

Project information

Project title

Mapping of nature types in North Norway and Svalbard

Year

2011/2012

Project leader

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Participants

- Nina Mari Jørgensen, Akvaplan-niva
- Hartvig Christie, NIVA and Eli Rinde, NIVA
- Frithjof Moy, IMR
- Dr. Jeanine L. Olsen, Professor, Department of Marine Benthic Ecology & Evolution (MarBEE), Centre for Ecological & Evolutionary Studies (CEES), Centre for Life Sciences. University of Groningen, NL.

Flagship

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

Funding Source

Fram Centre

Summary of Results

Eelgrass meadows are a prioritized nature type, and are considered an important habitat for both juvenile fish, invertebrates and birds. As pointed out in Orth et al. 2006, seagrasses losses are estimated at 20-30% globally due to rapid environmental changes as a result of coastal human population stressors. The increasing frequency and intensity of natural disasters, caused by extreme weather and changing climate are also considered a threat to seagrasses. At present, the Norwegian management is working on an action plan in order to ensure sustainable management of eel grass meadows. The project has benefitted from the national program for mapping of marine biodiversity, in which Troms county was mapped during 2007-2010. The mapping has revealed an extensive distribution of *Zostera marina* in several fjords in Troms (a total of 137 stations in 11 fjords with various size and density of the meadows), as discussed by Jørgensen et al. (2011), and Jørgensen & Bekkby in prep. Different morphological forms were apparent between the littoral and the sublittoral zones (Jørgensen et al. 2011). This raises the possibility of there being two species, *Zostera angustifolia* and *Z. marina*, respectively, as stated in the encyclopedia of plant taxonomy in Norway (Lid & Lid 2005) and in the databases of Norwegian Biodiversity Information Centre (<http://www.biodiversity.no/Article.aspx?m=98&amid=1382>) – which is the national source of information on biodiversity in Norway. Alternatively, they may represent ecotypes. Genetic data were required to resolve this issue.

The flagship project was designed to answer these issues, and sampling and genetic analyses of eel grass from the two zones was included in the flagship project. The genetic survey (using 10 high resolution microsatellite loci) will assess allelic diversity, clonal diversity (in indicator of meadow age, new recruitment and mating system) as well as dispersal connectivity within location within a fjord (Balsfjord) and other fjords (Salangen and Sør-Lenangen). Based on previous surveys of eelgrass (see Olsen et al. 2004, Procaccini et al. 2007), it is expected that between fjord isolation will be high. Within-fjord isolation has never been previously investigated and could go either way. If it is found that individual fjord meadows are isolated and possibly very clonal, this will dictate the need for a higher level of protection. Conclusions are, however, premature, as virtually nothing is known about eelgrass dynamics in these northern fjords.

The main scope of the study was to:

- Determine whether or not two species exist in the Balsfjord
- Assess genetic differentiation and population structure within and between locations (isolation vs. connectivity) with and between fjords
- Assess clonal diversity as a metric of meadow age, stability and new recruitment (or lack thereof); indications of inbreeding.
- Establish baseline conditions of genetic health and demographic stability for future comparisons in the event of anthropogenic or natural impacts.

Sampling was carried out in 4 out of the 11 fjords where eel grass was found, in a north-south gradient along the coast (Salangen, Balsfjord, Ramfjord and Sør-Lenangen), and the total number of stations were 15. The first sampling was completed in June 2011, in two fjords, Salangen (4 stations) and Sør-Lenangen (2 stations). The second sampling was conducted in August 2011, in Balsfjorden (8 stations within the length of the fjord) and in Ramfjorden (1 station). See figure 1 below for locations. One of the Balsfjorden sites were first registered in 1884 (Norman 1900), whereas the location of three other sites in Balsfjorden, the Elvelund site in Salangen and the meadow in Sør-Lenangen were published by Benum (1958).

Leaf pieces were sampled haphazardly at approximately 1-1.5-m intervals over 50-75 m. Samples were preserved in silica crystals and sent to The Netherlands for analysis. Dr. Olsen was part of the August sampling campaign and able to gain some familiarity with the plants and habitats in Balsfjord.

The results of the DNA-analyses will be available in February/March 2012.

The flagship project was designed in order to respond to knowledge gaps identified by the *Zostera* group within the national programme for mapping of marine biodiversity. The information gathered in this study will provide valuable input to the national programme and appropriate management strategies for eelgrass meadows.

Figure 1. Sampling sites: Numbers 1-4 in Salangen, 5-6 in Sør-Lenangen, 8 in Ramfjorden, 7 and 9-15 in Balsfjorden.



Published Results/Planned Publications

- 1-2 international publication planned, 2012/2013.
- 1 international publication based on the DNA-results.
- 1 poster/short communication on the implications for vulnerability/management of eel grass meadows based on the DNA-results.

Communicated Results

At the Framcentre webpage: <http://www.framsenteret.no/ikke-asia-men-balsfjord.4979640-141503.html>

Forskning.no: <http://www.forskning.no/artikler/2011/november/303469>

Interdisciplinary Cooperation

The project involved marine biologists, who planned and performed field work (diving and mapping) and population geneticists who are performing DNA-analyses of the plant.

Budget in accordance to results

The project had financing from Fram centre only. The project benefitted from the national program for mapping of marine biodiversity, mapping of *Z. marina* in Troms.

Could results from the project be subject for any commercial utilization

No

If Yes

But as the results have direct management relevance, the information will be used in area planning and might affect construction and industry (aquaculture, land fillings, sewage etc) indirectly.

Conclusions

No conclusions as the results of DNA-analyses will not be available until early 2012. However, observations of *Z. marina* meadows in Balsfjord revealed that there are flowering plants within the meadows in Balsfjorden, and they are producing seeds. This implies but does not prove sexual reproduction. Future research plans for 2012 include a project proposal for a multi-disciplinary study, in order to establish a baseline for understanding the fundamental function and composition of the eelgrass meadow ecosystems in the high north. This knowledge is essential in order to manage and maintain these habitats under the influence of multiple stressors, such as human exploitation and climate induced changes. The multi-disciplinary study will focus on the following issues:

□ Social sciences – importance of the local site in Balsfjorden, where multiple large eel grass meadows represent a possible attractive habitat and base for a local fishery. The survey will be based on fish landings and interviews with the local community.

□ Ecosystem based research on use of the eel grass meadows– to what extent and when are eelgrass meadows used as nursery area for fish larvae and juveniles? The survey will be conducted using a beach seine, in order to sample fish species (with special emphasis on anadromous fish) in the eel grass meadows at different seasons (spring, summer, late summer).

□ Community based research on eelgrass meadows – how is growth and recruitment of eel grass towards the northern end of distribution compared to meadows in southern Norway? Especially, study the germination capacity of the seeds from these northern sites. Are the associated biota of eel grass meadows the same functional groups and within comparable biodiversity as associated biota further south?

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