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Above :
Mud shrimp *Solenocera membranacea* larva, caught in the western Bay of Biscay. - Juan Bueno, Instituto Español de Oceanografía (IEO)

Cover image:
Assorted copepods and a decapod caught in the Mallorca Channel. - María Luz Fernández de Puelles, Instituto Español de Oceanografía (IEO)

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The full electronic document is available online at:
http://WGZE.net

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The time-series analyses and figures used in this report were created using COPEPODITE:
http://www.st.nmfs.noaa.gov/copepodite

3.3 Halifax Line 2, Scotian Shelf (Site 6)

Catherine Johnson and Erica Head

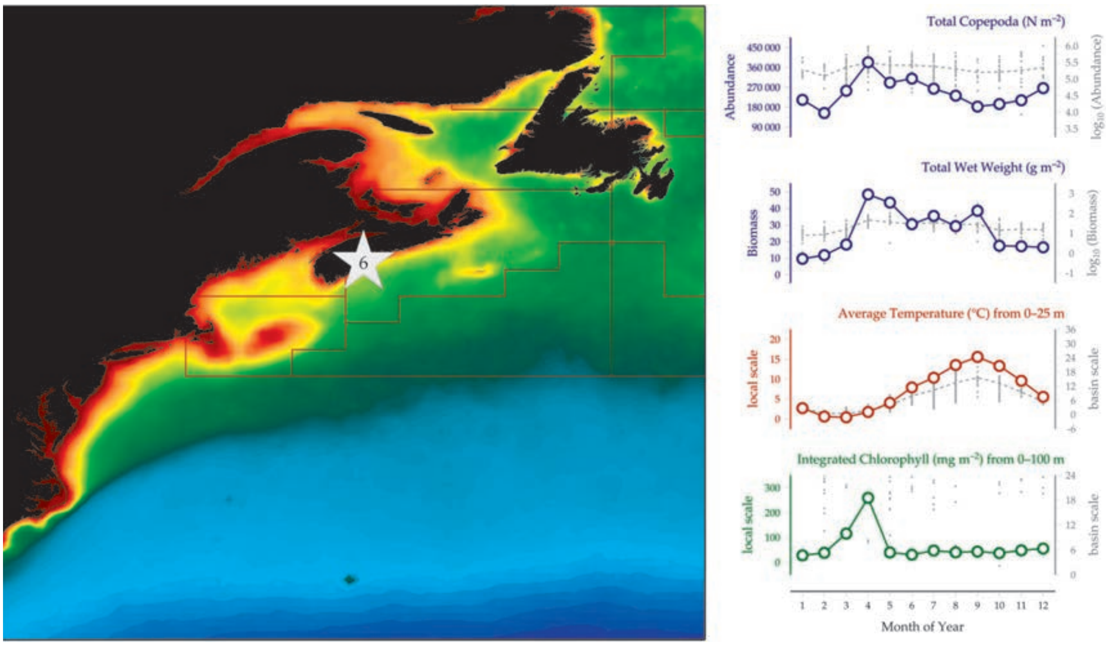

Figure 3.3.1 *Location of the Halifax Line 2 monitoring area (Site 6) on a map of average chlorophyll concentration, and its corresponding seasonal summary plot (see Section 2.2.1).*

Zooplankton have been sampled by AZMP every 2–4 weeks since 1999 at Station 2 of the Halifax Line (Halifax 2), which is 150 m deep and located approximately 12 km offshore from Halifax on the inshore edge of Emerald Basin. Zooplankton are sampled using vertical ring-net tows (0.75 m diameter, 200 µm mesh) from near-bottom to surface. Research ships, trawlers, and small vessels are used as sampling platforms. CTD profiles are recorded, and water samples are collected in Niskin bottles for the measurement of phytoplankton, nutrients, and extracted chlorophyll. Chlorophyll and nutrient concentrations are measured for individual depths, whereas subsamples from each depth are combined to give an integrated sample for phytoplankton cell counting. Zooplankton samples are split, and one-half is used for size fractionated (< 10 mm and > 10 mm) wet and dry weight determination. The other half is subsampled for taxonomic identification and enumeration. Biomass of the dominant groups is calculated using dry weights and abundance data for various groupings (*Calanus*, by species and stage, *Oithona*, *Pseudocalanus*, and *Metridia*). The data are entered into the "BioChem" database at DFO. An ecosystem status report on the state of phytoplankton and zooplankton in Canadian Atlantic waters is prepared every year; the report for 2009/2010 is available at http://www.dfo-mpo.gc.ca/Csas-sccs/publications/resdocs-docrech/2012/2012_071-eng.pdf.

