ASYMPTOTIC BEHAVIOR OF
N-SPECIES LOTKA-VOLTERRA SYSTEMS

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Abstract. In this paper, the n-species Lotka-Volterra systems are considered. The boundedness, existence of nonnegative equilibrium and persistence of such system are investigated. Some easily verifiable sufficient conditions and necessary conditions are obtained which guarantee the boundedness, existence of nonnegative equilibrium, as well as persistence of n-species Lotka-Volterra systems.
Keywords. n-species Lotka-Volterra system, Boundedness, Nonnegative equilibrium, Persistence, permanence.
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1   Introduction

The n-species Lotka-Volterra system is an important population model in mathematical ecology and has been studied by many scholars[1-7]. The authors of [1-4] studied the asymptomatic behavior of the two-species Lotka-Volterra competition model and two-species nonautonomous diffusion Lotka-Volterra models respectively. Freedman [5] and Hutson [6] considered persistence and permanence in two or three species Lotka-Volterra systems. Chen [7] gave a sufficient and necessary condition for the permanence of three-species Lotka-Volterra systems. It also presented some sufficient conditions for the permanence of n-species Lotka-Volterra systems.

In this paper, we study the problems about boundedness, nonnegative equilibrium, and persistence or permanence of n-species Lotka-Volterra systems. From [7], we know that a system is bounded if it is permanent and it may not be permanent if it has nonnegative equilibrium. In the following, we first discuss boundedness of n-species Lotka-Volterra systems. Then we investigate the property of nonnegative equilibria of such system and present a formula satisfied by the nonnegative equilibria. Based on the above result, we obtain some easily verifiable sufficient conditions and necessary conditions for the permanence of n-species Lotka-Volterra systems.