Ecologists have long struggled to predict features of ecological systems, such as the numbers and diversity of organisms. The wide range of body sizes in ecological communities, from tiny microbes to large animals and plants, is emerging as the key to prediction. Based on the relationship of body size with key biological rates and with the physical world experienced by aquatic organisms, we may be able to understand patterns of abundance and diversity, biogeography, interactions in food webs and the impact of fishing, adding up to a potential ‘periodic table’ for ecology. Remarkable progress on the unravelling, describing and modelling of aquatic food webs, revealing the fundamental role of body size, makes a book emphasizing marine and freshwater ecosystems particularly apt. Here, the importance of body size is examined at a range of scales, yielding broad perspectives that will be of interest to professional ecologists, from students to senior researchers.

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Body Size

The Structure and Function of Aquatic Ecosystems

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Preface

More than ten years ago, two of us (AGH and DGR) were lucky enough to edit a previous symposium of the British Ecological Society (BES) – *Aquatic Ecology: Scale, Pattern and Process* (Giller, Hildrew & Raffaelli, 1994). In the Introduction to that volume, we pointed out that the BES had not devoted a single previous symposium to aquatic ecosystems. Evidently we did not change the culture, since the *Body Size* symposium held at the University of Hertfordshire in September 2005 was only the second!

*Body Size: The Structure and Function of Aquatic Ecosystems* had two objectives: (i) to explore how the scale of approach affected the patterns that were detected and the processes that appeared to be important, and (ii) to compare freshwater and marine ecosystems. In *Body Size: The Structure and Function of Aquatic Ecosystems*, both those questions of scale and comparison among systems are very much still alive as continuing themes. Body size determines overwhelmingly the scale at which organisms perceive and navigate through their physical world, and the contrasts between freshwater and marine ecosystems remain evident. Body size is a species trait with implications beyond scale, however, and we believe that the present volume shows that more similarities than differences are evident among the diverse aquatic systems considered. Indeed, several authors argue here that fundamental ecological processes are revealed by comparing marine, freshwater and terrestrial systems.

In organizing this meeting, we were well aware of the increasing interest in body size from the wider ecological community over the past 30 years, as well as the technical challenge involved in exploring body-size data. Of course, the fascination with body size has a much longer history in ecology and was prominent in the writings, for example, of Alfred Wallace (1858) and Charles Elton (1927), the latter having discussed at length its relevance to trophic interactions (see review by Warren, 2005). It was R. H. Peters’ (1983) elegant exposition of the physiological, environmental and ecological correlates of body size that re-ignited modern interest, however, and which led indirectly to an explosion in the macroecological literature over the past ten years (Blackburn & Gaston, 2003), to the metabolic theory of ecology (Brown *et al.*, 2004) and indeed to this present volume. All of the papers presented at the Hatfield meeting connect...
with one or more of these themes and in many cases attempt to integrate aspects of body-size research that were previously treated separately. A focus on aquatic systems seemed appropriate because aquatic ecologists have historically been particularly prominent in the debate. Thus, Hardy (1924) was amongst the first to point out the significance of ontogenic (sized-based) shifts in the food webs supporting fisheries, Ryther (1969) illustrated the effects of predator and prey body sizes on food-chain length and global patterns of marine productivity, whilst Hutchinson (1959) provided a classic account of body size and species coexistence. It may well be that patterns and processes related to body size are particularly important in aquatic systems, or at least are more obvious.

We asked the author(s) of each paper to examine the importance and role of body size in the systems in which they work. Essentially the book builds from the level of the individual and a consideration of body size as a species trait (Humphries; Atkinson & Hirst; Huryn & Benke; Townsend & Thompson), through food webs and communities (Woodward & Warren; Jones & Jeppesen; Schmid & Schmid-Araya), to body-size related macroecological patterns in aquatic systems (Finlay & Esteban; Rundle, Hilton & Fogg; Warwick), to dynamics and patterns in whole communities and ecosystems (Persson & De Roos; Petchey, Long & Morin; Jennings & Reynolds; Hall et al.; Cohen). Jim Brown and colleagues set the scene with a ‘wet’ exposition of metabolic theory, and although we did not ask contributors explicitly to test these ideas several did. The meeting certainly generated an old-fashioned sense of community and of excitement in what people had to say, though it was just as apparent how fragmented the community is, as was reflected in the examples chosen to illustrate particular points and the literature cited by authors from different ‘stables’ and backgrounds.

We hope that this book reflects just a little of this excitement and serves as a useful synthesis of this area of ecology. Finally, we wish to thank all the contributors for their efforts and remarkable efficiency, the British Ecological Society and the Freshwater Biological Association for their support, and the local organizers at the University of Hertfordshire for all their hard work.

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