

by predation by larger sharks, but lack of suitable nursery areas may control the numbers of the latter. Segregation by maturity is seen as a device to limit intra-specific predation.

Much of the material presented in this book leaves the impression that elasmobranchs were the incidental material used in the various authors' studies into physiological and other problems, rather than that they were the prime object of study. Although it may be a "comprehensive compendium of our present knowledge of elasmobranch biology" to quote the publisher's words, it shows how little that knowledge is.

M. J. HOLDEN

ALL ABOUT ECHINODERMS

Echinoderm Biology

(Symposia of the Zoological Society of London, No. 20.) Edited by N. Millott. Pp. xiv + 240. (London: Academic Press, Inc. (London), Ltd.; New York: Academic Press, Inc., 1967. Published for the Zoological Society of London.) 63s.; \$11.

Those who attended the Zoological Society's symposium on echinoderm biology will remember it as a very enjoyable meeting, always interesting and often stimulating. Much of this vitality has come over in the printed proceedings and is due I think to the inclusion of suitably edited discussion. The incorporation of pages of endless questions and answers in many symposia is often of doubtful value, the points on which individual readers require clarification being frustratingly omitted. In this particular instance, however, it seems to have come off, especially in those papers by Chaet and Jefferies.

It is always difficult to review a book of this nature with its inevitable uneven treatment and restricted background of the reviewer. Within the short space of this review it will not be possible to do more than mention briefly some of the papers. On the whole, the symposium would seem to be a good mixture of review articles and papers with a high content of original work. The revival of interest in echinoderms during the past ten to fifteen years or so is well demonstrated in the publication of this volume and shows them to be convincingly out of the doldrums in which they reposed for nearly half a century. As would be expected, this new interest frequently has a different emphasis from that followed by workers at the turn of the century, which cannot always be attributed to the youth of the researcher as the editor would imply in this case!

Topics with a traditionally classical approach are given a modern treatment, such as the papers by Paul on the functional morphology of *Pleurocystites*; by Wright on the evolution and classification of the Asterozoa and the interesting and controversial papers by Jefferies and Nichols on the position of the carroids and the ancestry of the echinoderms, respectively. Such controversy is just what a symposium should and did engender. The wealth of detail which can be extracted or deduced from fossil material with the closely reasoned appeal to homology is always a source of amazement to those trained in a more physiological discipline.

The water vascular system has in the past often provided the thread of interest around which much detailed work has been carried out and some of the most recent contributions are to be found here. Woodley elegantly enlarges on his earlier work on the mechanism of the ophiuroid tube foot protraction and Heddle discusses the interaction of the musculo-skeletal system of the arm of primitive asteroids as a pointer to the origin of the group. Cobb and Laverack combine the information gained from electron microscopical studies with that from electrophysiological techniques to present what I think will be a classic paper on echinoderm neuromuscular physiology. Their results from *Echinus* lantern retractor muscles,

tube foot ampullae and pedicellariae shedding light on previous work.

Millott and Vevers present a study on the enigmatic echinoid axial organ which does something to settle the dust of present controversy. The paper by Chaet on starfish "shedding substance" is more in the nature of a review, and a good one at that. Buchanan's investigations of the infaunal echinoderm population suggest two categories of species, the fast growing short lived ones and the slow growing long lived ones. The complex dispersion patterns of this population can be biased by the sampling frequency and as a result the concept of biomass as an index of the contribution of each species is valueless.

In getting away from the textbook approach to the phylum this symposium must be considered extremely successful and can be recommended to all students of zoology.

E. J. BINYON

PARASITES OF FISH

Parasites of North American Freshwater Fishes

By Glenn L. Hoffman. Pp. viii + 486. (Berkeley and Los Angeles: University of California Press. London: Cambridge University Press, 1967.) \$15; 143s. 6d. net.

This book is the first to bring together keys to the identification of the genera of the parasites of the freshwater fishes of North America. In all about 254 genera are described.

In the introduction the dynamics of fish parasitology are briefly noted and the aims of the book given. The area covered is North America, but Dr Hoffman points out that little work has been done in Alaska and Mexico. Non-North American species of parasites are included if they are likely to be found in the area. A few comments are made about fish parasitology in economic terms and about the prevention, treatment and eradication of parasites. Methods of examination of fish, fixation, preservation and permanent preparation of parasites are given.

The keys together with related descriptions and figures form the major part of the book. The keys are normally arranged as couplets of contrasting characters, although triplets or quadruplets are used if convenient. The keys are to genera only, except in the case of the Hirudinea, where they go to species. Descriptions of genera and higher taxa are given, except for some small groups. A list of the species found in North America is provided for all genera described, and reference citations given. The reader must refer to the relevant literature in order to obtain specific identifications.

Trial identifications were made using specimens of North American Digenea, Cestoda and Acanthocephala. The keys worked well; an expert will find them easy to use, but a beginner will find rather more difficulty, for the introduction to each major taxon does not describe the anatomy of the group. A table of contents is given at the start of each group of parasites, and this is a most helpful feature. On the other hand, the absence of page references from parts of the keys is a nuisance. This absence is explained at the start of the book, and it means that the appropriate reference point is on a nearby page. Nevertheless, a nearby page is a variable factor, and it would have eased the task of the user if all page numbers had been given.

A figure is provided for each genus, with a few exceptions. The appropriate figure number is indicated in the keys—a great help. A standard shading of organs is followed. The first or a few early figures for each group are labelled to indicate the major structures. Normally the figures are of North American parasites, although a small number are of species from other parts of the world. Naturally the latter species do not appear in the text. In the case of the figure used to illustrate the genus *Rhadinorhynchus*