

Project information

Project title

Reduced sea urchin grazing – effect of climate change or predator change?

Year

2012/2013

Project leader

Hartvig Christie, NIVA

Participants

- Hartvig Christie, NIVA, Project leader
- Eli Rinde, NIVA
- Janne Gitmark, NIVA
- Hege Gundersen, NIVA
- Nina Mari Jørgensen, ApN, Framsenteret, Tromsø
- Knut Sivertsen, Høgskolen i Finnmark, Alta

Flagship

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

Funding Source

Fram Centre

Summary of Results

The studies in 2012 have particularly concentrated on quantitatively sampling of sea urchin density and size distribution stratified to different types of substrates (cryptic and predator refuge versus open substrates), and concentrated to three different areas: Helgeland/Vega, Troms/Senja and East Finnmark. From the 2011 results these three areas are of particular interest due to: Vega where sea urchins are declining and where both increasing temperature and crab predation may affect, Senja where neither crabs nor temperature are expected to affect sea urchins, and East Finnmark where temperature may not but crabs may affect sea urchin population distribution.

A number of sites at Vega showed macroalgal recovery compared to earlier recordings, but still there was a mosaic distribution between kelp forests, pioneer algae and sea urchins. Small sized sea urchins at some of the predator refuge habitats sampled indicate a certain, but patchy recruitment, while revegetation were found on adjacent open substrates. Going northwards to Senja, an all over high density of small recruits in most habitats as well as high density of larger sea urchins maintained the dominance of grazed bottom areas in this region. Similar situation as at Senja was found in Finnmark with exception for the eastern most area close to Kirkenes where recruitment also was high but grazing occurred mainly in predator refuge habitats (among stones). Kelp vegetation was found on the rocky surfaces in this particular region, thus a clear difference between stony bottoms and smooth rocky surfaces.

The results from our sampling in 2012 supported the hypotheses formed after the 2011 survey. Limited and patchier recruitment at Vega support temperature to influence on sea urchin populations, and crab predation may influence on distribution of adult sea urchins both at Vega and at Kirkenes.

These interpretations of the quantitative 2012 sampling results are further supported by General Additive Models based on our sampled data last years and fisheries statistics of Cancer crabs on Helgeland and king crabs at East Finnmark (but with some reservation as the data are not yet fully analyzed).

Our data on causes and consequences on dramatic changes between sea urchin dominated barren grounds and rich kelp forests are further supported by recent data presented from NW Atlantic where they have similar species, regime shifts and processes.

Published Results/Planned Publications

First draft of a manuscript is completed: E Rinde, H Christie, CW Fagerli, T Bekkby, H Gundersen, KM Norderhaug. Recovery of grazed kelp forests – important factors for kelp recovery success or failure along a latitudinal gradient in the NE Atlantic.

H Christie, Kelp status along the Norwegian coast, and possibilities for kelp cultivation. Abstract, Algae 2012, Bodø

We have analyzed data ready for publication on correlation between top down (predation) factors and regulation of community changes between kelp and sea urchin states. We are in regular contact with Prof. Bob Steneck at University of Maine for possible coordination of results for interpretations and possible presentations.

Communicated Results

Data from the project was presented at the conference Algae 2012.

Interdisciplinary Cooperation

Inter disciplinary cooperation has not been part of the project, but experiences from the project has been used in cooperation on description of what may affect ecosystem services further south. The data will be useful in future projects on ecosystem services in Northern Norway.

Budget in accordance to results

The funding from the Fram Centre has been the major contributor for fulfilling the work and providing the results so far.

If Yes

Results from the project have been to some extent advisory to commercial interests of both kelp cultivation and sea urchins harvesters. The results may also be useful for management of commercial exploitation of fish and crabs along the coast.

Conclusions

The project results may be useful for ecosystem based resource management of the North Norwegian coast concerning particularly northwards movement of crabs, kelps and thus both commercial and general biological production services.

The project has revealed a need for thorough statistical analysis of the relative importance of top-down and bottom-up processes as well as temporal and spatial variables.