BOOK REVIEW

MATTHEWS, M. 1999. Heliothine Moths of Australia: A Guide to Pest Bollworms and Related Noctuid Groups. CSIRO Publishing, Collingwood, Vict., Australia. x + 320 p. (23 color pl.) (17 × 25 cm), plus CD-ROM. ISBN 0-643-06305-6. Hardback. $90.

Although written from a project to identify the bollworms and related pest species of this important economic group of moths, Matthews has provided a careful taxonomic revision of the group that all students of the Noctuidae will find useful. The book treats 38 species from Australia, with 18 new synonymies and 8 new species, in 5 genera. The book has excellent illustrations, including 23 color plates of all adults and known larvae, plus 460 other figures (halftone photographs or SEM micrographs) illustrating genitalia and other morphological characters of adults and immatures. The CD-ROM included with the book includes a complete listing of all label data from the over 14,800 specimens examined for the study and taxonomic lists. The illustrations are all clear and finely printed. The color plates are very sharp and true to the color tone of the moths and larvae. The book is finely printed and well bound.

Following an introduction on the methodology used, there are chapters on the economic importance of Heliothinae in Australia, heliothine biology, systematics, morphology, phylogeny, and identification keys to genera and species. Thereafter, the author presents the species in the format of a traditional taxonomic revision, with diagnoses and descriptions of all taxa. Each species is discussed in detail, with new descriptions, whether of known or new species, followed by notes on bionomics. Each species has a range map included for Australia and Tasmania. After the taxonomic section, there follows a checklist of all species for Australia, and then a chapter giving detailed nomenclatural notes for all scientific names, including genera and all synonyms. Prior to the monochrome figures of genitalia, there is a short section with notes on the slides and specimens used for the figures.

The color plates include 2 plates showing some Australian habitats of heliothines, followed by 2 useful color plates showing adults greatly enlarged and overprinted with feature names for maculation and wing venation terms, plus details of the legs. There are 8 color plates showing the Australian species from museum specimens (about life size). There then is one color plate with enlarged views of the wing features that allow identification of two closely related species: *Helicoverpa armigera* and *H. punctigera*. Finally, there are 10 color plates illustrating adults in nature, larvae and pupae of many of the species.

The author gives a detailed treatment for each species for Australia, but rather less detailed discussion of the genera. This is partly due to his earlier work on the world genera of Heliothinae (1991. *Classification of the Heliothinae*), where he already went into detail as to the generic limits for the subfamily. He gives further evidence, particularly getting into molecular data, of the complexity of the heliothine genera of Australia. Since Hardwick split *Helicoverpa* from the well-known genus *Heliothis* in his 1965 monograph on North American heliothines, there has been continued argument from specialists as to whether *Helicoverpa* should be a subgenus or a full genus. Part of these varying opinions were based no doubt on the similarities of the species to be found in North America. Matthews, in covering all the many Australian species, clearly shows in this new study that the variation of the group is much more complex outside of North America, thus further supporting Hardwick's more preliminary work in splitting *Heliothis*. Thus, the Australian fauna in particular demonstrates that the old concept of *Heliothis* is too broad to include so many different species groups. Although many of the Australian species have characters that are

very similar, *Helicoverpa* in particular is distinct enough to be a genus on its own, and the other Australian groups vary so much from *Heliothis* that one concludes with Matthews that they are best treated as separate genera: thus, *Adisura, Heliothis, Heliocheilus, Australothis*, and *Helicoverpa*.

Economic entomologists using this book will be able to accurately identify all Australian heliothine adults and larvae: most species are distinct enough that the color plates of the adults will suffice for identification, and only a few may require genitalic dissection for species confirmation. The widespread Old World pest, *Helicoverpa armigera*, occurs in Australia, thus the book is of use in other regions as well, particularly since it is so carefully prepared and presented. The book is particularly important for those involved in checking ports of entry for exotic pests, since anything from Australia can be checked using this book as an identification guide for this group of moths.

Being virtually the finest and best illustrated revision of this group of moths for any region of the world, all researchers on Noctuidae will need this book on their reference shelf, and likewise for economic entomologists.

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