

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-

case to the dark-paneled library of that august body, roughly between the portraits of former presidents Charles Darwin and Alfred Russell Wallace, I was approached by an earnest young member. His name was Michael Parsons, and he was quite the keenest New Guinea enthusiast I had yet encountered. Unlike most collectors eager to go there, his desire was not fueled merely by his passion for birdwing butterflies, though he certainly had that. He seemed committed to going to New Guinea and learning everything he could about the island and its insects, and to enlist for their conservation.

Therefore, when I declined an offer to extend my consultancy with the Department of Wildlife, I recommended Mr. Parsons for the position. He was hired, and eventually spent over four years in Papua New Guinea on a series of missions. If he did not learn everything about the region's insects, he made a good start. He also created the research wing of the Insect Farming and Trading Agency, developed a manual for farmers, energized the overall program, set up a conservation and research project for *Ornithoptera alexandrae*, designed a superb set of butterfly stamps, and began a mapping scheme for the country's butterflies, among other efforts. Clearly, he was the right person for the job.

The work reviewed here is one of more than thirty to have come from Parsons' studies in Papua New Guinea (PNG) (see M. C. Morris' review of *Butterflies of the Bulolo-Wau Valley*, in *J. Lepid. Soc.* 47:341–342). It actually consists of two papers bound together to make a book in the form of a supplement to *Tropical Lepidoptera*, Volume 3. The first part, "Butterfly Farming and Conservation in the Indo-Australian Region," gives a detailed and extremely useful summary of this increasingly visible and important field. The second half, "The World's Largest Butterfly Endangered: The Ecology, Status and Conservation of *Ornithoptera alexandrae* (Lepidoptera: Papilionidae)," speaks for itself.

Part One introduces, defines, and summarizes the origins and practice of butterfly farming. The introduction makes a strong statement for sustainability, and raises the vital question of whether this renewable resource actually can be used to save tropical forests. Next, the author details the history of study and collecting in the region that led to the demand for specimens, and traces the evolution of the PNG model of meeting this demand. He examines the government rationale and policies for the Insect Farming and Trading Agency (IFTA), and explains the benefits of a successful system for both villagers and customers. Economic reform (with profits going to locals) and incentives for both conservation and reforestation clearly can arise from such a program, if successfully carried out. Parsons argues strongly for research and extension work to support such programs, and explores the kinds of financial figures that can be involved. The economics of IFTA are examined in some detail. In fact, the bulk of the paper is devoted to and drawn from the PNG experience. However, Parsons also discusses the butterfly trade in Taiwan, Malaysia, and China, and what he calls "failed take-offs" in the Solomon Islands, Indonesia, and India.

Not content to leave the subject on an ideal basis, the author presents and dissects a number of "myths and misunderstandings." He takes on the issue of collecting versus farming, and finds that overcollecting is probably irrelevant to most species. He examines the actual extent of farming, coming to the conclusion that it fluctuates widely and, in practice, is far less than some magazine writers have represented. He looks at the "ideal" butterfly farm versus its usual state in reality. And, at length, he teases apart what he calls "a tangled web of legislation" to find that laws, regulations, and treaties usually interfere more with farming and orderly trade than they help with meaningful conservation. The discussion of CITES (the Convention on International Trade in Endangered Species) and its Machiavelian application to *Ornithoptera* species is especially helpful history although maddening to read. In fact, the author's frustrations come through frequently in this long paper, not the least with respect to his Chinese consultancy. Nonetheless, the long conclusion shifts subtly from a plaint for adequate funding and sensible application of knowledge, to a hopeful insistence that "the time is apparently right to integrate butterfly farming into many tropical forest conservation plans."

The second part concerns the biology and management of Queen Alexandra's Birdwing, the world's largest butterfly. Although discovered in 1906 and recommended for protection since at least the 1960s, this extremely narrow endemic has lost most of its prime habitat and lives today in severe jeopardy of extinction. Parsons tells the history of the species'

decline in riveting detail. Through a combination of volcanic eruption, ancient grass-burning practices, subsistence gardening, wartime airstrips, oil palm plantation, and logging, the animal's obligate forest and host *Aristolochia* vines have become fragmented and scarce.

Ornithoptera alexandrae was first gazetted for protection in 1968 upon the recommendation of Joseph Szent-Ivany. Ramon Straatman was contracted to survey the insect and recommend a conservation program in 1970. When Sally Hughes and I finished our consultancy in 1977, we recommended to IUCN that it be made a world priority species, and this was later confirmed in the *IUCN Invertebrate Red Data Book*. In 1980 Parsons developed a detailed set of preserve recommendations. Yet despite all this and more, much of the butterfly's forest habitat was aggressively logged, not without government and local blessing, between 1983 and 1987. When Parsons returned, he had the distinct displeasure of resurveying former habitat now made wholly unsuitable.

