ple, there is a one paragraph discussion of the fossil record of bees in a chapter entitled "Development of an Industry" and information on liability for beekeepers is buried in chapter 7, "The Business of Bees."

The text is loaded with a great deal of useful information. However, paragraphs are very uneven in construction and tend to be either very short or very long. Longer paragraphs frequently include a number of topics. Sentence structure is often complex with multiple points included in one sentence. The text would have benefitted from a critical reading for structure and punctuation. There are a number of misspellings and awkward sentences in each chapter.

While there is much good information contained in this book, the index is inadequate. Pollination, a word in the title, is indexed only for the chapter by the same name. It should be indexed for pages 1, 7, 11, and 15 as well. Bumble bee (spelled incorrectly as a single word) is indexed to page 7 but it also should be listed for pages 2 and 22 (where it correctly appears as two words). There is no consistency of references of the African-Brazilian bee, listed on pages 156-161 but elsewhere in the text referred to (and not indexed) as the Brazilian-African hybrid.

There is a glossary of beekeeping terms but it includes misspellings (tarsus, for example). Some necessary terms such as the Africanized bee in South America are omitted while some inappropriate items such as Apis dorsata are included. Some terms listed do not appear in the text and, inevitably, some definitions are inappropriate (e.g., "jaws of insects" to define mandibles).

At the end of each chapter there is a bibliography. Generally, technical information is given without reference. At odd points an author and year reference may be supplied. The author uses references to avoid topics; for example, the concluding sentence of the first paragraph of chapter tells readers to see Ross (1964) for additional information on phylogenetic relationships and evolution, and elsewhere in the same chapter, there is a two sentence paragraph referring to a book on L.L. Langstroth.

The illustrations are not well done. Included are familiar USDA drawings of bee anatomy and disease; nowhere in the text is there reference to an illustration. They just appear. Some tables are of questionable value (tables 5.2, 6.1, 13.2 and 14.1, for example). Also poorly handled is the conversion to metric measurements. Why bother to list 1-2 lb. as .453 to .900 kg (p. 114) or 287.1 cells per dec2 for 16.5 in2 (p. 17) when there is so much possible error in the English measurements?

Despite shortcomings, the book is a good reference because of the amount of information included. Although it flows poorly due to uneven sentence and paragraph structure and needs a critical reading to eliminate numerous small problems, students and instructors of beekeeping will find it a valuable addition to their bookshelves.

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This book is a product of E.P. Wiltshire's 30+ years of interest in Middle East Lepidoptera. The Armadini is a tribe of desert-loving (eremic) noctuids that occurs in arid regions of the Middle East and north Africa with ranges of a few species extending as far east as central Asia and India and as far south as southern Africa.

The author provides keys to the ten recognized genera and forty-two species. The text for each species includes: distribution, synonymy, brief adult description, genitalia diagnosis, material examined, remarks. Adults of each species, male genitalia (39 species), and female genitalia (35 species), are illustrated with black and white photographs. An unfortunate aspect of the genitalia plates is that the numbering sequence is inconsistent; it may be horizontal, vertical, or a combination of both, depending on the plate.

The major problem that entomologists will encounter in attempting to use this book is that the tribe Armadini is not adequately diagnosed either for practical or phylogenetic purposes. Ten pages (11-20) are devoted to "the tribe; its characters; and terms used" in which range of variation in characters are described but no character, or combination of characters, is given by which members of the tribe may be recognized. A previous diagnosis of the tribe (Wiltshire, 1976, p. 162) is much better but was intended only to distinguish genera of the Armadini from other Old World eremic genera and does not eliminate some North American genera.

Problems of the phylogenetic placement of the Armadini are not a result of interpretation on the part of the author but are a reflection of the present chaotic state of the classification of noctuid subfamilies. The Armadini is assigned to the Catocalinae sensu lato on the basis of the "quadri
ded condition of the more primitive "trifid" lineages. The author places the Armadini in the subfamily Ophiderinae (Noctuidae sensu Hampson) because of reduction of larval prolegs, however, the Ophiderinae has been shown to be a polyphyletic assemblage of genera within the Catocalinae on the basis of the primitive condition of the Ophiderinae to the more primitive "trifid" lineages. Reduction of larval prolegs has occurred independently in both "quadri
ded" and "trifid" subfamilies. Several characters of the male genitalia suggest that the Armadini belong with the "trifid" subfamilies rather than to the Catocalinae. A fused pleural sclerite, a derived condition of the Catocalinae, is absent in the Armadini; the type of coremata found in the Armadini is unknown elsewhere in the Catocalinae but is a derived condition of the more primitive "trifid" subfamilies. The larvae, which could provide critical characters, are known for only two species and have not been adequately described.

Another potential source of characters is the tympanum. This structure, however, has been studied in only one species so the description given by Richards (1935) is difficult to interpret. Some unique tympanal characters noted by Richards may be characteristic of the Armadini, or may be restricted to the species examined. An investigation of this structure in other genera of the tribe would be necessary in order to determine if these characters are present throughout the Armadini.

