Panizzi, Antonio R., and Jose R. P. Parra [eds.]. 2012. Insect Bioecology and Nutrition for Integrated Pest Management, 732 pp. CRC Press, Boca Raton, FL, USA. ISBN 978-1-4398-3708-5, hardback, $169.95.

Earlier editions of this book were previously published in 1991 and 2009, in Portugese. Though widely heralded in Latin America, they were not much noticed in the English-speaking world. Thus, the updating of this book and translation into English is a very welcome addition to the world literature on insect feeding ecology. References as current as 2011 appear in the bibliography, so it is truly updated and not simply translated.

The editors are international leaders in the field, having devoted their entire careers to aspects of nutritional ecology: Panizzi on plant feeding insects, especially pentatomids, and Parra on rearing of insects, especially natural enemies. For this project, they assembled an impressive and authoritative group of contributors. The 48 authors involved overwhelmingly are from Brazil. The expertise and experiences of the participants provide for a distinctly Brazilian 'flavor', but only in the sense that many of the examples are from South America; the authors provide comprehensive world-wide reviews of pertinent literature. The book is divided into three major sections: (1) general aspects, (2) specific aspects, and (3) applied aspects.

The first section (general aspects) consists of 9 chapters covering the basic topics associated with insect nutrition. As any reader would expect, there are chapters on insect-plant coevolution, plant chemistry, host plant location and acceptance, digestion, and on the role of symbiotic microorganisms in insect nutrition. Also included in this section are chapters on the use of nutritional indices for assessing food intake and use by insects, and the use of artificial diets for rearing insects. In some respects, these latter 2 topics are 'applied aspects' that might be included in the third section of the book, but placement of these topics early in the book is important in assuring comprehension by the reader. Less expected, perhaps, but nevertheless very welcome, were chapters on cannibalism by insects, and the interaction of host nutrition and the development of entomopathogenic diseases in insects.

The second section (specific aspects) consists of host relationships of various feeding guilds, 16 chapters in all. Here we have discussion of feeding by diverse assemblages, namely neotropical ants, social bees, lepidopterous defoliators, seed-sucking bugs, seed-chewing bugs, rhizophagous beetles, gall-inducing insects, detritivores, stored grain insects, tephritid fruit flies, sap-sucking aphidoid insects, hymenopterous parasitoids, predatory bugs, coccinellid beetles, green lacewings, and hematophages. These obviously reflect the interests and expertise of the Brazilian contributors, but represent many of the most important and best-studied feeding guilds not only in Brazil, but world-wide.

The third section (applied aspects) contains only 2 chapters. The first, on host plant resistance, is a very nice summary of some of the morphological and physiological elements useful in providing insect resistance to plants. The final chapter provides a useful synopsis of field-level manipulations that affect feeding ecology, including trap crops, mixed cropping, cropping sequences, crop residues, and other techniques.

Anyone familiar with the field of feeding (nutritional) ecology will automatically want to compare this book to Slansky and Rodriguez's 1987 book "Nutritional Ecology of Insects, Mites, Spiders and Related Invertebrates". Conceived at about the same time, they display some parallels, but also some differences. 'Nutritional Ecology' contains 31 chapters devoted to feeding guilds, and there is a very broad array of guilds included. Thus, treatment of relatively minor topics such as lichen and moss feeders, fur and feather feeders, and pollen feeders are found in 'Nutritional Ecology' but not 'Insect Bioecology'. 'Insect Bioecology' contains only 16 feeding guilds, and they often are taxonomically restricted (e.g., discussion of predatory beetles is restricted to Coccinellidae). On the other hand, 'Nutritional Ecology' contains only a single introductory chapter whereas 'Insect Bioecology' provides a broader introduction, including material that was not much studied in earlier times. Overall, 'Insect Bioecology' complements 'Nutritional Ecology' rather than supplanting it, and a reader interested in the subject of nutritional ecology would likely want to commence reading about the topic with 'Nutritional Ecology' and then move to the more current 'Insect Bioecology'.

One other aspect of this book should be noted; it includes a CD-rom containing reproductions of photographs and diagrams in the book. This would be useful for anyone involved in teaching. Unfortunately, it is incomplete; not all images found in the book are reproduced on the CD.

It is easy to see why this book has gone through 2 Brazilian editions and now is translated into English. It contains some immensely interesting and valuable information. Information on feeding ecology of insects is scattered through a wide swath of the scientific literature, including many chemistry, molecular biology, physiology, behavior, ecology, botany and zoology journals in addition to entomology publications. However, in "Insect Bioecology and Nutrition for Integrated Pest Management" the contributors provide us with easy entry into the fascinating world of insect-

host relations. Without exception, the authors have provided comprehensive yet lucid discussions of the most important aspects of each topic treated. The bibliographic information is complete but not overwhelming. I can imagine this book being useful for a graduate-level class on insect-plant relationships or nutritional ecology, and it should be on the reference shelf of anyone working in this field.

English is not a simple language even for native English-speakers, and translation of this book into English is not without problems. Not all chapters contain errors, but they are frequent enough to be distracting.

Overall, this is a wonderful addition to the entomological literature, and English-speakers will be very grateful that they finally have ready access to this useful publication.

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