

# Glider Measurements as an Enhancement of a Monitoring Program on the Scotian Shelf

Dave Hebert, Melany Belzile and Clark Richards  
Fisheries and Oceans Canada

## Atlantic Zone Monitoring Program (AZMP)

AZMP is a coherent program for monitoring of physical, chemical and biological variables, performed in parallel in the Maritimes, Québec, and Newfoundland Department of Fisheries and Oceans regions. It was built on historical and existing monitoring programs. It represents the *minimum* requirements to adequately detect and measure climate variability and changes on the continental shelf and upper slope of the Northwest Atlantic at seasonal and inter-annual time scales. Common methods are used across platforms and regions. For the in-situ sampling, it consists sampling on the annual multi-species fish surveys, regular sampling at coastal stations on a monthly/semi-monthly basis throughout the year and seasonal sections across the shelves and in the Gulf of St. Lawrence.

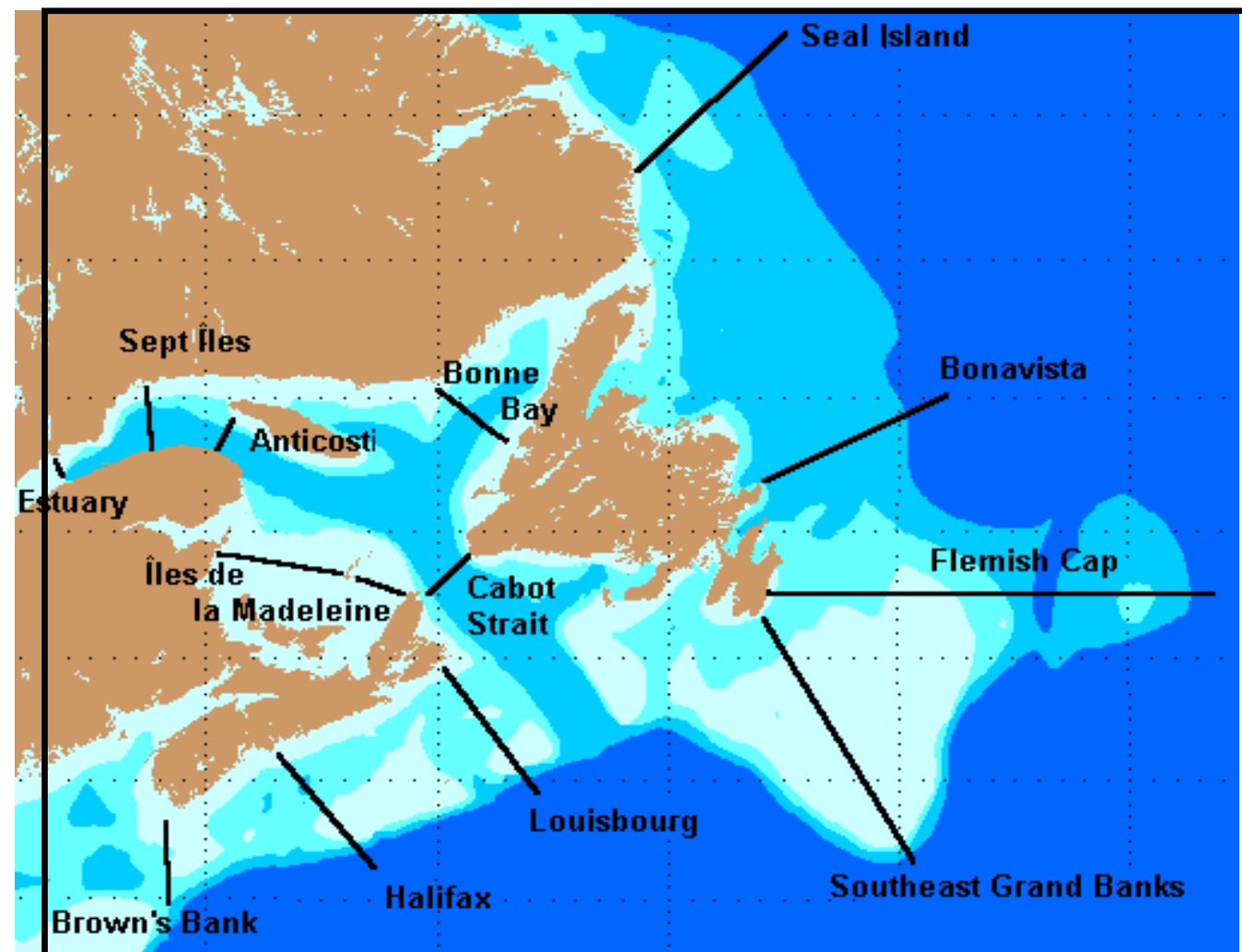
### Objectives

- Collect and analyze data to characterize and understand the causes of ocean variability at seasonal, interannual and decadal scales
- Provide multidisciplinary data to establish relationships among biological, chemical, and physical variability
- Provide adequate data to support development and management of ocean activities

