

Project information

Keywords

Meroplankton, Arctic, coast, biodiversity

Project title

Meroplankton biodiversity, seasonal dynamics and function in high latitude coastal ecosystems

Year

2018

Project leader

Janne E. Søreide

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

Isfjorden Adventfjorden Time series station (Stn. IsA): 78.261 N; 15.535 E, Fuglefjellet (Stn. S2): 78.188 N; 15.145 E, Bohemanneset (Stn. N1): 78.380 N; 14.702 E

Participants

Janne E. Søreide– project leader (University Centre in Svalbard)

Tove M. Gabrielsen (University Centre in Svalbard)

Claudia Halsband (Akvaplan-niva);

Agata Weydmann (University of Gdańsk);

Marta Ronowicz (Institute of Oceanology PAS)

Piotr Kukliński (Institute of Oceanology PAS)

Flagship

Fjord and Coast

Funding Source

350 KNOK from Fram Centre, manpower support (analyses, writing) from the Polish funded LARVEA project (~150 KNOK in 2018). UNIS support in form of manpower and lab facilities (~100 KNOK in 2018).

Summary of Results

The MEROPLANKTON project has been run together with the project LARVAE - Linking Annual cycle of Reproduction and recruitment with environmental Variables in Arctic Epifauna, funded by the Polish National Science Centre. The MEROPLANKTON project has focused on meroplankton – larvae of benthic invertebrates - that temporarily inhabit the pelagic domain, while the LARVAE project (ends in 2019) focuses on benthic community structure and reproductive success of hard bottom invertebrates in Isfjorden, including the benthic demersal larvae. The project has been run according to plan, and beyond, by expanding to also study tiny benthic larvae living inside the sea ice (sympagic fauna). In 2018, the main focus has been to analyse samples and data, and to write. Currently we have one manuscript in review and two manuscripts almost finished. Meroplankton has a strongly pulsed occurrence and they can be very numerous (up to 100.000 ind. m⁻³) during the productive spring and summer period. Particularly, Cirripedia larvae can be very numerous and it can be regarded as a good algal bloom indicator species since the adults release their larvae when algal food conditions are favorable (up to 100.000 nauplii per adult in one pulse). We observed two abundance peaks of Cirripedia in May in Isfjorden and investigated if these two peaks comprised of different species. DNA barcoding revealed that there were two species present, but that *Balanus balanus* dominated over *Semibalanus balanoides* at all four sampling dates in May. Length measurements of the Cirripedia larvae from May to July revealed that there was most likely one synchronized pulse of nauplii release in Isfjorden and that these nauplii had a pelagic residence time of approximately 2 months.

Students currently working with meroplankton-projects (time of defense given)

Katarzyna Walczyńska, PhD student, Gdansk University and UNIS – molecular work to identify meroplankton to species level (June 2019)

Vanessa Pitusi, MSc student, UiT and UNIS – sympagic meiofauna (May 2019)

Margot Ulfsdatter Nyeggen, MSc, UiB and UNIS - Coastal zooplankton dynamics in Svalbard (June 2019)

Anna Sowa, MSc, GU (Poland) - epifaunal recruitment on experimental panels in Isfjorden (March 2019)

Emilia Karłowicz, MSc, IO PAS (Poland) - Meroplankton variability close to bottom in Isfjorden (June 2019)

Students completed who has completed their theses within the project:

Dec. 2016: Eike I. Stübner, Phd student, meroplankton seasonal dynamics

June 2017: Helena Cuny, MsC student, UNIS – zooplankton community in ice-free vs. ice covered fjord

August 2017: Hela Øen Åsnes, Bsc student, UiB and UNIS – zooplankton with focus on meroplankton

For the Management

[English] Meroplankton are tiny larva of benthic invertebrates that take advantage of the pelagic environment to feed and spread to new habitats. These tiny larva are often unidentifiable beyond class level by morphological traits. In this project we gained new knowledge on meroplankton biodiversity and their pelagic duration in Arctic coastal waters by using molecular tools combined with high resolution sampling. In Svalbard coastal waters, meroplankton reached more than 100.000 individuals per m³ and they totally dominated the zooplankton community in spring-summer. Timing of benthic reproduction and the pelagic duration of these larva are important knowledge for managing coastal marine ecosystems and predict the potential for invasive benthic species as the climate warms.

