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A review on the Control of Eutrophication in Deep and Shallow Lakes

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Abstract: There has been a much debate about the relative importance of the determination of phytoplankton crops by nutrients (bottom-up control) or by zooplankton grazing (top-down control). Wide acceptance of the importance of nutrient concentrations in water quality deterioration has brought about external nutrient control by which eutrophication is, to some extent, reversible, and which has been proved its effectiveness mostly in deep lakes. In shallow lakes its effectiveness has not been as pronounced, owing to internal nutrient loading. Because the non-linearity of responses of biological systems is much more accentuated in small and shallow lakes. The use of profound effects of top level consumers, such as fish, is called biomanipulation and is generally regarded as a feasible technique in aquatic management, specifically for the control of algal biomass through the trophic pyramid in addition to external nutrient control. However, in deep and large lakes, biomanipulation is less likely to result in improved water quality than in shallow lakes owing to the weakened top-down effect near the bottom of food web. In shallow lakes, if increased water clarity through fish removal was associated with redevelopment of dense macrophytes, sustainable water quality improvement would be achieved due to clear water stabilizing mechanisms of macrophytes.

Key Words: Deep lake, shallow lake, phosphorus, biomanipulation, fish, macrophyte.

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