

Jorge Duarte^{1,2}, **Cristina Januário**¹, **Nuno Martins**² and **Josep Sardanyés**³

e-mail: jduarte@deq.isel.ipl.pt

e-mail: cjanuario@deq.isel.ipl.pt

e-mail: nmartins@math.ist.utl.pt

e-mail: josep.sardanes@upf.edu

¹ ISEL - ENGINEERING SUPERIOR INSTITUTE OF LISBON, MATHEMATICS DEPARTMENT, RUA CONSELHEIRO EMÍDIO NAVARRO, 1, 1949-014 LISBOA, PORTUGAL

² CENTRO DE ANÁLISE MATEMÁTICA, GEOMETRIA E SISTEMAS DINÂMICOS, DEPARTAMENTO DE MATEMÁTICA,, INSTITUTO SUPERIOR TÉCNICO, AV. ROVISCO PAIS 1, 1049-001 LISBOA, PORTUGAL

³ INSTITUTO DE BIOLOGIA MOLECULAR Y CELULAR DE PLANTAS, CENTRO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS-UPV, INGENIERO FAUSTO ELIO S/N, 46022 VALÈNCIA, SPAIN

Chaos and crises in a model for cooperative hunting

In this work we investigate the population dynamics of cooperative hunting extending the McCann and Yodzis model for a three-species food chain system with a predator, a prey, and a resource species. The new model considers that a given fraction σ of predators cooperates in prey's hunting, while the rest of the population $1 - \sigma$ hunts without cooperation. We use the theory of symbolic dynamics to study the topological entropy and the parameter space ordering of the kneading sequences associated with one-dimensional maps that reproduce significant aspects of the dynamics of the species under several degrees of cooperative hunting. Our model also allows us to investigate the so-called deterministic extinction via chaotic crisis and transient chaos in the framework of cooperative hunting.