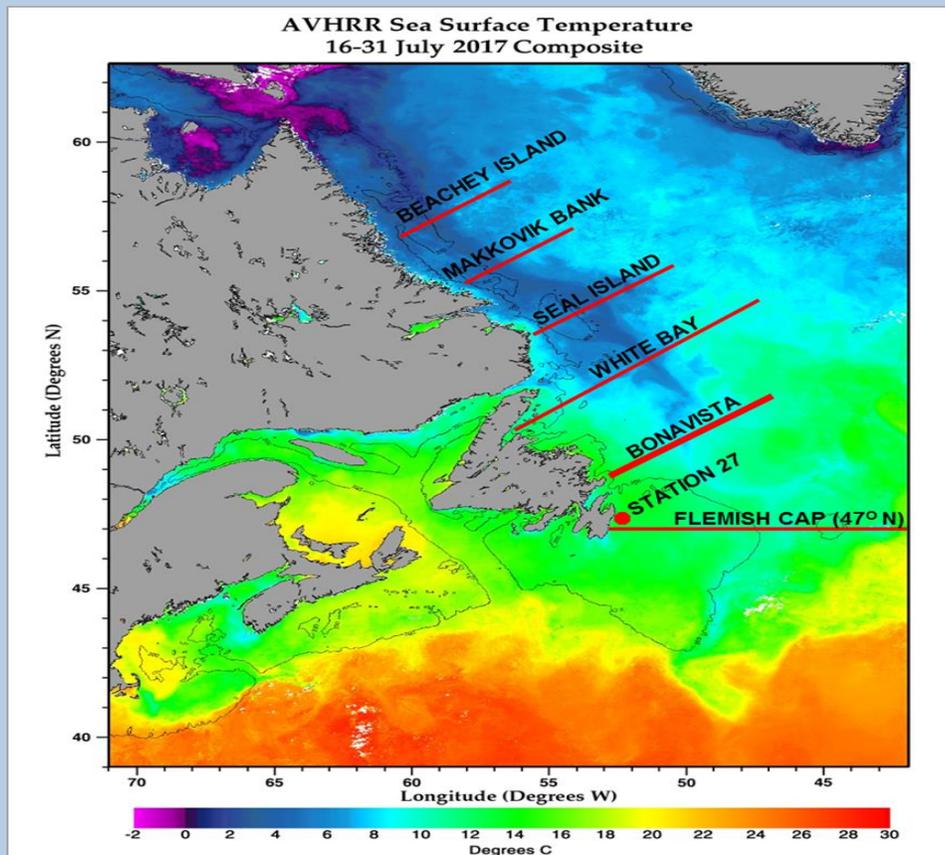


## The 2017 Ocean Climate Status Summary for NAFO S. A. 3

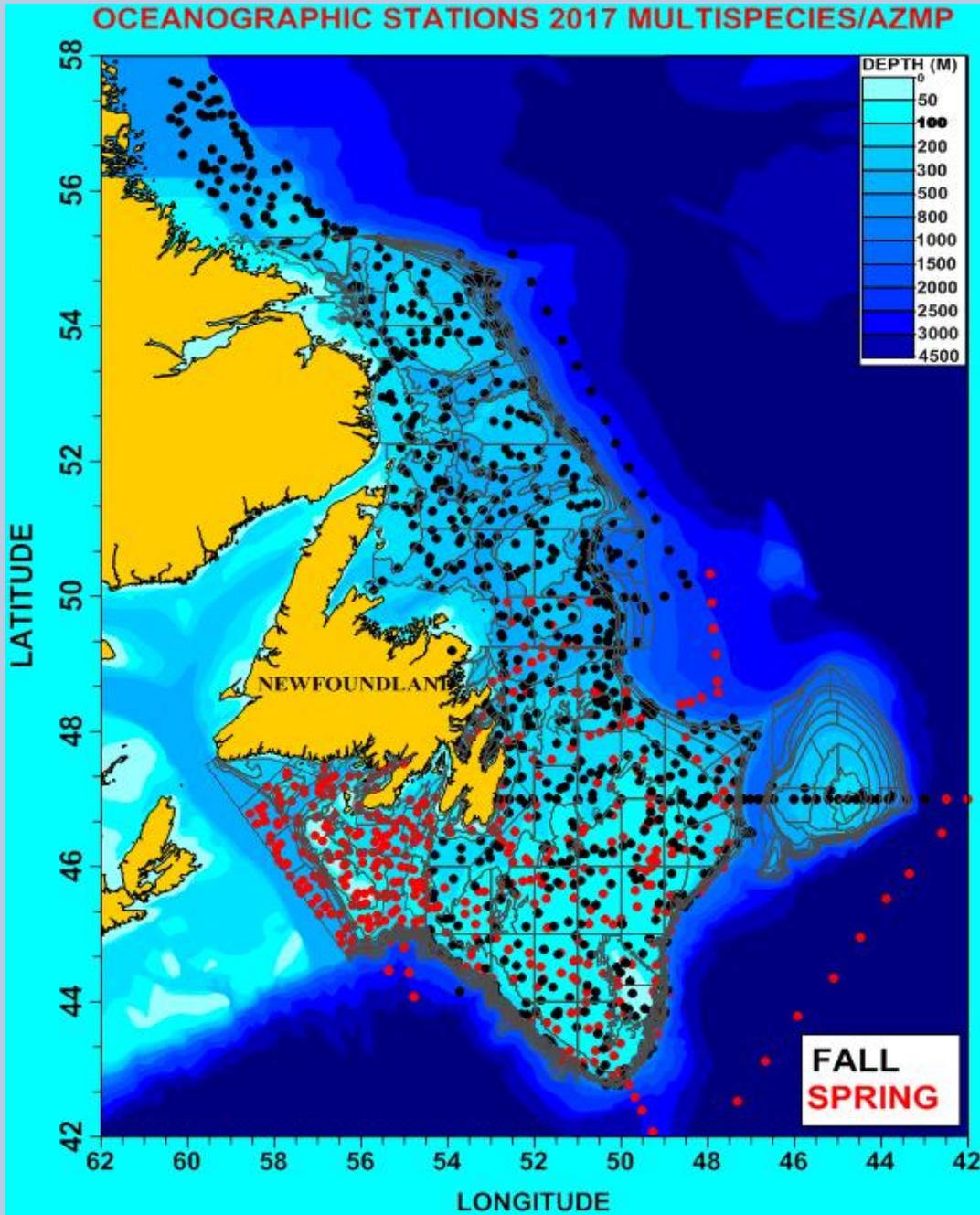
### Newfoundland Shelf and Grand Banks

Map of the Region **Red lines** represent Standard Sections sampled during the summer of 2017 together with the summer Sea-Surface-Temperature (SST) during