2.3. Hydrology and Limnology

Instructors: ***Jan Kavan***

Students: ***Martin Caletka, Eliška Kalčíková, Tereza Sankotová & Petra Vinšová***

The main goal of hydrology/limnology group (Fig. 2.3.1.) was to demonstrate specific features of polar aquatic ecosystems and how these can be studied directly in the field. All students have participated on two common long-term research projects that are carried out by the research team. The first and main one was the study of lake ecosystems in the Billefjorden area. The second one was focused on study of hydrological and thermal regime of selected water streams. Apart that, all students have their own specialized projects focusing on one particular hydrological and limnological features of the polar environment.

Fig. 2.3.1. Hydrology/limnology group on Nordenskioldbreen.

The whole group has participated on measurements of the basic physico-chemical parameters (temperature, pH, conductivity, dissolved oxygen), as well as on sampling of biological material for further analyses. Biological samples were then examined using microscopy techniques directly at the research station. Samples of diatoms from previous season were used for demonstration of diatom diversity among different types of lakes.

Discharge measurements have been done on chosen water streams to demonstrate different reactions of catchments to climatic forcings. Field techniques of hydrological measurements have been demonstrated, and all students participated on the long-term project of establishing a hydrological monitoring network. Students had the opportunity to study this data after they have been downloaded at the end of expedition. Special focus has been put on demonstrating fluvial activity of polar water ecosystem especially in highly glaciated and thus variable Bertilbreen and Svenbreen catchments, where M. Caletka elaborated his individual research project.

Besides this, a paleolimnological study on lakes Mimerdalen 2 and Mathiessondalen 3 has been done. Students were made familiar with techniques used for lake sediment sampling, processing of the sampled material and preparation for further analyses. We especially focused on using gravity corer to extract sediment cores from deeper lake basins and then process basic sample division and preparation for transport. Samples and data collected during this study will serve for continuation of Master thesis of M. Roman and E. Pinseel as well. Fig. 2.3.2. represents core taken in Garmaksla (11.8.2014) lake for further pigment analyses.

Fig. 2.3.2. Garmaksla core.

Marine environment has been studied as well. A gradient from Nordenskiold tidewater glacier towards deep sea environment was examined again after a year. (Figs. 2.3.3. and 2.3.4.). Basic physico-chemical parameters were measured and the influence of freshwater inflow to marine environment was demonstrated. Vertical stratification of selected measured features was shown. Zooplankton samples were collected and later examined in the laboratory (E. Kalčíková). A gradient from glacier front to the deep sea environment of the fjord has been established and sampled four times per season. Marine plankton net was used to sample zooplankton from 80 meters depth where possible. Dynamics of *Calanus hyperboreus* population was studied in spatial and temporal scale as shown in Fig. 2.3.5. Possible relationship with marine water properties (especially changes in salinity and fresh water inflow from glacier were taken into account) was studied – study design regarding the salinity distribution is shown in figure X. Basic features of tidal movement and ocean currents and wave erosional force was demonstrated during several field trips.

