The role of macrozoobenthos for Arctic production and energy flow

The pan-Arctic database project

Degen R[1], Jørgensen LL[2], Dannheim J[1], Boetius A[1, 3], Brey T[1]
renate.degen@awi.de

Rationale & Objectives

Forthcoming environmental change will affect the contribution of seafloor biota (benthos) to important Arctic ecosystem services and goods. We want to facilitate our understanding of this contribution and its future development on a pan-Arctic scale. In close cooperation with international partners, we intend to build a tool that consists of:

- **A georeferenced and quality-controlled data base of Arctic macrobenthos**
- A corresponding functional trait matrix for all taxa
- An interface to organism performance models (e.g. production)
- An interface to environmental drivers (models)

Such a tool will enable the scientific community to simulate the effects of different environmental scenarios on Arctic benthic structure and performance.

Over the last decades, institutions from various countries have produced quantitative Arctic benthos data for more than 5000 stations (see e.g. Bluhm et al. 2011, Piepenburg et al. 2011). However, these data are to a large extent either unpublished and/or not quality-controlled. For this reason, AWI is currently re-evaluating all benthos data obtained during Arctic expeditions on the Icebreaker Polarstern and other vessels (Fig. 1).

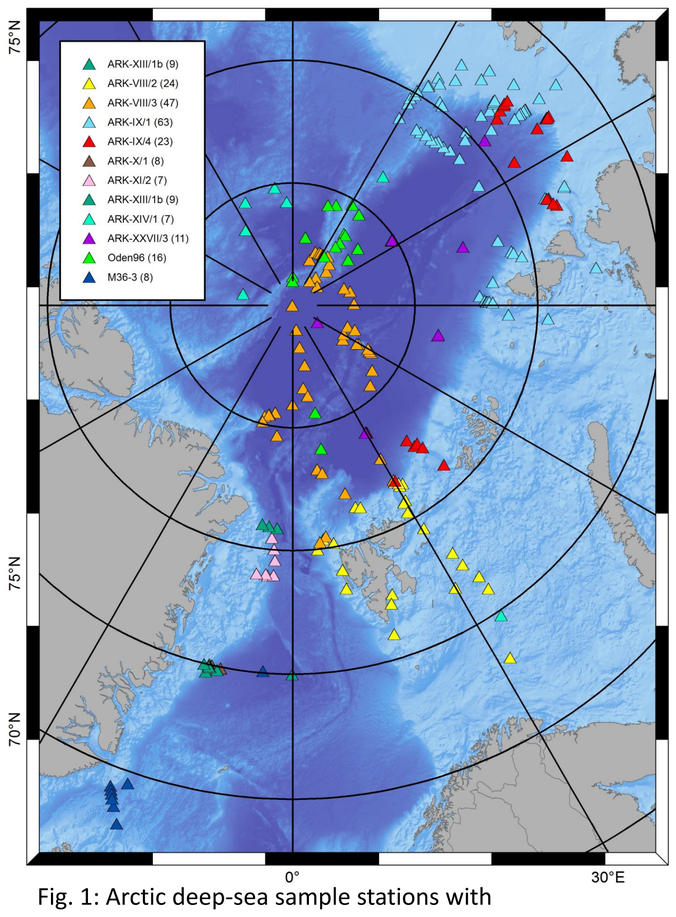


Fig. 1: Arctic deep-sea sample stations with benthic biomass data available.

Data mining

Identify and consolidate all available data (published and unpublished) on Arctic benthic macro- and megafauna in one georeferenced data management system

Quality control

Cross-calibrate and standardize taxonomic, geographic and sampling methodology

Create a searchable metadata inventory

Make the database available to the scientific community

Install a continuous data bank update process

Pan-Arctic Database

Barents Sea Example

Here we use a Barents Sea data set (bycatch data from 900 trawl sampling stations, Lis L. Jørgensen, IMR-PINRO Project) to demonstrate how such a database can be applied (Fig. 2). We show the spatial distribution of basic community parameters, i.e. biodiversity (Fig. 3) and biomass (Fig. 4), as well as the spatial distribution of community production (Fig. 5). Further on, we will use these data to model the impact of environmental drivers on the benthic system in order to predict future scenarios.

