BOOK REVIEW


This is one of the few revisionary treatments of butterflies on a world-wide basis and is probably the best of such efforts to date. It might be further categorized as one of the more important revisions of any large insect group from a theoretical as well as a practical standpoint.

The treatment is composed of six sections: Introduction, Comparative Morphology, Systematic Treatment, Evolution and Zoogeography, Bibliography, and Index. The revision owes its excellence in part to the uniform, concise writing, the imaginative construction, and the nearly faultless logic of the theoretical aspects.

Miller's work is not holistic as only external features of the adults are considered. The immature stages and internal features of the adults are ignored. Thirty-two characters of the antennae, head, labial palpi, thorax, legs, and wings were measured for all of the nearly four hundred nomenclatorially valid satyrid genera of the world. In such a large undertaking Miller's use of the "exemplar method" as explained by Sokal and Sneath (Principles of Numerical Taxonomy, 1963: 161-162) was both expedient and scientifically valid. Miller considered the type-species of a genus to be typical of it, since it is this entity which bears nomenclatorial "responsibility" for the generic name. Thus, Miller states "systematic decisions at one taxonomic level should be reached by examination of most (preferably all) of the entities at the next lower major taxonomic level.", and thereby justifies his study of genera rather than species in his construction of a higher classification for the Satyridae.

One drawback of Miller's study is that it is not stated in the text by what method his measurements (approximately 12,000) were evaluated. If a computer was not utilized to calculate the numerous possible relationships involved, it is difficult to imagine how Dr. Miller was able to reach any objective conclusions free from bias. Instead the reader can only assume that the author employed subjective weighting of a few selected characters to devise his categorizations.

The assembly of the data has been executed in a manner enabling future application of other techniques such as the phylogenetic methods of Hennig or those of numerical taxonomy as practiced by the "pheneticists."

A statement of the objective of the study, "the analysis, both in space, and, where possible, in time, of the evolution, phylogeny and zoogeography of the higher taxa of the Satyridae.", is comprehensive and is followed by an historical sketch which considers the previous attempts toward the construction of classifications of higher categories of the Satyridae. In table 1, Miller compares the higher classifications of previous authors with his own.

The introductory section is terminated with a discussion of material studied and methods employed. The collections of the Carnegie Museum and British Museum of Natural History were the sources most heavily utilized for study material.

The section on comparative morphology is a recitation of the 32 characters utilized in the study and their variation and usefulness. Miller states that much needless emphasis has been placed on androconial patches, venation, and external genitalia by past workers in their attempts to cope with the suprageneric relationships of the satyrids.

The largest section of the work deals with the systematics of the Satyridae. All nomenclatorially valid genera are placed in a hierarchy of subfamilies, tribes, and "generic-series" and treated in keys. All subfamilies and tribes, nine of which are proposed by Miller, are characterized by 23 of the 32 measured features. For each higher category an objective synonymy is presented along with the original citation. For each tribe all included genera are listed, including primary objective synonymy.
Line drawings of both wings and leg features of selected genera are presented for each of the higher categories. For each tribe bar graphs are presented which contrast relative lengths of femur + tibia + tarsus of the fore- and hindlegs with the midlegs (unity). Measurements for most genera are presented and the sexes are treated separately. Brief remarks on occurrence, economic importance, and folklore add to the information content of the work, but some of this seems out-of-place.

Tables are presented which list diagnostic characters for the tribes within a subfamily. These allow a reader to quickly perceive the major differences between the subordinate categories within the group.

Miller begins his section on the evolution and zoogeography of the satyrids by concisely stating the principles followed in his reconstruction. He points out that the fossil record for butterflies is almost nonexistent, and states the reasonable thesis that butterflies can disperse much more rapidly than continents can drift or land bridges can wax and wane. He gives the origin of the Papilionoidea as Jurassic. In his hypothetical reconstruction inferences derived from the recent distribution of satyrids and the principles of animal evolution as based on vertebrate fossil evidence and interpretation are heavily relied upon.

A discussion of the probable time sequence of the evolution and intercontinental dispersals within Satyridae is then presented. The text is supplemented by 11 sequentially arranged diagrams of the world upon which the migrations and radiations as proposed in the text are schematically represented.

The Neotropical Faunal Region is chosen as the site of origin of the satyrids. Subsequent trans-beringian migrations of New World stock to the Old World and succeeding radiations and dispersals are proposed in no more detail than is justified by the tenuous evidence available. The author presents a proposed phylogeny of the Satyridae which is a dichotomous construction plotted against the geologic time scale. None of the tribes are supposed by Miller to have arisen any later than mid-Tertiary. The "generic-series" are not included in the phylogenetic scheme described above, but are included in the time sequence discussion ("later history of the Satyridae").

In summary, this reviewer found Miller's work to be characterized by conciseness, lucidity, and smoothness of conception, technique, writing, and expression. His painstaking work does not include recent techniques in the field, e.g., computer methods, cytogenetics, or chromatography. Realistically, such involvement might have delayed the appearance or even prevented the completion of this one man vs. 400 genera undertaking. It is unfortunate that there have been so few families of insects subjected to such fine, critical treatments on a world-wide basis. This should stand as an example for lepidopterists to contrast with failings of less fortunately endowed works on butterflies.—PAUL A. OPLER, University of California, Berkeley, California.

**BOOK NOTICE**


Six species are recognized: *distria, constrictum* (2 subspecies), *tigris, americanum, californicum* (6 subspecies) and *incurvum* (3 subspecies); *M. californicum* is particularly variable and sometimes difficult to distinguish from *M. incurvum*, but the other species appear to be clearly separated. A comprehensive and valuable monograph of a difficult genus.—PETER F. BELLINGER, San Fernando Valley State College, Northridge, California.