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Book Review - The Adult Limnephilus Leach (Trichoptera:Limnephilidae) of the New World

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The adult *Limnephilus* Leach (Trichoptera:Limnephilidae) of the New World. D. E. Ruiter. ISBN 0-86727-117-5. Ohio Biological Survey Bulletin New Series Volume 11, Number 1. The Ohio Biological Survey, 1315 Kinnear Road, Columbus, OH 43212-1192, 1995. 200 pp. \$25.00 (paper, either soft-bound or wire-o bound; add \$2.50 for shipping and handling).

Species of the caddisfly genus *Limnephilus*, like most other members of Limnephilidae (so-called "northern caddisflies"), are most common in the boreal parts of the Holarctic Biogeographic Region. Larvae are tube-case makers and are ubiquitous in northern and high altitude lentic and seep habitats, and are encountered frequently in benthic studies in northern North America, Europe, and Asia. Adults and mature larvae are relatively large for caddisflies, with larvae ranging from about 10 to 28 mm in length and adults from about 7 to 20 mm, allowing rather easy handling and examination. The genus also is diverse for caddisflies, with 97 species recognized in this work for the New World and 191 species currently recognized globally. Adult diagnostic characters are variable, however. One measure of the extent of character variation within individual species is 165 synonyms for those 191 species. A measure of the morphological and ecological diversity among those species is 14 generic synonyms for *Limnephilus*.

The taxonomy of most caddisfly species is based on adult males. As noted in the Introduction, Ruiter hoped that his synopsis of adult identification "will assist in the development of the larval associations and lead to further clarification of the adult systematics and phylogeny".

Larvae of only 9 New World species of *Limnephilus* have been described (first appearing in works by Ross 1944, Flint 1960, Nimmo 1965, Lepneva 1966, and Gislason 1979). Wiggins (1977) reported associations for 34 species, but descriptions of these larvae are yet unpublished. Clearly, the use of species for benthic investigations presently is very limited by inability to identify them as larvae. Despite their common occurrence, the species have been poorly known as adults. Adults of species of *Limnephilus* were reviewed last for America north of Mexico more than 43 years ago by Ross and Merkle (1952),

with emphasis on the diagnosis of males. More recently, Nimmo (1971, 1977) reviewed males and females of the species occurring in Alberta and eastern British Columbia, and Marshall and Larson (1982) reviewed the males and females of Newfoundland. Nevertheless, little effort has been made to explore the range of variation among diagnostic characters of males of North American species, and relatively few species have been identifiable as females. Consequently, several synonyms have been unrecognized until now.

Despite the potential for phylogenetic schemes to assist in predictive ecology, almost no research has been attempted on the phylogeny of *Limnephilus* species. Ross and Merkle (1952) made some general phylogenetic observations. Schmid (1955) organized many of the world species into presumably monophyletic species groups, but did not mention specific homologues as evidence for their monophyly.

Ruiter's volume was designed to provide advances in identification of adult *Limnephilus* species and to lay groundwork for larval associations and descriptions and for phylogenetic analysis. On the whole, he appears to have succeeded admirably! The scientific significance of the work rests in the considerable number of specimens examined (ca. 5200, including types of most species), providing diagnoses of females of most New World species for the first time and clarification of the taxonomy of 4 new species, 1 new replacement name, 17 new synonyms, and 4 new combinations. Collection data are given for all specimens studied.

The work includes 19 sections, the most useful of which are those regarding methods, male and female genitalic terminology, species groups and species *incertae sedis*, list of species, illustrated keys to species for males and females, plates of illustrations for each species, literature cited, and the index of valid names and species groups. The Methods section emphasizes the importance of relaxing and clearing genitalia before attempting identifications and discusses well the means Ruiter used to accomplish this. Lacking is a discussion of the fascinating computer technique used to prepare all the illustrations. Terms for the genitalic structures are provided with brief explanations; non-specialists would have benefitted from fully labeled diagrams to illustrate these structures.

Ruiter organized the North American species in groups similar to those of Schmid (1955) and Nimmo (1971, 1977), with changes mostly reflecting new data from females and from variation discovered among newly available specimens. Phylogenetically significant homologues or synapomorphies generally are not discussed in support of these groups. Rather, the emphasis is on diagnostically important characteristics. Besides the diagnostic characters, additions to earlier descriptions are provided where needed, together with rationale for various taxonomic decisions. A separate section regarding unidentifiable species that have been mentioned in earlier publications is helpful. (Note that the named species in this Unidentifiable Species section are properly termed *nomina dubia* [singular *nomen dubium*, or "names of uncertain identity"], rather than *nomina nuda* [singular *nomen nudum*, or "illegal names"].) The List of the New World species of *Limnephilus* is comprehensive and very useful, with valid species names and new taxonomic and distributional data in boldface type and synonyms cross-referenced. (Note that "*Limnephilus subpunctulatus* Hagen, 1861" [not *Limnephilus subpunctulatus* (Zetterstedt, 1840)] and "*L. trimaculatus* [Hagen, 1861]" [not *Arctopora trimaculata* (Zetterstedt 1840)] are misidentified Eurasian species reported from North America in error [Ross 1944].)

Keys are illustrated with figures generally appearing on the facing page. As in some popular field guides used by non-specialists, the characters mentioned in the keys are emphasized with arrows. Males of 2 species without formal names and females of 5 named species are yet unknown; all other New World species are keyed. Besides the smaller illustrations for the keys, 97 plates of illustrations are provided, 1 for each New World species, with views of diagnostically important structures of known males and females. Also, the reader will be thankful that literature citations are not abbreviated.

The index works very well for the valid North American species. Names that are not valid, however, are not provided in the index. These can be found in the synonymies of the valid names in the comprehensive "List of the New World species of *Limnephilus*" (pp. 40-45), but one must search for them rather than expect to locate them alphabetically.

The work is an indispensable contribution to the primary literature for *Limnephilus* and its value will endure at least as long as Ross and Merkley's (1952) work. Taxonomic specialists certainly will use it to identify adult collections, and systematists to infer phylogeny. The rising interest in caddisfly adult behavior and ecology also will be well-served. For benthic ecologists, the book provides means to associate otherwise unidentifiable larvae and, hopefully, to stimulate environmental assessments using adult caddisflies, where sampling methods for adults may be appropriate to the question being asked.

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