Reviews

Syst. Biol. 45(1):119–120, 1996

Lehrbuch der Speziellen Zoologie begründet von A. Kaestner, 4. Auflage Bd. 1: Wirbellose Tiere. 4. Teil: Arthropoda (ohne Insecta).—H.-E. Gruner (ed.). 1993. 1,280 pp. Gustav Fischer Verlag, Jena. DM 178.

The fourth volume of the *Lehrbuch der Speziellen Zoologie, Bd. 1 Wirbellose Tiere* succeeds in covering the morphology, development, behavior, and phylogeny of the large taxon Arthropoda (except for Hexapoda) in a single volume. The first three volumes (covering the Protozoa, Cnidaria, Ctenophora, and the remaining noneuarthropod Protostomia) were published between 1980 and 1984. The volumes on the Insecta and nonvertebrate Deuterostomia will be published shortly.

The entire series of publications constitutes a new (fourth) edition of the *Lehrbuch der Speziellen Zoologie, Bd. 1 Wirbellose Tiere,* which was initially published and written by the German zoologist A. Kaestner in the 1950s and 1960s. The second edition was translated into English (Kaestner, 1967–1970). The new German edition, which has doubled in size, presents a largely rewritten text incorporating the relevant research of the last 30 years. Unchanged is coverage of the entire animal kingdom and the organization of the *Lehrbuch.* After the death of A. Kaestner (author and editor), the new edition was prepared by H.-E. Gruner, the former curator of Crustacea and director of the Museum für Naturkunde in Berlin. In this new volume, Dr. Gruner has written the introductory chapter on Arthropoda and the systematic chapter on the Crustacea.

In the 1993 Arthropoda volume, the Arachnata take up 379 pages, the Crustacea 583 pages, and the "Myriapoda" 114 pages. Introductory chapters are provided for the Arthropoda (53 pages), Mandibulata (5 pages), and Antennata (16 pages). Although the focus is on extant taxa, the fossil taxa Trilobita, Eurypterida, Lipostraca, Archaeostraca, and Anthracocaridomorpha are also mentioned. The Tardigrada, Onychophora, and Pentastomida have already been treated in the third volume of the *Lehrbuch.* In addition to H.-E. Gruner, the authors of the most recent edition are M. Moritz, Berlin (Arachnata), and W. Dunger, Görlitz (Antennata, "Myriapoda").

In each of the three major sections (Arachnata, Crustacea, and Antennata ["Myriapoda"]), the taxa are presented in systematic order. One of the most characteristic features of the *Lehrbuch der Speziellen Zoologie* is the identical order in which topics are covered in the individual chapters. Almost always, chapters are organized as follows: diagnosis, general description, anatomy, reproduction, development, larvae, phylogeny, distribution, natural history, economic significance, and taxonomy. The main advantage of this organization is the ease with which the relevant information is located when the *Lehrbuch* is used as an encyclopedia. As an example, it is easy to find information on the nervous system of Ostracoda, the behavior of Solifugae, or the reproduction of Symphyla. This makes the *Lehrbuch* very helpful for students who have to prepare a paper on a topic such as excretion in Crustacea. Here, the *Lehrbuch* is a valuable addition to more specialized textbooks on specific topics such as physiology or ethology. Quick reference is enhanced by the fact that the less important information is printed in a smaller font.

The main focus of this Arthropoda volume is anatomy and morphology. The various subheadings such as nervous system, sensory organs, digestion, circulatory system, etc., are in bold print. The sections are well written, sufficiently detailed, and always precise. In special cases, organs are described in detail (e.g., stomach of the Decapoda). Particularly valuable are reviews on subjects such as the larvae of the Crustacea. Anatomy, morphology, and development in the major taxa are described in some detail. Furthermore, the relevant species are given for which the information applies, and sweeping generalizations are avoided. Very recent studies are almost always included. The high standard of the text is reinforced by the selection of almost 700 figures, which were taken from original publications or previous editions of the *Lehrbuch.* Most figures are of excellent quality. However, photographs have not been reproduced and even electron micrographs have been redrawn. Descriptions of natural history are summarized under reproduction and biology. The descriptions differ in length, and usually only a few species are covered. Unfortunately, the relevant references are sometimes missing.

The taxonomic subgroups are treated in the sections on systematics, mostly to the family level. Habit, natural history, species number, and distribution are mentioned, and the most important species and genera are listed. Unfortunately, categories such as subphylum, infraclass, and cohort are used, although ranks are arbitrary. These categories obscure relationships, as is evident in the systematic classification of the Arthropoda on pages 63 and 1047. "Myriapoda," which is presumably paraphyletic (Dohle, 1988), is divided into the four independent "classes" Chilopoda, Symphyla, Pauropoda, and Diplopoda. According to the treatment in the book, Insecta is a fifth class, and all five classes are united to form the Antennata. This classification obscures the sister group relationships

between Diplopoda and Pauropoda (Dignatha) and between Dignatha and Symphyla (Progoneata), which are discussed in the Antennata chapter of the book. Also obscured is the sister group relationship between Progoneata and Insecta. Omitting the categories above the family level from the discussion would not result in a loss of information (see Ax, 1987) and would improve the usefulness of the index.

The phylogenetic relationships among the taxa are summarized under "Stammesgeschichte." Here, the Arthropoda volume is not as convincing as it could be. Only seven cladograms are depicted, and three pertain to the short Antennata chapter of the book (p. 1043: Antennata; p. 1078: Chilopoda; p. 1142: Diplopoda). There are only two cladograms in both the Arachnata chapter (p. 84: Arachnata; p. 86: Chelicerata) and the Crustacea chapter (p. 721: Malacostraca; p. 760: Peracarida). Certainly, much care has to be devoted to selecting well-supported cladograms for textbooks, and it is also appropriate not to use preliminary phylogenetic trees, of which there are too many in the literature. But the authors are more than cautious. For example, there is a convincing cladogram for the Maxillopoda by Boxshall and Huys (1989) that should have been included in the Crustacea chapter (the paper is only cited). Also, the results of a phylogenetic analysis of the Chelicerata by Shultz (1990) are not compared with the results of a previous analysis by Weygoldt and Paulus (1979). Schultz's paper is not even included in the reference section.

Several specific points have to be criticized. Incorrect terminology is sometimes used. In the Arachnata section, "apomorphic" and "plesiomorphic" are used to describe taxa instead of characters. Merostomata is said to be both paraphyletic (p. 97) and polyphyletic (p. 82). Sometimes, the line of reasoning is not consistent. For example, the absence of the carapax is used to support a close relationship of the Mystacocarida and Copepoda within the Maxillopoda (p. 607). A few pages earlier (p. 604), the same character is described as plesiomorphic. In some cases, statements are not supported by data. For example, it is claimed that Conchostraca is monophyletic (p. 560), but no character support is presented. Despite these isolated criticisms, most of the phylogenetic statements reflect the current state of knowledge, although phylogenetic studies could have been discussed in more detail.

The Arthropoda volume concludes with three very useful appendices. The citation section includes more than 2,000 references and presents a good summary of the German literature without ignoring publications in English. The references will be very useful for biologists who would like to include German references in their work. Also very helpful is the comprehensive index to the taxa and subjects covered by the book. The species and taxon index especially will be very useful for taxonomic revisions because the authors and year of description are given for all the species and genera that are listed. The editorial board is to be congratulated for the care that went into the editing. Few spelling errors were found. In conclusion, the *Arthropoda* will be an extremely valuable reference book for all biologists who are able to read German. Despite the fact that this *Lehrbuch* is in German, it definitely should be made available in all the scientific libraries of institutions in non-German-speaking countries.

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