



Seasonal Development of Aquatic and Semiaquatic True Bugs (Heteroptera)

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SAULICH, A. H., AND D. L. MUSOLIN. 2007. Seasonal Development of Aquatic and Semiaquatic True Bugs (Heteroptera) [in Russian with a six-page English summary]. St. Petersburg Univ. Press, St. Petersburg, Russia. 205 pp. Paperback, ISBN 978-5-288-04332-1. ~\$40 + postage.

A recently published book on Heteroptera was offered to me for review with the comments that it was in Russian, and that there may be no point in publishing its review in the southeast. I have found this book very interesting. I recommend it to others, whether they are heteropterists, ecologists, insect physiologists, or limnologists, and whether they are in southeastern U.S. or elsewhere in the world.

The purpose of this book is to review and summarize what is known about seasonal development cycles and adaptations of aquatic and semiaquatic bugs. The following topics are reviewed: dormancy (facultative, obligatory, winter, summer, drought), seasonal polymorphy (size, color, wing structure), migration, and reproduction (number of generations per year, seasonal timing of growth). Contrary to the general statement that water bugs overwinter as adults, lay eggs in the spring, develop during the summer, and then repeat the yearly cycle, water bugs have a great variety of life strategies making each species unique. Examples of very different overwintering strategies include some corixids (water boatmen) that overwinter in air bubbles in ice, some Pleidae (pygmy backswimmers) that switch to plastron respiration to overwinter on the bottom of ponds, some ochterids (velvety shore bugs) that overwinter as nymphs on moss on soil, some hydrometrids (marsh treaders) that overwinter as adults on land far from water, and some veliids (broad-shouldered water striders) that are active in the warmer days in winter.

The scope of this book is broad, covering 28 heteropteran families and presenting examples from the entire world, with an emphasis on temperate zones. The authors include Gerromorpha, known as the true aquatic bugs, and Nepomorpha, known as the semi aquatic bugs, as well as Leptopodomorpha (which includes Saldidae, shore bugs) and Dipsocoromorpha (which includes Dipsocoridae, jumping ground bugs). A table on chapter 1 (page 12) shows the classification used in this book. Ceratocombomorpha, composed of the families Ceratocombidae, Hysipterigidae, and Schizopteridae, is an additional infraorder to the 7 infraorders recognized at present in Heteroptera. This taxon was first proposed by Pavel Štýz in 2002 at the second quadrennial meeting of the International Heteropterists' Society in St. Petersburg, Russia. The suprageneric classification of Heteroptera is still in flux, with this new infraorder not yet accepted by all.

The book is organized into 7 chapters, a conclusion and a summary. In the introduction, the evolution of morphological and life-history adaptations to aquatic and semiaquatic habitats is sum-

marized and illustrated. In chapter 2, brachyptery, life cycles, numbers of instars, length of life cycles, and habitats are reviewed. Perhaps no Heteroptera live or overwinter in tiny pools of water in tree holes (on live or dead trees) or in carnivorous pitcher plants, or maybe this was simply not specifically mentioned in the summary. Some veliids live in bromeliads (Polhemus & Polhemus 1991), which apparently were not mentioned. Otherwise, aquatic and semi aquatic bugs are found in a great variety of habitats that include ponds, lakes, streams, surface of water, small temporary pools, rocky river shores, brackish-water pools, sandy beaches, water falls, rock crevices in intertidal zones, and open ocean. The bulk of the book comprises chapters 3 through 7, which cover 5 heteropteran infraorders. Even if little is known about the seasonal development of species in a family, the family is included in the book, which is a good indicator of where research is needed. The conclusion is mostly in the form of a long summary table about seasonal adaptations, which allow water "bugs" populations to survive under environmental conditions with pronounced alternation of favorable and unfavorable seasons" (p. 200). This book ends with a 6-page summary in English. If a second edition of this book were published (even if entirely in English), the inclusion of an extended summary such as this one would be very useful. A glossary of terms also would be welcome.

The senior author, Professor Aida H. Saulich, has published extensively on the topic of environmental control of voltinism in insects. The junior author, Dr. Dmitry L. Musolin, has published widely also, especially on photoperiodic induction of diapause in Heteroptera. Together, they have written on photoperiodic control of nymphal growth of bugs. They published in 1999 an article in English titled, "Diversity of seasonal adaptations in terrestrial true bugs (Heteroptera) from the temperate zone", which is a review of known literature including that derived from their own independent research. Reading this publication helped me understand the style and content of their book on aquatic bugs. The authors probably started to write a similar article for aquatic bugs and in finding a great diversity of life histories they ended up writing a whole book. I am not sure why it was written in Russian since the writers have already published extensively in similar topics in various English language journals. It is as if the authors may have thought that not many readers would be interested in their book and would not buy it. If translated, this book will be more widely sought.

Two references not included in this book are worth mentioning. Papáček & Zettel (2006) described a new species, *Mixotrephes freitagii* (Nepo-

morpha: Helotrephidae), which lives in small mountain springs in Nepal. Another interesting species mentioned in this article, *Mixotrephes thermophilus*, is reported from extreme water habitats such as warm pools below hot springs. The book "Australian water bugs: their biology and identification" by Andersen & Weir (2004) was not listed in the references either.

The soft cover book is approximately 20 by 14.5 cm, and opened fully it fits well in one standard page (8.5 × 11 inches). On the cover is a sepia illustration of belostomatids (giant water bugs), showing one in flight indicating they are strong fliers, and 2 bugs underwater, one eating a frog. I could not find a caption for this interesting illustration. The book may be obtained from either Pemberly Books (UK) (online at www.merlioshop.co.uk/pemberley) or from PENSOFT (Bulgaria) (online at www.pensoft.net). Dr. Musolin can be contacted directly (musolin@gmail.com) to arrange shipment and payment (approx. US \$40 plus postage). That this book is in Russian is not a complete barrier to reading it because it includes the 6-page summary in English as well as a list of contents, an index, and a reference section with most of the 294 entries in English. Also, some of the tables include text that is not in Russian-Cyrillic but in the Latin alphabet. As this book is sold and shipped to customers, it would be greatly appreciated if the publisher inserted an addendum with a translation by the authors of the captions for the figures and tables.

This is the first book of its kind for aquatic and semi aquatic Heteroptera. One would have to do an extensive literature search to find the equivalent

information summarized in it. It may be useful for conservation studies because it provides data on species in some of the most endangered habitats in the world due to habitat loss. Although this book is directed primarily to specialists, I can recommend this book to anyone interested in life histories of insects.

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