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The use of underwater video mosaics for comparative analysis of benthic megafauna in the upper sublittoral of glaciated and ice-free Arctic fjords

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Abstract

Increased melting and retreat of glaciers on Svalbard leads to the release of coastal marine habitats in the upper sublittoral for colonization by benthic macroorganisms. The study of this process is important for understanding the processes occurring in the Arctic. However, complex bottom topography and the presence of floating ice significantly complicates the use of traditional sampling methods, forcing to look for alternative approaches. One such technique is underwater visual technology, which has grown in popularity in recent decades based on its effectiveness in hard-to-reach places. In our work, we show that the use of an underwater video mosaic based on video filming along transects in the upper sublittoral can be a reliable method for identifying communities of visible macro-fauna, as well as for comparative analysis of glaciated and ice-free Arctic habitats.

Underwater video filming was carried out in July-August 2018-2019 in the upper sublittoral (2-66 m) of Hornsund and Isfjord areas (western Svalbard), representing two ice-free and two glaciated sites. The 2.8 hours of video materials were obtained using an ROV and "drop-down" video cameras. Video footage was transformed into 148 video mosaics, from which 35 biological features (morphologic taxa) were identified to the lowest possible taxonomic level, which were further ascribed to benthic functional groups (feeding type and mobility mode), and those were used for further analysis of benthic communities.

The study showed that benthic communities near retreating glaciers are largely dominated by mobile fauna and scavengers, while communities in ice-free sites are more diverse and consist of sessile and discretely mobile suspension feeders and other groups of benthos. Moreover, the morphological and functional composition of macrofauna reflected also conditions in turbid water riverine bays. The underwater imagery proved to be a rapid and sufficiently reliable method for the characterization of benthic communities in the Arctic upper sublittoral.

Keywords

Benthic communities, Underwater video, Video mosaics, Arctic fjords