High frequency stations  
Monthly / semi-monthly

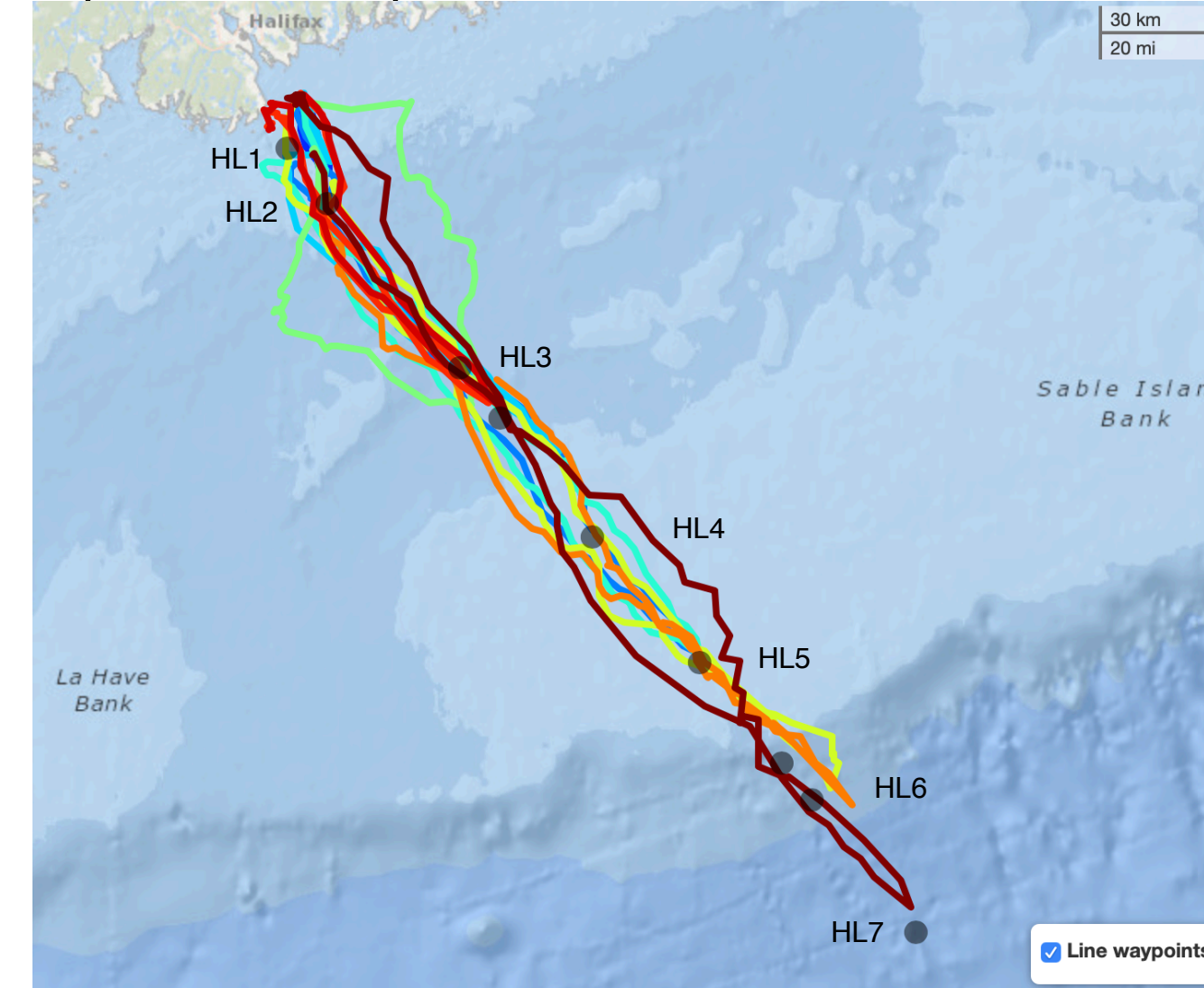


Seasonal section surveys  
Spring and fall

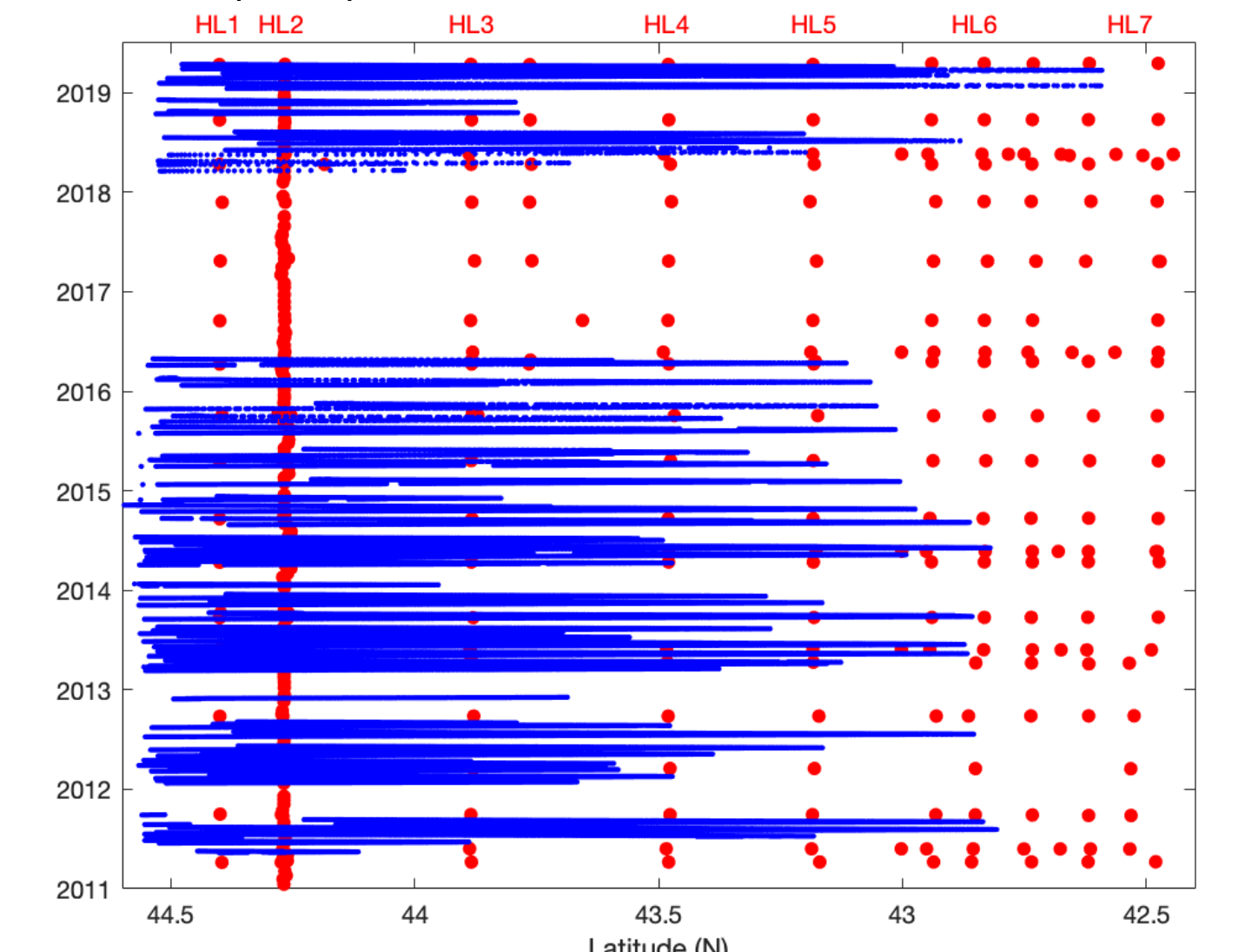


## Hydrographic sampling on the Halifax Line

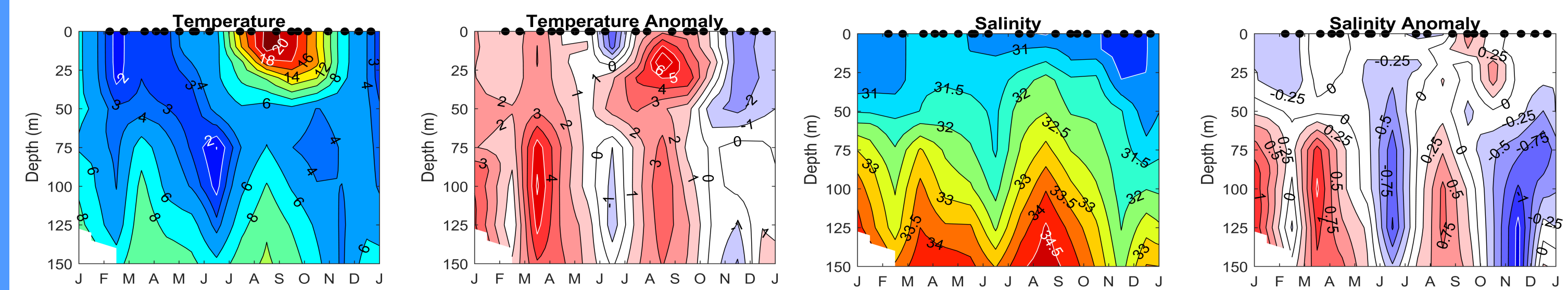
