4-1990

Plant Morphology and Herbivory: Review of M.J.A. Werger et al., eds., *Plant Form and Vegetation Structure: Adaptation, Plasticity and Relation to Herbivory*

Svata M. Louda
University of Nebraska - Lincoln, slouda1@unl.edu

Ecology, 71(2), 1990, pp. 829–830

Plant Morphology and Herbivory

Werger, M. J. A., P. J. M. van der Aart, H. J. During, and J. T. A. Verhoeven (eds.). 1988. **Plant form and vegetation structure: adaptation, plasticity and relation to herbivory.** S.P.B. Academic Publishing b.v., The Hague, The Netherlands. xii + 352 p. $58.00 (paper), ISBN: 90-5103-019-3.

This edited volume contains 26 contributed papers presented at the International Symposium on Vegetation Structure in Utrecht 14–18 July 1987. The editors organize the papers into three broadly related areas: (1) morphological plasticity of plant growth form in response to environmental variation, (2) morphological and ecological aspects of dry matter partitioning, and (3) herbivory in plant growth and plant community structure. All of the papers take a functional view of plant growth form and vegetation architectural structure, to one extent or another. The papers are uneven; stated objectives, scope of the subject matter covered, and degree of conceptualization vary substantially among papers. In addition, a surprisingly large number of the contributions are predominantly repetitions of previously published results, with only sometimes the addition of new information.

The contributions in the first section of the book, on the nature and function of plant growth forms, are particularly varied. These papers include descriptions of: a classification system (Barkman); the vegetation at Atkasook, Alaska (Komárková and McKendrick); some morphological correlates of competitive ability (Epp and Aarssen); selected observations on early establishment of dicotyledons in grasslands (De Broeck); rooting depths in harsh successional seres (Wright and Mueller-Dombois); vertical structure in *Spartina* marshes (Figueroa and Castellanos); and, the distribution of plant biomass in relation to small-scale physical heterogeneity (Lotz and Olff). Each paper seemed to me to represent an individually interesting topic. Several of the papers suggest new perspectives, or at least thought-provoking refinements of present ones. For example, I found myself reformulating some of my thinking on morphological components of competitive ability after reading Epp and Aarssen's short review. However, in spite of the title, none of these papers seriously analyzes the hypothesis that growth forms observed under field conditions might reflect processes discussed in the other sections of the book, i.e., resource allocation strategies or the responses of plants to herbivory, as well as the influence of physical factors. In addition, the range of variation in topics, the minimal nature of some of the papers, and the differences in the level of analysis among contributions left me feeling that the section as a whole lacked depth and required more synthesis.

The second part of the book is organized mainly around the theme of resource allocation. Allocation is typically estimated as proportionate distribution of dry matter among organ systems. All of the papers assume, implicitly or explicitly, that the observed allocation of biomass is determined by resource availability. Again, none consider that allocation patterns might be influenced by the processes in the other two sections, e.g., evolutionary constraints on growth form or ecological constraints on stature or root/shoot ratios caused by herbivory. The papers in this section include discussions of clonal structure (Hutchings and Slade); modeling of shoot/root ratios and growth in relation to nitrogen (Hirose); phenotypic variation in growth (Hara and Haraguchi); foliage distribution and light interception (Grace); modular growth of branches (Kellomäki); canopy structure of stands of dicotyledonous herbs in relation to light and nitrogen (Werger and Hirose); distribution of photosynthetic vs. nonphotosynthetic mass aboveground (Ojea, Pereiras, and Basanta); variation in leaf traits of individuals with sun vs. shade exposure (Bongers and Popma); short stature in vegetation at tree line (Grace); and plant growth forms in arid environments (Shmida and Burgess). Here, the papers seem to me to "hang together" more comfortably. Although the papers are still quite individualistic and variable in the amount of new information presented, the net effect is a review of plant growth and morphology in relation to levels of several potentially limiting resources.

The final section of the book concentrates on herbivory and its various influences on plant form and vegetation structure. The papers of this section include evidence of decreased flowering and increased extinction for woodland herbs caused by foliage and corm consumers (Whigham and O'Neill); increased mortality, reduced crown coverage, and limited recruitment of balsam fir after a spruce budworm outbreak (MacLean); no change in species diversity but increases in cover and sward height, especially for short-lived perennial herbs, within one or two years of beginning the exclusion of insect herbivores with insecticides (Brown, Gange, and Gibson); modified structure and composition of coastal wetlands in response to the foraging of Lesser Snow Geese (Jeffries); an interaction between prairie dogs and other herbivores in shortgrass community structure (Whicker and Detling); changes in the structure and composition of Argentine subhumid grassland in response to grazing, with light as the main factor determining the net effect of the herbivory (Sala); the selective effect of consistent differences in the intensity of grazing by an antelope, the Kafue lechwe, on canopy structure and productivity of flooded grasslands in Zambia (Ellenbroek and Werger); and interactive effects of grazing by large mammals and fires on the mixture of life forms in African savanna

(McNaughton and Sabuni). Although the papers in this section are also variable, on the whole this section seems to include more new information than do the other sections of the book.

Overall, the book is quite well organized, especially considering the chapters represent contributed, rather than invited, papers. One aspect of this compendium is a particular strength. The book unites topics that are related but seldom considered together: individual plant growth form, community and vegetation structure, and herbivore influences on both. Unfortunately, there is much left to be done along these lines. Few new links among these areas have been forged directly by the mix of reviews and original research presented here. It is clear that we are still "talking to ourselves," communicating primarily *within* subdisciplines of plant ecology. For example, there is little overlap in references among the three sections of the book. Also, although my bias may be showing, I find it particularly puzzling that herbivory is so seldom evaluated in field studies of plant stature, canopy morphology, resource acquisition, and resource allocation. In this book, for example, none of the papers in the first two-thirds of the book seriously considers *any* hypotheses involving trophic interactions as factors in plant form or resource partitioning, on either an individual or a landscape basis. Yet, extensive evidence has accumulated that, in fact, trophic interactions (including pollination, mutualism, predation, and parasitism) often influence individual plant performance, plant population dynamics, and plant community structure of the vegetation. Such interactions and their effects are evident on ecological time scales and, in some systems, are also likely to have had a prominent influence on evolutionary time scales. Perhaps the juxtaposition of the topics and results will stimulate improved communication among groups of plant ecologists and more exploration of such important interfaces in the future.

In sum, this book seems to me to present a diverse, interesting, and potentially innovative combination of papers on plant ecology. The content of papers ranges widely, from reviews to new data. Unfortunately, the quality and depth of papers also varies substantially. The book presents a challenge: we clearly need to improve communication and synthesis among groups working in the area of field-oriented plant ecology and evolution. While the book seems expensive to me, it is well put together and should be made accessible through research libraries. I know I will recommend it as reading for graduate students, as an introduction to the diversity of topics and the potential for further work in plant ecology.

Svaťa M. Louda

University of Nebraska
School of Biological Sciences
Lincoln, Nebraska 68588-0343