

## Project information

### Keywords

DNA repair, copepod, *Acartia*, mortality

### Project title

The effect of OA on DNA damage and repair in arctic copepods

### Year

2019

### Project leader

Claudia Halsband

### Geographical localization of the research project in decimal degrees (max 5 per project, ex. 70,662°N and 23,707°E)

69.6714598 N, 18.7879219 E

### Participants

Helena Reinardy (UNIS), Pierre de Wit (U Gothenburg, SE), Iris Hendriks (IMEDEA, ES)

### Flagship

Ocean Acidification

### Funding Source

NA

## Summary of Results

In 2019 two four-week exposure studies were conducted with *Acartia longiremis*, one in July and a second in August, at a target pH of 7.6 (IPCC scenario for the year 2100). During the July experiment the pH in the header tank was consistently 0.5 units too low (7.1) during the first week, and could only be adjusted to the desired value of 7.6 for the remaining 3 weeks. The experiment was therefore repeated in August. Approximately 100 individuals of *A. longiremis* were incubated in 500 mL bottles and *Rhodomonas* sp. as algal food source, and attached to a submerged plankton wheel for gentle rotation in ambient seawater (10 degrees C). The experiment consisted of 12 controls (pH 8.1) and 12 low pH treatments. Food and water were renewed 1-2 per week. After one week, one control and one treatment bottle were drained over a 90 µm mesh and the copepods washed and transferred to RNAlater solution for subsequent analysis of DNA damage. This procedure was repeated every week for 4 weeks, resulting in a time series of exposed copepods (7, 14, 21 and 28 days).

In addition, a positive control at pH 5.5 was run for 1 week. All copepods had died in that period and were preserved in RNAlater. To compare *Acartia* with other arctic taxa, *Calanus* copepodites, fish eggs, fish larvae and crab larvae were preserved in RNAlater unexposed.

The preserved samples were sent to the Scottish Association for Marine Sciences in Oban, UK, for analysis of DNA damage in exposed and unexposed individuals in early 2020. Samples from the previous year (2018, exposure experiment at pH 7.1) were unfortunately lost during transport to Scotland.

The applicants applied for a travel grant to C. Halsband through the EU ASSEMBLE+ program, to support a visit at SAMS during the sample analyses with the fast micromethod (Bibany et al. 2014) and to assess possibilities for future comparative studies between the two laboratories. SAMS has recently established a new OA exposure facility for sea urchins and pelagic taxa, allowing latitudinal comparisons of closely related taxa. The notification from ASSEMBLE+ is expected to be published in December 2019.

## Master and PhD-students involved in the project

Mascha Dix, undergraduate student at SAMS, Scotland, UK. Mascha has been visiting our lab in Kraknes in summer 2019 and took part in the exposure study. She will also be involved in sample processing and developing suitable protocols for the analysis of DNA damage of arctic copepods and other taxa with the fast micromethod (Bibany et al. 2014).

## For the Management

DNA is vulnerable to ocean acidification-induced damage, and repair mechanisms may be induced or impacted to different extents. The susceptibility for DNA damage and capacity for repair in important Arctic copepods is unknown, but important to predict impacts of future ocean changes on Arctic ecosystems. Consequently, this study aims to further develop these understudied areas of OA research and understand the underlying mechanisms for species vulnerabilities and adaptabilities among arctic marine invertebrates.

## Published Results/Planned Publications

Planned:

DNA damage from ocean acidification in arctic zooplankton.

Communicated Results

ARCTOS colloquium on ocean acidification, 30 Oct 2019, UiT

Interdisciplinary Cooperation

The project combines experimental ecology (APN, IMEDEA) with novel techniques in molecular biology (SAMS, UGoth).

Budget in accordance to results

yes.

The project could not have been conducted without Fram Centre funding. The funds support 90% of the work (salaries, consumables and other direct costs), with 10% in own contributions from SAMS, IMEDEA and UGoth.

Could results from the project be subject for any commercial utilization

No

If Yes

NA

Conclusions

Conclusions will become available at the end of the project in year 3 (2020).