July 16-31, 2017. The Location of the AZMP fixed monitoring site Station 27 is also shown as the **red dot**.

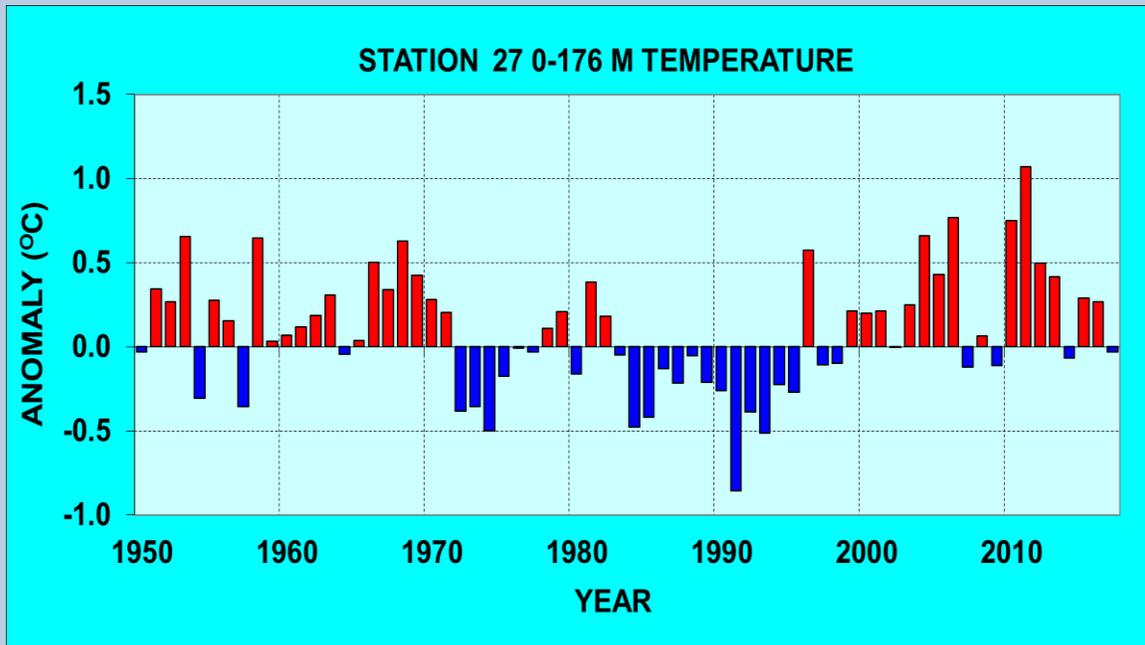


**Most climate indices in this area have been trending downward since the near-record highs of 2010 and 2011 to mostly below normal values (cold/fresh) during the past 4 years.**

