

Project information

Project title

Benthic biodiversity and ecosystem function in Svalbard and North Norway

Year

2011/2012

Project leader

Lis Lindal Jørgensen, IMR

Participants

Co-leaders (alphabetical order)

- Sabine Cochrane, ApN
- Kari E. Ellingsen, NINA
- Lis Lindal Jørgensen, Institute for Marine Research, IMR

Collaborators (alphabetical order):

- Einar Nilsen; Mona Fuhrmann, University of Tromsø, UiT
- Eivind Oug, Norwegian Institute of Water Research, NIVA
- Jan Sundet, IMR
- Maria Wlodarska-Kowalczyk; Jan M. Weslawski, Institute of Oceanology, Polish Academy of Sciences (IOPAS)

Flagship

Fjord and coast, Theme: Structure, function and change in Arctic and boreal fjord ecosystems

Funding Source

Fram Centre, internal

Summary of Results

Overall objective:

The primary scientific goal is to examine and compare how ongoing climatic and ecosystem changes impact benthic systems in fjords in Northern Norway and Svalbard.

Summary of results:

1. Metadatabase

Existing soft-bottom macrofaunal data (biological and environmental) collected by grab from Northern Norway and Svalbard have been compiled in a database (Figure 1). The currently included 450 data points are from APN, but within January 2012, also the data points and overview from collaborators (IOPAS and NIVA, UiT) will be incorporated (work in progress). For epifauna/megabenthos, the work has been carried out within the EPIGRAPH programme, and synergy effects are obtained. Mapping and monitoring of benthic communities in Porsanger fjord has been done during the period 2007-2011, mainly to investigate possible changes in the benthic faunal composition as a consequence of predation from the invading red king crab. The sampling equipment used was 2m beam trawl, and species abundances, biomass and length of selected benthic animals have been recorded and productivity estimates made.

2. Identification of knowledge gaps and appropriate future sampling strategy

Based on our assessment of knowledge gaps, we identify the following future strategy:

☐ Sampling using different types of equipment (i.e. different parts of the benthic communities) from the same fjords/areas to be able to compare faunal patterns. Priorities are Isfjorden and Porsangerfjorden (synergy with collaborators);

☐ Ensuring collection of temporal data from the priority fjords.

3. Analyses of existing data

A subset of macrobenthos data from Northern Norway (34 stations) and Isfjorden, Svalbard (14 stations from Isfjorden) was analysed. Diversity and faunal patterns in Northern Norway are highly variable. More than 40% of the species both in Northern Norway and Isfjorden were only found at one or two stations, i.e. there was a high proportion of rare species. The number of species at a small scale (i.e. at a station) was highly variable in Northern Norway, and generally lower in Isfjorden, Svalbard (Figure 2). In Northern Norway, many stations had different faunal compositions despite being geographically close, but that the stations from Isfjorden, Svalbard were more similar to each other (Figure 3). Understanding these patterns in relation to environmental variables provides the basis for

addressing the main project aims, i.e. how climate changes are affecting this underlying natural variability.

4. Sampling in 2011

Akvaplan-niva, in collaboration with UNIS and UiT, collected grab samples from 11 stations in Billefjorden, Svalbard, in September 2011. This sampling was made possible because of coordination with other field work (RV Helmer Hanssen). IMR/UiT has conducted sampling in Porsangerfjord (see Figure 1).

5. Highlights

□ Metadata database of 450 macrobenthic sampling stations compiled, and pledged collaboration with all the main institutes who carry out benthic research in northern Norway and/or Svalbard;

□ Macrobenthic communities on Svalbard and northern Norway both have a high representation of rare species, but the local-scale taxon richness and/or diversity was higher in northern Norwegian fjords relative to those in Isfjord.

□ New sampling carried out in 2011 in Billefjorden, Isfjord complex. Preliminary analyses of the data have revealed some patterns in benthic composition, in relation to glacial input, bottom topography and potentially also water masses.







Fig. 1. Overview of sampling stations where data has been included in the project metadata database. Upper and lower left: soft-bottom macrobenthos from northern Norway and Svalbard (APN et al.). Lower right: Epifauna/megafauna from trawl sampling, Porsanger (IMR/UiT et al.).