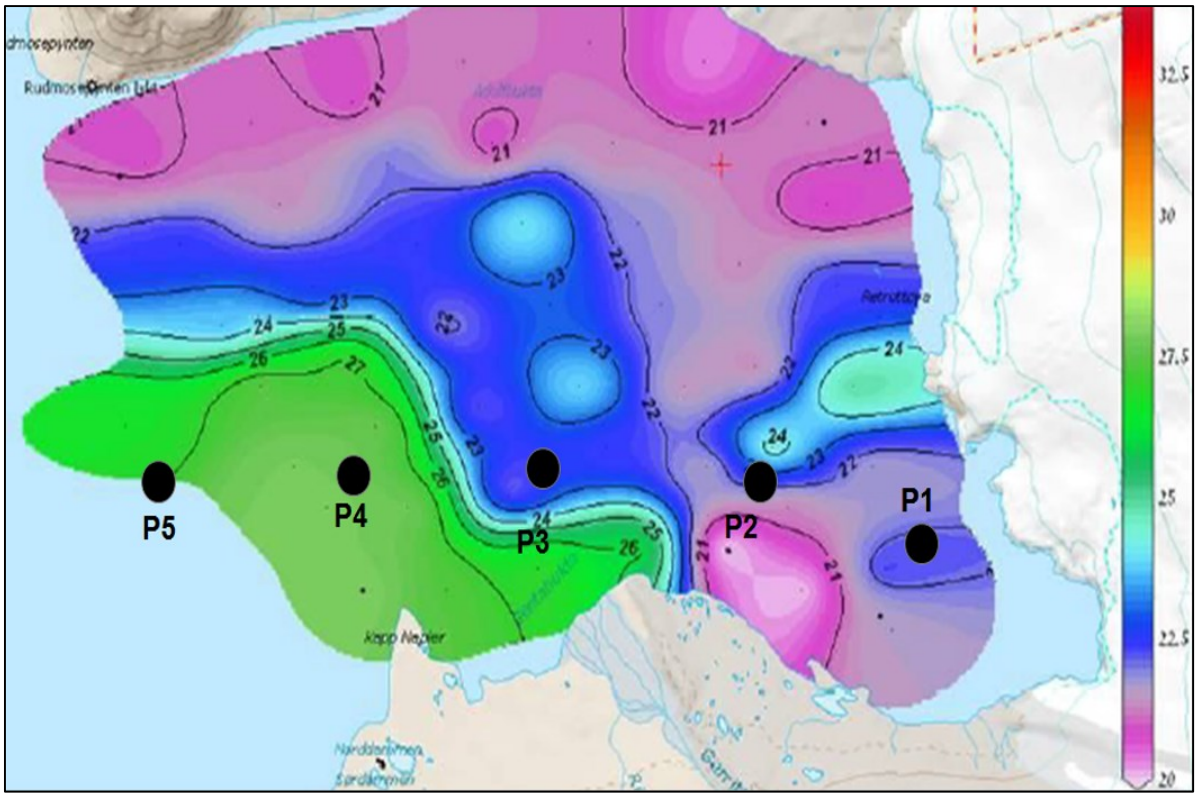

Figure. 2.3.3. Adolfbukta salinity map with location of 5 sampling points.

Fig. 2.3.4. Zooplankton sampling near Nordenskiold glacier.

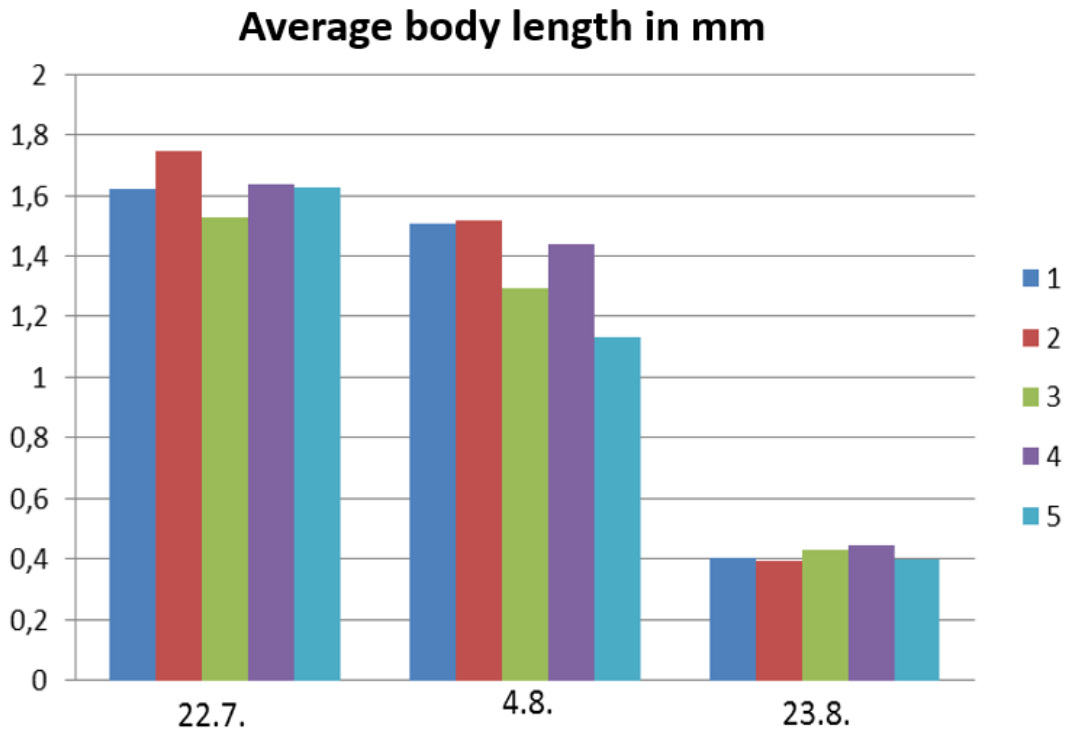

Fig. 2.3.5. Average body length of *Calanus hyperboreus* sampled in the studied area.

Fig.2.3.5. Installing sampling buckets on Nordenskioldbreen

Special attention this season was paid on glacial ecosystems, especially within a research project on Nordenskiold glacier. This locality was visited several times focusing on surface hydrology of a supraglacial lake in the central part of the Nordenskioldbreen. A subglacial features were demonstrated in the ice cave on the right side of Nordenskild glacier, where a safe insight in the body of glacier is possible. A special research project focused on cryoconite diatom community composition was carried out by Petra Vinšová with help of Jakub Žárský as well. Report on this work is to be found in the Research report (Fig. 2.3.5.).

A common work on studying lake ecosystems was supported by an individual project of Tereza Sankotová with her interest in bathymetry mapping (Fig. 2.3.6.). Several lakes were measured to make the bathymetry collection complete (most of the lakes were measured during previous seasons). An interesting work has been done on Ragnar lake which is directly affected by retreating Ragnar glacier changing progressively its morphology both of its bottom but also the shore line. Repeated bathymetry measurement of the same area as in 2011 show increase of

depth of more than 8 meters in some parts of the lake. This study will be processed in more detail next season.

Fig. 2.3.6. Working at Garmaksla lake with rubber boat (sediment sampling and bathymetry mapping).