Benthic photosynthesis in an acidic mining lake (pH 2.6)

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ABSTRACT: Natural neutralization of acidic mining lakes is usually limited by the availability of organic carbon. We investigated whether benthic photosynthesis could contribute to primary production in an acidic mining lake (pH 2.6). The occurrence and light dependence of benthic photosynthesis in the lake was investigated using oxygen microelectrodes. Oxygen microprofiles measured in light and darkness were significantly different, indicating photosynthetic activity. The photic zone was 300 µm thick and the highest photosynthetic activity was found at the sediment surface, which was covered by a dense layer of diatoms. These algae, predominantly *Eunotia* spp. and *Pinnularia obscura*, were found to be adapted to low light intensities. The community compensation irradiance was 6.8 µE m^{-2} s^{-1}, corresponding to an annual mean compensation depth of 1.8 m. These results imply that 13% of the lake area could have a net efflux of oxygen from the sediment. Even at an irradiance as low as 1.2 µE m^{-2} s^{-1}, photosynthetic activity was detected. The relatively low light requirements for benthic photosynthesis in this acidic environment may be due to an efficient absorption of red light, the dominant wavelength available in this ferric iron-rich lake. Our results suggest that benthic photosynthesis can play an important role in the biogeochemistry of acidic mining lakes.