



NICHE HIERARCHY

Written by Dr. George Sugihara while at Princeton University, this pioneering work represents a unifying synthesis to tie together four disparate areas of ecology: 1) topological structure of food webs; 2) ecosystem dynamics; 3) ecosystem/food web assembly; and 4) universal patterns of species abundance. Based on the premise that deep general principles are likely to be associated with widely observed empirical regularities, it is organized around uncovering and explaining such patterns for each of the four research areas, and then showing how they interrelate. While this book has historic interest, it is even more relevant today in its findings and overall scope.

KEY FEATURES

- Contains one of the earliest food web data atlases
- Shows the development of several novel data-transformation models (transformations of food web matrices) based on graph theory and algebraic topology
- Includes Sugihara's "Resource Graph", the "Consumer Overlap Graph", and the "Simplicial Complex" model of the niche
- Finds that the simplicial complexes of real niche spaces do not have holes but are densely packed
- Shows that chordality (triangulation) is a ubiquitous topological feature of food webs
- Demonstrates the first, and only, empirical ecological assembly rule mathematically deduced from data. The rule involving conservative assembly with an underlying ordering of resources is the basis of current methods for generating model food webs
- Relates the observed topological regularities and the assembly rule to higher dynamic stability in model ecosystems
- Shows how the specific topological features uncovered in food webs resonate with the niche hierarchy model of species abundance – a model with no free parameters that reproduces two universal empirical regularities in ecological species-relative-abundance data (the ubiquitous canonical lognormal species abundance distribution and the species area constant $z=1/4$)

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