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Kitching, R. L.: Food Webs and Container Habitats. The Natural History and Ecology of Phytotelmata. 105 figs., 60 tabs., vii, 431 pp. Cambridge University Press, Cambridge New York, 2000. Hardcover £ 65.00, US $ 100.00. ISBN 0-521-77316-4.

The organisms inhabiting phytotelmata (plant-held waters) have interested ecologists and naturalists for the better part of a century. Phytotelmata occur in most forested parts of the world and host diverse, yet experimentally tractable, animal assemblages. Larvae of flies, beetles, dragonflies, damselflies, and frogs are just a few of the many intriguing macroorganisms that can be found in these habitats. Phytotelmata are appealing to a relatively broad range of people: to botanists and entomologists because they frequently involve exotic plants and insects, to ecologists because they are clearly delimited and easily manipulated microcosms, and to naturalists for all of these reasons, plus the innate appeal of an interacting assemblage of life within another (usually) living organism. This book successfully combines and satisfies all of these perspectives.

The Introduction (Chapter 1) defines "phytotelmata" and briefly summarizes the early history of scientific interest in these habitats. This is followed by an overview of Kitching's ecological studies of phytotelmata in various parts of the world. The organization of the book is then explained and includes a useful flowchart (Fig. 1.1, p. 10), which graphically outlines the conceptual framework. The chapter ends with some helpful directives for future work on phytotelm food webs and faunistics.

The remainder of the book is divided into five parts. Each part, as well as the Introduction, begins with an essay apparently derived from the author's field notes and memory. These short essays are intended "to recreate some of the excitement of the naturalist, to offset in part the objectivity of the ecologist" (p. 9). The first couple of essays focus more on location and setting than exciting observations of plants and animals. However, these are balanced by the latter essays, which more vividly impart a sense of discovery and a passion for nature. These verbal illustrations certainly make an otherwise potentially daunting scientific text appealing to a broader audience.

Part 1 (Chapters 2–4) describes the flora, fauna, and abiotic characteristics of phytotelm systems. Chapter 2 focuses on the five major types of phytotelmata (bromeliads, pitcher plants, tree holes, bamboo internodes, and plant axil waters), and provides thorough descriptions and detailed line drawings of each type. Each description either includes or is immediately followed by a tabular summary of the prominent literature pertaining to that phytotelm category. Chapter 3 gives a general overview of the fauna of phytotelmata based on trophic position. Terms describing the degree of specificity between animals and the phytotelmata they inhabit are clearly defined early in the chapter. Chapter 4 addresses five topics: 1) abundance and spatial distribution of phytotelmata within larger ecosystems; 2) variation in the size of individual phytotelmata across regions; 3) allochthonous nutrient dynamics, specifically leaf litter and stemflow inputs; 4) water quality, including volume, chemistry, and temperature; and 5) temporal variation in several of these parameters. This chapter should be read by anyone involved in

research on phytotelmata because it underscores the need for (and importance of) data on the fundamental abiotic characteristics of these systems.

The remaining major divisions of the book are arranged much like the format of a traditional scientific paper. Part 2 broadly introduces some variables that influence phytotelm food webs. Part 3 provides a summary of methods and results. Parts 4 and 5 serve as the ''Discussion'' section, in which theory is revisited to potentially explain the patterns presented earlier. This structure is relatively easy to follow, and avoids redundancy of explanations among chapters.

In Part 2 (Chapters 5 and 6), Kitching introduces food webs and establishes a conceptual foundation for specific topics presented later in the book. Chapter 5 explains what food webs are, how they are constructed, and how they are quantified. Example food webs are presented for the five major classes of phytotelmata presented in Chapter 2, and hypothetical webs are used to illustrate various analytical techniques. Chapter 6 opens with a discussion of temporal vs. spatial scale, and pattern vs. process in ecology. The evolution of food webs as a topic within ecology, from pattern description to identification of emergent properties and mechanistic processes, is then reviewed. The remainder of the chapter is divided into subsections which briefly summarize some of the major environmental, ecological, and evolutionary processes acting at each of four different spatial scales: global, continental, regional, and local. Explicit hypotheses and predictions related to these processes and their possible roles in structuring phytotelm communities are presented in box summaries appearing at the end of each subsection. These hypotheses will be particularly useful to students working on phytotelmata, and are readily applicable to a variety of other ''patchy'' systems.