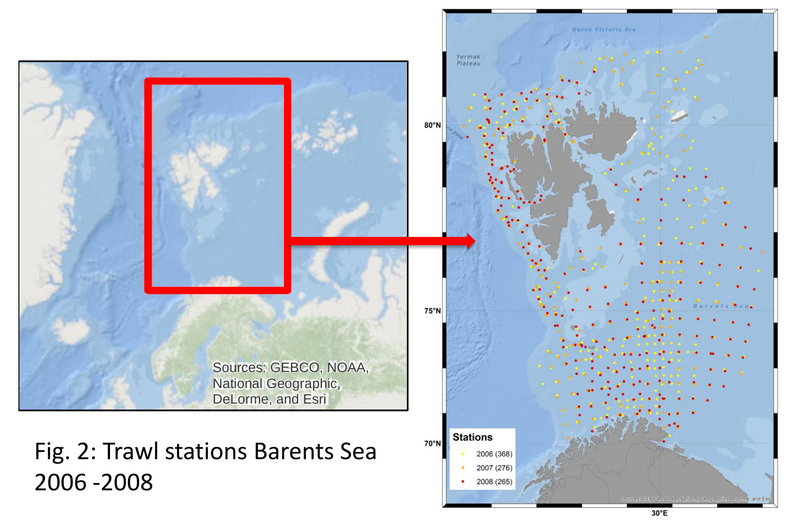


Fig. 2: Trawl stations Barents Sea 2006 -2008

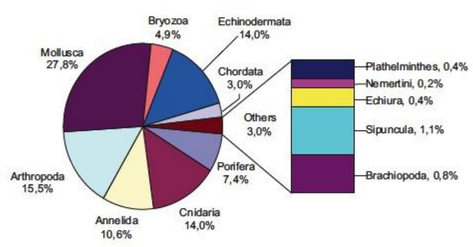
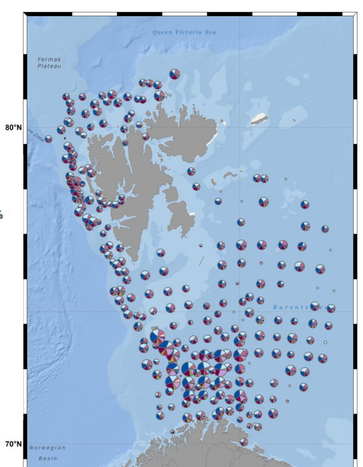


Fig. 3: Ratio of species number of main taxonomic groups for 2008 (pie chart from Anisimova et al. 2010).



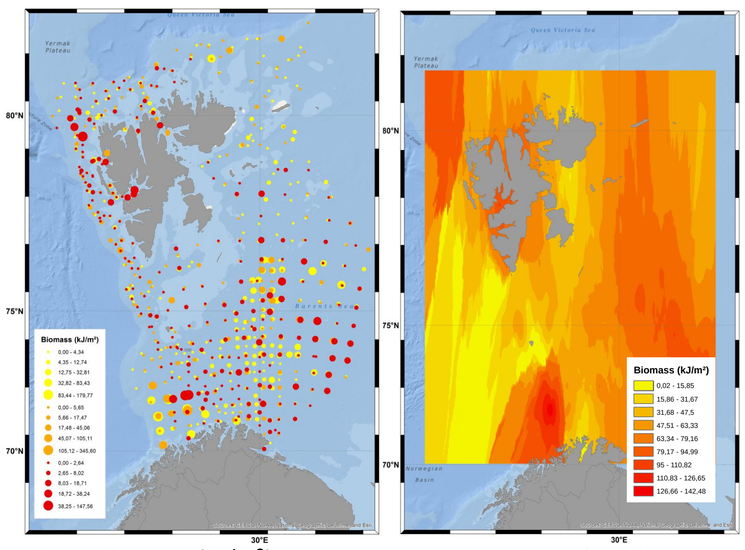


Fig. 4: Biomass (kJ/m²) per station and interpolated for 2008.

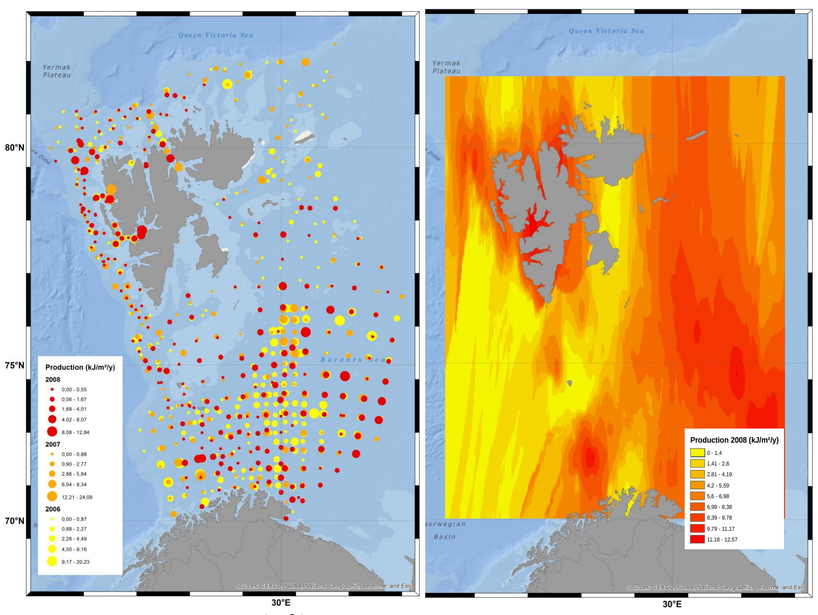


Fig. 5: Production (kJ/m²/y) per station and interpolated for 2008.

References:
Anisimova et al. (2010) Mapping and monitoring of benthos in the Barents Sea and Svalbard waters: Results from the joint Russian – Norwegian benthic programme 2006-2008. IMR-PINRO Joint Report Series 1-2010
Bluhm et al. (2011) Diversity of the arctic deep-sea benthos. Mar Biodiv 41:87-107
Piepenburg et al. (2011) Towards a pan-Arctic inventory of the species diversity of the macro- and megabenthic fauna of the Arctic shelf seas. Mar Biodiv 41:51-70

[1]Alfred Wegener Institute for Polar and Marine Research, D-27570 Bremerhaven, Germany
[2]Institute of Marine Research, N-9294, Tromsø, Norway
[3]Max Planck Institute for Marine Microbiology, D-28359, Bremen, Germany