

Any reader who knew the British butterflies in the 1950s and before will have memories of rich localities, of pastures, woods and downland from which once common species have long vanished, even if the land seems superficially to have survived. This book misses no opportunity for optimism, however: a few expanding ranges, of the Essex Skipper (*Thymelicus lineola*), the Speckled Wood (*Pararge aegeria*), and perhaps the White Admiral (*Ladoga camilla*), are recorded, together with current conservation efforts to keep now highly restricted and threatened species on the British List. To read this book in conjunction with South or Frohawk reveals the general and rapid decline of a fauna, for long relatively stable, for which the blame lies almost entirely with habitat change and degradation, in their richly varied aspects.

The illustrations, by Richard Lewington, have never, in my view, been surpassed. Each butterfly is shown by an upperside (of both sexes where appreciably dimorphic) in "set" position, and by an underside in "perching" pose. British lepidopterists have for long paid much attention to aberrations, and many very remarkable examples of these variants are shown. Other figures, illustrating the butterflies at rest or nectaring are particularly striking through Lewington's use of black and white pencil for the plant or other perching site, against which the beauty of the painted butterflies is seen to best advantage. The effect achieved, for example, by a mating pair of Black Hairstreaks (*Strymonidia pruni*) on a penciled blackthorn twig, of a male Purple Hairstreak (*Quercusia quercus*) basking on an oak twig, or the once widespread but now endangered High Brown Fritillary (*Argynnis adippe*) perching on a bramble, selected for the title page, is brilliant. Life history stages are fully and elegantly illustrated, and the life cycle of each, the periods of the year occupied by each stage from egg to adult, is summarized in simple charts, precise to a week or so, attesting to the completeness of our knowledge of the phenology of these butterflies in their British and Irish localities. Where appropriate, the text is embellished with pencil drawings showing aspects of behavior—the courtship sequence of the Wood White (*Leptidea sinapis*), courtship and thermal orientation in the Grayling (*Hipparchia semele*), of ants attending a larva of the Adonis Blue (*Lysandra bellargus*), and others. I have long believed that F. W. Frohawk's illustrations could never be bettered: for seventy years this was true, but in my eye Richard Lewington has achieved this feat.

No apology for use of vernacular names in this book (or indeed in this review) is needed; these came into use with interest in the butterflies, sometimes changing across two centuries and more (without reference to any International Commission) and are an integral part of the history of these faunas, and of the English language. Moreover, the "popular" names have enjoyed a stability not shared by the Linnaean binominals—several long-familiar generic names having changed in recent years. The text is followed by suggestions for further reading, including guides to identification of British and European butterflies, general biology of these insects, and, in recognition of the important contribution made by local natural history societies in Britain, references to selected works on individual counties and other local geographical areas.

The book is published in association with The National Trust; it is well produced and printed, and remarkably inexpensive. It will be admired and enjoyed by all with an interest in butterflies, whether familiar with the faunas covered or not, by those with just a general enthusiasm for natural history and conservation, and by any student of the art of entomological illustration.

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THE LEPIDOPTERA: FORM, FUNCTION AND DIVERSITY, by Malcom J. Scoble. 1992. Natural History Museum Publications. Oxford University Press, 200 Madison Avenue, New York, NY 10016. xi + 404 pp., 321 text figs., 4 color plates. Hard cover, 18 × 25 cm. ISBN 0-19-854031-0. \$78.00.

I cannot imagine attempting to summarize our knowledge of Lepidoptera in a single volume. Just think about the enormity of the task: there are monographs of most major taxa from one or more continents; books on the faunas of many regions; several butterfly books every year; an enormous literature on economically important species (e.g., more than 5,000 references on the Spruce Budworm complex), which describes most of what we know about larval diets, pheromone chemistry and correlated behavior patterns, diapause, population dynamics, predators and parasitoids, and many other aspects of Lepidoptera biology. Moreover, Lepidoptera often have been the subjects in lab studies, such as physiology and development, and in field studies, such as mimicry and speciation; they are the most diverse group of plant-feeding animals and therefore principal subjects of several books summarizing an extensive literature on insect-plant relationships and coevolution.

Scoble warns in the opening sentence of the introduction: "It is impossible to do justice in a book of modest length to a group of organisms as large, and with so complex a biology, as the Lepidoptera; so this volume is a summary and selective one at that." He accomplishes this by emphasizing the subtitled aspects: form, function, and diversity. However, I suspect many readers of *The Lepidoptera* will find themselves noticing what was not included and wondering why, rather than concentrating on the excellent summary of subjects that are treated.

The text is grouped into three parts: Part I, 5 chapters on form and function; II, a brief chapter on environmental and ecological importance of Lepidoptera; and III, a summary of diversity, in 5 chapters. Of these, the second is weak, but I think most lepidopterists will find the chapters treating morphology/function and the taxa to be extremely useful resources.

The sections on head, thorax, and abdomen of adults and on immature stages present synopses of morphology but emphasize function, so, for example, rather than just a description of thoracic anatomy, we are given discussions of wing folding, flight, migration, and diversity of color pattern; the larval description includes defenses against predators, diversity of food sources, and uses in classification; and structure of hearing, sound- and scent-producing organs are accompanied by their ecological and evolutionary significance and distribution in Lepidoptera.

