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Title: *Estimation of summer zooplankton production in a glacial Arctic fjord (Hornsund, Svalbard)*

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The rapid development of optical in situ plankton counters has increased significantly the understanding of marine processes, including quantitative assessments of zooplankton production in regions exposed to the most dramatic changes in climate.

The present study was performed in Hornsund - the southernmost, glacial fjord on the west coast of Spitsbergen, which was selected as a European Marine Biodiversity Research Site representing typical Arctic marine ecosystem. Thirteen glaciers strongly modify the physical environment of the fjord by discharging high loads of fresh water and inorganic suspensions, which is of great importance for biological production.

Data were collected in July 2012 by a towed instrument platform equipped with a Laser Optical Plankton Counter (LOPC), Conductivity-Temperature-Depth sensor (CTD) and fluorometer in 28 vertical hauls from surface to the bottom as well as in horizontal continuous hauls (9 h) performed along four transects in the upper euphotic layer. Traditional zooplankton net sampling was performed with a MPS (Multi Plankton Sampler, 180-µm mesh) in vertically stratified hauls from bottom to surface at four stations to supplement the high-resolution measurements with taxonomical zooplankton information. The location of all stations and transects were set so as to cover the whole fjord evenly and to study open fjord waters along with glacial bays.

The application of normalized biomass size spectrum (NBSS) theory to zooplankton data enabled us to estimate the secondary production as well as the trophic levels (TLs) of particular zooplankton communities. Stations located near glaciers were characterized by higher plankton biomass and potential secondary production than stations located in the centre parts of the fjord. TLs differed significantly between open and glacial fjord waters. Comprehensive assessment of the production and TLs of plankton communities (whole investigated community and size-separated for mesozooplankton and Calanus communities) proved to be a powerful tool to understand processes in the physically and biologically variable Hornsund fjord ecosystem. The understanding of processes occurring in ice-associated waters is an essential basis for future modelling and understanding the consequences of observed changes in the Arctic.