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Large Time Behaviour for a Prey-Taxis System

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Abstract. The large time behaviour for a more general prey-axis system is considered. The asymptotically uniform boundedness of solutions in a suitable space is derived to ensure the dissipativity of the system. Based on the dissipativity of the system, the existence of a global attractor is obtained. The main technique used in this paper is the L^p-L^q estimation method.

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Key Words: Asymptotic behavior; prey-taxis; dissipativity; global attractor; L^p-L^q estimate.

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1 Introduction

This paper deals with the following parabolic system

$$\begin{cases} u_t = \Delta u - \nabla\cdot(uP(u,v)\nabla v) + G_1(u,v), & (x,t)\in\Omega\times(0,T),\\ v_t = \Delta v + G_2(u,v), & (x,t)\in\Omega\times(0,T),\\ \dfrac{\partial u}{\partial n} = \dfrac{\partial v}{\partial n} = 0, & (x,t)\in\partial\Omega\times(0,T),\\ u(x,0)=u_0(x), v(x,0)=v_0(x), & x\in\Omega, \end{cases} \tag{1.1}$$

which was introduced by Karevia and Odell [1] to describe a direct motion of the predator u in response to a variation of the prey v, where $\Omega\subset\mathbb{R}^n (n\geq 1)$ is a bounded domain with smooth boundary, the predator u and the prey v interact in terms of the functions $G_1(u,v)$ and $G_2(u,v)$, and the term $-\nabla\cdot(uP(u,v)\nabla v)$ reflects the prey-taxis mechanism.

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