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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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# *ICES Zooplankton Status Report 2010/2011*

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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

## 5.2 Faroe Islands (Site 17)

*Eilif Gaard and Høgni Debes*

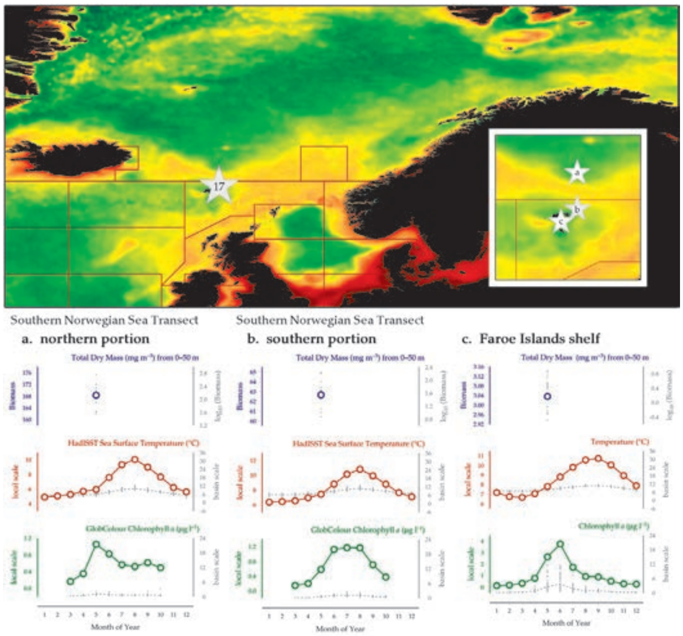



***Figure 5.2.1***
*Location of the Faroe Islands (Site 17) zooplankton monitoring areas, plotted on a map of average chlorophyll concentration, and their corresponding environmental summary plots (see Section 2.2.1).*

The Faroe Marine Research Institute (FAMRI) operates a standard transect running from the Faroe Shelf into the southern part of the Norwegian Sea (Figure 5.2.1). FAMRI also operates monitoring on the Faroe Shelf. This section summarizes zooplankton monitoring along the northern and southern portions of the southern Norwegian Sea transect and the Faroe Shelf region.

### Southern Norwegian Sea

Zooplankton are collected annually (May 1990–2010) using a WP-2 net (56 cm diameter, 200 µm mesh) and vertical hauls from a depth of 50 m to the surface. The transect contains 14 stations, 10 nautical miles apart, crossing between two major water bodies. The southern portion of the transect is located in warm Atlantic Water (AW) flowing from the west–southwest, whereas the northern portion is located in cold East Icelandic Water (EIW) flowing from the northwest. In most years, the zooplankton samples were collected close to the phytoplankton spring bloom. *Calanus finmarchicus* is the dominant species in both water masses. Until the early 2000s, biomass was clearly higher in the cold-water mass in the northern portion than in the warmer southern portion. However, since around 2004–2005, this pattern has changed.

The reason for the usually higher biomass in the northern portion in previous years was a higher abundance of overwintering *C. finmarchicus* (CV and adults) (Figures 5.2.2 and 5.2.4), combined with the presence of *Calanus hyperboreus*. In the AW, fewer large individuals, but larger numbers of small stages, were present in May. Due to an earlier start of reproduction in the southern portion prior to 2004, total numbers of *C. finmarchicus* were, on average, usually higher in the AW than in the EIW, despite the lower biomass.

However, since 2003, the abundance of young *C. finmarchicus* copepodite stages in May in the northern portion of the transect has increased significantly, and now no clear differences are evident in the *C. finmarchicus* stage composition in these two water masses (Figure 5.2.4). This indicates earlier reproduction in the EIW in recent years (i.e. since 2003) than in previous years. Thus, in May 1990–2002, the fraction of *C. finmarchicus* recruits in this water mass was only ~10%; in 2003, it increased to ~45% and, since 2004, it has been 75–80%. Another change is that, since 2003, practically no *C. hyperboreus* have been found in the northern portion of the transect. These large copepods were quite plentiful in the first years of the time-series and had a substantial effect on the biomass.

