

A HISTORY OF FISHES

by

J. R. NORMAN

F.L.S., F.Z.S.

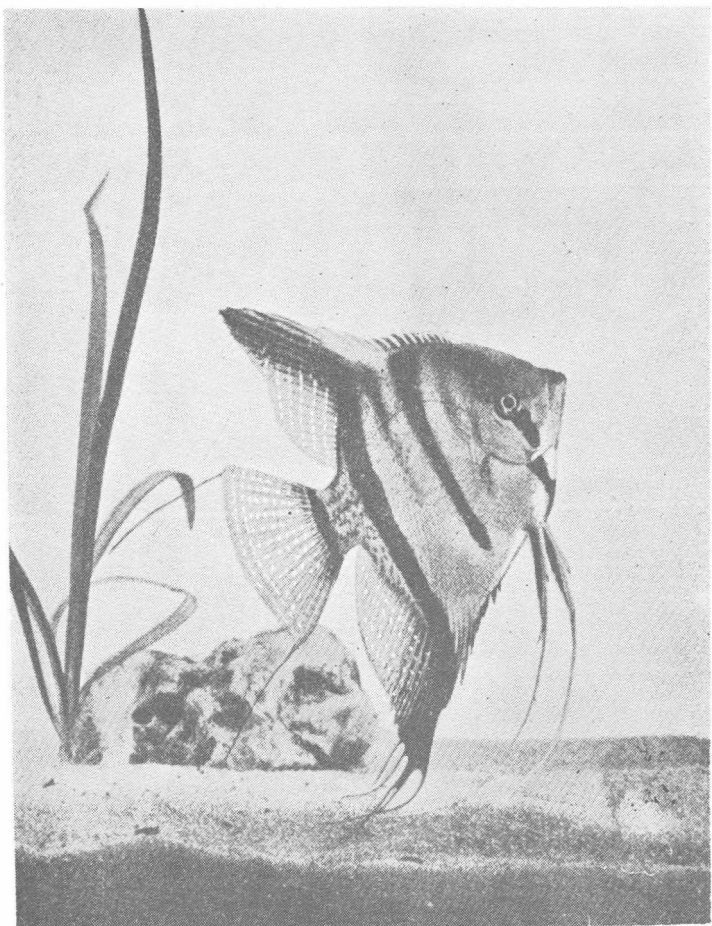
ILLUSTRATED BY

LIEUT.-COL. W. P. C. TENISON

D.S.O., F.Z.S.

WITH 9 PLATES AND 148 TEXT-FIGURES

"HISTORY.—A written statement of what is known ;
an account of that which exists or has existed ; a
record ; a description."—*English Dictionary*.



ANGEL-FISH (*Pterophyllum eimekei*).
Photograph by Mr. W. S. Pitt.

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FOREWORD

JOHN ROXBOROUGH NORMAN died on 24 May, 1944. His long-cherished wish of seeing a revised edition of this book cannot now be fulfilled, so it is therefore reprinted as he wrote it.

The science of ichthyology has not stood still during the past sixteen years in spite of the cataclysm of a second world war, and it is inevitable that specialists in the science may today take exception to some of the conclusions that Norman arrived at, especially as regards classification. But so much change continually goes on in these matters that even the latest decisions by the highest authorities cannot be accepted as the last word. Modern systematists may affirm that sharks are no more fishes than spiders are insects, but until the gallant little army of ichthyologists is considerably reinforced, it will be the man in charge of fishes who will have to answer questions about sharks.

My friend, Dr. Errol I. White, of the British Museum (Natural History), tells me that great advances have been made in the knowledge of fossil fishes and that the restorations made by Dr. R. H. Traquair sixty years ago (Fig. 123) are now quite out of date. Considering that a living fossil fish turned up in 1938, that was supposed to have been extinct for the past fifty million years or so (see Appendix), we can only guess at the vast store of knowledge that has still to be sifted and made available to the "common man" for whom this book was written.

I should like to thank the publishers for permitting me to make these preliminary remarks, meant in no way as an apology for any shortcomings of this most excellent book, but as an introduction, such as my dear friend "J.R." would have liked, to a reprinting of the words he wrote in 1931.

W. P. C. TENISON.

March, 1947.

