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review

Hawkmoths of Australia. Identification, Biology and Distribution

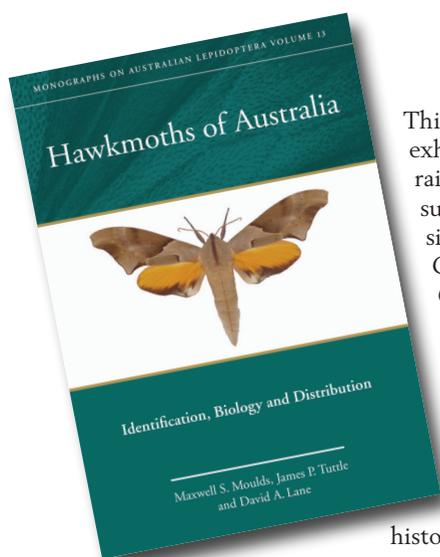
(Vol. 13 in *Monographs of Australian Lepidoptera*)

Maxwell Moulds, James Tuttle & David Lane

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This is Volume 13 of the *Monographs of Australian Lepidoptera*. Coverage of the subject is exhaustive; sphingid fauna in the region is diverse: 31 genera (including one genus, *Chelacneme*, raised here for the species previously known as *Hopliocnema ochra*); 87 species, and two subspecies. The title of the book could reasonably be *Hawkmoths of Australia and its Territories*, since it includes Norfolk Island, 1,600 miles east of Sydney in the Pacific Ocean, and Christmas Island (with five species not known to occur on the Australian mainland) and Cocos Keeling Atolls (one non-mainland species), 1,500 and 2,7500 kilometres respectively west of Australia in the Indian Ocean and very much closer to Indonesia (Java) than to the Australian mainland. A further seven species only occur on Dauan and associated islands near the New Guinea coast. The book includes the results of a mammoth rearing effort, with more than 70 life histories – very nearly all the mainland species – incorporating many new host-plant records.

A short preface is followed by extensive acknowledgements, an outline of the book's organisation and presentation, a list of taxonomic changes (20), abbreviations used, an historical review of sphingid research in the area, structure and function, collection and preservation, rearing, biology, classification and nomenclature, a species list, and a key to final instar larvae and pupae, before reaching the species sections which comprise most of the volume. Of these introductory segments, that on structure and function is particularly impressive – text descriptions are easy to read, and the beautifully prepared line drawings of morphological features from head, thorax and body, through wings to both male and female genitalia are large, clear and detailed. Similar high quality drawings accompany larval and pupal keys. Unusual entries refer to artificial diets for larvae, and viral, bacterial and fungal issues are fascinating.

The first species to be dealt with (oddly, since all other sections begin on a new page, this begins immediately following the end of the pupal key, part-way down a right-hand column) is *Acherontia lachesis*, in Australian Territory recorded only from Dauan Island, adjacent to the New Guinea mainland. Text for each species appears thorough, with emphasis on early stages: a comprehensive synonymy, distribution and habitat, adult diagnosis, immature stages descriptions, biology including parasitoids and predators, and a reasonably sized distribution map based on specific locality data, are all impressive. The nightmare that is the genus *Psilogramma* is dealt with sensibly and includes a key to the seven species now recognised in Australia (it excludes the Christmas Island *P. discistriga*) together with a series of adult photographs identifying important diagnostic features, and long descriptive text for each species.

Where necessary – and it often is – monochrome photographs and drawings embedded in the text clearly present differences between similar species. For example, *Cephenodes australis* and *C. cunninghami* (p. 74, 77) include 'halved' adult specimens illustrating variation in venation and width of wing margin, plus leg diagrams showing the foreleg tibial apex, whilst *Hippotion boerhaviae* and *H. rosetta* (pp 130,143) have monochrome pictures of both species indicating differences in wing pattern. Other species have similar photographs or line drawings of male genitalia, and *Theretra silhetensis* and *T. margarita* are separated by the shape of the larval body below the caudal horn (pp 252, 264). The reason for the spread in pages is because throughout the book genera are presented, not in systematic sequence, but alphabetically, with species within genera also being introduced alphabetically. Thus, instead of being on consecutive pages as might be expected, the very similar *boerhaviae* and *rosetta* are 13 pages apart. The necessity of flicking between pages for diagnoses is resolved by having both figures reproduced twice, with *boerhaviae* first under that species and reversed under *rosetta*. This novel solution, employed throughout the book, works very well.

Everything known about the Australian hawkmoths has been squeezed into this book, in remarkable detail; stages from egg to adult, including each of the usual *ca* five, but up to eight (*Coequosa triangularis*, p. 106) larval instars – is described (including different colour forms), and sections on ecology and hawkmoth behaviour are informative and thorough. But if this sounds like a technical treatise aimed at professionals, think again. It is, but an easy writing style and some informative gems sprinkled through the text make it accessible to a novice and everyone with an interest in Australian Lepidoptera generally. For example (p. 27), larvae of two species that sometimes occur in phenomenal numbers following heavy rain were historically "kept alive

until their gut cleared” and then cooked in coals by aboriginal people; later, “they were ground, then kneaded into a paste and baked”. And larvae of six hawkmoth species have “at various times been considered to be effective in treatments of tuberculosis, stomach upsets, mumps, tumours, fever and snake bite”. There is a photograph of *Acherontia lachesis* apparently about to steal honey from a bee colony (p. 46) and of unbelievable numbers “in places several centimetres deep” of adult *Hyles livornica* in Queensland (p. 160).

An addendum records for the first time *Daphnis hypothous* and *Macroglossum unguis* from Christmas Island and *Marumba timora* from a solitary specimen taken in 2019 on the northern Kimberly coast in Western Australia. This is followed by three pages of Hymenoptera and Diptera parasitoids recorded from ova and larvae of a variety of sphingid species. A series of 68 colour plates depicting early stages of Australian hawkmoths and adults in natural poses, interspersed with other pictures: an *Acosmeryx* adult (p. 284) and a *Hippotion* larva (p. 307) attacked by fungus; a bee-eater taking an adult *Hippotion* (p. 310); parasitoid wasps emerging from *Hippotion* (p. 311) and *Psilogramma* (p. 331); a huntsman spider eating a *Theretra* larva (p. 348) and much more. Ten pages of adult hawkmoths (these are rather dark on my copy) and nine pages of male genitalia are followed by a short glossary and appendices referring to known parasitoid associations and larval host-plants, comprehensive references and an index.

I remember in Kuranda many years ago peering over Max’s shoulder at phylogenetic trees on his computer. This book is the result of a monumental effort since then. Time well spent. It is a relief to see that, despite the outdated requirements of The Code, original spellings of species names are in use throughout the book. As the preface notes, this book is the result of the different strengths of each of the three authors, founded on the encyclopedic knowledge of Max Moulds and combined with “generous guidance” from Ian Kitching, the acknowledged foremost sphingid authority internationally. This will be the standard work on the Sphingidae of Australia and its Territories for the foreseeable future.

John Tennent