Location of the AZMP stations on the Halifax Line (bullets) and the trajectories of DFO's glider sampling on the Halifax Line for the period: April 2018 – April 2019



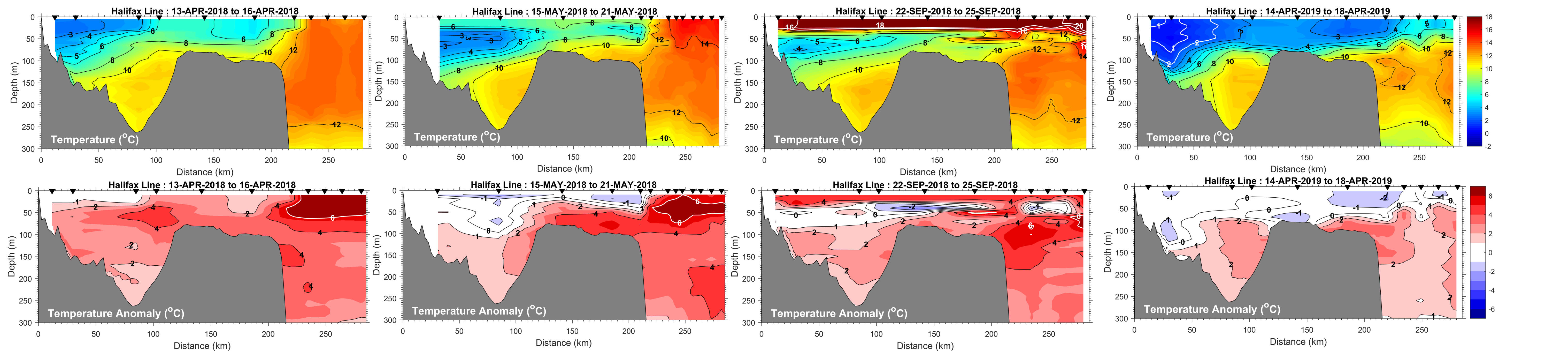
Temporal/Spatial sampling of the Halifax Line by AZMP cruises (red) and the Ocean Tracking Network glider before 2017 and DFO gliders after 2018 (blue)



Temperature and salinity at the high-resolution station HL 2 during 2018 and the anomaly relative to the 1981-2010 climatology