Lower temperatures in the northern portion of the transect (Figure 5.2.4, lower-left subpanel) may explain the generally later *C. finmarchicus* reproduction, compared with the southern portion, in previous years. The difference does not seem to be explained by phytoplankton abundance because chlorophyll *a* concentrations in most years were higher in the cold EIW than in the warmer AW (Figure 5.2.4, lower-right subpanel).

For the time being, it is difficult to identify a cause for the apparently early reproduction of *C. finmarchicus* and for the disappearance of *C. hyperboreus* in the EIW in 2003–2010, compared with previous years in the time-series. Potential weakening of the East Icelandic Current or temperature changes of the EIW (or a combination of both) might explain this change.

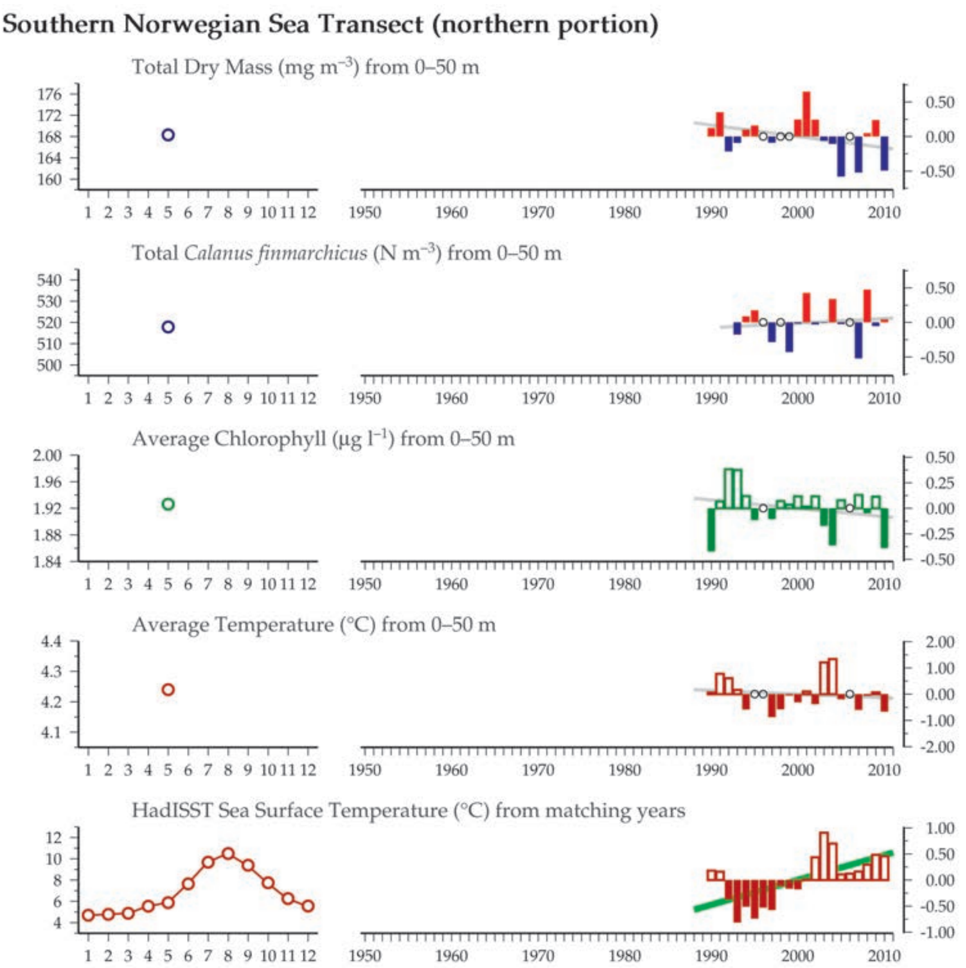



*Figure 5.2.2*
*Multiple-variable comparison plot (see Section 2.2.2) showing the seasonal and interannual properties of select cosampled variables at the southern Norwegian Sea transect (northern portion) monitoring area.*