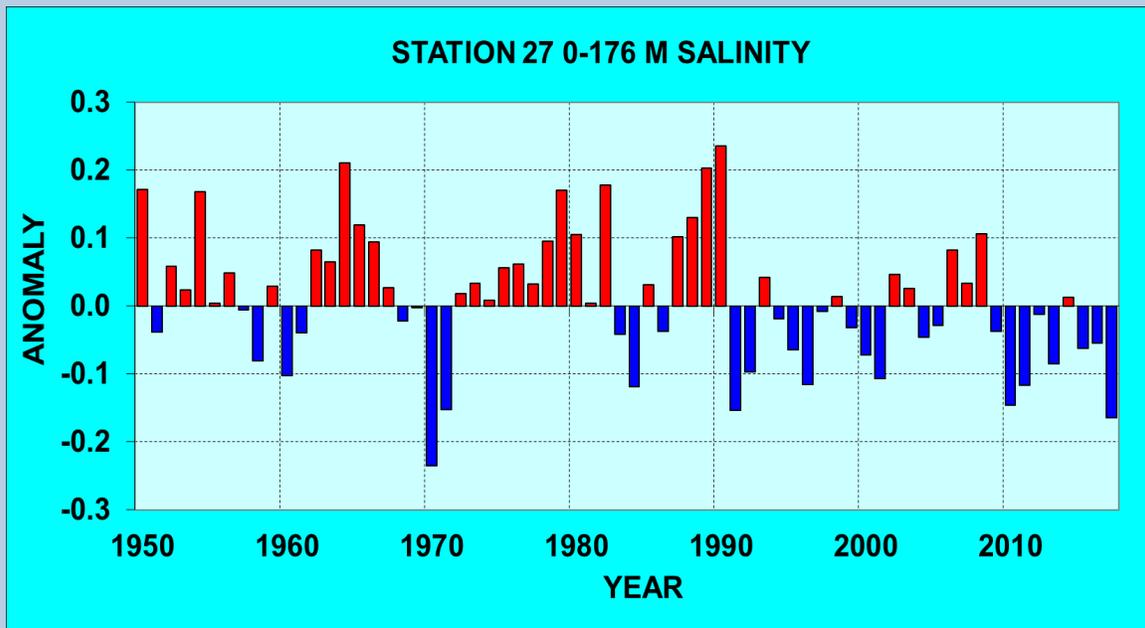
Map showing the positions of CTD profiles obtained from seasonal AZMP surveys and from spring (red dots) and fall (black dots) multi-species assessment surveys during 2017 on the NL Shelf.



The water column (0-176 m) annual averaged temperature at Station 27 off St. John's NL decreased in recent years from the record high during 2011 to slightly below normal in 2017.

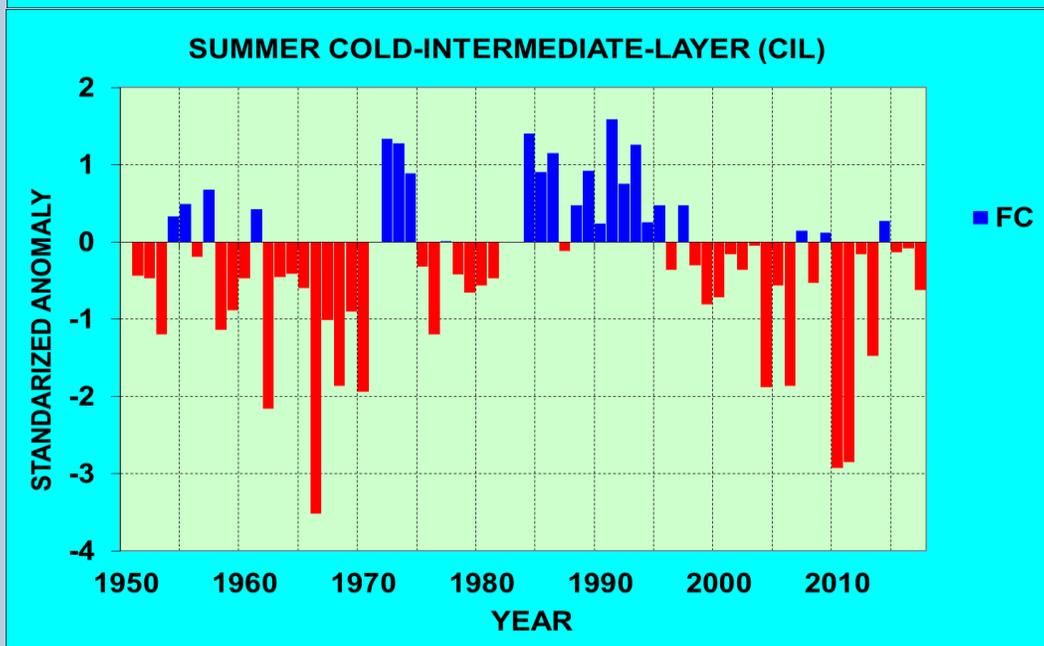
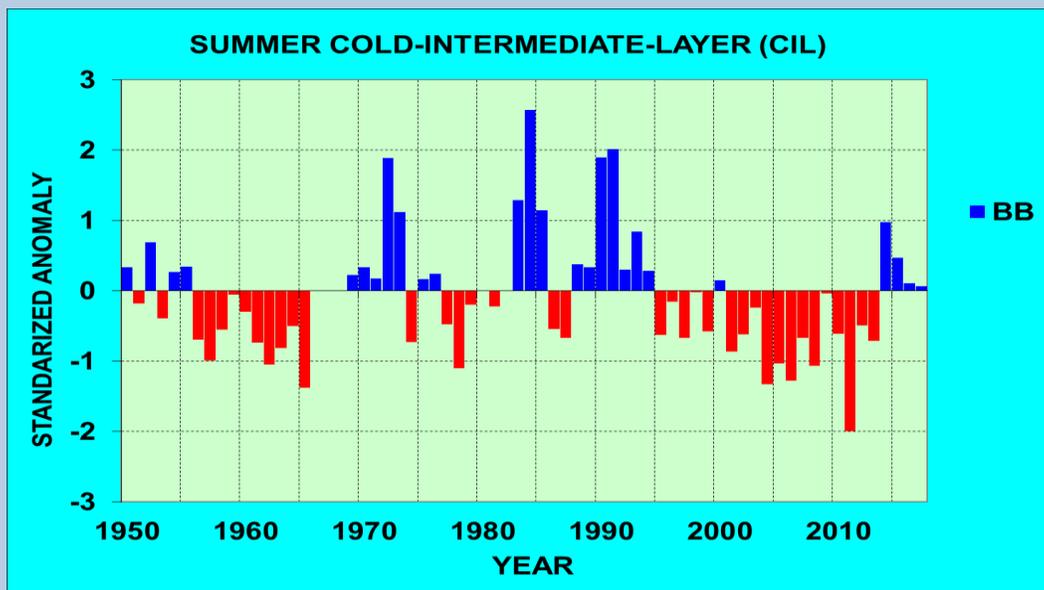


