

Psychrophilic biomass producers in the trophic chain of the microbial community of Lake Untersee, Antarctica

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Abstract

The study of photosynthetic microorganisms from the Lake Untersee samples showed dispersed distribution of phototrophs within ~80 m water column. Lake Untersee represents a unique ecosystem that experienced complete isolation: sealed by the Anuchin Glacier for many millennia. Consequently, its biocenosis has evolved over a significant period of time without exchange or external interaction with species from other environments. The major producers of organic matter in Lake Untersee are represented by phototrophic and chemolithotrophic microorganisms. This is the traditional trophic scheme for lacustrine ecosystems on Earth. Among the phototrophs, diatoms were not found, which differentiates this lake from other known ecosystems. The dominant species among phototrophs was *Chlamydomonas* sp. with typical morphostructure: green chloroplasts, bright red round spot, and two polar flagella near the opening. As expected, the physiology of studied phototrophs was limited by low temperature, which defined them as obligate psychrophilic microorganisms. By the quantity estimation of methanogenesis in this lake, the litho-autotrophic production of organic matter is competitive with phototrophic production. However, pure cultures of methanogens have not yet been obtained. We discuss the primary producers of organic matter and the participation of our novel psychrophilic homoacetogen into the litho-autotrophic link of biomass production in Lake Untersee.

Key words: trophic chain, chemolitho-autotrophs, photosynthetic microorganisms, psychrophiles, Lake Untersee, Antarctica.