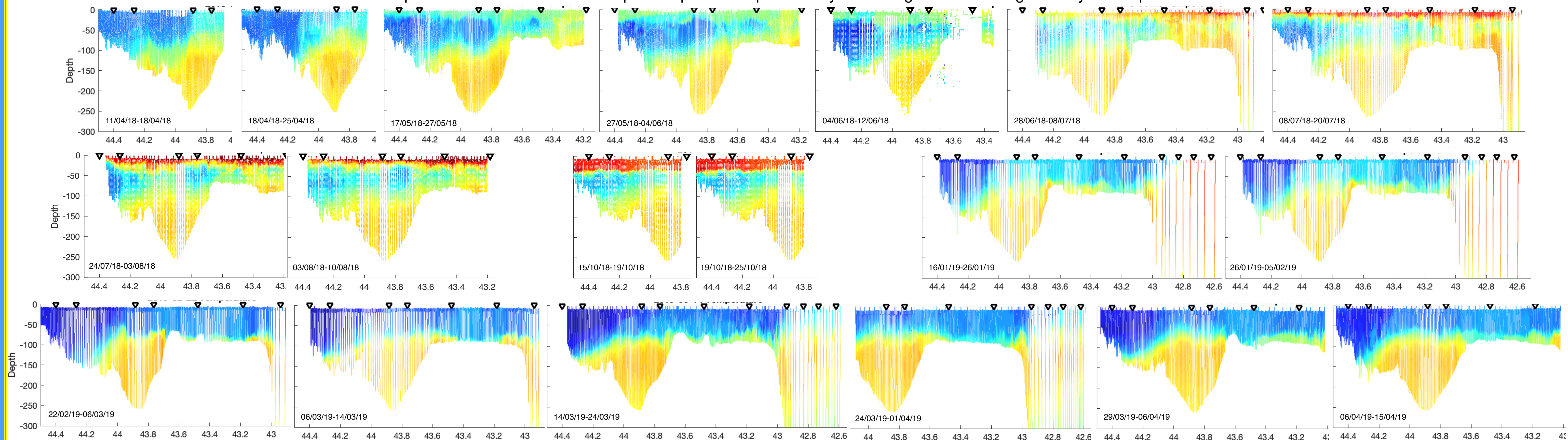


## Temperature Variations Throughout the Year

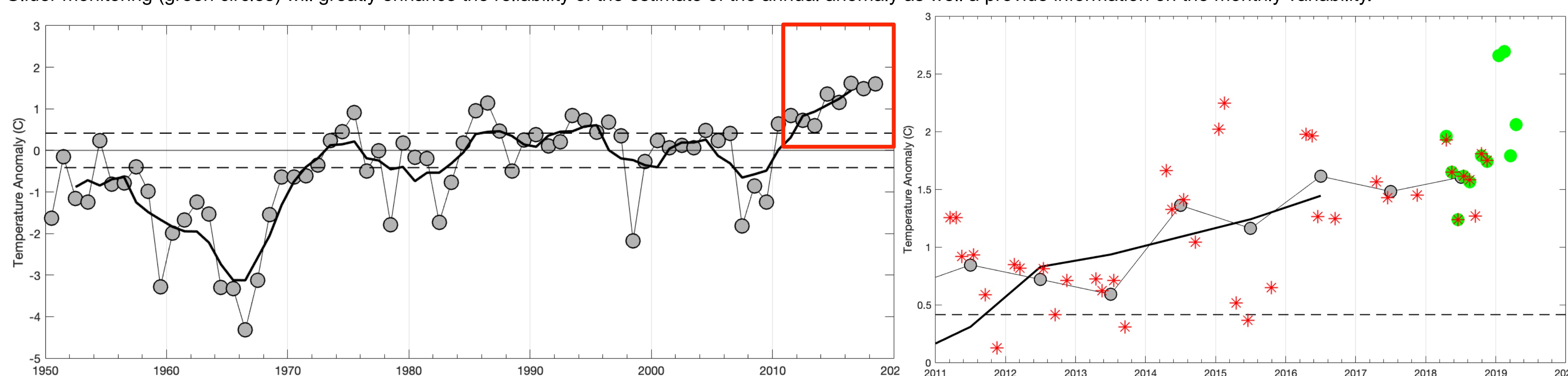


Temperature and its anomaly relative to the 1981-2010 climatology on the Halifax Line for April 2018-April 2019 from the standard ship-based sampling.

Temperature on the Halifax Line for period April 2018-April 2019 by the DFO glider fleet during its first year of operation.



As part of the AZMP reporting of the conditions on the Scotian Shelf, indices such as the annual temperature anomaly at 250m in Emerald Basin are reported. This annual anomaly is based on the average of monthly anomalies for the year. The number and timing of sampling at Emerald Basin can varied from year (see red asterisks for the period 2011-2018). Glider monitoring (green circles) will greatly enhance the reliability of the estimate of the annual anomaly as well as provide information on the monthly variability.



## Summary

- AZMP is providing a world class long term (approximately twenty years now) dataset of physical, biological and chemical data that is only produced in a few places around the world.
- AZMP is taking advantage of new technologies (but they won't replace at sea sampling) but they require additional resources.
- DFO has purchased gliders for its monitoring programs in order to provide more continuous sampling, with higher resolution than the ship-based sampling for selected transects.
- Gliders will help improve calculation of climate indices as well as allow for new indices to be developed (e.g. strength and duration of the subsurface chlorophyll maximum).