The water column (0-176 m) annual averaged salinities at Station 27 off eastern Newfoundland were either near-normal or below normal during the past 9-years, with a significant negative anomaly in 2017.

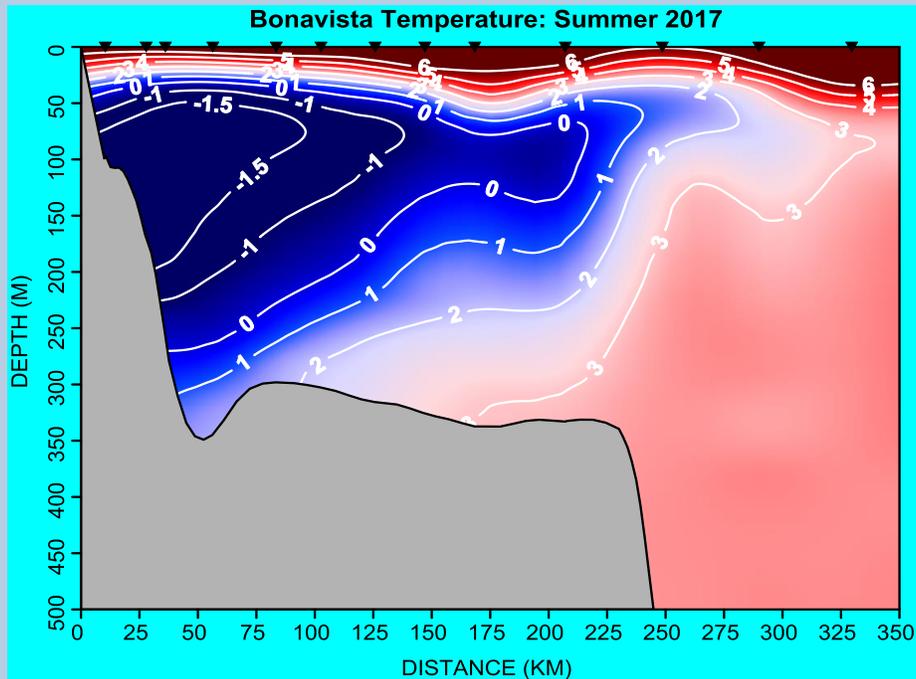


The extent of the cold-intermediate-layer (CIL) of  $<0^{\circ}\text{C}$  water overlying the eastern Canadian continental shelf generally corresponds to trends in the NAO, Air Temperatures and Sea-Ice extent.

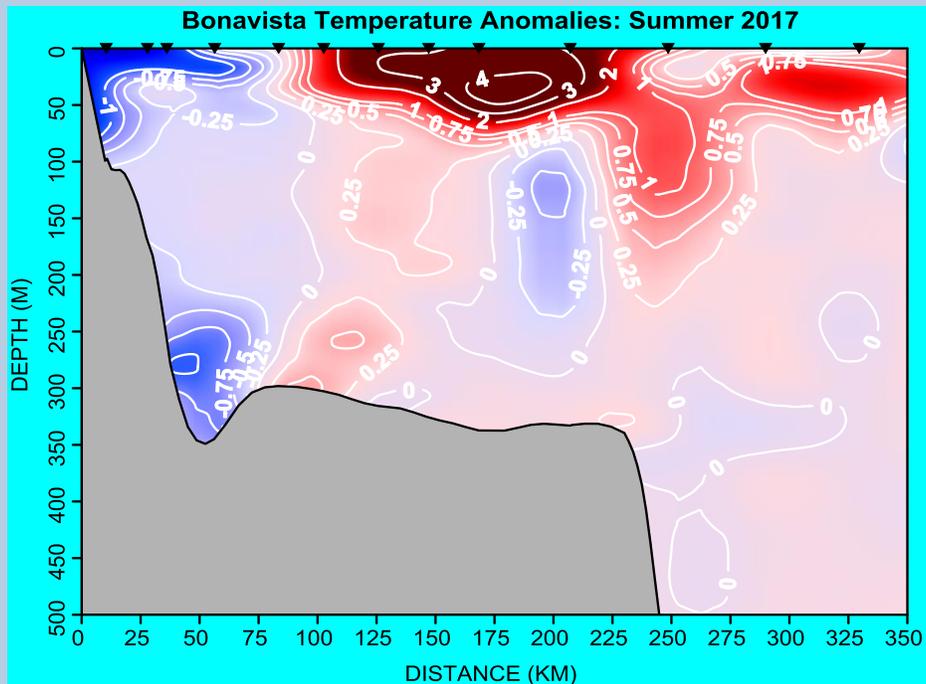
Summer CIL (water  $<0^{\circ}\text{C}$ ) cross sectional area during 2011 was among the lowest on record (warmer than normal water column temperatures). It has increased during the past 4-years reaching above the long term mean in 2014 and 2015 and about normal in 2016-2017 off Bonavista (BB). On the Grand Bank (FC  $47^{\circ}\text{N}$ ) the summer CIL was below normal in 2017.



