

Tackling Biocomplexity: The Role of People, Tools, and Scale

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Human activities triggered by explosive population growth, such as use of commercial fertilizers and fossil fuels, are rapidly altering Earth's environment (e.g., Likens 1992, Pauly and Christensen 1995, Vitousek et al. 1997). Many ecologists seek to understand, predict, and manage ecological responses to anthropogenic change. However, the highly complex behaviors of Earth's biological systems make achieving these goals difficult (Holling 1999), especially using conventional approaches to science. Consequently, we need to develop new research approaches to successfully tackle the scientific issues raised by human-induced environmental change.

The National Science Foundation (NSF) explicitly recognized the need for innovative research strategies in developing the "Biocomplexity in the Environment" program, which promotes creative, interdisciplinary approaches to understanding the complexity of biological systems (see www.geo.nsf.gov/ere/). Michener and colleagues (2001) define biocomplexity as "properties emerging from the interplay of behavioral, biological, chemical, physical, and social interactions that affect, sustain, or are modified by living organisms, including humans" (p. 1018). Characteristics of biocomplexity include nonlinear or chaotic dynamics, unpredictable behavior, and interactions that span multiple levels of biological organization or spatiotemporal scales. Examples of biocomplexity research projects include studies of the emergent properties of biological systems, linkages between climate and the distribution and abundance of organisms (including diseases), and interrelations between humans and the natural ecosystems on which they depend.

Editor's note: This article was derived from Dr. Cottingham's plenary address at the 2001 AIBS annual meeting.

THIS ARTICLE USES CASE STUDIES FROM AQUATIC ECOSYSTEMS TO DEMONSTRATE THAT A KEY COMPONENT OF A SUCCESSFUL BIOCOMPLEXITY RESEARCH PROJECT IS THE CAREFUL CHOICE OF PEOPLE, TOOLS, AND SCALE TO ANSWER THE QUESTIONS UNDER INVESTIGATION

Components of successful biocomplexity research projects

Speakers for the 2001 AIBS annual meeting were encouraged to suggest how the research community might address questions involving biological diversity and biocomplexity. I developed my talk around the idea that two key components of successful biocomplexity research projects are asking hard and important, but answerable, questions and carefully identifying the appropriate people, tools, and scales to answer those questions. I focus here on the latter component—people, tools, and scale.

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