

bacteria, viruses and plants, and from Protozoa to Mammalia, whether these other organisms be food or enemies of the fishes.

The second part of the book, entitled "Fundamental Links in the Life Cycles of Fishes", is a series of discussions on reproduction and development, size, growth and age of fishes and ways of estimating these, population dynamics, migrations, overwintering and hibernation behaviour, and feeding relationships. There is inevitably some repetition of Part 1.

Part 3 is much shorter, and a discussion on the significance of fishes in the life of mankind and the biological basis of a rational fishery. Here it is emphasized that fundamental knowledge of the ecology and behaviour of the fish, at all stages of the life-cycle, is the only rational basis for fishery development. One point raised is that whereas in temperate waters much can be done to manipulate age classes of fish to give highest sustained yields, in tropical waters production is unlikely to be increased by this method, as the life-cycles of the fishes are so much shorter and age groups represented in the catchable population fewer.

To compress the whole 'ecology of fishes' into some 300 pages is bound to lead to generalizations which are rather sweeping and thereby lose in accuracy, and some of the parts concerning fishes outside the U.S.S.R. have to be read with discretion. A rather surprising omission when discussing the role of coelenterates in the lives of fishes is that there is no mention of corals, and the whole groups of fishes which gain food and shelter from them. References to work in the tropics, for example, are rather out of date. One particularly puzzling point, to which no reference is given, is the "intestinal incubation of eggs in *Tachysurus barbatus*" figured. Could these possibly have swallowed their eggs when disturbed, as fishes practising oral incubation so often do?

One is very grateful to the translator for making this book available in English, but the impression is given that he is not a zoologist. The choice of "abiotic" for 'physico-chemical factors' becomes misleading in some contexts, and "upstream" is used when 'higher up in the water' is probably meant. Curious punctuation occasionally gives misleading ideas, and one could wish that the English names used for the fish were the common ones, as the names used are sometimes confusing. (The translation of Nikolsky's *Special Ichthyology* seems more successful in this respect.)

The 140 figures illustrating the text are helpful, though a few graphs lack information concerning the units used, or which curve is which. Three figures present a visual summary of the biotic links in the sea and fresh water and "the proper and improper conduct of a fishing industry".

Despite minor drawbacks, this is a splendidly stimulating and thoughtful book, which should have a profound effect on the approach to fish ecology. It is a book which should be in the possession of every ecologist interested in fish, and of all those concerned with the management of fisheries, though the price is unfortunately high.

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DEVELOPMENTS IN PARASITOLOGY

Advances in Parasitology

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IT is not possible, in a relatively short review, to tell prospective readers of the wealth and detail of the information contained in this well-written and well-produced book.

Introduced by a short preface by its editor, Prof. B. Dawes, the book begins with two chapters devoted to the parasitic Protozoa. In the first of these, Clay G. Huff

sums up recent researches done on the species of *Plasmodium*, *Haemoproteus* and *Leucocytozoon* parasitic in birds. This valuable article contains a detailed section on the avian species of *Plasmodium* which discusses the natural immunity and susceptibility of the avian and mosquito hosts, the effects of X-irradiation on the development of these Protozoa in their mosquito hosts, the cytology and genetics of the species discussed, the growth of their sexual phases *in vitro* and *in vivo*, the development of the gametocytes and their infectivity, the periodicity of the asexual multiplication, the effects of viruses, bacteria and yeasts and coccidia on the parasites, their cytochemistry, fine structure, immunology and pathology and their exoerythrocytic phases. Shorter, but no less interesting, sections follow on recent work on *Haemoproteus* and *Leucocytozoon*.

In the second essay on Protozoa, C. Horton-Smith and P. Long discuss the pathology and life-cycles of the species of *Eimeria* which cause coccidiosis of the domestic fowl and the turkey, the oocyst production of these species, the DNA, RNA and other chemical substances encountered in the coccidian life-cycle and modern knowledge of the immunology of this economically important disease.

The rest of the volume is devoted to parasitic nematodes and to the larval phases of monogenean trematodes. A valuable essay by W. P. Rogers and R. I. Sommerville describes in detail the significant and promising work that has been recently done on the infective stages of parasitic nematodes and their significance in parasitism. In a short review it is impossible to indicate the importance of the investigations here described. They include studies of the nematode life-cycle as a whole, the physiology, behaviour and survival of the all-important infective stages, the process of infection of the host by these stages through the gastro-intestinal tract or through the skin and the problems faced by the nematode when it has to pass from the world outside the host to the environment it encounters inside the host's body. The mechanisms of the vital ecdyses are here involved, and the authors discuss the problems of infectiousness and their hypothesis of infectiousness considered as an adaptation to parasitism.

In the next article, D. Poynter discusses the lungworm of cattle, *Dictyocaulus viviparus*, which causes parasitic bronchitis, or husk, in cattle, the pathology of this economically important disease, the biology of the infective stages on the pastures from which the cattle pick them up and the remarkable recent use of X-irradiated larvae of the parasite, to make the vaccine developed by workers at the Glasgow School of Veterinary Medicine, which is proving an effective means of protecting cattle from the disease. This vaccine marks a 'break-through' in the field of the immunology of parasitic infections the importance of which can scarcely be overestimated.

There follows a useful article by John E. Larsh, jun., on recent work on experimental trichinosis in hamsters, rats and mice, and the volume concludes with an article by J. Llewellyn on the morphology of the larvae of monogenean trematodes and their post-miracidial development.

So rapid have been the advances in our understanding of the parasite as an organism living, like other creatures, in conflict with the risks of its mode of life and with the challenge of its environment, that everyone who has to deal with parasitic life can scarcely afford not to read this book and to learn how the application of the methods of biochemistry, biophysics and experimental biology in general have altered, in a few productive years, the whole structure of this branch of biology. The promise of this kind of work is incalculable. Not only the biologist but also the medical man and the veterinarian and everyone else who is concerned with the mitigation of the suffering and loss of life inflicted by the parasite will welcome this volume and will hope for successors to it which will deal with the fields of work not covered in these pages.

G. LAPAGE