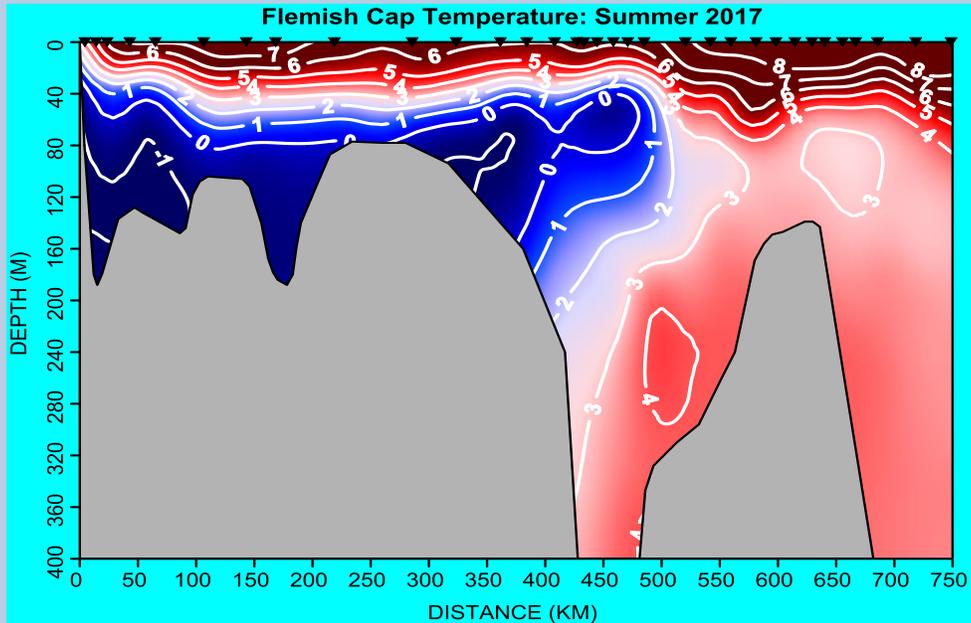
**A cross-section of the temperature structure off Eastern Newfoundland during the summer of 2017. The dominate thermal feature is the cold intermediate layer (CIL) extending over 200 km offshore.**



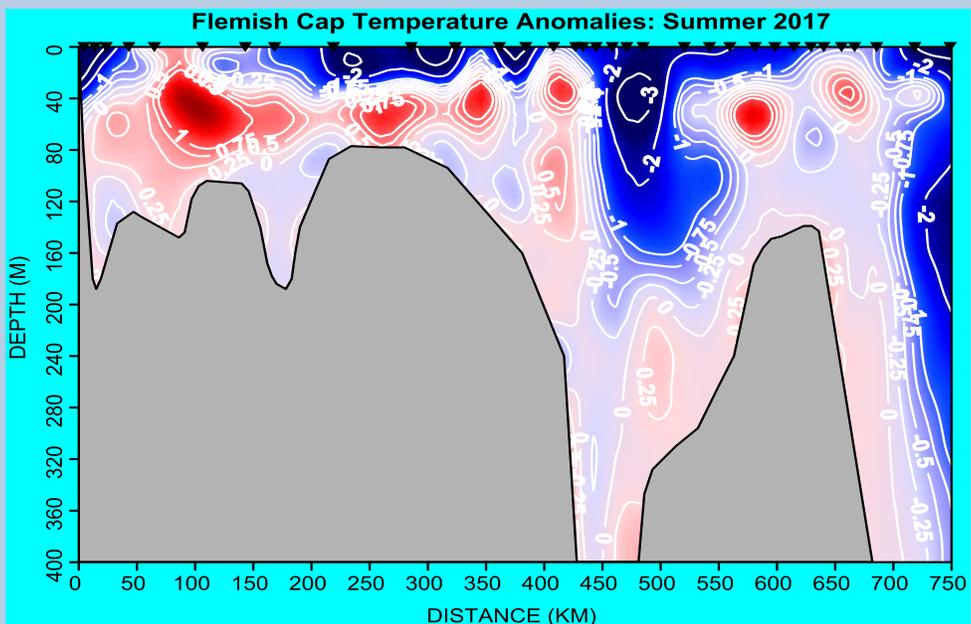
**Temperature anomalies off Eastern Newfoundland during 2017 showing warmer than normal conditions, particularly in the offshore upper layer. Temperatures in deep water over the shelf were about normal, while values inshore were below normal.**



