

THE STRUCTURE AND EVOLUTION OF COMPETITION-ORGANIZED ECOLOGICAL COMMUNITIES

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1. Introduction. It frequently is asserted that conservation biology can advance only by transcending the current species-by-species approach and refocusing on whole-ecosystem preservation [13]. But a strong scientific basis does not presently exist for carrying out ecosystem viability analyses, and in particular the theory of community ecology seems to be in disarray [3]. Even classical equilibrium co-evolutionary theory [8] which remains the basis for much subsequent work, seems to have dissolved into controversy, with disputes over what had seemed previously to have been settled principles [2, 9].

It is our view that much of this confusion and controversy has resulted from an excessive level of abstraction in the models employed, making it difficult to distinguish between individual and group control mechanisms, and confounding behavioral and evolutionary processes of adaptation.

Our response is to present a more mechanistic, less phenomenological class of models, in which these separate controls and processes are explicitly distinguished. To our knowledge, ours is the first attempt to systematically incorporate both behavioral optimization and strategic evolutionary processes into a single model.

This article is the first of several that we intend to devote to this subject. Here we describe the model precisely and undertake its theoretical analysis.

In a second article we shall apply the analytical results to specific situations, and thereby reexamine classical questions such as competitive exclusion and niche displacement. This enables us to investigate

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