AOGS 2005

Modelling and Simulation of Plankton Dynamics in Chilika Lagoon (East Coast of India)

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Chilika Lagoon (19$_0$28'N and 19$_0$54'N and 85$_0$06'E and 85$_0$36'E) on the east coast of India is the largest brackish water lagoon with estuarine character. On account of its rich biodiversity and socio – economic importance, it was designated as a 'Ramsar site'- a wetland of international importance in 1981. Interest in detailed analysis of the circulation, biotic and abiotic factors affecting the lagoon is due to the opening of the new additional mouth connecting the Bay of Bengal to resolve the threat to its environment from various factors – Eutrophication, weed proliferation, siltation, industrial pollution and depletion of bioresources.

Productivity of the lagoon depends on the distribution of nutrients and algal forms. Due to the dynamic circulation in the lagoon there is a thorough exchange of nutrients and planktons. Though there have been various taxonomic studies as well as detailed accounts of the distribution and seasonal abundance of algal forms in four different sectors (division due to hydrological conditions and salinity variations (2 – 32 ppt)), very little work is done in terms of modelling the circulation or biological production in the lagoon. The present study is aimed at studying the seasonal and interannual variability of marine plankton in Chilika through

(i) purely ecological model - a three-compartment model consisting of a system of rate equations for nutrients, phytoplankton and zooplankton. The model is solved for different sectors as they have different sediment nutrient concentrations depths and salinity.

(ii) coupled physico-biological model - a 2D depth averaged model representing the spatio-temporal dynamics of the circulation, nutrients, phytoplankton and zooplankton.

The observed values obtained from different sectors are for diatoms, blue-green algae and dinoflagellates. Our model results compare well with the average number per litre of the phytoplankton population in the different sectors and different months.

Keywords: Chilika Lagoon; NPZ model; physico-biological model.