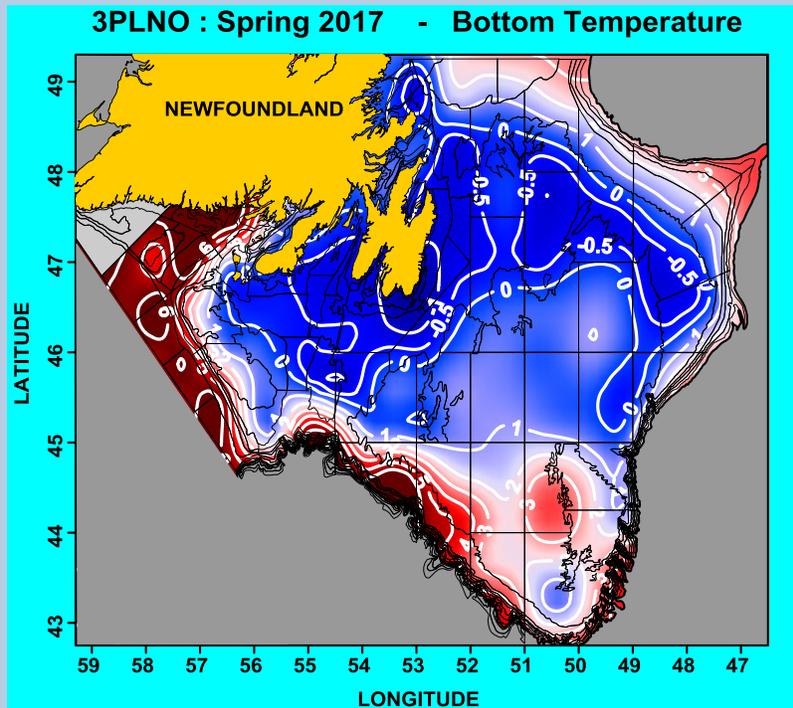
**A cross-section of the temperature structure across the Grand Banks and Flemish Cap during the summer of 2017 showing the extent of cold water overlying the Grand Bank and the warmer offshore waters over the Flemish Cap.**



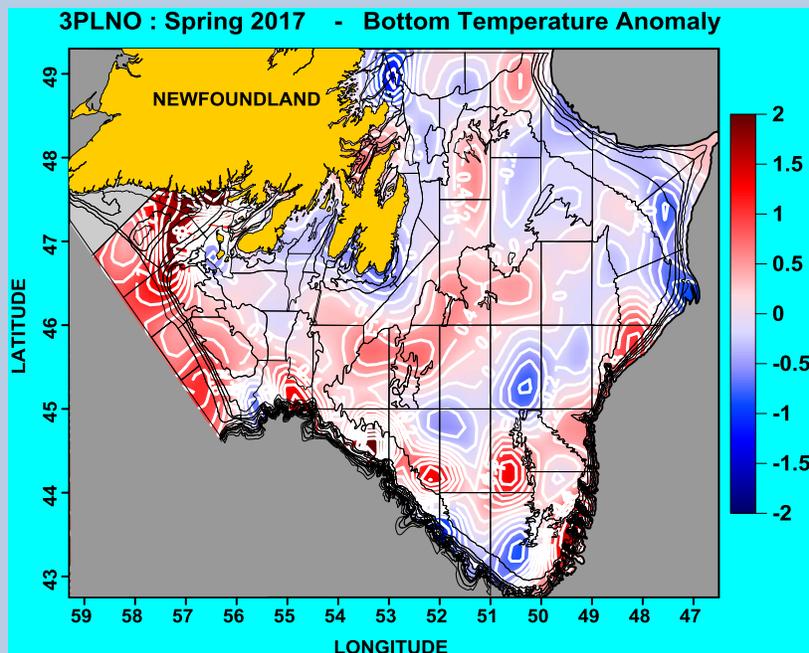
**Temperature anomalies across the Grand Banks and Flemish Cap during the summer of 2017 showing colder than normal conditions in the near-surface layer, the Flemish Pass and east of the Cap. Temperatures were warmer than normal at intermediate depths and near-normal near bottom.**