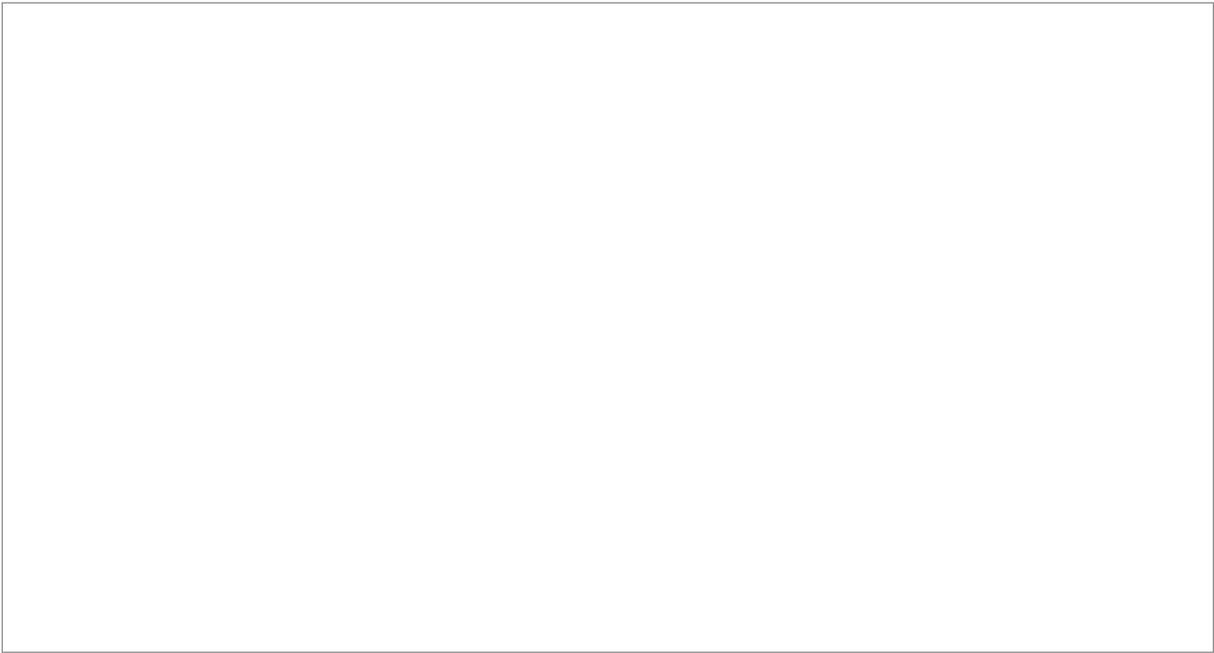


Fig. 2. The number of species at the stations in Northern Norway and in Isfjorden, Svalbard. Each station is the sum of 3 grab samples.



Figure 3. Multidimensional scaling ordination (MDS) for macrobenthos data based on Jaccard similarities (i.e. presence/absence data). The distances between the sites in the plot indicate how different the stations are to each other with regard to faunal composition. The stations from Isfjorden, Svalbard are grouped together.

Published Results/Planned Publications

We aim to publish the results from this project/collaboration in peer-reviewed international journals. The work carried out in 2011 must be seen as a starting point, and publications will begin to emerge in 2012-2013. Popular-style outreach material will be made available from the beginning of 2012 (see below).

Communicated Results

Within January 2012, the first results will be communicated in a popular-style through the Fram Centre outreach facilities (web-site

and/or leaflet).

Interdisciplinary Cooperation

Traditionally, benthic biodiversity research often has been carried out treating the biological components independently (macrofauna, meiofauna, megabenthos, epibenthos etc). Mostly this is because the sampling methods are different, and different research groups specialize in their own particular area of expertise/interests. Even at this early stage in the project, we have tried to integrate analyses of epifauna/megafauna with macrofaunal assessments. Because the respective sampling programmes do not currently overlap (there are few, if any, areas where both megafauna and macrofauna have been sampled, and even if so, the sampling years are not consistent).

Positive aspects:

- moving more towards 'ecosystem-thinking', rather than treating only single components of the benthos.

Challenges:

- further development needed in combining different kinds of analyses (quantitative, semi-quantitative, different sampling areas etc).

From 2012, the interdisciplinary approach will be expanded as follows:

- Coordination of future sampling, such that trawl sampling and grab sampling is carried out in the same areas, and within similar time-frames. First focus for this will be Isfjorden/Billefjorden.
- Inclusion of (living) benthic Foraminifera into sampling programmes, and experimental studies to assess the niche interactions/competition between foraminiferans and macrofauna.
- Collaboration with oceanographers and the pelagic components of the flagship programme.

Budget in accordance to results

Without funding from the Fram Centre this project could not have been initiated. Anticipation of funding for 2012 provided the incentive to carry out sampling in Billefjord. Without this Fram Centre flagship project, such sampling would not be prioritized.

Could results from the project be subject for any commercial utilization

No

If Yes

Not directly of commercial importance. However, the knowledge gained will be important and relevant to any arising needs to understand the actual or potential anthropogenic impacts in Isfjorden (increasing population in Longyearbyen). Potential stakeholders would be local governance (Sysselemanden på Svalbard; Fylkesmannen Finnmark etc).

Conclusions

Our project in 2011 was the start of larger project where we aim to examine and compare how ongoing climate and ecosystem changes impact benthic systems in fjords in Northern Norway and Svalbard.

This initial work has laid foundations for future joint work between institutes, not all of whom have collaborated before, with a focus on interdisciplinary benthic sampling and analyses in Porsanger and the Isfjorden complex. The project has made new sampling possible.