

# Low-dimensional dynamics of a chaotic food chain model

J. Duarte<sup>1</sup>      C. Januario<sup>1</sup>      N. Martins<sup>2</sup>

May 16, 2007

1. Department of Chemistry, Mathematics Unit, Instituto Superior de Engenharia de Lisboa.1949-014 Lisboa, Portugal
2. Department of Mathematics, Instituto Superior Técnico, Av. Rovisco Pais 1, 1049-001 Lisboa, Portugal

An ecosystem is a web of complex interactions among species. With the purpose of understanding this complexity, it is necessary to study basic food chain dynamics. Although there is an elegant interpretation of ecological models in terms of chaos theory, the complex behavior of chaotic food chain systems is not completely understood. In the present work we study a specific food chain model from the literature. Using results from symbolic dynamics, we characterize the topological entropy of a Poincaré return map that replicates salient aspects of the dynamics of the model. The analysis of the variation of this numerical invariant, in some realistic system parameter region, allows us to quantify and to distinguish different chaotic regimes. This work is still another illustration of the role that the theory of dynamical systems can play in the study of chaotic dynamics in life sciences.