

PREFACE

This is the fourth volume of a ten-volume series on *The Natural History of the Crustacea*. Our volume is on *Physiology*. It follows *Volume 1: Functional Morphology and Diversity*, *Volume 2: Life Styles and Feeding Biology*, and *Volume 3: Nervous Systems and Control of Behavior*. The next six volumes will focus on various aspects of the lives of crustaceans, including reproduction, development, life history and behavioral ecology, evolution and biogeography, fisheries and aquaculture, and ecology and conservation biology.

A comprehensive overview of the comparative physiology of crustaceans is essential to the understanding of many aspects of their biology. General overviews of specific aspects of the physiology of crustaceans can be found in some of the major invertebrate zoology textbooks. However, due to space limitations, those textbook chapters can only present a very general introduction to this diverse group. The last extensive overview on this topic was provided in three volumes (vols. 5, 8, and 9) of the 10-volume series on *The Biology of Crustacea*, which was published more than 29 years ago. Those volumes were the successors to the two-volume treatise *The Physiology of Crustacea* published in 1960–1961. Since then, several reviews about particular aspects of crustacean physiology have been published, but these are dispersed in the specialized primary literature. Thus, we believe the time is ripe to synthesize present knowledge about the physiology of crustaceans in a new volume where the information will be presented in a form that is attractive and accessible to a wide general audience of comparative physiologists.

In this volume, Webster details the distinct hormones that regulate molting and metabolism and also describes the functional overlap of these hormones in the first two chapters. McNamara and Milograna then present a review of the physiological control of pigmentation. Muscle structure, function, and development are covered in two chapters by Medler and Mykles and Mykles and Medler. The intriguing ability of crustaceans to drop a limb and subsequently regenerate it is reviewed by Hopkins and Das. The various types of hearts and circulatory systems are described in a chapter by McGaw and Reiber, and that is followed by a review of osmoregulation and excretion by Lignot and Charmantier. Nutrition and digestion are described by Saborowski. Many of the chapters in this volume describe not only normal physiology, but also physiological responses to environmental stress. These include responses to varying oxygen, temperature, and pH by Whiteley and Taylor, respiration and oxygen transport by Terwilliger, and metabolic regulation by Jimenez and Kinsey. The cellular and molecular responses to various stressors are reviewed by Stillman and Hart. The volume concludes with discussions of endocrine disrupters by deFur and Williams and various other environmental pollutants by Weis.

We hope that this volume will not only provide a synthetic overview for scholars interested in the physiology of crustaceans and other arthropods, but also encourage further studies. As becomes evident from many of the contributions, crustaceans are ideal model organisms to study physiological responses to environmental factors, the understanding of which is of utmost importance in a world that is continuously changing. Crustaceans as model organisms will become all the more significant due to their functions as keystone members of food webs, dominance in a multitude of habitats, and economic value as major components of world fisheries and aquaculture.