Food Web Dynamics and Metacommunities

Chapter 3

Metacommunity Dynamics

Robert D. Holt and Martina E. Hoopes

Introduction

The mass effect, or product-related effects on food web structure, comes from the fact that, with higher density of producers (P), the impact of each consumer (C) is reduced, because the total available food is divided among all consumers. This leads to a reduced impact of each consumer on the food web structure, which can affect the importance of regional processes on the ecosystem, such as nutrient cycling and energy flow. In addition, the mass effect can also affect the spatial distribution of consumers and producers, leading to changes in the structure and function of food webs.
Trophic Island Biogeography: A Step Toward Generalization

The nested specialist models for food chains discussed above provide a first step toward generalization of island biogeography models for food chains. We suggest that the models can be extended to include the effects of trophic interactions. The basic idea is to consider the island biogeography models for food chains as special cases of more general models that incorporate trophic interactions. The general models can then be used to predict the effects of factors such as habitat size, island area, and predator-prey interactions on species richness at different trophic levels.

The trophic island biogeography models are based on the hypothesis that species richness in a community is determined by the balance between species immigration and extinction. The models predict that species richness will increase with island area and decrease with habitat size. However, the models do not take into account the effects of trophic interactions, which can have a significant impact on species richness.

To incorporate trophic interactions into the models, we suggest using a trophic matrix to represent the flow of energy and resources among different trophic levels. The trophic matrix can then be used to calculate the effects of trophic interactions on species richness.

The trophic island biogeography models are a step toward generalization of island biogeography models for food chains. However, more work is needed to fully understand the effects of trophic interactions on species richness.