

Project information

Project title

Ecology and population dynamics in sea urchins and kelp during overgrazing and regrowing processes with focus on sea temperature

Year

2012/2013

Project leader

Knut Sivertsen, HiFi

Participants

- Knut Sivertsen, Finnmark University College (HiF) Leader
- Hartvig Christie, NIVA
- Tove Gabrielsen, UNIS
- Arne Bjørge, HI
- Kjersti Sjøtun, UiB

Flagship

Fjord and Coast, Theme: Physical-biological coupling: Oceanography and habitat use by predators and their prey

Funding Source

Fram Centre (ME and MFCA)

Summary of Results

Areas overgrazed of sea urchins in Varangerfjorden and Kongsfjorden in Øst Finnmark (Knut Sivertsen and Hartvig Christie)

In Varangerfjorden from Bugøynes westwards to Karlebotn 60 localities were investigated in 2011 og 2012 (Fig. 1). On 52 of these all kelp was overgrazed and the bottom was dominated by sea urchins (*Strongylocentrotus droebachiensis*), while on two localities the bottom had sandy substrate. On six localities kelp grew. Investigations in the same area in 1985 showed that overgrazed bottom was found on three out of 20 localities. The extent of overgrazing had increased significantly in Varangerfjorden. In Kongsfjorden 30 localities were investigated in 2012, and overgrazed areas were found at twelve of these (Fig. 2). In Kongsfjorden the extent of overgrazing was about the same as in 1985 when ten localities were investigated.

Varangerfjorden was the first area where king crab invaded the Norwegian coast, and here the king crab has higher densities in Norway. In spite of the high occurrence of king crab over long time, the sea urchin had high densities and the kelp beds were grazed down. The extent of barren grounds is now considerable greater than in 1985. As contrast to this, in accordance to Lis Lindal Jørgensen (EPIGRAPH), results from muddy bottom at greater depths in the middle part of the Porsangerfjorden the king crab had reduced the occurrence of bottom animals.

Recruitment of sea urchins is good in Varangerfjorden and Kongsfjorden. Individuals between 3 and 14 mm were frequently found at bottom substrate consisting of corallines, pebbles or in haptera of the kelp.

Subarctic kelp beds i Porsangerfjorden

Collaborators: Arne Bjørge (HI) and Kjersti Sjøtun (UiB)

Littorale kelp communities were found during mapping of wreck, kelp and sea urchins in Porsangerfjorden in the research program EPIGRAPH (Fig. 3). These kelp communities have a special character as they grow in the tidal zone on soft bottom in sheltered areas in the inner part of the fjord. The dominating species were *Laminaria digitata*, here called porsangertare (Fig. 4), and *Saccharina latissima*. Totally 32 species were found and identified in these kelp associations. Most of these species were also found on Svalbard. These kelp communities live in arctic conditions covered by ice in winter, while in temperate areas with temperatures up to 10-15 °C at summer time (August). An article will be published about these communities. The article is nearly completed. It will be sent for collaborators for comments in November before it will be sent further to a scientific journal.

New species

During the investigations of subarctic kelp communities in Porsangerfjorden one of the kelp species had an uncommon outlook. We wondered if it was the very rare kelp species *L. gunneri* (berlevågtare) found in Berlevåg in the 1880s. Berlevåg became visited, and berlevågtare was found (Fig. 5). Genetic analyses of both species showed that they were two different species. Porsangertaren showed to be a growth form of *L. digitata*. Berlevågtare surprised to be a close relative to *S. latissima* and other species found on Grønland. More genetic analyses will be done to weigh berlevågtare with other kelp species in the Arctic.

Occurrence of algae in Isfjorden on Spitsbergen and Porsangerfjorden (Tove Gabrielsen, UNIS)

The algae vegetation in inner Porsangerfjorden had an arctic character as they had about the same species composition as found on Svalbard. More exhaustive investigations of Porsangerfjorden on different types of biotopes may give a better basis for comparisons. May be inner Porsangerfjorden will show expected changes as may happen if the summer temperatures increase on the coast of Svalbard.

Collection of algae in Isfjorden, Svalbard, for comparison started in August 2012.

An active work is going on with statistical analyses of the material of wreck, kelp and sea urchins collected during the Epigraph investigations.