For complex reasons that the author explains in admirable detail, the conversion of *O. alexandrae* habitat through oil palm plantation and logging continues even as the government declares repeatedly its intention to save this species, one of seven declared National Butterflies as well as the symbol of Oro Province, where it occurs. Traditional rights of land tenure, coupled with the temptation of quick cash from foreign investors, have defeated all efforts to date. One could have forgiven Parsons for turning his back on what must have been an extremely frustrating endeavor. However, he returned in the early 1990s to perform a new survey (funded by Conservation International) and to create an action plan (commissioned by the World Bank) for the integration of oil palm development and birdwing conservation. This paper outlines the findings of both documents.

Parsons believes the world's largest butterfly can still be saved, but only through concerted action, involving education, local and national agreement on habitat protection and management, and sustainable farming of *O. alexandrae* to provide locals with a stake in the forest it requires. This latter goal has long been suggested and hoped for by almost everyone involved, but the special status of the butterfly has always prevented it—a case of supposed “protection” blocking actual conservation.

Papua New Guinea was once known for its ambitious stance toward wildlife conservation, its national constitution even naming insect protection as a goal. Recession, custom, and the temptations of foreign capital have all combined to enfeeble these objectives. As Parsons concludes this section: “An *O. alexandrae* Conservation Project may provide a means of, once again, putting the National Goals into practice.” We must all hope that his well-crafted plan has a real chance to work, and be grateful for this fine account of an exceedingly difficult and important problem in biodiversity conservation.

Parsons' labors in the Melanesian fields have been so fruitful that I wish I could leave this review with summary and praise. However, perhaps in part due to his very fecundity, the work is studded with flaws that merit mention. Most serious among these are omissions of consequence. The paper lacks any reference to the *IUCN Invertebrate Red Data Book* or indeed to any IUCN sources other than the swallowtail red data book and action plan, though it was IUCN's influence that brought prominence to the PNG undertaking. He fails to mention either M. G. Morris' Churchill Fellowship to examine butterfly farming throughout Oceania or a National Academy of Science panel that visited PNG to report on the state of butterfly and crocodile farming, though he cites their reports. He refers to an “EEC mission” but never explains what this is. His treatment of the situation in Irian Jaya is thin in terms of recent developments, and the same can even be said for PNG, where much of his information might have been updated through consultation with manager Peter Clarke. Parsons nowhere mentions Wings for the Earth, a California-based non-profit engaged in promoting butterfly farming. His discussion of CITES, though extremely helpful in these rule-conscious times, neglects to define what its several appendices actually require until quite late in the second paper. Also notable in its absence is any reference to the work of Larry Orsak, who has been engaged in butterfly conservation projects in PNG for a decade. True, Orsak's paper “Killing Butterflies to Save Butterflies: A Tool for Tropical Forest Conservation in Papua New Guinea” (*News Lepid. Soc.* May/June 1993:71–80) appeared after the present paper, and his 742-page report on conserving *Ornithoptera alexandrae* is dated 1992, so Parsons probably had not seen it. How-

ever, it is unlikely that Parsons was unaware of Orsak's contribution, or his consultancy for the government of PNG (through the Wau Ecology Institute) to prepare an action plan for the butterfly's recovery. One is naturally curious how this plan relates to that prepared by Parsons for the same government.

Whether or not Parsons felt himself competing with Orsak for currency of publication, the papers do carry the unfortunate appearance of rushed production. The poor editing is dramatic, or rather, the absence of editing. With all of his impressive findings to report, the author should have been able to count on assistance when it came to copy-editing, but he seems to have received none. The paper is rife with repetitive misspellings ("truely," "intergrated," etc.), cumbrous language, orphaned referents, misplaced modifiers, fractured grammar and syntax, skipped and superfluous words, and so on. Carelessness creeps in, as "In PNG, many hundreds of swallowtail species . . . are also collected." Or, "Countries like New Guinea"—there never was a country called New Guinea, and there is certainly no place "like" it. Irian Jaya has "competative monopolies"—a misspelled oxymoron. There is a confusing plethora of acronyms, often used many pages away from the definition. Four plates of splendid color photographs are unnumbered, leaving the reader to guess at matching captions. (Despite the title referring only to butterflies, four of the eight cover photographs depict moths; but faced with Parsons' spectacular photos, one can't quibble.)

The language veers toward the turgid. Some quotations are cavalier: I am quoted referring to butterfly "dead stock," a term I have never used. The author indulges some quaint and dated terms (logging with "airships"?; "Washington, USA") and arbitrary capitalization ("World Economy," "World Economic Recession"). British and American usages alternate at random. The text is repetitive, wordy, and could be cut by one-third to its advantage.

In short, it is sad that such a fundamental source as this is bound to stick in the eye and the mind for its rough-draft nature. It is not required that remarkably accomplished lepidopterists also write with polish; but if they do not, it is required that they receive the favors of a good editor before they are hung out to dry. If the editor of the journal in question (in this case John B. Heppner, another prolific and highly talented lepidopterist) is too busy to do it, then outside editorial assistance should be sought. If these papers were indeed peer-reviewed, that process also was entirely too casual.

