

Project information

Keywords

Benthos, fjord, biodiversity

Project title

Benthic biodiversity and ecosystem function in Svalbard and North Norway

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2015

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Flagship

Fjord and Coast

Funding Source

Fram Centre

Summary of Results

Benthic fauna, the organisms living on or in the sea floor substrate, are widely studied as an indicator of environmental status and human impacts. As a result, consultancy companies such as Akvaplan-niva generate a wealth of data, from enormous numbers of sampling stations all along the Norwegian coastline as well as offshore. Many individual studies have been published, but to date there is no cohesive synthesis of benthic faunal data at a regional scale. This project has aimed to analyse benthic faunal data collected for monitoring purposes, and to see whether there are patterns which characterise the faunal structure along the north Norwegian coastline, in Svalbard fjords and the offshore petroleum exploration area in the south western Barents Sea. The present report focuses on analyses carried out in 2015, focusing on northern Norway.

One of the obvious challenges in trying to characterise benthic fauna along our coastline is the very varied topography and sediment conditions. In contrast to the relatively homogenous sandy mud substrates in the offshore areas in the south-western Barents Sea (previously reported), the seafloor along the Norwegian coastline varies from areas of almost pure mud to bare rock, with many variations in-between. Habitat structure is one of the most influential drivers of benthic faunal communities, so we would expect a high degree of variability in faunal structure, with burrowing organisms dominating in soft sediments and for example filter-feeders on coarser substrates. Water depth influences the quality and amount of food material reaching the bottom, and also in many cases the substrate type, where fine particulate material accumulates in deeper, low-current areas and sandy-gravelly bottoms occur in shallower high-current areas.

We have analysed data on benthic fauna from 141 stations from Nordland, Troms and Finnmark (Figure 1), together with information on water depth, sediment particle size and organic content.



Figure 1. Location of the 141 sampling stations analysed in 2015.

At a general level, polychaete worms dominated the fauna, especially in terms of numbers of individuals, but also to a lesser extent in terms of taxa (species) recorded. Crustaceans, molluscs and echinoderms (mostly brittle stars) comprised most of the remainder of the faunal groups represented (Figure 2).



Figure 2. Distribution of the main faunal groups within the communities sampled in terms of numbers of (left) individuals and (right) taxa.

Just under 1000 taxa were recorded and the first notable finding was that none of the species occurred at all stations. Only one species was among the top ten dominant in terms of both frequency of occurrence and numbers of individuals recorded. This means that there is no set of individual species which can be said to represent northern Norwegian benthic faunal communities. This is not surprising, because the dataset spanned a depth range from 2.5 m to more than 550m, sediments containing less than 1% mud grains to 99.7%. The organic content also varied from less than 1 mg per kg sediment to over 50 mg/kg in areas where human impacts are evident. There was no significant correlation between the environmental parameters, illustrating that the "deep and muddy/ shallow and gravelly" hypothesis has as many exceptions to the rule as conformities. Some deep areas comprised muddy sediments, but many did not. Not surprisingly, perhaps, there was no significant overall relationship between the dominant species and environmental variables.

Looking at general faunal structure as a function of the environmental parameters, we found similarities in the faunal composition amongst the stations with water depths from 250 m and the deepest stations sampled, over 500 m (Figure 3). These stations had a characteristic set of associated species which did not occur at shallower stations.



Figure 3. Canonical correspondence analysis (CCA) of the faunal communities at all 141 sampling stations, showing associations with the three environmental variables depth, mud content and organic content. Stations marked in red are all deeper than 250 m, and form an obvious group. On the left, in green, are stations shallower than 10 m.

Working progressively through the dataset, it has become clear that the faunal communities do not show geographic trends at the scale of the study area, but rather in terms of depth zones. We identify four main depth ranges within which we can identify common faunal characteristics:

0-10 m, between 10 and 100 m, 100-250 m and deeper than 250 m.

Within the 10-100 m depth range, there was the highest heterogeneity in substrate condition, and this also was reflected in the faunal diversity. Within this depth range, the fauna grouped mostly in terms of sediment type (muddy or coarse sediment).

Published Results/Planned Publications

Manuscript in progress. Results and methods sections completed, most of Introduction completed and

Could results from the project be subject for any commercial utilization

No