Project information

Keywords
ocean acidification
Project title
Capacity for adaptation in arctic invertebrates to multiple OA drivers (pCO2, salinity and temperature)
Year
2019
Project leader
Allison Bailey, Haakon Hop (NPI)
Geographical localization of the research project in decimal degrees (max 5 per project, ex. 70,662°N and 23,707°E)
78.930923 N and 11.922421 E
Participants

Allison Bailey (NPI), Haakon Hop (NPI), Amalia Keck (NPI), Sindre Andre Pedersen (NTNU), Howard Browman (NPI), Ane Cecilie Kvernvik (NPI), Philipp Assmy (NPI), Agneta Fransson (NPI), Clara Hoppe (Alfred Wegener Institute, Germany), Anette Wold (NPI)

Flagship
Ocean Acidification
Funding Source

OA-Flagship, NPI

Summary of Results

In the summer of 2019, a series of nine ocean acidification experiments were conducted in Ny-Ålesund, Svalbard that covered the entire growing season, from late April to September. In each experiment, the natural assemblage of phytoplankton and copepods in the fjord were collected and exposed to increased pCO_2 in the lab for four days, after which the growth of the phytoplankton and the grazing rate of the copepods on the phytoplankton were measured. Interestingly, the same experiment, repeated at different times throughout the year, provided different results. Initial analyses indicate that the seasonal changes in algal species composition and biomass affected both the response of the phytoplankton and copepods to high pCO_2 (ocean acidification). By analyzing concurrently collected biological and chemical data from the fjord (planned for winter 2019-2020), we will be able to learn about what drivers make the copepod-phytoplankton link, and thus the base of the marine ecosystem in Kongsfjorden, more or less sensitive to ocean acidification over time.

A meta-analysis of all published results on the effects of experimental ocean acidification on marine copepods has also been conducted, and the results digitized, making a quantitative comparison possible. Analyses of these data will focus on understanding what underlying factors affect the degree to which species are either affected or unaffected by ocean

acidification.

For the Management

Initial analyses of these results show that high pCO_2 does affect both phytoplankton and zooplankton in the Arctic, contrary to some previous literature, but that the response varies throughout the season. Thus, by repeating the same experiment nine times throughout five months, this study provides data to show that we should treat studies examining only one point in time with caution—important effects of ocean acidification may be missed.

Published Results/Planned Publications

Bailey, A. M., Hoppe, C., Kvernvik, A. C., Wold, A., Keck, A., H., Hop, H. Variation in the effect of ocean acidification on Arctic copepod grazing: season and prey type matter. In preparation.

Bailey, A. M., Keck, A., Pedersen, S. A., Browman, H., Hop, H. Quantitative meta-analysis of ocean acidification effects on marine copepods. In preparation.

Kvernvik, A. C., Bailey, A. M., Hoppe, C., Wold, A., Keck, A., H., Hop, H. The effect of ocean acidification on in-situ Arctic algae assemblages: seasonal changes. In preparation.

Communicated Results

Ocean acidification, a threat. Maritimt Magasin 12/2018, p. 6.

Fram Forum 2020

Interdisciplinary Cooperation

The project benefited greatly from collaborators across several disciplines, including:

Algae physiology

Copepod physiology

Chemical oceanography

Systematic reviews

Budget in accordance to results

The project could not be conducted without Fram Centre funding, which supported the postdoc salary of Allison Bailey, who led the meta-analysis and the seasonal study, as well as supporting almost 50% of the total cost of the seasonal study, including salary for staff (Ane Cecilie Kvernvik, Amalia Keck) conducting the experiments.

Could results from the project be subject for any commercial utilization

No

Conclusions

Future analyses will hopefully indicate factors that make the Arctic marine ecosystem more or less sensitive to ocean acidification, and pinpoint what time of year the strongest effects might be seen.