

## BOOK REVIEW

Damkaer, David M. 2002. *The Copepodologist's Cabinet: A Biographical and Bibliographical History, Volume One*, Aristotle to Alexander von Nordmann (330 B.C. to A.D. 1832). *Memoirs of the American Philosophical Society*, vol. 240. American Philosophical Society, Philadelphia. xix + 300 pages. ISBN: 0-87169-240-6. Hardcover US\$60.00.

Today, aquatic crustaceans called copepods are considered the most abundant group of metazoans in the world. This follows because water covers about 70% of our planet, marine waters which cover 66% average more than 4000 m in depth, and copepods appear to occupy almost every aquatic niche imaginable plus a few not yet imagined. Copepods range in size from nauplii less than 0.01 mm long to adults of 35.0 mm, although most are less than 0.5 mm long. Yet copepods contribute more biomass to the world than any other comparable animal group. A less appreciated fact about copepods is that they are more diverse morphologically than any other comparable group of metazoans. This diversity is a result of their having adapted to a wide range of life styles, from free-living to wonderfully transformed parasites. Parasitism has evolved independently among copepods several different times and is an important factor contributing to their morphological diversity.

Copepod morphological diversity poses a basic question in the Damkaer book. What kinds of physical evidence led taxonomists to accept the fact that the species belonging to this diverse group of animals are indeed their own closest relatives? The answer to that question is embedded in the most thorough history yet written about studies of copepods through the early 1800's. Contributions to copepodology by eighty-nine scholars from Aristotle to Alexander von Nordmann are described in detail, and often include a discussion of the general biological perspective and historical context of each scholar. Some essays are original historical contributions about little known carcinologists; many others thoughtfully document the friendships and intellectual connections within the carcinological community of different times. This historical presentation provides a wealth of interesting details. For example, in

1554 Guillaume Rondelet was the first person to illustrate a copepod, and it was a parasite. Stephan Blankaart first illustrated a free-living copepod in 1688, and in 1770, Johan Ernst Gunnerus illustrated a marine free-living copepod for the first time. Mauthurin Jacques Brisson first used the name *Crustacca* in 1756, and Otto Fridrich Mueller the name *Entomostraca* in 1785. Carl Linnaeus is the correct name for the famous Swedish taxonomist; the name Carl Linné was created when Linnaeus was made a Swedish noble. Louis Jurine's work in 1820 on changes in the population structure of freshwater cyclopids appears to be the first ecological study of copepods. Microscopes are invaluable to studies of copepods, and their history is given in brief.

Damkaer pays particular attention to the contributions of Linnaeus, Mueller, Jean-Baptiste Lamarck, and Pierre André Latreille, all of whom attempted to place the animals we now call copepods within an ordered system. Parasitic copepods, from their discovery by Aristotle to the time of Joseph Hughes de Boissieu de La Martiniere were quite enigmatic and considered to be worms, soft-bodied mollusks or zoophytes, but never associated in any context with the free-living copepods then known. The first published description of a free-living copepod was Blankaart's, although copepods were mentioned earlier by Antony van Leeuwenhoek in his unpublished letters. Blankaart thought that free-living copepods, like many crustaceans, were wingless insects. Despite the striking differences in adult morphology between some parasitic and free-living species, de La Martiniere suggested in 1797 that they were the same kind of organism, again wingless insects. General agreement about this conclusion evolved over several decades, culminating in 1860 with a publication by Tamerlan Thorell who placed the parasitic and free-living animals in the same taxon, Copepoda. The taxonomic name Copepoda was created by Henri Milne Edwards in 1830 but only for the free-living species known then; Milne Edwards placed the parasites in Siphonostoma.

There are, then, three important concepts guiding contemporary systematics of copepods: (1) that parasitic and free-living copepods are their own closest relatives; (2) that parasitic

and free-living copepods should be placed together in a taxon that contains only themselves and no other crustacean; (3) that parasitism has evolved more than once from different free-living copepod ancestors within that taxon [in effect, not all parasitic copepods are their own closest relatives]. In his book, Damkaer explains that the first concept was unthinkable for most of the history of biology, and then how and why it became thinkable. In a promised next volume, Damkaer will explain how copepodologists have come to accept the second and third concepts.

How and why did taxonomists come to accept the fact that so morphologically diverse a group of animals are their own closest relatives? Damkaer shows that the conclusion was derived from studies of copepod development. These studies began in 1756 with the work of Johan Christian Lange who first observed a crustacean nauplius and crustacean molting, and first recognized juvenile copepodid stages of copepods. These three discoveries were made while Lange was studying freshwater, cyclopoid copepods. Later, observations on the development of parasitic copepods by Jacques Simon Amand Suriray and Henri-Marie Ducrotay de Blainville laid the groundwork for the grand synthesis of von Nordmann in 1832. All of these animals are of the same kind because each hatches from an egg as a nauplius, and because the last naupliar stage is transformed into a first copepodid which is the phylotypic stage of the group. Nordmann's beautiful plate of *Achtheres percarum* is reproduced in the book; the illustration of the parasite's first copepodid emerging from a naupliar exuvium captures the essence of the evidence.

Damkaer is a unique scholar who has studied many aspects of the biology of copepods. He is best known as a taxonomist, and his love of historical studies results from the importance given to the concept of priority in taxonomy. He has contributed significantly to the taxonomy of both free-living and parasitic copepods (Damkaer, 1975; Heron, English, and Damkaer, 1984). He also has maintained an active historical interest in taxonomists and oceanographers. His essay on the complex competition between the evolutionary biologist Ernst Haeckel and the plankton ecologist Friedrich Dahl over the mission of the Humboldt Foundation's famous Plankton Expedition of 1889 (Damkaer and Mrozek-Dahl, 1980) and his studies of the physician naturalist Richard Norris Wolfenden

(Damkaer, 1989; 2000) are invaluable additions to the history of biology. By combining his taxonomic and historical interests, Damkaer has produced an unique analysis of the delay in establishing taxonomic names above species (Damkaer, 1996); that analysis is an excellent commentary on the sociology of taxonomy.

This volume is one in the American Philosophical Society's Memoirs series, and with its publication the society has been very generous to copepodologists and other carcinologists. The page size is large and the margins are wide; when the book is opened each page lies flat so it is easy to read and study. The covers are sturdy and the binding is good. The paper is of high quality and very white so that the invaluable figures of copepods and the portraits of individuals who studied them, with their signatures to natural size, are reproduced very well. In short, this book is a treasure. It is available from the American Philosophical Society, P.O. Box 481, Canton, MA 02021-0481 [fax number 781-828-8915; e-mail address acadsvca@aol.com].

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