Part 3 (Chapters 7–11) revisits each of the spatial scales identified in Chapter 6, as well as small spatial (individual phytotelm units), and temporal scales. Each chapter examines within-scale variation in food webs using data gathered from tree holes, *Nepenthes* pitchers, or both. Differences in phytotelm food webs at the global scale (i.e., among continents) are summarized in Chapter 7. Intercorrelations among the various metrics used to quantitatively describe food webs are also presented and explained in this chapter. Chapter 8 examines food web variation in tree holes on a continental scale (within eastern Australia). Several hypotheses are presented to potentially explain the observed patterns, and difficulties in the interpretation of the 'connectance' metric in food webs are discussed. Phytotelm food webs within regional and local scales are addressed in Chapter 9. Metapopulation dynamics (introduced in Chapter 6) and their pertinence to organisms inhabiting phytotelmata are explained near the beginning of this chapter. Results presented here illustrate how stochastic processes make it difficult, if not impossible, to predict the faunistic composition and food web structure of individual phytotelm units.

The final two chapters of this section depart from the standard levels of spatial scale examined earlier, and address somewhat less obvious influences on phytotelm food web structure. Chapter 10 focuses on a fundamental question in phytotelm biology: Does the species of plant affect the animal communities that develop in its water-filled cavities? Using food web data from the water held in various species of *Nepenthes* pitchers, Kitching shows that animal communities do indeed differ among phytotelm plant species within a region. Explaining *why* these differences exist is more challenging, and this difficulty is discussed at the end of the chapter. Here, Kitching notes the importance of understanding the basic natural history of all (including non-aquatic) organisms associated with a given species of plant. Ignorance of natural history is a common problem in ecological studies (especially those with a strong theoretical basis), and this chapter effectively shows the value of ''knowing'' the organisms in one's system in order to fully understand the emergent ecological patterns. Variation in phytotelm food webs over ecological time scales is

the theme of Chapter 11. Specifically, this chapter examines effects of seasonality, succession, and invasion/extinction (over shorter time frames) on animal communities in tree holes and *Nepenthes* pitchers. Again, Kitching stresses the need for understanding the natural history of species in the system. This is exemplified (in part) by seasonal data from tree holes, in which community parameters were quite stable despite dramatic temporal fluctuations in the abundance of some species.

Part 4 (Chapters 12 and 13) concerns "bottom-up" (i.e., intrinsic) and "top-down" (i.e., extrinsic) ecological influences on phytotelm communities. These directional terms were initially confusing, because they are more commonly used in the ecological literature to describe predator and resource effects *within* food webs. Chapter 12 begins with a summary of competition theory, with particular emphasis on interspecific competition. This is followed by a review of various studies of competition among mosquito species in temperate tree holes. Predation is then introduced (and reviewed) as a mediator of competition, and as an important factor affecting overall community structure (i.e., keystone predators) in a variety of phytotelmata. The last section of this chapter presents a case from tree holes in which a predator species does not significantly control the abundance of its principal prey species, thus providing an example of a top predator without a keystone effect. Chapter 13 links the results given in Part 3 with the hypotheses, predictions, and spatial scale theory presented in Part 2. Like Chapter 6, this chapter is divided into global, continental, regional, and local scale subsections. Hypotheses and predictions presented earlier are listed again in each subsection, and results from Part 3 are reexamined to support or refute them. As a whole, this chapter provides a very useful overview of the current state of knowledge of phytotelm ecology. In doing so, it also clearly identifies many areas that need further study. Thus, the contents of this chapter will be especially valuable to students who wish to focus on phytotelmata for thesis research.

In Part 5 of the book (Chapter 14), Kitching summarizes patterns of spatial and temporal variation in phytotelm food webs into a tabular model (or "templet" sensu Southwood 1977). This is a daunting task considering the diversity of phytotelm types and the variation they exhibit across scales, but the end result is a thought-provoking synthesis of general ecological patterns in this system. The chapter ends with a broad summary of the entire book framed around two fundamental questions that are likely to be asked by any ecologist or naturalist examining the contents of a water-filled tree hole, pitcher plant, etc.: Why is this particular animal here, now? and Why is this particular food web present here, now?