[In Norwegian] Meroplankton er små larver av bunndyr som benytter seg av det pelagiske miljøet til å spise og spre seg til nye habitater. Meroplankton er små og nærmest umulig å identifisere til art morfologisk. I dette prosjektet har vi fått ny kunnskap om artsmangfoldet til meroplankton og hvor lang tid de oppholder seg pelagisk ved hjelp av hyppig prøvetaking og molekylære metoder. I Isfjorden, Svalbard, kan meroplankton komme opp i 100.000 individer per m³ og de kan totalt dominere dyreplanktonsamfunnet gjennom våren og sommeren. Kunnskap om tidspunktet for bentisk reproduksjon og hvor lenge larvene oppholder seg i de frie vannmassene er viktig for forvaltningen av kystøkosystemet og risikovurderingen for etablering av nye, fremmede arter nå som klimaet blir varmere.

Published Results/Planned Publications

Published papers (peer-reviewed)

Stubner EI, Søreide JE, Reigstad M, Marquardt M, Blachowiak-Samolyk K (2016) Year-round meroplankton dynamics in high-Arctic Svalbard. *Journal of Plankton Research* 38, 522-536.

Marquardt M, Majaneva S, Pitusi V, Søreide, JE (2018). Pan-Arctic distribution of the hydrozoan *Sympagohydra tuuli*? First record in sea ice from Svalbard (European Arctic). *Polar Biol* 41, 583-588.

Submitted papers

Walczyńska et al. (in revision) Cirripedia timing, duration and ecological role in Arctic coastal regions. *Hydrobiologia*

Manuscripts in prep.

Stübner E, Renaud P, Gabrielsen TM, Berge J, Reigstad M, Kwasniewski S, Vlachowiak-Samolyk K, Boehnke R, Søreide (manuscript) Timing of meroplankton in different Arctic primary production regimes.

Walczyńska K, Ronowicz M, Bałazy P, Kukliński P, Søreide J, Weydmann A. (manuscript) Composition and seasonal dynamics of meroplankton community in a high Arctic fjord.

Ronowicz M, Sowa A, Walczyńska K, Bałazy P, Søreide J, Kukliński P, Weydmann A (in prep) Seasonality and spatial variability of epifaunal recruitment in the Arctic.

Communicated Results

Popular scientific publications

Kukliński P, Bałazy P (2017) Longyearbyen - Life beneath the waves. A celebration of the marine life in the heart of Svalbard. Institute of Oceanology, Polish Academy of Sciences, Gdańsk, ISBN 978-83-941037-7-4, 104 pp.

Communicated results

Søreide JE (2016) Meroplankton biodiversity, seasonal dynamics and function in high latitude coastal ecosystems. Fjord and Coast annual meeting, 4-5 October, Sommarøy, Tromsø.

Kukliński P, Weydmann A, Walczyńska K, Bałazy P, Søreide J, Gabrielsen, T, Halsband C, Ronowicz, M (2017) LARVAE - Linking Annual cycle of Reproduction and recruitment to environmental variables in Arctic Epifauna – overview of the project. 14th Larwood Symposium, Vienna, Austria, 25-27 May 2017 - oral presentation

Søreide JE (2017) Meroplankton biodiversity, seasonal dynamics and function in high latitude coastal ecosystems. Fjord and Coast annual meeting, 17-18 October, Sommarøy, Tromsø.

