

# Species interactions and diversity: a unified framework using Hill numbers

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## Abstract

Biodiversity describes the variety of organisms on planet earth. Ecologists have long hoped for a synthesis between analyses of biodiversity and analyses of biotic interactions among species, such as predation, competition, and mutualism. However, it is often unclear how to connect details of these interactions with complex modern analyses of biodiversity. Using methods pioneered in studies of ecological-evolutionary dynamics, we link biotic interactions and changes in measures of biodiversity such as Hill numbers. We show that analyses of biodiversity obscure details about biotic interactions. For example, identical changes in biodiversity can arise from predation, competition or mutualism, locally or across a metacommunity. Our approach indicates that traditional models of community assembly miss key facets of diversity change. Instead, we suggest that analyses of diversity change should focus on partitions, which measure mechanisms that directly shape changes in diversity, notably relative fitness and immigration, rather than traditional analyses of biotic interactions.

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