

Invasion and Extinction Dynamics in Foodwebs

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Foodwebs represents the species interactions in a local habitat. When a new species invade a local habitat, their competitive interaction with resident species may result in cascade of extinction of resident species, but the condition for extinction and the evolution of foodweb under such invasion events are not well understood. We here present a study on the dynamics of invasion and extinction using the generalized Lotka-Volterra equations. When the foodweb has a tree-structure, we prove that there is a unique, globally stable solution that determine the species that will extinct and the species that coexist stably. Using this, we propose a protocol that describes the repetition of invasion and extinction events in a foodweb, and analyze the dynamics and the resulting foodweb structure. We further simplify the process to the Invasion Extinction Model, which gives a power law distribution of the species life time, consistent with the simulated invasion extinction dynamics.

Reference: J. O. Haeter, N. Mitarai, and K. Sneppen, Plos Comp. Biol. 12 (2016): e1004727; J. O. Haeter, N. Mitarai, and K. Sneppen doi: <https://doi.org/10.1101/097907>; J. O. Haeter, N. Mitarai, and K. Sneppen, under review.

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