Project information

Keywords
DNA repair, copepod, Acartia, mortality
Project title
The effect of OA on DNA damage and repair in arctic copepods
Year
2020
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

Claudia Halsband (APN)

Helena Reinardy (SAMS)

Iris Hendriks (IMEDEA)

Melisssa Chierici (IMR)

Flagship
Ocean Acidification
Funding Source

NA

Summary of Results

The samples of *Acartia longiremis* exposed to ambient and low pH from 2019 preserved in RNAlater were analysed for DNA damage at the Scottish Association for Marine Sciences in Oban, UK, in early 2020. The results were reviewed and discussed during a research visit in Oban (UK) in February. Elevated DNA damage was detected in individuals of A. longiremis exposed to low pH (7.2-7.7), together with higher cumulative mortality compared to controls. The levels of DNA damage were highest after 2 weeks of incubation, but declined thereafter, indicating possible capacity for repair in acclimated individuals. Further data analyses and statistics were conducted throughout 2020. In the second half of 2020 the project partipipants prepared a manuscript for publication. This is currently in final review by all co-authors and will be submitted to a scientific journal in late November, with a view to publish by the end of 2020.

Master and PhD-students involved in the project

Mascha Dix, Bachelor student at SAMS, Scotland, UK, has been visiting our lab in Kraknes in summer 2019 and took part in the exposure study. She has subsequently been involved in sample processing and developed a protocol for the analysis of DNA damage in small copepods (*Acartia* sp.) based on the fast micromethod. Mascha successfully defended her Bachelor of Science with honours in Marine Science with Arctic Studies in summer 2020.In addition, Mascha won the SAMS Council Award for Academic Excellence: SAMS graduation 2020.

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

Genotoxic effect of ocean acidification in an Arctic coastal copepod, *Acartia longiremis*. submitted November 2020

Communicated Results

NA

Interdisciplinary Cooperation

NA

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 and IMEDEA.

Could results from the project be subject for any commercial utilization

No

Conclusions

Our study demonstrates that *A. longiremis* is vulnerable to OA-induced DNA damage at pH levels predicted to be realistic within the next century. Significant OA-induced effects on survival and DNA integrity in the Arctic copepod *A. longiremis* may vary seasonally as a function of age. Indications of DNA repair in acclimating individuals (exposure times > 2 weeks) suggest possible potential for adaptation in this species. Transgenerational population level effects are mediated via altered genetic (or epi-genetic) material, therefore predicting long-term impacts and/or adaptation capacity to environmental stressors such as OA should include assessment of genotoxicity susceptibility and response systems.