Seasonal and interannual trends (Figure 3.3.2)

At Halifax 2, the water column is well mixed in the winter. Stratification increases in the early spring and is greatest in the late summer–early fall (August–September). There is an intense spring phytoplankton bloom, and maximum chlorophyll values are generally observed in April (Figure 3.3.2). The seasonal range of variation in total copepod abundance is relatively low at Halifax 2 compared with Prince 5 and other stations in the Gulf of Maine, due to the persistence of small copepods such as *Oithona similis* through the fall and winter at Halifax 2. On average, the maximum copepod abundance is observed in April, and minima occur in February and September. Annual average copepod abundance anomalies were highest in 1999 and 2000, and lowest in 2002, 2007, and 2010. There were no significant trends in total copepod abundance over 1999–2010 and the same was true for the longer time- series derived from CPR observations (Fig. 3.3.3). Annual anomalies of small (< 10 mm) organism wet weight show a significant downward trend since 2000. *Calanus finmarchicus* abundance anomalies tended to be higher at the beginning of the time-series in 1999 to 2003 than in recent years, although they showed no significant trend over time. The recent decline in annual chlorophyll concentrations is thought to be caused by a decline in diatom abundance (Li *et al*., 2006), although CPR observations indicate that over the long-term near-surface diatom abundance has been higher since the 1990s than it was in the 1960s and 1970s (Fig. 3.3.3). At-site sampled integrated temperature and Hadley SST demonstrate similar interannual increases and decreases, but differ slightly in their seasonal cycles, attributable to the larger spatial region represented by the Hadley data and seasonal changes in the mixed layer depth. Temperature was not related to any of the dominant ring-net zooplankton groups at Halifax 2.

Halifax Line 2, Scotian Shelf

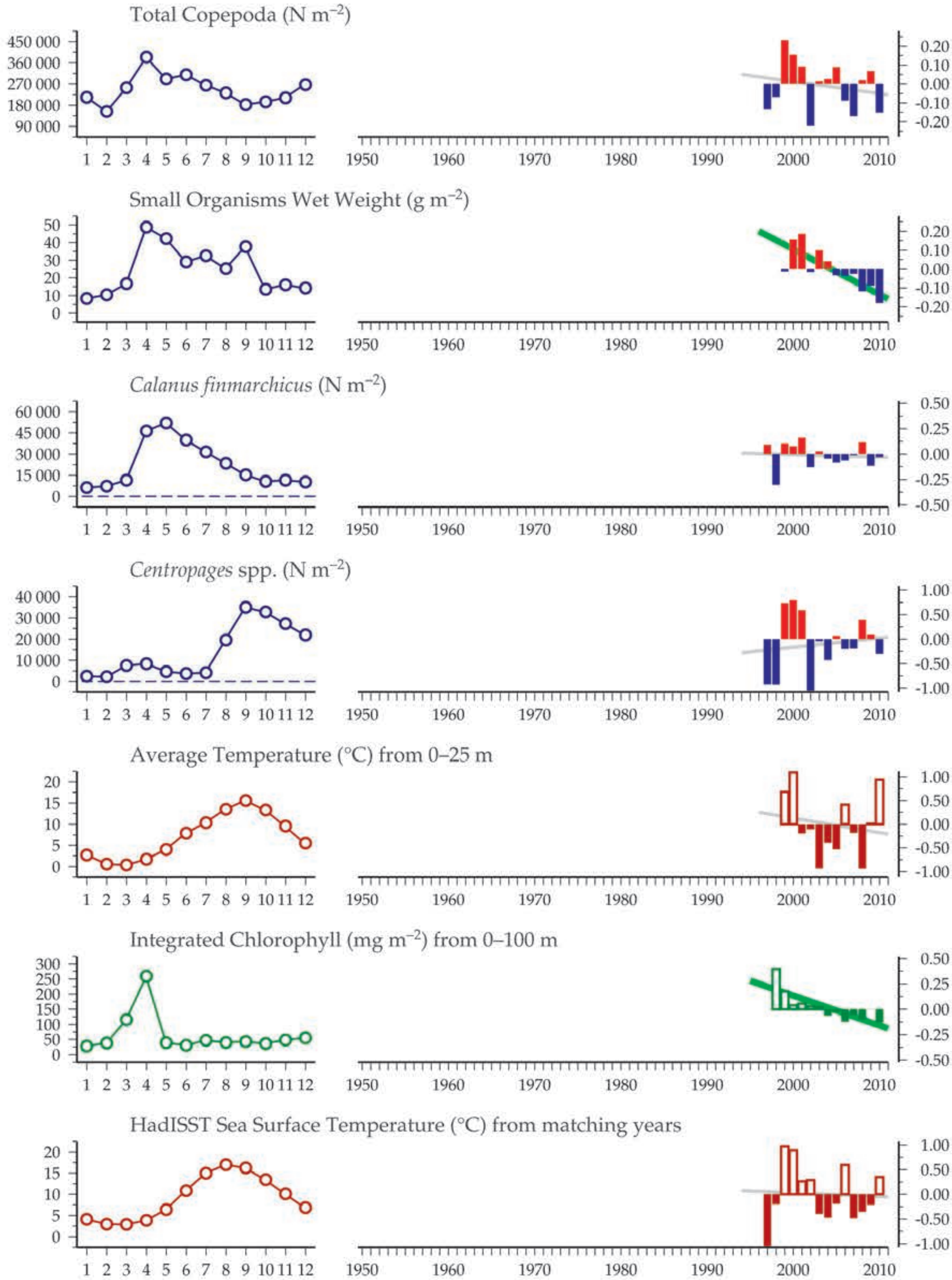

Figure 3.3.2 Multiple-variable comparison plot (see Section 2.2.2) showing the seasonal and interannual properties of select cosampled variables at the Halifax Line 2 monitoring area.

Additional variables are available online at: http://WGZE.net/time-series.

Figure 3.3.3
Regional overview plot (see Section 2.2.3) showing long-term sea surface temperatures and wind speeds in the general region surrounding the Halifax Line 2 monitoring area, along with data from the adjacent CPR E10 Standard Area.