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SALT STRATIFIES LAKES NATURALLY SEPARATED FROM THE WHITE SEA SHORE: HYDROLOGICAL STRUCTURE AND MULTIPLE COLORED LAYERS IN THE CHEMOCLINE

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On the shore of the White Sea many coastal saline stratified lakes were formed due to the postglacial uplift resulted in separation of some bays from the sea. Generally these lakes are small (1-4 ha), shallow (max depth 2-10 meters) with a bottom depression where a stagnant salt zone is formed. Their salinity depends on the extent of lake isolation. A typical vertical structure of the lake consists of five layers. 1) The zone of wind mixing about 1 m deep. It is almost fresh in the lakes lacking sea water intrusions, or salt in the lagoons with regular tides. 2) Pycnocline with the sharp salinity gradient. In most continental meromictic lakes pycnocline serves also as a chemocline (the interface between the aerobic and anaerobic zones), but in the studied lakes the redox boundary is situated lower than pycnocline. 3) Salty water saturated with oxygen, often supersaturated up to 200-300 %. In summer it is often the warmest due to the heat accumulation like in a solar salt pond. This layer is larger in the lagoons with regular tides, than in isolated lakes. 4) Chemocline (redox zone) characterized by low illuminance, high nutrients concentration, and presence of H_2S. Brightly colored layers usually are here; often two or three differently colored in same lake. In the upper horizon where the conditions are still microaerobic, or anaerobic with minor concentration of hydrogen sulphide, mixotrophic microorganisms are located (marine cryptophyte flagellates *Rhodomonas* sp. colors water in bright red, freshwater *Cryptomonas* sp. in pinkish, or *Euglenozoa* in greenish). Below the boundary of aerobic and anaerobic environment a dense community of anoxigenic phototrophic bacteria is usually formed, with the leading role of green sulfur bacteria. Green-colored strains color the layer is dense green, and brownish-colored strains - in brown. The layers with mixotrophs and anoxigenic phototrophs can exist in the same lake close to each other, we assume trophic relations between them. Number and biomass of the microorganisms in the redox zone are one or two orders of magnitude higher than those in the other layers. 5) Below the chemocline aphotic anaerobic zone with a high content of hydrogen sulfide, methane, organic substances and biogenic elements is situated. Colored layers in five lakes at the different stages of the separation from the sea were investigated using spectrophotometry, spectrofluorimetry and photobiology (measurements of primary photochemistry of PSII activity). Surface stratum, pycnocline and bottom anaerobic layer are poor of plankton. Thin layer with the algae containing Chl *a* in the lower part of the middle salt water in different lakes is inhabited by different dominant species such as dinoflagellate *Gymnodinium*, small non-identified protococcal algae, small flagellated alga belonging to *Chlorophyta* preliminary identified it as cf. *Micromonas*, green algae *Scenedesmus* and *Carteria*. The maximum density of the phototrophs appears in the chemocline. In spite of the contact with H_2S, photosynthetic apparatus of algae associated with the chemocline is characterized by high values of the maximum quantum yield of primary photochemistry, activity of electron transport, photosynthetic performance of photosystem II, fraction of the active centers and low values of heat dissipation. The specific electron fluxes per reaction center of photosynthesis were higher in green algae in chemocline zone due to the inactivation of some active centers and high dissipation of the inactive reaction centers. Cryptophytes were characterized by higher fraction of active centers and lower dissipation of the inactive reaction centers.

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