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

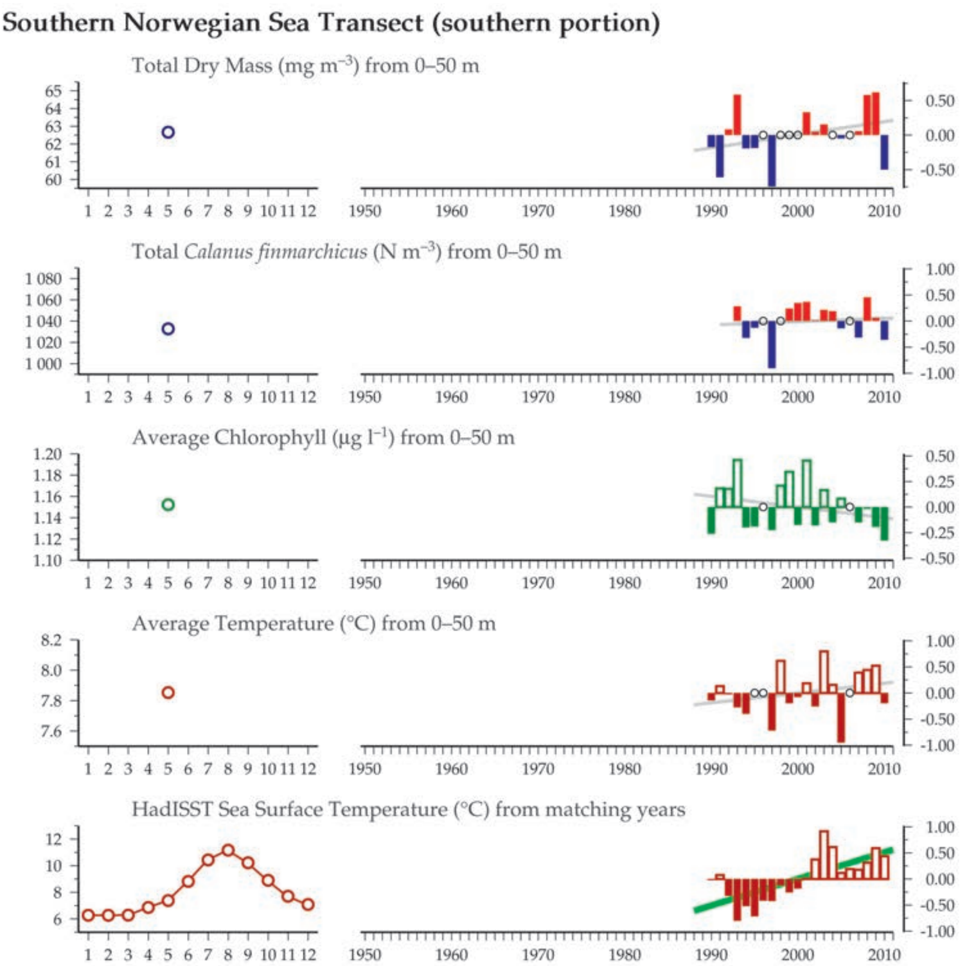
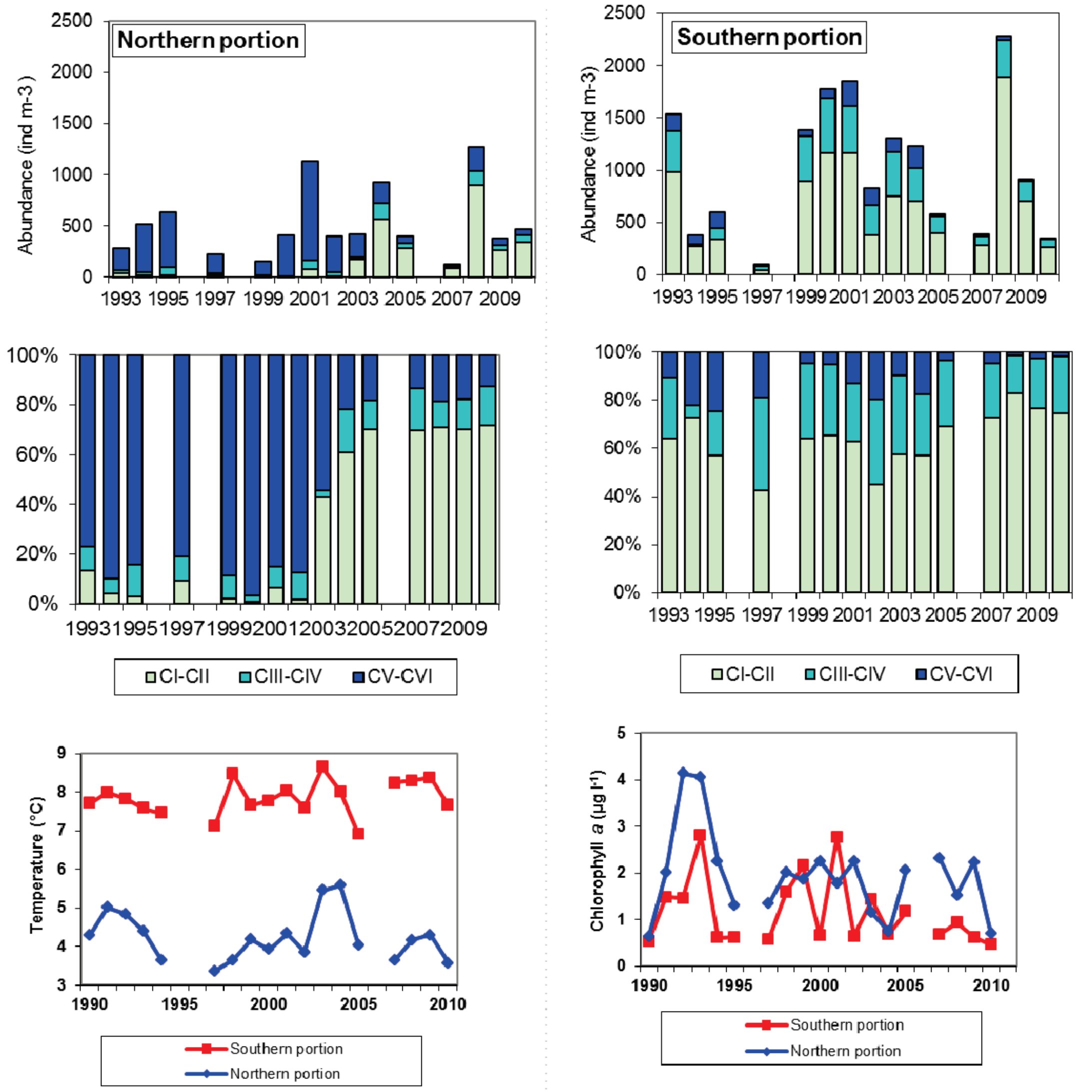



