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Zooplankton in the Arctic outflow

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Climate changes in the Arctic cause the changes in the current system that may have cascading effect on the structure of plankton community and consequently on the interlinked and delicately balanced food web. Zooplankton species are by definition incapable to perform horizontal moving. Their transport is connected with flowing water. There are zooplankton species specific for the definite water masses and they can be used as markers for the different currents. That allows us to consider zooplankton community composition as a result of water mixing in the studied area. Little is known however about the mechanisms by which spatial and temporal variability in advection affect dynamics of local populations. Ice conditions are also very important in the function of pelagic communities. Melting time is the trigger to all "plankton blooming" processes, and the duration of ice-free conditions determines the food web development in the future.
Fram Strait is one of the key regions for the Arctic: the cold water outflow comes through it with the East Greenland Current and meets warm Atlantic water, the West Spitsbergen Current, producing complicated hydrological situation. During 2007 and 2008 we investigated the structure functional characteristics of zooplankton community in the Fram Strait region onboard KV "Svalbard" (April 2007, April and May 2008) and RV "Jan Mayen" (May 2007, August 2008). This study was conducted in frame of iAOOS Norway project "Closing the loop", which, in turn, was a part of IPY. During this cruises multidisciplinary investigations were performed, including sea-ice observations, CTD and ADCP profiling, carbon flux, nutrients and primary production measurements, phytoplankton sampling. Zooplankton was collected with the Hydro-Bios WP2 net and MultiNet Zooplankton Sampler, (mouth area 0.25 m2, mesh size 180 um).Samples were taken from the depth strata of 2000-1500, 1500-1000, 1000-500,500-200, 200-100, 100-60, 60-30, 30-0 m. Gut fluorescence content were measured in dominant species to investigate effect of Chl a concentration and phytoplankton composition on ingestion rate. Egg production experiments were carried out under different food conditions. Rare deep water zooplankton species were also investigated to increase our knowledge in the Arctic biodiversity. Copepods Calanus finmarchicus is known as a marker of the Atlantic water mass, Calanus glacialis and Calanus hyperboreus, vice versa, are the coldwater Arctic species. In our study we investigated three Calanus species distribution and analyzed their ecological status. Changes in zooplankton composition results in the alteration of energy transfer within the pelagic food web ("cold" and "warm" scenarios) with potential consequences for growth and survival of seabirds Little Auk (Alle alle) and Black-legged kittiwake (Rissa tridactyla). We discuss the advection effect on the zooplankton community, compare the population development phases with phytoplankton bloom phases (match-mismatch), estimate grazing impact on phytoplankton community and consider different life strategies for the three different Calanus species.