The role of light and concentration gradients in the vertical stratification and seasonal development of phototrophic bacteria in a meromictic lake

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With 6 figures and 1 table

Abstract: The seasonal population dynamics of phototrophic sulphur bacteria and their vertical stratification in Lake La Cruz were studied over two consecutive summers. Development of purple sulphur bacteria occurred just below the oxic-anoxic boundary (the plate located at 14–15 m depth). The principal constituent was a species of Amoebobacter, containing okenone as its main carotenoid and which reached maximal densities at the end of summer \((2.2 \times 10^6\) cells/ml and BChl.-a concentrations of \(111\ \mu g/l\) in September 1987). Green phototrophic bacteria developed below the Amoebobacter layer at a mean depth of 16 m. Pelodictyon clathratiforme was the dominant species, reaching maximal cell concentrations of \(3.1 \times 10^6\) cells/ml and BChl.-d concentrations of \(362\ \mu g/l\), also in September. Growth of these purple and green sulphur bacteria was light-limited, and sulphide was also present in very low concentrations owing to the low sulphate content of the lake. The two thermal stratification periods under study differed noticeably as a consequence of altered meteorological conditions and structural differences in the water column, with a shallower oxic–anoxic boundary and a major development of algal populations in the upper oxic layer during the second period. This reduced the light available to deep phototrophic bacteria, which were unable to attain the biomass achieved in the earlier period. The monimolimnion of Lake La Cruz acts as a refuge for phototrophic bacteria during the mixing period and this is considered to be a key factor in understanding the ecology of these microorganisms.

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