Parsons distinguishes between high value/low volume specimen trade and low value/high volume trinket trade, but then mixes them up like apples and oranges. He mentions private concerns in PNG, but not their legal ramifications or how they are likely to affect IFTA. The Taiwan section is somewhat muddled, and the Malaysian statement hyperbolic; references ranging in rigor from science to Sunday supplements are given equal weight. If the level of farming in Irian Jaya is as low-level as he says, are the many birdwings in trade from there all wild-collected, in contradiction of their ads? If collecting is as harmless as he states, where is the sense in saying that "the evidence . . . furnishes proof of the benefits of collecting to satiate, and thereby beneficially suppress, their market demand?" This seems both circular and specious—if a species such as *Trogonoptera brookiana* is not being overcollected (as it may well not), how can satiation of the market through collecting be beneficial? Again, Parsons later speaks of farming rarer species as providing a "beneficial decrease in their desirability;" yet this follows a strong argument that collecting is benign. He seems to be seeking a rationale for farming in a danger that he has himself defused. Parsons usefully criticizes legislation, but fails to mention its early value in cutting back the iniquitous black market; or the unusual population biology of *Ornithoptera*, making them somewhat more vulnerable to collecting than most insects. Similarly, the historical rationale for adding birdwings to Appendix II of CITES—to monitor world trade—is not discussed.

Even hurt by careless editing, the value of this work far outweighs its difficulties. Parsons was the right person in the right place to stimulate butterflies as a sustainable resource reform, while dramatically adding to our understanding of the biological nirvana we call New Guinea. His grand summary of the results, partially self-funded for its publication, provides an essential reference to all those interested in butterfly farming. It will necessarily serve as the basic resource in the field. Revised, edited, updated, and printed

in a handier format, it would stand even stronger as a classic in the ever-growing field of butterfly conservation and sustainable development. Either way, I'm glad Mike Parsons went to Papua New Guinea and came back to write about it, and I hope he will go again and be given the chance to follow through on his recommendations for *O. alexandrae*. His strong call for real habitat conservation instead of deflective regulations is heartening at a time when bureaucratic reaction to sampling intensifies. And his call for all lepidopterists to "adopt a policy of actively caring for the 'goose that lays the golden egg'" is something we certainly need to hear and heed.

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BUTTERFLIES AND CLIMATE CHANGE, by Roger L. H. Dennis 1993. Manchester University Press, Manchester. 301 pp., 25 × 38 cm. Hard cover, ISBN 0-7190-35058, £50 (about \$80 US); soft cover, ISBN 0-7190-40337, \$39.95 US (distributed by St. Martin's Press, New York, NY).

The day my review copy of *Butterflies and Climate Change* arrived, I happened to commiserate with a colleague about the poor intellectual health of ecology. I complained that almost every other branch of biology had progressed more in the past 25 years than had ecology. "True," she said, "and the biggest breakthrough ecology has made is the rediscovery of history."

Since the eighteenth century, biogeographers have recognized that the distributions of plants and animals have two components: history and ecology. History determines whether an organism has the opportunity to live in a place: ecology, whether or not it does. Somehow this simple truth evaded a whole generation of ecologists, who in their search for mathematical elegance in the structure of the biosphere had no taste for the messiness of historical contingency. But it forced itself on them; for lack of it, their oversimplified research program failed. Now history is suddenly trendy. Roger Dennis is to be congratulated for doing ecohistory long before it became trendy.

The British Butterflies: Their Origin and Establishment (E. W. Classey, London, 318 pp.), Dennis' first major excursion into ecohistory, appeared in 1977. That happened to be the centenary year of Samuel H. Scudder's first paper on the fossil insects of the Scarborough Bluffs, a paper generally considered the beginning of paleoentomology as a discipline. When Scudder died, he was eulogized (in *Science*, 1911) by T. D. A. Cockerell as the entomological equivalent of the three great vertebrate paleontologists Leidy, Cope, and Marsh combined. We lepidopterists tend to remember Scudder as one of the nineteenth century's greatest butterfly workers. He combined his two passions in early studies of fossil butterflies and attempts at lepidopteran phylogeny reconstruction. As a former student of Louis Agassiz, the intellectual father of the Ice Age concept, Scudder was very aware of the heavy hand laid by the glaciers on the New England landscape, and he speculated on Pleistocene influences in butterfly biogeography. It was he who told and retold the tale of the White Mountain butterfly, *Oeneis melissa semidea*, as a living relict of the Ice Age. Nothing much happened in butterfly ecohistory for the next 90 years.

Meanwhile, paleovegetational reconstruction advanced; palynology (study of fossil pollen in bogs and other environments) and the study of plant macrofossils made immense conceptual and methodological strides. Beginning in the 1960s and largely as an offshoot of archeological digs, paleocoleopterology—the study of fossil beetles—joined paleovegetation as a tool for reconstructing ecohistory. This work, pioneered by G. R. Coope and H. K. Kenward in England, attracted little attention at first. Meanwhile, no one was finding rich troves of fossil butterflies in peat or early man's kitchen middens, and butterfly biogeographers seemed preoccupied with the then-trendy question of why there were so many species in the tropics.