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Modelling system dynamics and phytoplankton diversity in a Eutrophic lake at Ranchi

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Modelling system dynamics in a hyper-eutrophic lake is quite complex especially with a constant influx of detergents and sewage material which continually changes the state variables and interferes with the assessment of the chemical rhythm occurring in polluted conditions as compared to unpolluted systems. In this paper we present a model for predicting system dynamics in a complex environment. Studies were done on a hyper-eutrophic lake at Ranchi to understand the altered environmental dynamics of the system, and its impact on the plankton community. The lake was monitored regularly for five years (2007 – 2011) and the data collected was used to design a model for evaluating the system. Nutrient dynamics of carbon, nitrates, phosphates and silicates were considered and an attempt was made to coordinate the chemical rhythm with that of the plankton dynamics. Nitrates and phosphates were not limiting (mean nitrate and phosphate concentrations were 1.74 and 0.83 mg l⁻¹ respectively). Free carbon dioxide was found to control the system and interacting with other parameters determines the diversity and dynamics of the plankton community. The N/P ratio determines which group of phytoplankton dominates the community, above 5 it favours the growth of chlorophyceae while below 5 cyanobacteria dominates. The TOC/TIC ratio determines the abundance. The overall system is controlled by the availability of free carbon dioxide which serves as a limiting factor.

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