Complex Dynamics of a Four Species Food-Web Model: An Analysis through Beddington-Deangelis Functional Response in the Presence of Additional Food

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Abstract : The four-dimensional food web system consisting of two prey species for a generalist middle predator and a top predator is proposed and investigated. The middle predator is predating both the prey species with a modified Holling type-II functional response. The food web model is found to be well-posed, bounded, and dissipative. The proposed model's essential dynamical features are studied in terms of local stability. The four species' survival is explored, and persistence conditions are established. The numerical simulations reveal the persistence in the form of a chaotic attractor or stable focus. The conclusion is that providing additional food to the middle predator may help to control the food chain's chaos.

Keywords : predator-prey model, existence of equilibrium points, local stability, chaos, numerical simulations

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