Mathematical Analysis in a Model of Obligate Mutualism with Food Chain Populations

R. Kumar[1+] and H.I. Freedman[2*]

[1] *Department of Mathematics, Dayalbagh Educational Institute, Dayalbagh Agra (U.P.) 282005, India*

[2] *Applied Mathematics Institute, Department of Mathematical Sciences, University of Alberta, Edmonton, Alberta, Canada T6G 2G1*

and

[2] *School of Mathematical Sciences, Swinburne University, Hawthorn, Victoria 3122, Australia*

Received: June 26, 2000; Revised: June 14, 2001

Abstract: This paper is concerned with a three-species food chain whose populations interact with a mutualist. The mutualism is obligate for one of the predators, and is modeled by a system of autonomous ordinary differential equations. Persistence and extinction criteria are developed in the cases of trivial, periodic and almost periodic dynamics.

Keywords: *Food chain; obligate mutualism; persistence; extinction; stability; periodic solutions; almost periodic solutions.*

Mathematics Subject Classification (2000): 34A34, 34C25, 34D20,92B99.