

Project information

Keywords

Ocean acidification, acclimatisation, adaptation, evolution

Project title

ECOAN WP2-OA-5: Evolutionary rescue from Arctic OA

Year

2015

Project leader

Peter Thor

Participants

Haakon Hop (NPI), Allison Bailey (NPI). Collaborators: Sam Dupont (Physiology - UGOT), Piero Calosi (Physiology - UQAR), Pierre De Wit (Molecular biology - UGOT), Torkel Gissel Nielsen (Population dynamics - DTU), Janne E. Søreide (Population dynamics - UNIS)

Flagship

Ocean Acidification

Funding Source

Fram Centre Flagship "Ocean acidification and ecosystem effects in Northern waters"

Summary of Results

Calanoid copepods constitute some 80% of the Arctic zooplankton biomass and they support most fish stocks due to their importance as prey for many species during their larval life. Any detrimental effects on Arctic copepod populations will therefore extend to commercial fish stocks. In this study we will investigate if genetic diversity in important Arctic copepod species can alleviate the long term effects of OA. Differences in local adaptation may enable sub-populations to complement each other, and repopulation of local communities by other more fit sub-populations may occur during environmental change. Thus, we are measuring local adaptation to different levels of present day pH, and assess to what extent these differ and complement each other. To this end, we will measure differences of reaction norms of fecundity, metabolism, concentrations of specific metabolites ("metabolomics") and expression of all known genes ("transcriptomics") among sub-populations. Concurrently, we are investigating genetic distance among sub-populations to assess to what extent reaction norm differences occur as a result of genetic diversity and thus to what extent sub-populations may be able to complement each other.

During 2015 we have focused on the shelf species *Calanus glacialis*. Experiments were completed on three different sub-populations from Billefjorden, Kongsfjorden, and the Disko Bay, West Greenland. pH reaction norms of ingestion rates and metabolic rate (ie. The change in rates with changing pH) were measured during a total of 5 experiments on the three sub-populations. We found significant increases in metabolic rate with decreasing pH (8.2-6.4) in the sub-populations from Bille- and Kongsfjorden but not in the sub-population from Disko Bay (see fig). Furthermore, ingestion rates decrease with decreasing pH in the Kongsfjord sub-population but not in the Billefjord sub-population. Analysis of the Disko Bay sub-population is still pending. Analysis for metabolomics and transcriptomics will initiate primo 2016.



Published Results/Planned Publications

Planned publications

Thor et al. (2016) Differential adaptation to ocean acidification throughout the Arctic in *Calanus glacialis*

De Wit et al (2016) Physiological response to ocean acidification among genetically distinct subpopulations of *Calanus glacialis*

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Communicated Results

results were communicated on Fram dagen 2015

We plan for dissemination through the OA International Coordination Centre (OA-ICC), AMAP AOA, and GOA-ON, and within the ICES OSPAR study group of OA.

Interdisciplinary Cooperation

We plan for using the results to parameterize population models within the ECOAN WP3-Population level effects of OA on copepods in collaboration with Pedro Duarte. This will be initiated medio december 2015.

Budget in accordance to results

Yes. Most of the budget cover salary for Peter Thor. Sample costs for metabolomics and transcriptomics are covered by the NFR grant.

Could results from the project be subject for any commercial utilization

No

Conclusions

Ocean acidification has varying impacts on *Calanus glacialis* depending on location. There is room for "evolutionary rescue" from OA effects due to strong differences in the impact.