Figure 1: Varangerfjorden with 60 localities investigated in 2011 and 2012, with kelp beds (red dots), barren grounds (green dots), sandy bottom (blue dots).



Figure 2: Kongsfjorden with 30 localities investigated in 2012, with kelp beds (red dots), barren grounds (green dots), sandy bottom (blue dots).

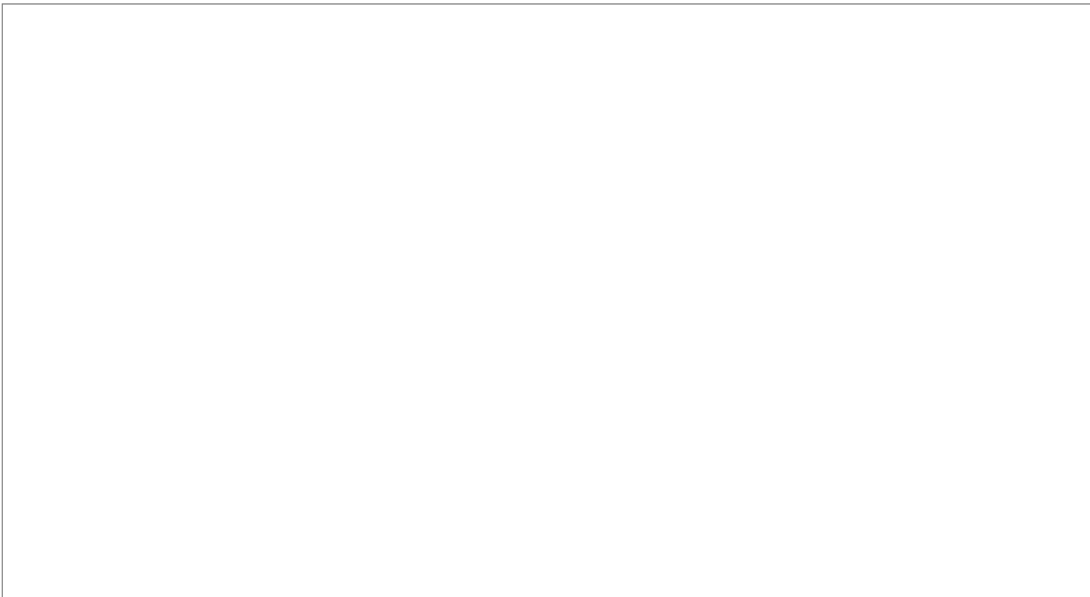


Figure 3: Intertidal association of *Laminaria digitata* and *Saccharina latissima* at locality Muolko in Porsangerfjorden. Photo Knut Sivertsen.

Published Results/Planned Publications

Subarctic associations:

- Poster on Norske havforskere forening in Bergen November 2011: (Sivertsen 2011)
- Publication in preparation (Sivertsen et al. in preparation)
- Sivertsen K. 2011. Subarktisk tareskog i fjæresonen i Porsangerfjorden. Trondheim: Høgskolen i Finnmark, Alta, og Havforskningsinstituttet. Report no.
- Sivertsen K, Sjøtun K, Bjørge A. in preparation. On the brink of the Arctic. Unusual, intertidal subarctic kelp association in Porsangerfjorden, North Norway.

Communicated Results

Results were presented on

1. The opening of Flaggskip Fjord og Kyst in Børselv, Lakselv in October 2011
2. Forskningsdagene 29 september 2012 in Alta
3. Articles in newspapers and NRK about the “new” kelp species

Interdisciplinary Cooperation

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Budget in accordance to results

The fundings from the Fram Centre and HI have been to good help to get more time to speed up the publishing works with the projects.

Could results from the project be subject for any commercial utilization

No

Conclusions

1. More work is needed to publish results from all data collected in the program EPIGRAPH.
2. More investigations of algae in Svalbard and the subarctic areas in Porsangerfjorden should be done to make comparisons between these areas. The subarctic areas in Porsangerfjorden may show how the vegetation in Svalbard may look like according to the ongoing increase in sea water temperature in the Arctic.

More investigations of berlevågtare (*Laminaria gunneri*) should be done to state the name and relationship to other species. Chemical contents should also be investigated in this poisonous kelp.