

Trends and variability in environmental conditions and zooplankton communities in the Northwest Atlantic 1960-2013

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Plankton have been collected in the Northwest Atlantic by Continuous Plankton Recorders (CPRs) since the early 1960s, with sampling along routes that cross the Sub-Polar Gyre (SPG), the Newfoundland Shelf (NLS) and the Scotian Shelf (SS). As well, plankton have been collected at fixed stations off Halifax (Halifax-2 on the SS) and St Johns (Stn 27 on the NLS) in the Atlantic Zone Monitoring Programme (AZMP) since 1999. Over the entire study period annual average sea surface temperatures (SSTs) have varied by about 2°C in the SPG and 3°C on the NLS and SS, with relatively rapid warming everywhere since 1990. CPR sampling indicates marked changes in species abundances and seasonal cycles for several zooplankton taxa between the pre-1980 and post-1991 periods, which appear to be related to changes in environmental conditions (temperature, stratification, phytoplankton concentration). CPR seasonal cycles post-1991 on the SS and NLS are consistent with AZMP observations at Halifax-2 and Stn 27, and both show record low abundances for *C. finmarchicus* on the SS in 2012, when SSTs were at a record high. Warming in the Northeast Atlantic has led to the northward retreat of boreal species, such as *C. finmarchicus*, and invasion by southern species. This is facilitated by the circulation, which transports warm water organisms northwards. In the shelf regions of the Northwest Atlantic, by contrast, the currents flow from north to south, so that warming has not been accompanied by invasions of southern species and Arctic species continue to be found.