*Figure 5.2.3*
*Multiple-variable comparison plot (see Section 2.2.2) showing the seasonal and interannual properties of select cosampled variables at the southern Norwegian Sea transect (southern portion) monitoring area.*

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

*Figure 5.2.4*
*Mean abundance of* Calanus finmarchicus *copepodite stages in East Icelandic Water (northern portion of the transect) and in Atlantic Water (southern portion of the transect) in May. Corresponding average temperature and chlorophyll values are plotted in the lower panels.*




On the Faroe Shelf, strong tidal currents mix the shelf water very efficiently and result in a homogeneous water mass in the shallow shelf areas. The well-mixed shelf water is separated relatively well from the offshore water by a persistent shelf front that circles the islands at a depth of ca. 100–130 m. In addition, residual currents have a persistent clockwise circulation around the islands. The shelf front provides a reasonable, although variable, degree of isolation between the "onshelf" and "offshelf" areas. This allows the onshelf areas to support a relatively uniform shelf ecosystem that, in many ways, is distinct from offshelf waters.

Although the zooplankton community outside the shelf front ("offshelf") is dominated by the copepod *C. finmarchicus*, the onshelf zooplankton community is basically neritic, with variable abundance of *C. finmarchicus*. During spring and summer, the zooplankton in the shelf water is usually dominated by *Temora longicornis* and *Acartia longiremis*. *C. finmarchicus* is advected onto the shelf from the surrounding oceanic environment and occurs in the shelf water in interannually variable abundance, which is usually highest in spring and early summer. Meroplanktonic larvae (mainly cirripedia larvae) may also be abundant, and decapod larvae and fish larvae and juveniles are common on the shelf during spring and summer.

In most years, zooplankton summer biomass on the Faroe Shelf is low, and is clearly lower than in the surrounding oceanic environment. This is explained by the higher abundance of *C. finmarchicus* offshelf. This species is much larger than the neritic species and, therefore, strongly affects the total zooplankton biomass (Figure 5.2.5). Owing to the interannually variable abundance of *C. finmarchicus* onshelf, biomass on the shelf is also more variable than that in the surrounding oceanic environment; this is probably the result of the variable amounts of advection onto the shelf.

In 2006–2010, zooplankton biomass on the shelf and in the surrounding offshelf oceanic water was higher than in previous years. This seems to be mainly the result of a higher abundance of *C. finmarchicus* in late copepodite stages (CIV and CV) in both water masses, compared with the dominance of younger stages in the previous years, indicating phenological variability or change.

Another trend in shelf zooplankton is a marked increase in abundance of *T. longicornis*. During 1993–2009, there was a gradual tenfold increase in abundance of *T. longicornis* on the shelf in midsummer; in 2010, the species increased in abundance by a factor of 10 compared to 2009 (Figure 5.2.5).

