

one spot, only three were recaptured two days later and none a week later. Two-thirds of these butterflies were males. A few weeks later, adult numbers had declined considerably at five different spots where abundances were very high for at least three weeks. Brown and Neto (op. cit.) found that populations of *H. euclea* and *H. daeta* diminish rapidly in size as a result of high dispersal and high longevity of adults. If July–August 1977 is used as an example, August was characterized by heavy daily downpours, both day and night, but this rainy period was preceded by a dry period during the last two weeks of July (Fig. 1).

The life cycle of *H. euclea* at this locality takes about 22 days (Young, op. cit.). Thus frequent deposition of large egg masses at this locality and high survival of eggs and larvae result in a large wave of fresh adults about three weeks later. For example, egg masses deposited during the dry period in July 1977 produced the large adult population present in August. Mortality factors operative on egg rafts and gregarious young larvae may be drastically reduced in frequency and intensity during periods of dry weather (Young, op. cit.). Although the proximal causes of this apparent mortality are unknown, their activity correlates well with wet periods. A broad range of invertebrate predators and pathogenic fungi are very likely involved in the regulation of *H. euclea* populations. Gilbert (1969, Some aspects of the ecology and community structure of ithomiid butterflies in Costa Rica, Organization for Tropical Studies, mimeo report) found ants and wasps to be predators of *H. euclea* larvae. Gilbert also suggests that egg mortality from leaf-patrolling predators is operative in *H. euclea* populations. Waves of pupal and adult flour beetles (*Tribolium* spp.) follow periods of slackened predation (Mertz 1969, Ecol. Mongr. 39: 1–31. Dry weather may also enhance mating and oviposition (Young, op. cit.), thereby “stacking the deck” even further for a large cohort of adults to appear.

These observations suggest that tropical butterfly populations subject to control or regulation by biotic agents may be, in fact, regulated only to the extent to which daily rainfall patterns influence the activity of these agents.

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## BOOK REVIEW

PENNINGTON'S BUTTERFLIES OF SOUTHERN AFRICA, edited by C. G. C. Dickson with D. M. Kroon, 1978. Ad. Donker, Johannesburg and London. 671 pp., including frontispiece, 198 plates, 1 text figure and 1 map. Price: R49.00 (approximately \$80.00 U.S.).

The manuscript for this book was begun many years ago by K. M. Pennington, but “KMP” never lived to see its appearance. It is a testimony to the heartfelt admiration that his fellow collectors felt toward Pennington that they were determined that KMP's life work would not go unpublished. For the next three years Mr. Dickson and Dr. Kroon revised, updated and added to the manuscript to make it ready for publication. They have done an admirable job and produced in Pennington's honor a truly outstanding book, one that is not duplicated by other regional treatments of a comparably sized fauna.

The 781 species of butterflies found in southern Africa (including South Africa, Southwest Africa and much of adjacent Rhodesia and Mozambique) are treated in the text on pages 33–201. This is a fauna comparable to the rhopaloceran fauna oc-

curing in the United States and Canada. The treatment includes information on where, when and in what habitats one may find any South African butterfly. Original descriptions are cited meticulously and accurately for all species and many of their synonyms—I only wish in a couple of instances that the editors had used the senior title for works (such as *Die Grossschmetterlinge der Erde* instead of the later translation *The Macrolepidoptera of the World* by Seitz, and *De Uitlandsche Kapellen . . .* rather than *Papillons Exotiques . . .* for Cramer), though in both of these instances footnotes show that the editors accepted the correctness of the original titles but were using those customarily employed in past English language publications.

The plates are excellent, very informative and of the highest technical quality. Using them to identify a South African butterfly is a joy compared with the aggravations the reader is faced with in some recent major books on other faunas. The illustrations in this book, along with those in the equally wonderful *Butterflies of Japan* (T. Fujioka, 1975) are the best advertisements for using quality colored photographic plates that I can imagine. There is no possibility of confusing similar species (assuming that superficial characters will distinguish them) by use of these plates and the accompanying text. I might have preferred to see the backgrounds a bit paler blue, but this is just a personal complaint; in no way do the backgrounds detract from the plates' usefulness.

Dr. Kroon's list of the foodplants of South African butterflies (pages 604–643) is a fine and useful compilation of what is known about the life cycles of the region's Rhopalocera. The introductory portion (pages 22–30) by Mr. Dickson show that the South African collectors are far more interested in life histories than are we in this country, and one suspects that they are near the top of the world in awareness of this aspect of lepidopterology.

In any event, the text and plates combined make the identification of any South African butterfly at least possible, something that could not have been said before the publication of the present book.

But no book is perfect, as the editors would be the first to admit, and this one is no exception. Very few typographical errors or mistaken facts have crept into these pages, but the editors might profitably have looked to this side of the Atlantic for some higher classificatory schemes. Munroe's papilionid, Klots' pierid and my satyrid higher classifications are not mentioned, much less used; some relationships could have been elucidated had they been. Fox demonstrated rather well that *Sallya* (= *Crenis* of authors) is really only a glorified *Eunica*, at least the *boisduvali* complex is, but since this work was not cited, the conclusions were apparently not seen. More surprising, though, is the use of *Meneris* instead of *Aeropetes* for the spectacular satyrid *A. tulbaghia* (Linné). That generic synonymy was pointed out years ago by Hemming who resurrected Billberg's 1820 work from obscurity, thus correctly replacing some well-known generic names with Billbergian ones.

The plates, excellent as they are, have not totally escaped the inevitable "glitches." Plate 76 is especially affected since wet and dry season forms are uniformly mixed and Figure 146.ix is of a dry season individual, but this fact is not noted.

Most of the specimens illustrated are in the collection of the Transvaal Museum in Pretoria, but a few are taken from material in other museum and private collections. All sources are cited in the captions. The figure numbers are cross-referenced to the running catalog of the species in the text. This makes finding the text material referred to by the plates very easy, and it also gives an idea of how many of each species are figured. For example, there are 15 specimens of *Charaxes zoolina zoolina* (species 146 in the text) figured, and they are marked by figure numbers 146i to 146xv on the plates. On the occasions that additional specimens are figured out of sequence, this fact is noted where the specimen might have been expected, so the gynandromorph of *Colotis ione* (species 606) is figured on Plate 196 as figure 606xxv, but it is cross-referenced on Plate 150 where it logically would have been placed. Parenthetically, the symbol used in this book for a gynandromorph (♂) is that tra-

ditionally used for a worker caste of a social insect, rather than the usual ♂ employed for these oddities. The fact that so many examples are figured in variable species enables one to see at a glance the expected variation—a further aid in identification.

The first 38 plates are taken from the late G. C. Clark's incomparable life history studies, encompassing the cycles of 37 species (there are two of *Borbo fatuellus* from different populations) of Hesperidae. They are of the same quality and in the same style as his earlier plates on the Papilionoidea of South Africa, and Clark, too, has left an impressive legacy to future lepidopterists.

The shortcomings pointed to here in no way diminish the value of this book. It is a major accomplishment, and one that has quickly changed working with South African butterflies from one of the least, to one of the most, possible tasks. Everyone connected with this book—Mr. Dickson, Dr. Kroon, the Trustees of the Ken Pennington's Butterflies of Southern Africa Trust and the printer—are to be congratulated on producing a magnificent major work. I think that K. M. Pennington would be proud of it!

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