Benthic size spectra, biomass and production along the bathymetric gradient in the Arctic Ocean (Fram Strait, 79°N).

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We present bathymetric patterns in benthic community structure and functioning at the LTER (Long-term Ecological Research) observatory HAUSGARTEN in the Fram Strait. Meiofauna, macrofauna and sediments were sampled at 15 stations along a bathymetric gradient from Spitsbergen coastal waters (100-300m) across the Vestnesa Ridge (1000m) down to the Molloy Hole (5561m). Benthic organisms were identified, enumerated and measured to obtain individual dimensions, biovolume and biomass. Secondary production, respiration and carbon demand were estimated based on individual biomass data. Benthic size spectra were constructed by plotting the biomass or production against the log2-transformed size classes.

Benthic standing stocks, production and carbon demand declined with depth alongside with the decline in food quantity and quality (as indicated by POC and chlorophyll *a* content in sediments). Compared to those for the meiofauna, bathymetric declines were stronger for macrofauna and a transition towards a system dominated by smaller organisms in deeper ocean zones could be documented. Meiofauna:macrofauna biomass and production ratios increased from 0.1 and 0.6, respectively, in coastal waters to 0.3 and 1.9 on the rise (4042-5102m). The benthic biomass size spectra were bimodal in shape, the width of size spectra declined with increasing depth (from 32 to 23 classes). A reduction of the number of size classes was stronger in macrofaunal part of the spectra. The largest and the smallest size classes as well as the peak in biomass for macrofauna were shifted towards smaller sizes in deeper zones. Fragmented size spectra observed at the two stations (including the Molloy Hole) could be interpreted as effects of physical sediment disturbance (by currents or bioturbation) and resulted in dramatic increase in meiofauna:macrofauna ratio in biomass (0.8) and production (6.5) in the Molloy Hole. The presented patterns are likely to be modified by on-going regional changes in ice coverage and productivity, and the food supply to the deep sea in the course of the climate warming.

Keywords: size spectra; benthic biomass; Arctic Ocean; deep-sea; benthic secondary production