

BOOK REVIEWS

ADLER, P. H. D., D. C. CURRIE, AND D. M. WOOD. 2004. *The Black Flies (Simuliidae) of North America*. Comstock Publishing Associates, a division of Cornell Press; Ithaca, NY in association with The Royal Ontario Museum. 941 pp. ISBN 0-8014-2498-4. Hardback. \$99.95.

Black fly larvae are a significant component of many running water communities and on land the adult biting females not only cause trauma and blood loss but also carry parasites and pathogens. Less studied is their role as food for insectivores such as spiders, birds and bats. Their role as pollinators is unproven although suspected because adult black flies feed on flower sugars for flight energy. Finally, although again unproven, the death of vast numbers of adults on land must transport some nutrients back to the terrestrial ecosystems, which in nutrient poor regions may be significant. These attributes of black flies have generated considerable research over the last 240 years. This book alone cites over 2200 references on taxonomy, biology, vector status, control and management, and provides a broad overview of these topics in the North American context with an emphasis on systematics and taxonomy. It discusses the 367 species' names for North American Simuliidae, of which 43 are proposed in this volume.

The lack of comprehensive knowledge of the phylogeny and systematics of this family has been a major hindrance both to identification and to the development of a clear phylogenetic context. The authors of this book recognized the confused state of our knowledge and took up the challenge for the North American fauna. The result is a remarkable and rigorous review of the history, biology, systematics, taxonomy and distribution of the family Simuliidae in North America that will be a standard reference for years to come.

The book is divided into four parts: Background, Biology, Economic Aspects and Systematics and Taxonomy. Part I (The Background) is 30 pages and three chapters. The Overview chapter gives a thumbnail review of black fly knowledge. The chapter on the History of Research is a fascinating review of the last 200 years of study of North American black flies with 32 photographs that put a face to a number of people who have contributed to the field. Prior to the publication of this book 324 formal species' names had been proposed for North American simuliids and this book adds 43 new species for a total 367 proposed names (with 120 of these accepted or placed as synonyms). The chapter on Techniques for Collection, Preparation and Curation provides clearly outlined methods for preserving and preparing specimens for use in morphological, cytological and molecular investigations.

Part II (Biology) comprises 63 pages and three chapters. The chapter on Structure and Function is a clearly illustrated description primarily of ex-

ternal morphology and its functional significance for all stages. Internal anatomy gets only a brief description without illustrations, which would have been a useful addition, and the authors note that studies of comparative internal anatomy are very limited but are needed to provide additional phylogenetic information. The chapter on Cytology describes the polytene chromosome structure in detail and the development of using the distinctive banding patterns as characters for elucidating taxonomy and systematics of black flies. The chapter on Behavior and Ecology provides both a concise overview of the ecology, behavior, parasites, and pathogens of simuliids, and an account of the taxa carried by simuliids to vertebrate hosts. Later in the book (Part IV) more specific data on all these subjects are provided for each species, making it an enormous resource of biological information along with references to primary sources.

Part III (Economic Aspects) comprises 24 pages and two chapters. The Social and Economic Impact chapter is an excellent overview of social and economic impacts of the biting females and the associated vectoring of parasites and pathogens to humans and animals. These include both behavioral and medical reactions in humans which seriously affect outdoor work and recreation. They note that the true impact of blood feeding and transmitted parasites on wild host populations is poorly known, but the pictures of blood-feeding flies on a loon and swarms of them over cattle suggest it is significant and needs evaluation. The chapter on Management is a concise and informative review of the history and development of control measures primarily in the 20th century both for larvae and for the protection of humans and animals from biting females. Some early control measures and their environmentally disastrous nature illustrate the desperation people felt when confronted by these biting pests.

Part IV, Systematics and Taxonomy, forms the bulk of the book with 728 pages and two chapters. The chapter Phylogenetics and Classification of Holarctic Black Flies is one of the most clearly written arguments for a phylogenetic classification I have read. They use 230 characters to classify the Holarctic taxa to the level of family, subfamily, tribe, genera, subgenera and species group. They recognize two subfamilies in North America, Parasimuliinae with one genus and Simuliinae with two tribes and 12 genera. Many of the genera recognized by European workers are considered synonyms of one of these genera or

reduced to subgenera or to species group. This welcome framework provides a workable phylogenetic system within which taxonomic relationships and associated biological characteristics can be easily visualized. The chapter called Synoptic List, Identification Keys and Taxonomic Accounts of North American Black Flies will be the main focus for most users of this book. It starts with a synoptic list of all proposed species' names and their status. This is followed by 64 pages of keys to all stages, then 204 pages of accounts of all 255 recognized species, and the remainder of the chapter is illustrations and distribution maps. The keys are well designed with some taxa appearing in more than one couplet to cover variants. External morphological characters are used first and polytene chromosome characters last if required. The accounts of species provide not only details of synonymy and brief synopses of taxonomy and biological characteristics but also key references to primary literature. These, combined with the review chapters, are a goldmine of information. There are 824 line-drawn illustrations and 18 photomicrographs along with 24 colored plates illustrating 18 species of adult female scutal patterns and 131 species of mature larvae in dorsal view. All illustrations have sharp defini-

tion and are very informative with color beautifully reproduced. The polytene chromosome characters are not provided here but ample references are provided. Each distribution map shows all of Canada and the USA with provinces, states and counties shown and each species is separately plotted. These are a goldmine of biogeographical information; for example, somewhat to my surprise they show that Alaska and Northwest Territories have a rich blackfly fauna whereas the south central regions are relatively impoverished.

This book is a superb basic reference on phylogeny, systematics, identification, and biology of the Simuliidae of North America. I strongly recommend this reasonably priced volume to anyone interested in black flies, medical entomology, stream ecology, biodiversity, or biogeography. It is simply a wonderful example of good, rigorous science. I acknowledge constructive suggestions that improved the clarity of the review by colleagues Roger Pickavance and Peter Scott.

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