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WALZ High Quality Instrumentation for Plant Sciences

Degenerative processes in Lake Idro: anoxia, reducing conditions and internal loadings

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Ecological studies in Lake Idro, performed in the last five years (May 2010 - April 2012 and September 2013 - November 2014), evidenced a progressive deterioration of water quality and ecosystem status. The water column is permanently stratified and the chemocline is presently at about 40-50 m depth, out of 120 m maximum depth. The monimolimnion, which is ~50% of the water volume, is devoid of oxygen, with a concurrent accumulation of Fe^{2+} and Mn^{2+}, methane, dissolved sulphides, ammonium (NH_4^+), soluble reactive phosphorus (SRP) and dissolved reactive silica. Conversely, in surface waters NH_4^+ , SRP and trace metals are almost completely depleted, whilst nitrate is the main nitrogen species. The littoral zone (<10 m depth) is colonized by a wide macrophyte belt, with the dominance of invasive elodeids. The high primary productivity of both phytoplankton and macrophytes is sustained by external nutrient loads and by internal nutrient regeneration, especially SRP.

Critical issues and threats for lake management and recovery have been also identified. The monimolimnion and the surface sediment horizon have accumulated a bulk of phosphorus. Moreover, the strong reducing conditions of the monimolimnion favour the SRP release from sediments which greatly exceeds the external P loading and will bias the effects of reducing external loadings. Conversely, a net inorganic nitrogen loss occurs, due to denitrification processes in the chemocline. The concurrent inorganic N to P ratio imbalance has to be studied as a possible trigger of the development of toxigenic cyanobacteria. Finally, the reducing compounds bulk in the monimolimnion can potentially account for an oxygen demand which is nearly two- threefold the actual oxygen availability. Hence, in case of complete water overturn, oxygen dilution and consumption, might lead to a critical oxygen shortage with a possible collapse of the aquatic food web.