Ronowicz M, Sowa A, Walczyńska K, Bałazy P, Søreide J, Kukliński P, Weydmann A (2018) Seasonality and spatial variability of epifaunal recruitment in the Arctic. Polar 2018, 19-23 June 2018, Davos, Switzerland – oral presentation

Sowa A, Kukliński P, Bałazy P, Weydmann A, Ronowicz M (2018) Seasonal variability of epifaunal recruitment on artificial experimental plates in the high Arctic (Isfjorden, Spitsbergen). XXXVII Polar Symposium – Polar Change- Global Change, 7-10 June 2018, Poznań, Poland.

Søreide JE, Stübner E, Renaud P, Gabrielsen TM, Berge J, Reigstad M, Kwasniewski S, Vlachowiak-Samolyk K, Boehnke R (2018) Timing of meroplankton in different Arctic primary production regimes. Polar 2018, 19-23 June 2018, Davos, Switzerland – poster presentation.

Walczyńska K, Weydmann A, Ronowicz M, Søreide J, Gabrielsen TM (2018) Meroplankton and potential for benthic colonization in high-Arctic ecosystems. Polar 2018, 19-23 June 2018, Davos, Switzerland – poster presentation.

Søreide JE, Svendsen C, Halsband C (2018) Hvorfor er plankton viktig i kystøkosystemet. Dialogmøte: Effekter av klimaendringer på fjord- og kystøkosystemer/kystøkologi i nord. Framsenteret, Tromsø, 16 oktober.

Outreach

Marine biodiversity exhibition (algae, macroalgae and live invertebrates and fish) for kinder gardens in Longyearbyen at UNIS (May, 2017) Resulted in a 2 pages reportage in the newspaper Klassekampen.

UNIS Open Day 25 November 2017. Plankton exhibition (live organisms) for everyone interested both children and adults. Live plankton exhibition at UNIS during Open Day of Forskningsparken/UNIS in November

UNIS Open day 20 October 2018. Plankton exhibition (live organisms) with possibility for kids and adults to collect their own sample with net and look at the catch in the stereomicroscope.

2018 Citizen Science, funded by Svalbard Miljøvernfond. UNIS has established a cooperation with Hurtigruten AS for sampling coastal plankton. Summer 2018, UNIS master students and staff joined 5 times the Hurtigruten Expedition team onboard Spitsbergen to collect water and plankton around Svalbard. Guests were encouraged to take part in the sampling and got the opportunity to explore the plankton in microscopes in the ship's "Science corner". It was a great success and will be repeated in summer 2019.

Meroplankton has received special attention in the UNIS student courses AB-202 Marine Arctic Biology and AB330: Ecosystems in ice covered waters. Both these courses have field work in April-May, when high numbers of meroplankton are present both in the pelagic and inside sea ice in Svalbard fjords.

Interdisciplinary Cooperation

The Meroplankton project has been studying the seasonal zooplankton dynamics in Isfjorden and Van Mljenfjorden with focus on the less know meroplankton. In this project we have worked closely together with other projects in field the laboratory to map physical (light, hydrography, currents) and biological (phytoplankton diversity and chlorophyll a bomasss) drivers for the highly pulsed occurrence of meroplankton. In the laboratory we have worked closely with other molecular biologists to optimize the DNA protocol to be able to successfully extract DNA from the very tiny and thus challenging meroplankton specimens (we work on single individuals).

Budget in accordance to results

Yes

Could results from the project be subject for any commercial utilization

No

If Yes

No, but important new knowledge and activities for the general public, and high educational and scientific added value which is also relevant for the managers

Conclusions

In the MEROPLANKTON project we have conducted intensive sampling to study the meroplankton dynamics in relation to environmental conditions in Arctic coastal waters. Further we have by molecular tools identified the most numerous ones to species level. Based on our results we can predict that in a warmer Arctic the mesozooplankton abundance will increase and that meroplankton will be an even more important fraction of this mesozooplankton community in spring and summer as the productive season gets longer and sea temperatures increases. Long pelagic presence, large potential for biofouling on ships and larger plastic debris, combined with the disappearance of landfast sea ice and thus less ice scouring opens new opportunities for barnacles and other benthic invertebrates to colonize high-Arctic coastal waters in the future.