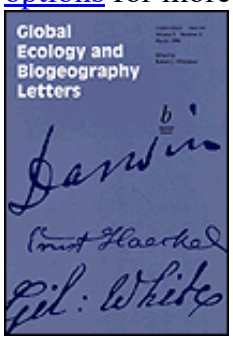

Mangrove Biodiversity and Ecosystem Function

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MANGROVE SPECIAL ISSUE

Mangrove biodiversity and ecosystem function

CHRISTOPHER B. FIELD[1]*, JULIE G. OSBORN[1,2], LAURA L. HOFFMAN[2], JOHANNA F. POLSENBERG[1,2], DAVID D. ACKERLY[2], JOSEPH A. BERRY[1], OLLE BJÖRKMAN[1], ALEX HELD[3], PAMELA A. MATSON[4] and HAROLD A. MOONEY[2]

[1]*Department of Plant Biology, Carnegie Institution of Washington, Stanford, CA 94305, U.S.A.,* [2]*Department of Biological Sciences, Stanford University, Stanford, CA 94305, U.S.A.,* [3]*CSIRO Division of Land and Water, Canberra, ACT 2601, Australia and* [4]*Department of Geological and Environmental Sciences and Institute for International Studies, Stanford University, Stanford, CA 94305, U.S.A.*

Abstract. Direct, manipulative experiments can yield important insights into the role of biodiversity in ecosystem function, but they are intrinsically limited when it comes to aspects of this relationship that emerge over long temporal and large spatial scales. Natural experiments with model systems can be a powerful complement to direct, manipulative experiments, especially where the processes that regulate biodiversity have no more than modest direct impacts on ecosystem function. Mangrove ecosystems on continental land masses and isolated islands offer unusual potential as natural experiments for biodiversity and ecosystem function studies, largely because sites with similar physical environments can have clear contrasts in the diversity of the dominant autotrophs. These contrasts provide a starting point for exploring the role of species diversity of higher plants in modulating biogeochemical functions (e.g. production, nutrient cycling), ecological functions (e.g. habitat for organisms in different tropic levels), and anthropogenic functions (e.g. maintenance of fisheries, management of sediments), on a range of time scales.

Key words. Biological diversity, ecosystem goods and services, intertidal, mangrove, model ecosystems, natural experiments, vegetation mapping from remote sensing.

BIODIVERSITY AND ECOSYSTEM FUNCTION

What are the functional implications of differences in biological richness? This question, long at the core of the search for general principles in ecology (Elton, 1958; May, 1973; Walker, 1992; Tilman & Downing, 1994), has acquired new relevance and urgency with the growing realization that human activities are eroding natural stocks of biological diversity (Ehrlich & Ehrlich, 1981; Lawton & May 1995). In response to the broad recognition that biological diversity has decreased or is under threat in a large fraction of the world's habitats, both the scientific community (Heywood, 1995) and the world's governments (Framework Convention on Biodiversity) have made biological diversity one of the centrepiece issues of global change.

Research on ecosystem function and biological diversity has a long history, beginning with early studies on the maintenance of genetic diversity (Fisher, 1930; Wright, 1931) and mechanisms of coexistence (Gause, 1934). May's (1973) theoretical demonstration that increases in diversity could lead to decreased stability played a key role in laying the quantitative foundations for the ecological aspects of this research, which has, until recently, emphasized the role of biological diversity in modulating population dynamics and community structure. Recently, this focus has broadened, with discussions and studies on the implications of biological diversity for a wider range of ecosystem functions, including stocks and fluxes of matter and energy, as well as ecosystem goods and services valued by humans (Chapin & Körner, 1995; Davis & Richardson, 1995; Vitousek, Loope & Adsersen, 1995; Mooney *et al.*, 1996a; Orians, Dirzo

* Corresponding author. E-mail: chris@jasper.stanford.edu.

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