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Abstract: The theory of ecological stoichiometry considers ecological interactions among species with different chemical compositions. Both experimental and theoretical investigations have shown the importance of species composition in the outcome of the population dynamics. A recent study of a theoretical three-species food chain model considering stoichiometry [B. Deng and I. Loladze, Chaos 17, 033108 (2007)] shows that coexistence between two consumers predating on the same prey is possible via chaos. In this work we study the topological and dynamical measures of the chaotic attractors found in such a model under ecological relevant parameters. By using the theory of symbolic dynamics, we first compute the topological entropy associated with unimodal Poincareacute return maps obtained by Deng and Loladze from a dimension reduction. With this measure we numerically prove chaotic competitive coexistence, which is characterized by positive topological entropy and positive Lyapunov exponents, achieved when the first predator reduces its maximum growth rate, as happens at increasing delta(1). However, for higher values of delta(1) the dynamics become again stable due to an asymmetric bubble-like bifurcation scenario. We also show that a decrease in the efficiency of the predator sensitive to prey's quality (increasing parameter zeta) stabilizes the dynamics. Finally, we estimate the fractal dimension of the chaotic attractors for the stoichiometric ecological model. (c) 2010 American Institute of Physics. [doi: 10.1063/1.3464327]

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