

Project information

Keywords

Calanus, gonad, population, abundance, reproduction

Project title

The new generation of *Calanus finmarchicus*: estimating population recruitment from egg production rates and gonad stage analysis off northern Norway (GONAD)

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) between 69°20.932N, 13°10.237E and 70°49.958N, 19°01.667E

Participants

Sünnje Basedow, UiT The Arctic University of Norway (UiT)

Emilia Trudnowska, Institute of Oceanology (IOPAN, PL)

Barbara Niehoff, Alfred Wegener Institute (AWI, DE)

Flagship

Fjord and Coast

Funding Source

Fram Centre Fjord & Coast

Summary of Results

Reproductive parameters were compared between two regions and two seasons for *Calanus finmarchicus* populations in the northern Norwegian Sea. Large variations were observed between stations for proportions of spawning females, egg production rates and clutch sizes in both years, indicating small-scale variations in food supply and physiological state of the females (Fig. 1).



In April 2017, most females were mature and ready to spawn, except some individuals residing at depth. There was, however, a difference between the shelf stations and the stations offshore, where the proportions of mature/spawning females was higher on the shelf than in oceanic locations (Fig. 2). This points to the existence of two separate populations divided by water mass, where the offshelf individuals mature later and were still to a higher proportion in gonad stage 3.

In the second year, only the northern stations have been analyzed so far. These were collected on the shelf further north later in the season (late June). It is evident from the gonad stages that these females have fewer ripe gonads and many were senescent/spent, despite active egg-laying in the experiments. Most of the senescent females were found in the deep samples, indicating that the remaining actively spawning females were still at the surface, while the spent females had started their descent to depth for overwintering (Fig. 3).

A correlation between the number of mature females (gonad stage 4) and spawning females was observed, but showed two exceptions (outliers): The data point with high % GS4 but low spawning activity is attributed to food limitation. This will be investigated further with the help of chlorophyll a data as proxy for phytoplankton abundance. The second outlier showed relatively high egg production activity at low proportion of GS 4 females. This is interpreted as a sign of longer inter-clutch periods due to low temperature, where the females return to the immature gonad stage GS3 upon egg release, before they can spawn again. This will be studied further through correlations with abiotic and biotic parameters.

The southern station of 2018 remain to be analysed for gonad stage proportions in 2020. Upon completion, a comparison with other published data from the southern Norwegian Sea will be conducted to investigate possible phenological shift in Calanus reproductive activity due to climate warming.

Master and PhD-students involved in the project

NA

For the Management

Arctic coastal food webs support large fish populations through highly abundant zooplankton resources that serve as the primary food

source for fish larvae. Zooplankton stock size is a direct function of initial population size plus reproduction minus predation losses, but none of these parameters are easily obtained for advective marine populations. In GONAD, we experimentally determine egg production rates and relate those to potential clutch sizes estimated from gonad maturation stages of preserved females to quantify population reproduction. In combination with available population size data population growth and secondary production can be calculated. GONAD contributes new knowledge on the timing and spatial variations of reproduction and recruitment in *Calanus* off the north Norwegian coast to facilitate predictions of potential shifts in recruitment phenology and impacts on fish recruitment under climate warming.

Published Results/Planned Publications

Planned:

Timing and spatial distribution of *Calanus* recruitment and secondary production in coastal systems of the Norwegian Sea

Communicated Results

Presentation at Havforskermøte Feb 2019 (Halsband)

Interdisciplinary Cooperation

NA

Budget in accordance to results

yes

Could results from the project be subject for any commercial utilization

No

If Yes

no

Conclusions

This study provides new data on *Calanus* reproduction in spring on the north-Norwegian shelf and will compare these with earlier observations in adjacent areas to assess phenological changes and potential implications for higher trophic levels, including commercial fish stocks.