## Faroe Islands Shelf

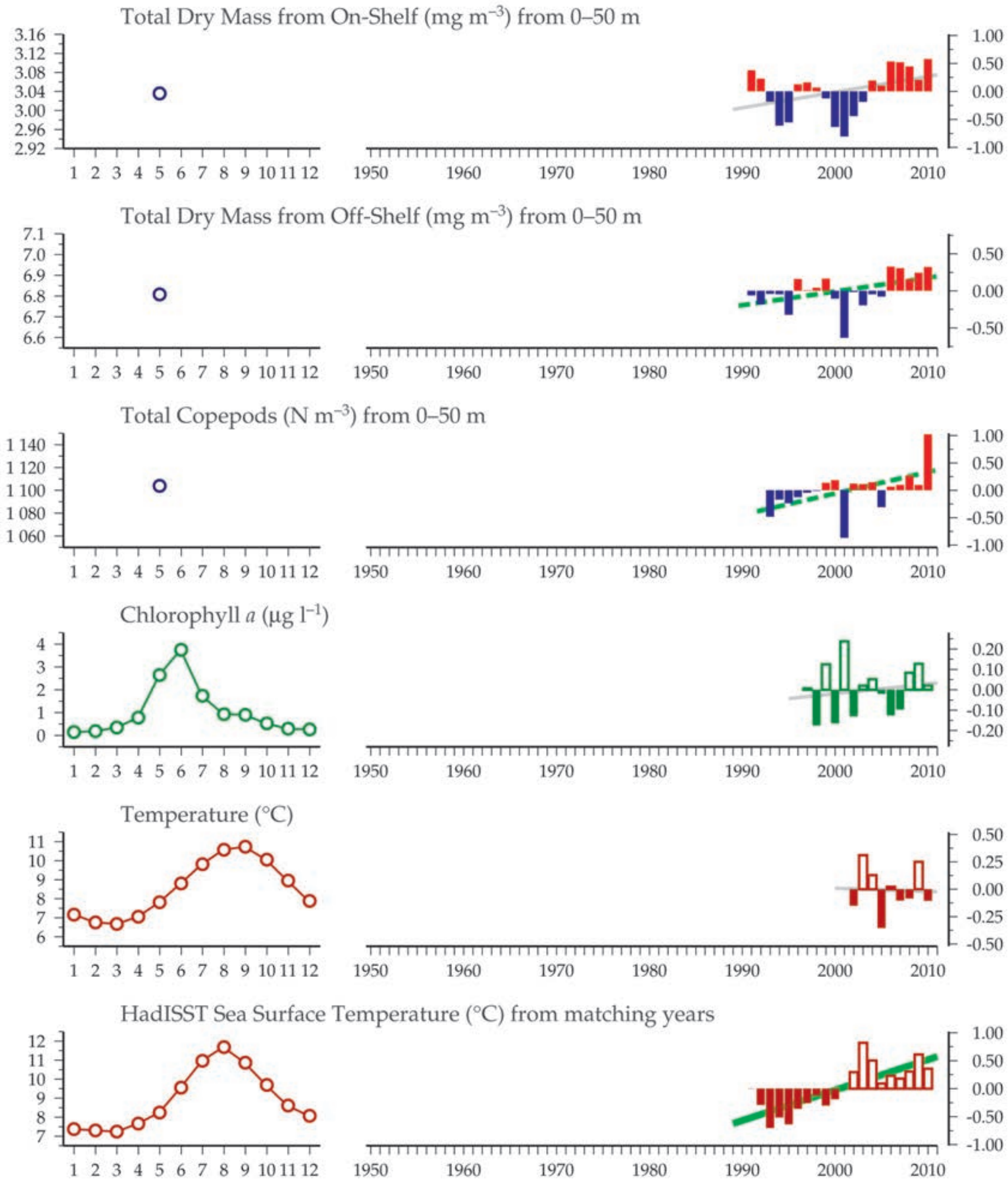



*Figure 5.2.5*
*Multiple-variable comparison plot (see Section 2.2.2) showing the seasonal and interannual properties of select cosampled variables at the Faroe Islands shelf monitoring area.*

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

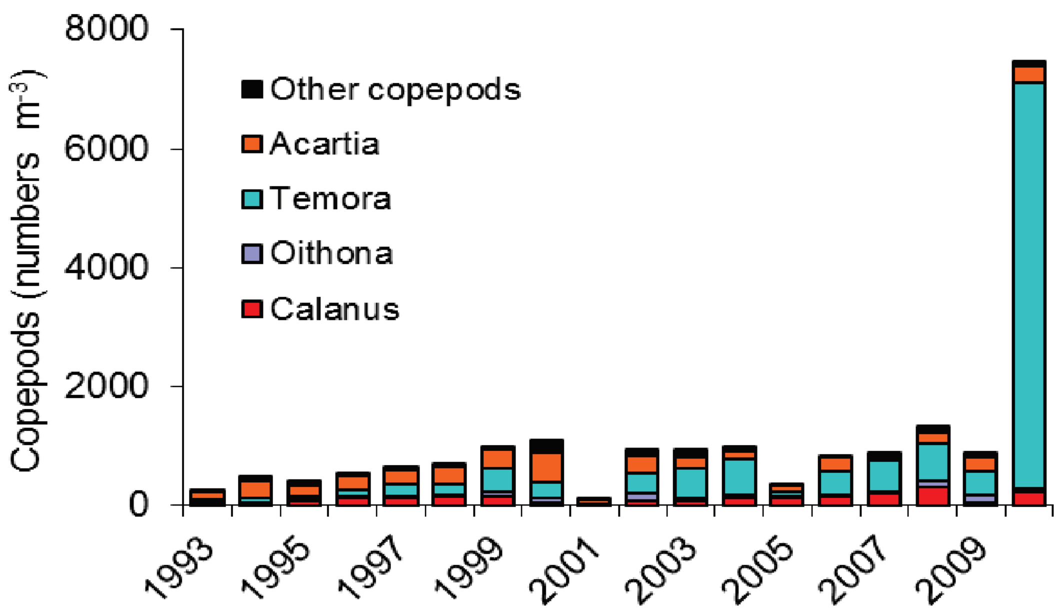



*Figure 5.2.6*
*Mean abundance of copepods on the Faroe Shelf in late June.*

*Figure 5.2.7*
*Regional overview plot (see Section 2.2.3) showing long-term sea surface temperatures and wind speeds in the general region surrounding the Faroe Islands monitoring area.*