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# Biogeochemistry of sediments from restricted exchange environments of Kandalaksha bay, White Sea, Russian Arctic

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The Arctic has come under intense scrutiny by the scientific community in recent years. The White sea of Russian Arctic is characterised by extreme diversity of enclosed estuarine systems that are often sites of unique biota. The present study focuses on the sediments of the inner part of Kandalaksha bay, adjacent to the Karelian shore of the White sea. Due to the endogenous crustal uplift (4 mm per year an average), this bay contains a continuum of shallow environments, ranging from estuaries of different types to separating basins where water exchange is severely restricted. The evolution of sediments here is caused by specific depositional conditions, which are strongly affected by small-scale hydrological and hydrodynamic processes unique for each particular area.
The detrital, non-detrital (labile) and organically bound fractions of Fe, Mn, Cu, Zn, Pb, Cr, Li along with TOC, n-alkanes, granulometry and bacteria species distribution were determined in surface sediment samples from representative separating basins and small exchange environments of the Karelian shore. The sediments studied tended to be terrigenous with major input of organic matter from both terrestrial remains and autochthonous microbial sources. According to sediment quality guidelines, all trace-metal contents were below the threshold levels. The strong positive correlation between labile Fe, Mn, Cr, Zn and total Li revealed their association with Fe-hydroxides and clay minerals, while Pb and especially Cu exhibited their affinity to organic matter. The metals in sediments studied occur mainly in a biogeochemically stabile mineral-incorporated form, which comprises 77-99% of total metal content. The contents of labile form were high for Fe, Mn and Cr (up to 7.5 %) in sediments from separating basins, which are also enriched in clay fraction <0.01 mm (up to 60%), TOC (5-20%) and hydrogen sulfide. This is due to the anaerobic conditions formed in sediments in the coarse of separating process. In such environments with restricted water exchange with an open sea, from one side, and permanent organic matter input from land, from the other side, the mass extinction of marine biota with simultaneous spread of microbiota take place. Thus, in the basins studied the colonies of Thiocapsa roseopersicina and Amoebobacter sp., Microcystis sp. and Oscillatotia sp., and Beggiatoa alba (B.Gigantea) were found.
The present study can serve as a basis of an environmenthal assessment of the region and objective anoxia prognosis in Arctic ecosystems.