

### Modes of Reproduction in Fishes

By CHARLES M. BREDER, JR. and DONN ERIC ROSEN. Published for the American Museum of Natural History by the Natural History Press, Garden City, New York. 1966. 940 pp., 56 illustrated charts. \$20.00.

Impelled by annual grants to publish quickly and by promotion based on output of papers to publish often, scientists are publishing more and shorter articles in the scientific "weeklies." Few scientists are able to resist these pressures and progressively fewer large and maturely considered monographs are appearing. It therefore gives me satisfaction to review Breder and Rosen's 900 page treatise, collected and written over a period of 33 years, covering the Amphioxii, Agnatha, Placodermi, Chondrichthyes and the Osteichthyes.

The body of the monograph, following a brief introduction, consists of descriptions of reproduction in the various species, which are grouped in families and arranged phylogenetically. Summaries are given at the beginning of each major taxon.

The sizes of the species accounts vary considerably according to what is known — they may be only a line or two, or as much as five pages. According to the introduction the following features are treated: breeding season, breeding site, migration, secondary sex characters, sex discrimination, competition for mates, courtship, mating and parental care. But frequently egg form, adhesiveness and buoyancy, hatching time and age at sexual maturity are also included. Accounts follow the sources closely, a method which often gives something of the flavour of the original and makes for interesting as well as accurate accounts. The sources are always cited. The reader is referred to Dean's *Bibliography of fishes* for the full citation of earlier references. Later references, over 2,000 of them, are given in a bibliography at the end of the book. The cut-off date for references is 1962.

These accounts reveal the rich variety of reproductive methods in fishes, from oviparity to viviparity, from nest builders to mouth breeders, and from demersal to pelagic eggs. Described, for example are the habits of a characin, *Copeina arnoldi*, a pair of which leaps together out of the water to deposit and fertilize their eggs on vegetation or on a stone, and a Kamchatkan *Careproctus* which lays its eggs in the gill chamber of a crab.

Following the species accounts which comprise the body of the text, is a summary. This section succinctly surveys the diversity in certain aspects of reproduction — mating associations; mating habits, breeding sites and migration; and secondary sexual characters and mating patterns.

After the summary is a 56 page illustrated chart which outlines for each family what is known of secondary sex characteristics, mating, breeding sites, sex products, parental care and migration. A line drawing of a typical member of each family is provided. A bibliography and an index to taxa completes the volume.

The most disappointing aspect of the book, to this reviewer, is the lack of analysis. There is no discussion of reproductive phenomena cutting across evolutionary lines. No generalizations are made about, for example, viviparity, cavernicolous, and deep-sea reproduction, or sexual dimorphism. Why, for example, are eggs often placed on the ceilings of the nests? Does this avoid the settling out of sediment on eggs? Definitions to terms are not provided, nor are illustrations (aside from chart figures) included.

When covering such a wide field it is difficult not to miss references. The following references (some of which are after the cut-off date) cover taxa for which little or no information was recorded and are intended as an addenda



rather than a criticism. Brodal and Fänge (1963) in *Biology of Myxine* give a comprehensive survey of the biology of the hagfish. Spermatophores, an unusual feature, are known in the basking shark, *Cetorhinus maximus* (Maxwell, 1955, *Harpoon at a venture*). Millot and Anthony (1960, C. R. Acad. Sci. Paris 251: 442) describe reproductive organs of the coelacanth, *Latimeria chalumnae*. Okada (1959-60, Journal of the Faculty of Fisheries, Prefectoral University of Mie) gives considerable new information on the reproduction of Japanese freshwater fishes, including the Salangidae, and Andriashev (1954) in his *Fishes of the northern seas of the U.S.S.R.* presents material on Arctic fishes, especially the Stichaedae and Zoarcidae. Blacket (1962, Copeia (1): 128) and Krejsa (1964, Copeia (2): 448) give data on reproduction of *Dallia* and *Synchirus*, respectively. Taliev's (1955) monograph *The sculpins of Lake Baikal* is omitted

and the Baikal Comephoridae are erroneously ascribed to the marine waters of northern Europe. *Lapsus calami* include the placement of *Lestidium* in the Alepisauridae instead of Paralepididae, and *Ernogrammus* is the Hexagrammidae instead of Stichaeidae.

Much is unknown about fish reproduction. The breeding habits of only 300 of the 20,000 species are well known. Most of our knowledge is based on 9 families. The author's provision of lists of families whose reproduction is unknown will be a valuable stimulus to research. It is certain that this monograph will remain for many years a source book and guide to those interested in aspects of fish reproduction, be they ichthyologist, ethologist, fishery biologist or aquarist.

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### OTHER NEW TITLES

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**In the Service of Man.** Technology and the Future of Human Values. J. V. Langmead Casserley. Regnery, 1967. 204 p. \$4.95 (US).

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of Calif. Press, 1967. 173 p. Photographs. Maps. \$8.75 (US).

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**They Dared the Deep.** A History of Diving. Robert F. Marx. World Pub. Co., 1967. 160 p. Illus. \$3.95 (US).

**Hummingbirds.** Walter Scheithauer, transl. from German by Gwynne Vevers. Crowell, 1967. 176 p. 76 color photographs by author. Drawings. \$10.00 (US).





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