Ecosystem changes in relation to anthropogenic impacts: Addressing Chilka lagoon, a Ramsar site in India

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Sound scientific knowledge concerning functioning and service appropriation is essential to the management of any ecosystem and Chilka Lake, Asia's largest brackishwater lagoon and a Ramsar site since 1981, is no exception. The Lake, as with any other coastal lagoon, is in the process of transformation ecologically. On the basis of periodic monthly monitoring (at 36 GPS fixed locations) involving a suite of environmental variables following alteration to flushing and salinity regimes associated with a new mouth created in September 2000, it was possible to examine system behaviour over the last two years (2004-'06). This work provided a very large (year round) database dealing with nutrient inputs (ammonia, nitrite, nitrate, phosphate and silicate), chlorophyll *a,* dissolved oxygen, salinity, turbidity, transparency, suspended matter and the others which together offered considerable spatial and temporal clues on the nature of their distribution. Mean monthly nitrogen inputs from catchments revealed that DON constituted up to 74% of total nitrogen. Bacterial denitrification in sediments appeared a key process. From the (integrated) work held so far, it was possible to identify five functional groups – (smaller and larger phytoplankton, microphytobenthos, seagrass and macroalgae – which seem to play a crucial role regulating nutrient dynamics in the lagoon. Phytoplankton (represented by 197 species) in two size fractions (0.2-20 and >20μm) revealed highest (pico/nano) chlorophyll *a* levels (mean 96.94 mg m^{-3}) during March-May 2006 (pre-monsoon) in the northern sector (mean salinity 11 PSU) where also cyanophyceans (e.g. *Microcoleus* sp., *Oscillatoria limnetica*) constituted up to 86% of the total phytoplankton population. There were distinct phytoplankton assemblages (determined through multivariate procedures, PRIMER) each dominated by bacillariophyceans, dinophyceans or cyanophyceans. Microphytobenthos biomass (chlorophyll *a* 10-20 $\mu g.g^{-1}$ sediment dry weight) across lagoon revealed their distinctive contribution to Lake's productivity. Seagrass (e.g. *Halodule*) and macroalgae (e.g. *Chaetomorpha* and *Gracillaria*) distribution and biomass (wet wt. 2-4 kg m^{-2}) along with several aquatic angiosperms confirmed their importance to the energetic and overall nutrient pathways and budgets for the Lake.