In his review of diversity, Scoble copes with the extensive and rapidly changing recent literature on theories of relationships among higher taxa with a conservative approach. He presents a cladogram of relationships among primitive Lepidoptera, modified from Kristensen's 1984 review, so the several names that have been applied recently at the subordinal and lesser intermediate levels, such as Glossata, Exoporia, and Heteroneura, can be visualized, but he does not apply any of these in the text. Instead, Scoble recognizes 41 superfamilies, essentially all that have been proposed by Minet and others, and their included families. These he groups into four chapters treating Primitive Lepidoptera, Early Heteroneura, Lower Ditrysia, and Higher Ditrysia. A cladogram of relationships within Ditrysia ought to have been presented, comparable to that for the primitive taxa, so that readers might comprehend something about relationships among superfamilies within the unnatural groupings by chapters. Minet's 1991 classification of Ditrysia is cited but not applied in practice. Thus, Apoditrysia and Obtectomera are mentioned in the introduction to 'Lower Ditrysia,' but are not accorded status in the classification. An exception is Rhopalocera, which Scoble defines as a clade, emphasizing his theory of relationships of Hedyloidea as primitive butterflies.

The summaries of current literature (to 1991 in most instances) for individual families are well done. This likely will be the most useful aspect of the book for lepidopterists and other biologists who have not kept in touch with specialized taxonomic literature. Each superfamily is briefly characterized, followed by a synopsis of each family, and in some instances subfamilies, that includes adult and larval morphology, biology, and phylogenetic relationships. Often, only the most recent comprehensive work is cited, such as a chapter in Stehr's *Immature Insects*, and not the more specialized literature from which the information originates.

Often, too, it seems that the view is based on British or European concepts. Examples include: mention of yucca as a South American plant, a mistake that was made in the popular BBC TV series, *Life on Earth*; economic importance of Sesiidae mentioned particularly for raspberry and currant, based on British species, whereas the genus has an

extensive literature on pheromones, biology, and control in relation to fruit and forest tree and squash vine borers in North America; the peculiar pupal 'legs' of ethmiids given as a defining character for the subfamily (citing Sattler's *Microlepidoptera Palaearctica*), a feature that is presumed secondarily lost in a major New World clade, described in my 1973 monograph. Among other imponderables, Scoble follows Kyrki's 1990 classification of Yponomeutoidea that distinguishes Ypsolophidae, including Ochsenheimeriidae, from plutelids, but he limits the biological summary to *Ochsenheimeria*, rather than the much more diverse and widespread *Ypsoloha*; omission of the *Lactura* group, which has been considered part of Yponomeutoidea but placed in Zygaenidae by Common in *Moths of Australia* and by Kyrki; and the moth illustrated as typical of Heliodinidae is *Pancalia nodosella*, a gelechioid, rather than the type species of *Heliodines*, which occurs in England.

The text is illustrated by excellent line drawings, along with SEM and micro photographs. The expressed purpose of Part III is to provide a guide to Lepidoptera diversity but not identification, and it is accompanied by 136 good half-tone photos of adult specimens, usually of one specimen judged to be typical for each family. Inconsistently, representatives of several subfamilies are shown for some families (Oecophoridae, Pyralidae, Arctiidae, Noctuidae) but not for other diverse families (Gelechiidae, Tortricidae, Lycaenidae). The four color plates contain 34 photographs depicting living adults, larvae, and eggs.

Numerous generic and specific names are cited as examples in the text and in figure legends but without authors or reference to geographic regions, and none is indexed, so the family of a given insect has to be known to locate discussion of it. Biological features are well indexed (e.g., aestivation, courtship, boring/tunneling, leaf mining, migration, mimicry), and the Table of Contents is explicit, so search for non-taxonomic subjects is efficient. In some cases reviews of such subjects are split among different topics; for example, elements of yucca moth biology appear under modifications of the head in Part I, pollination in Part II, and Prodoxidae in Part III.

Any reader might nit-pick over particular subjects that have been omitted or slighted. Among the more surprising, I thought, was diapause, which is mentioned only in passing relative to migration patterns. Diapause certainly has been the key to life cycle adaptations by Lepidoptera in diverse climates and regions, not only winter at high latitudes and elevations, but in areas of seasonal drought, and in dry forest vs. lowland tropical forests at low latitudes. Lepidoptera exhibit countless fascinating specializations enabling different taxa to become diverse in regions of climatic stress, which has major biogeographical implications. Another major omission by choice is review of the importance of Lepidoptera in agriculture and forestry, which has motivated most of the studies leading to our knowledge of their biology and justified much of the funding of taxonomic research.

Nonetheless, this book does an admirable job of summarizing a vast and complex literature. I recommend it to every lepidopterist who is interested in morphology, diversity, taxonomy, or biology of moths and butterflies.

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BUTTERFLY FARMING AND CONSERVATION IN THE INDO-AUSTRALIAN REGION, by Michael J. Parsons. 1992. *Tropical Lepidoptera*, Volume 3, Supplement 1. Association for Tropical Lepidoptera, c/o Florida State Collection of Arthropods, P.O. Box 141210, Gainesville, FL 32614-1210. 62 pp. + index, 48 color photographs, text figures. Soft cover, 21.5 × 28 cm, ISSN (for *Tropical Lepidoptera*) 1048-8138. \$18.00 postpaid (\$10.00 for ATL members.).

Sometime after I returned from a 1977 consultancy in Papua New Guinea, I lectured on the experience at the Royal Entomological Society of London. Afterward, on the stair-