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Functioning of phytoplankton in the bays of Novaya Zemlya Archipelago, Kara Sea (Blagopoluchiya Bay) during summer.

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Pronounced changes in the climate system that lead to a significant reduction in sea ice cover and active glacier melting provoke the great interest in ecosystem studies of archipelago bays in the high Arctic. In addition to increasing the duration of the open water period, the glacier melting increases the fresh water discharge from the archipelagos and thereby affects the coastal ecosystems of the Arctic region. There is practically no information about the ecosystems of the archipelago bays of the seas of the Russian Arctic due to the inaccessibility. Within the framework of the program “Investigation of the Russian Arctic ecosystems” in 2007-2020 held by Shirshov Institute of Oceanology, modern comprehensive studies of ecosystems of Novaya Zemlya bays, including phytoplankton (as primary producer of organic matter) were carried out. The most frequent observations were conducted in Blagopoluchiya Bay (North Island of Novaya Zemlya Archipelago), which has several coastal runoffs of glacial origin flow.

We found that despite the constant enrichment with allochthonous suspended matter and nutrients with runoff from Novaya Zemlya to the Blagopoluchiya Bay there was no increase in phytoplankton production during the summer open water period (Borisenko et al. Thesis EGU21-9528). On the contrary, the quantitative characteristics of phytoplankton in euphotic layer were extremely low: 0.2-0.7 mkgC/l and 0.03 - 0.15 mkgChl/l. Obviously the inclusion of allochthonous nutrients in local production cycles over the sea part of the bay was difficult.

To clarify the reasons of such low phytoplankton productivity against the background of the enrichment with nutrients of Blagopoluchiya Bay, multifactorial experiments were carried out on the monoculture of the cosmopolitan diatom *Thalassiosira nordenskioeldii* Cleve, 1873, which is one of the dominant species in the Novaya Zemlya bays. Algae culture was isolated from the phytoplankton community of the Kara Sea and adapted to a salinity of 31 psu, typical for Novaya Zemlya bays. In addition to routine cell counting under microscope we used PAM-fluorometry to control the growth characteristics of algae that makes it possible to observe the photosynthetic activity of algae.

It was shown that the functioning of algae is greatly influenced by a significant gradients in salinity. When fresh runoff from Novaya Zemlya is mixed with the seawater of the bay, marine planktonic algae experience significant osmostress and immediately settle down and die off. With a slight

dilution (up to 29-30 psu) of sea water by freshwater from the archipelago, the algae functioned well and doubled their biomass for 2-3 days. At the same time, we found that the algae were well adapted to a significant range of illumination: 40-200 μE, which apparently allows them to maintain high level of photosynthetic activity under the changing arctic illumination during the Arctic summer at high latitudes.

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