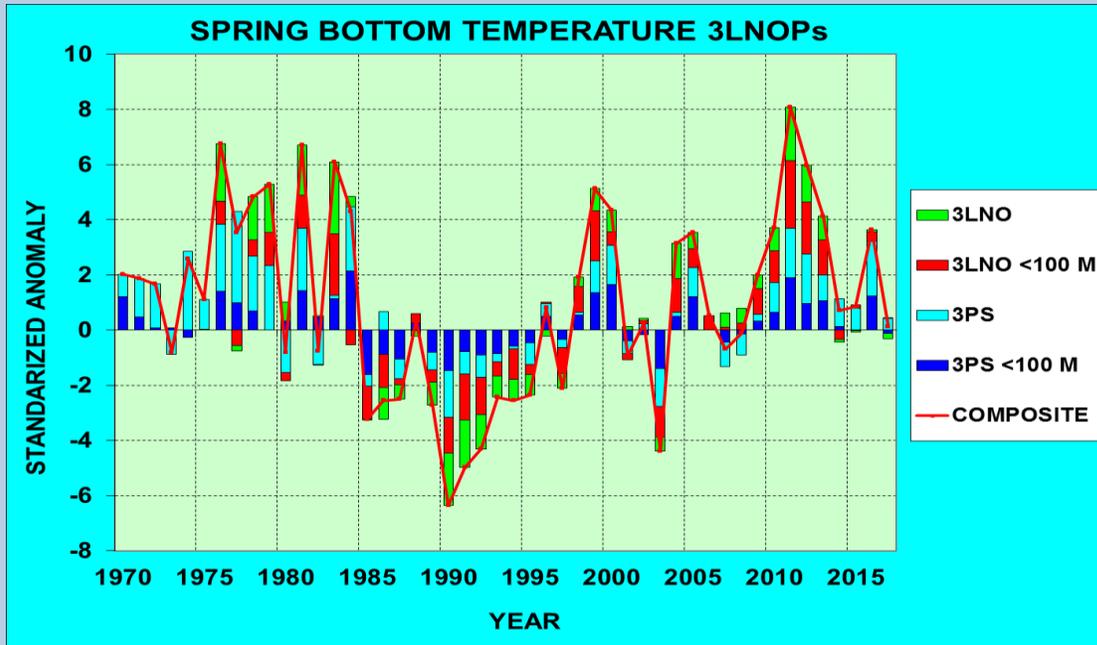
Bottom temperature (in °C) during the spring of 2017 in NAFO Divs. 3PLNO showing a large area of cold CIL water covering the bottom over the Northern Grand Banks.



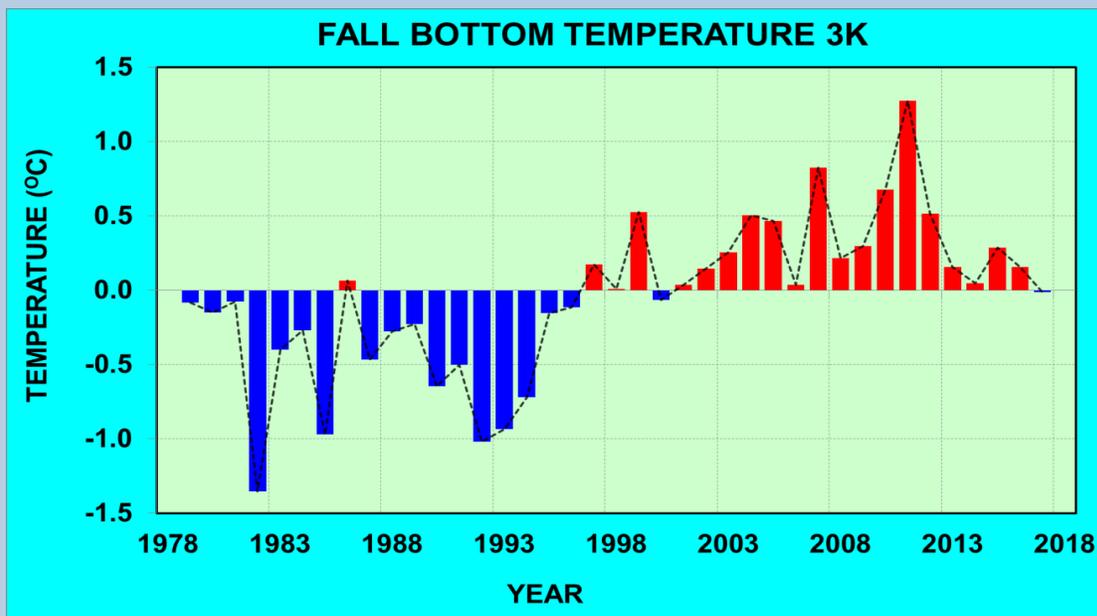
Bottom temperature anomalies (in °C) during the spring of 2017 in NAFO Divs. 3PLNO showing variable conditions with mostly above normal conditions in the southwestern areas including the 3Ps region.



