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EFFECT OF ALGAL BLOOMS DUE TO TROPHIC INTERACTION : A QUALITATIVE STUDY

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Abstract. In this paper, we consider a mathematical model of an outbreaks that links the trophic structure of primary and secondary producer in the estuary. Although the environmental and meteorological factors are cosidered to be exogenously induced physical factors that unleashed the bloom, but ensuing duration and severity of an outbreak are largely due to the subsequent biological interplay between organisms. We give results that are qualitatively resemble with those observed in the estuary and thereby offers an insight for the factors that sustain a bloom.

Keywords. Phytoplankton bloom, endogenous trophic interaction, Lienard equation,limit cycle, Hopf-bifurcation, stability.

1. Introduction

Plankton populations undergo dramatic surges.Rapid increase and decrease by factors are observed, often separated by relativly stable interludes.We propose a description of plankton communities as excitable system.In particular, we present a model for the evolution of pico-and nanoplankton and microzooplankton populations which resembles models for the behavior of excitable media. The parameter dependency of the various "excitable" phenomena, threshold and slow recovery, is clear and permits ready investigation of the influnce of properties of the physical environment, including variations in nutrient fluxs or population levels. Some of the mechanisms proposed include the availability of trace elements such as (Provasoli,1978) and vitamin B_{12} (Nishjima and Hata,1989), the vertical stability of the water column (Cloren,1991)and salinity.Algal blooms occour seasonally almost certainly included by changes in temperature or nutrient availability, connected with seasonal changes in thermocline depth and strength, and consequent mixing. Growth of algae have been studied in estuaries and coastal areas for a long period of time (Canale et.al.,1976; Vidal, 1980; Powel and Richerson,1985; Legovic,1997). In recent years there have been more severe bouts of certain algal species along coastal areas. There is mounting world-wide concern for these unusual bloom because of their adverse impact on fisheries, aquaculture and from the eutrophication that results from their collapse. The bloom events are marked by a sudden proliferation of cell counts that exhibit haphazard fluctuations, followed by rapid disintegration. The example