In spite of these shortcomings, the book does present a comprehensive taxonomic revision of this poorly known group of noctuids. Considering the rarity of most species, particularly in North American collections, and the political situation in the Middle East at present, this revision may be as close to having material of Armadini for study as most North American entomologists will ever get. Problems in defining the tribe, and in resolving its phylogenetic position, will require a revision of the higher classification of the Noctuidae and to this end, this book will be a most invaluable source of information. Any entomologist with access to
material of the Armadini will find this revision essential to their work.

REFERENCES CITED


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A volume of disparate essays is difficult to review as a whole. If there is a unity of theme in this one, it lies in the demonstration that evolutionary biology has become a study of behavior, of changes in quantity and quality of populations, and of their genetic bases. Necessarily, then, essays bearing the word "reproductive" in their titles will abound, as will the word "population." Both words occur twice in titles here, and four of the seven essays discuss events at the level of the population. Yet even accepting that evolutionary biologists are now preoccupied with reproduction and populations, I find strained the relationship between some of these essays and evolutionary biology. Captivated by technology, too many evolutionary biologists believe evolution occurs in the rearing cage and the computer. Surely some theoreticians might venture out-of-doors.

Nevertheless, the essays here are excellent, notwithstanding the tenuous connection of some of them to the overall title of the series. Only one (Walker's) deals directly with insects, but entomologists might read all—even that by Davey and Reanney—with interest.

In the first essay ("Some Relationships between Density-Independent Selection and Density-Dependent Population Growth," pp. 1-68), Timothy Prout attempts "to develop a more complete integration of density-independent population genetic theory with the growth dynamics of... populations with discrete generations." The "main conclusion" of this contribution, Prout writes (p. 2), is "that the effects of genetic composition cannot be fully understood without a careful accounting of the point in the life history where the census of population size is made...", more specifically in his model, "genetic composition effects population size," but the reverse is not true. If he is correct, the implications for entomologists concerned with manipulations of pest populations are obvious and profound.

The second essay, by David G. Lloyd (pp. 69-111), is an able discussion of the oft-discussed "Benefits and Handicaps of Sexual Reproduction." The essay does not review early accounts in any detail, but rather suggests additional benefits of sexual reproduction; perhaps the most significant of these is the idea that sex allows one parent to "borrow" from the other genes that individually (not as part of a genetic complex) provide offspring protection from or an advantage against biological components of the environment. Several examples are cited (p. 95), most from insects.

Entomologists may find little of direct concern in the third essay, "Extrachromosomal Genetic Elements and the Adaptive Evolution of Bacteria" (pp. 113-47), by R.B. Davey and D.C. Reanney. But when we know as much about eucaryotic genetics as we do about procaryotic, it should be more clear if extrachromosomal units and transposable DNA units play some evolutionary role (see pp. 141-2).

Henryk Szcarski concludes in his "A Functional and Evolutionary Interpretation of Brain Size in Vertebrates" (pp. 149-74), that the concomitant increase of brain size with vertebrate body size is neither automatic nor so simple as has been thought; functional needs play an important role. He also mentions Pitt's idea that human intelligence was helped to develop by positive feedback between warring groups; he does not suggest the same for the authors and the reviewers of books.

The analysis of population genetics by observing the off-spring, and theirs, of a single female is considered in Peter A. Parsons's, "Iso-female Strains and Evolutionary Strategies in Natural Populations" (pp. 175-217). The method is particularly useful in the study of continuous variation. Many of the examples are taken of course from work with that creature long since abandoned by entomologists to geneticists: Drosophila melanogaster Meigen.

The data J.W. Walker presents in his "Reproductive Behavior and Mating Success of Male Short-tailed Crickets: Differences within and between Demes" (pp. 219-60) were gathered out-of-doors. I suspect it was salutary for all indoor biologists to go out-of-doors, and thereby mingling with nature to clean themselves of scholastic rust (to paraphrase Samuel Johnson [Life of William Broome]). For Walker concludes that the complexity of life in the field far exceeds that of life in the laboratory. Sound-producing orthopterans do indeed perform in the laboratory, but they do so under the simplifying constraints of their artificial environment and their keepers' convenience. Walker's paper discusses these differences (and does so with an ease and clarity the other authors in this volume should envy and emulate) and implies a rebuke to those who prefer the simple.

R. Haven Wiley and Alexander Cruz appear less certain that field work is good to do. They insist theirs is acceptable because they did not merely look for correlations but went into the field with hypotheses. Nevertheless, the lack of controls and of manipulable variables bothers them, and they devote too much of the paper to long-winded justifications. Luckily, they show in "The Jamaican Blackbird: 'Natural Experiment' for Hypotheses in Systematics" (pp. 261-93) that under the simplified conditions of Jamaica (no predators on the adult birds, e.g.), the birds do behave as two of the three hypotheses predicted.

It is customary for a reviewer to end with a flourish. I cannot, and must content myself with the observation that the study and concept of evolution itself have changed in recent decades, and the hope that someone will document that change, perhaps by going through all thirteen volumes of the series Evolutionary Biology.