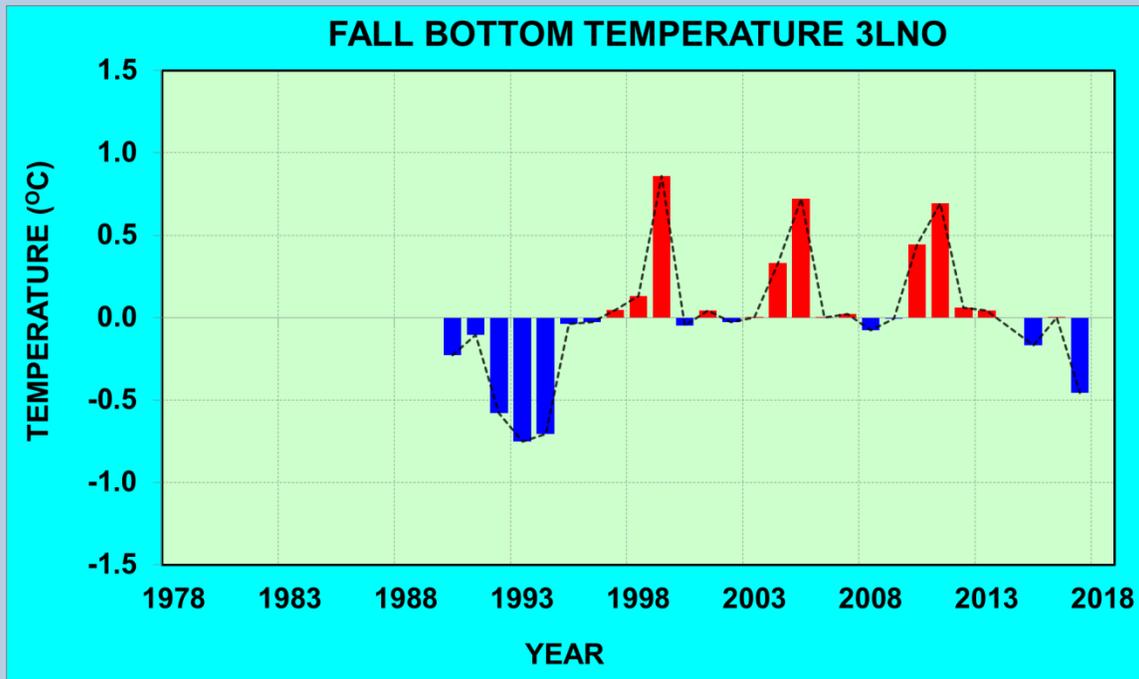
Time series of the spatially averaged spring bottom temperatures in NAFO Divs. 3PLNO showing the record high values in 2011 and the significant decrease since then, with values near the long-term mean in 2017.



Time series of the spatially averaged fall bottom temperature in NAFO Div. 3K showing the record high values in 2011 and the significant decrease in recent years.



Time series of the spatially averaged fall bottom temperature in NAFO Divs. 3LNO showing the significant decrease in recent years and the negative anomaly in 3LNO during the fall of 2017.



### Highlights for 2017

- **Annual sea surface temperatures (SST) were mostly below or near-normal from eastern Newfoundland Shelf, Flemish Cap and Grand Banks. St. Pierre and Green Banks (+0.3 SD) and Flemish Pass (+1.1 SD) were exceptions.**
- **The annual surface temperature anomaly at Station 27 off eastern Newfoundland was +0.4°C or 0.6 SD above normal, similar to 2016.**
- **The annual bottom (176 m) temperature anomaly at Station 27 was -0.2°C or 0.6 SD below normal, similar to 2016.**
- **The annual surface salinity anomaly at Station 27 was -0.4 or -1.6 SD below normal.**
- **The annual bottom (176 m) salinity anomaly at Station 27 was -0.12 or -1.6 SD below normal.**

- *The annual water column average (0-176 m) temperature and salinity anomaly at Station 27 was +0.03°C and -0.16 or -0.1 and -1.6 SD different from normal, respectively.*
- *The summer area of CIL (<0°C) water on the Grand Banks, eastern Newfoundland, northeast Newfoundland Shelf and southern Labrador was 22.7, 26.2, 66.9 and 33.2 km<sup>2</sup> or -0.6, +0.1, +0.8 and +0.8 SD different from normal, respectively.*
- *The averaged spring bottom temperature in NAFO Div. 3P was about 2.7°C, or 0.2°C (0.4 SD) above normal, a significant decrease from 2 SD above normal in 2016.*
- *The spatially averaged spring and fall bottom temperature in NAFO Divs. 3LNO was 1.4°C (anomaly of -0.1°C, -0.2 SD) and 1.3°C (anomaly of -0.5°C, -1.2 SD), respectively.*
- *In 3K, the spatially averaged fall bottom temperature was 2.3°C or 0.03 SD below normal.*
- *A composite climate index for the NL region derived from 28 meteorological, ice and ocean temperature and salinity time series returned to slightly below normal (15th lowest). In 2015 it was the 7th lowest in 67 years and the lowest since 1993. Annual sea surface temperatures (SST) around the Flemish Cap increased over the previous two years but remained at -0.5°C below normal in 2017.*

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**Reference:**

*E. Colbourne, J. Holden, S. Snook, S. Lewis, F. Cyr, D. Senciall, W. Bailey and J. Higdon. 2018. Physical Oceanographic Environment on the Newfoundland and Labrador Shelf in NAFO Subareas 2 and 3 during 2017. NAFO SCR. Doc. 2018/009. Serial No. N6793.*



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