

EFFECTS OF ARTIFICIAL FERTILIZATION OF A HIGH-MOUNTAIN LAKE (VORDERER FINSTERTALER SEE, TIROL).

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Abstract

The epilimnion of Vorderer Finstertaler See, a high-mountain lake (2237 m) was fertilized weekly from July till September 1974 with phosphate (NaH_2PO_4). This experiment was carried out to answer the question: Is the high short-wave radiation or the low nutrient availability the primary responsible factor for the deep stratification of phytoplankton biomass (in 15–20 m depth) during summer stagnation? This phenomenon has been observed in all deep and clear high-mountain lakes, investigated till now.

The fertilization caused a considerable increase in primary production in the upper 10 m of the water column one month after the first addition. Standing crop showed only a slight increase, compared with the years before, but species composition changed towards a dominance of small desmids and μ -chlorophyta which caused an epilimnial biomass maximum, built up about four weeks after the beginning of the experiment, too. O_2 -supersaturation and pH-maxima (up to pH 8.6) (in the years before they never exceeded pH 6.8) were measured in the same layers and at the time of highest primary production levels. Secchi-disk transparency descended down to 1.7 m in the middle of September, whereas the values in the years before ranged between 5 and 8 m.

Total radiation and underwater spectral transmission for blue, green, and red were registered continually.

The results of this experiment indicate that in Vorderer Finstertaler See, and perhaps generally in high-mountain lakes, the high radiation is not primary responsible for the concentration of algae in the deep layers (dependent on the maximum depth of the lakes between 15 and 30 or 50 m). The most important factor seems to be the disproportion of high radiation intensities to minimal nutrient availability in the epilimnion of these lakes.

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