The last major section of the book is an 84-page appendix (or "Annexe") which catalogs the known fauna (up to mid-1997) of phytotelmata on a taxon-by-taxon basis. Some basic natural history information is presented for each group, and numerous references are mentioned or tabulated which provide entry into the primary literature for each taxon. Representatives of several common phytotelm-inhabiting insects (within Diptera and Coleoptera) are also illustrated with detailed line drawings. Although this section was probably not intended to serve as a field guide to the fauna of phytotelmata in the strict sense, the figures and text will certainly aid in the preliminary identification of all of the common organisms (above Protozoa) occurring in this system.

Overall, this is an excellent reference. It is by far the most detailed treatment of the topic ever attempted, and it is essential reading for anyone interested in phytotelmata. My criticisms are minor, and pertain mainly to a couple of specific details that could easily be corrected in future printings. First, several spelling and proofing errors occur in the text, including misspelled author's names and scientific names. Although somewhat distracting, they are certainly not atypical for a first edition book. Second, tables and figures are abundant and nicely complement the text, but some could be greatly improved by cosmetic changes or a second editorial effort. For example, many

are missing units, sample sizes, and other information that would assist in their interpretation. Most of the figures are clear and informative, but several that were redrawn or constructed specifically for the book do not reflect the basic advances in computer graphics that have occurred in the past five years or more. The use of stacked-bar graphs (e.g., Figs. 4.4 and 4.7) was troublesome, because results plotted in this format are difficult to interpret (Cleveland 1985). Finally, many readers will note that the book is strongly biased towards the work of Kitching and his students. This is justified for at least two reasons: 1) it is *his* book, and 2) he is one of the most prominent contemporary phytotelm biologists in the world.

In combination with the book edited by Frank and Lounibos (1983), this text provides a thorough introduction for students and established professionals interested in working on phytotelmata. It is unfortunate that a less expensive paperback edition is not currently in print, as this would certainly make it more accessible to students. This book will also serve as a useful companion to other food web books (e.g. Polis and Winemiller 1996) for ecologists who do not necessarily have a special interest in phytotelmata. If Kitching's intention was to make this work informative and interesting to a relatively broad audience, he has succeeded.

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Leistner, O.A. (ed.): Seed Plants of Southern Africa: Families and Genera. (Strelitzia Series, Vol. 10). 1 fig., 775 pp. National Botanical Institute, Pretoria, 2000. Hardcover US $ 90.00. ISBN 1-919795-51-0.

This massive, 775 page volume is packed with descriptive information on the rich flora of southern Africa – geographically defined as the area south of the Kunene, Zambezi and Limpopo, or in political terms, the countries of Namibia, Botswana, South Africa, Lesotho and Swaziland. The body of the book consists of descriptions of the 227 families and 2180 genera recognised in this area. The families are arranged alphabetically in three groups: gymnosperms, dicotyledons and monocotyledons. Each family account contains references to the nomenclatural and taxonomic literature, a technical description of the morphology, notes on the distribution and numbers of genera and species. This is followed by a key to the genera, and for each genus there is a brief note on the number of species and distribution. The work is concluded by a detailed glossary and an index to all the names. The book starts with a long, dichotomous key to the families, and under each family a key to the genera is given.

The book was written by specialists in the various families, or the staff who curate these collections either in the National Herbarium in Pretoria, or the Compton Herbarium at the Kirstenbosch Botanical Gardens. The editing is remarkably consistent throughout.

I would regard this volume as essential literature for any student of the southern Africa, and probably the African, flora. With the exception of the family key concluding the Prodromus einer flora von Südwestafrika (Merxmueller 1972), it contains the only recent key to the families of southern or south-central African plants (there is a key to the families in West Africa, and one to the flora of Ethiopia, but none to the rich flora to the south of these areas). It also gives a quick insight into the generic diversity of the seed plants in this rich flora.

The layout of the book is commendable. The printing is clear, the font easy to read. I am not