PREFACE

IN the course of my work at the British Museum I am called upon from time to time to supply answers to all kinds of strange questions, some of them but remotely connected with fishes themselves. How fast does a fish swim? How many fishes are there in the sea? Why does a fish die when taken from the water? Where did fishes first come from? To what age does the average fish live? Can a fish think or feel pain? (A favourite query from the angler!) What is Rock Salmon? Are we depleting the stocks of fishes in the sea by over-fishing? It is in the hope that it will provide solutions to these and other problems that the present work has been written, and, believing that it has been planned on more or less original lines, I feel that no apology is needed for its publication. At the same time, it is hoped that it will serve as more than a mere book of reference—a storehouse of facts—and will prove of sufficient interest to provide general reading, not only for the student of fishes and the angler, but for all those who take an intelligent interest in wild life.

The customary method of dealing with any group of animals is to begin with a recognised scheme of classification, and to take up each of the smaller groups in turn, describing the main distinguishing features of some of the better-known members of each group, their mode of life, food, distribution, and so on. Sometimes one or two chapters devoted to the anatomy, development, etc., of the animals precede the more general part, but, as a rule, these subjects are omitted altogether or dismissed in a few lines. In the following pages I have tried to give some idea of the story of fish life in all its varied aspects, to show how the fishes “live and move and have their being.” In one chapter the manner in which they swim is considered; in another their food; in another their breeding habits, their development, and so on. Many different kinds of fishes are mentioned in illustration of one point or another, and some inevitably figure in more than one chapter. Special stress has been laid throughout on the evolutionary aspect of fish life, the fishes themselves being regarded, not as museum specimens or corpses on the fishmonger’s slab, but as living organisms

which have been modified in a multitude of different ways in accordance with the nature of their surroundings, in order to fit them for the particular conditions under which they are compelled to live. The importance of the part played by the "struggle for existence" in moulding the bodies of fishes will be apparent, and I have endeavoured to show how many of the remarkable modifications of the various organs which go to make up the body of a fish, although sometimes meaningless at first sight, may be readily interpreted in terms of environment, animate or inanimate.

The relation of fishes to the life of mankind has not been neglected, and chapters dealing with the fisheries, fishing methods, fishery research and so on have also been included. The enormous development of our own sea fisheries towards the close of the last century led to a great interest being taken in the habits, and particularly in the feeding and spawning habits, of the edible species. Much important research has been carried out on these problems during recent years, but the results are mostly buried away in scientific journals not readily accessible to the public, who remain largely in ignorance of the work which is being continuously done in order to maintain or improve the harvest of the sea.

In preparing this work I have drawn on my knowledge of the vast literature of the various branches of the science of ichthyology, and have consequently consulted a large number of works of a technical nature, some of them in foreign languages, not available to the general reader. It would, of course, be of little value to include a bibliography of such works here, but a short list of the more important and accessible books of reference on fishes and kindred subjects in the English tongue is appended for the convenience of those who may wish to pursue the subject further.

The use of technicalities has been avoided as far as possible, and scientific terms have been included only where their omission would be at the expense of clarity. It has seemed to me convenient, however, to refer to each fish by its scientific name (usually only the generic name, but occasionally the specific name as well) in addition to that by which it is popularly known, except in the case of lesser-known species for which there are no vernacular appellations. In the legends below the figures the name of the species is nearly always given in full.

Regarding the illustrations, the figures in the text are, with

very few exceptions, new, and have all been drawn specially for this work by my friend Lieut.-Col. W. P. C. Tenison. I take this opportunity of offering him my sincere thanks, not only for the great care that he has taken in their preparation, but also for the kindly interest he has shown in the book since its inception. We have been content to make the drawings as simple as possible, believing that it is better to show the salient and characteristic features of the fishes rather than to produce an artistic effect. Those illustrations copied from other works are duly acknowledged in their place, and I am especially indebted to Mr. Arthur Hutton, Professor F. B. Sumner, and to Professor Johannes Schmidt, for permission to reproduce the photographs appearing in plates I, II and IV respectively.

It only remains for me to tender my grateful thanks to my colleague Mr. M. Burton for the trouble he has taken in reading through the greater part of the manuscript, and for many helpful suggestions and criticisms; to Dr. E. I. White, for reading and criticising Chapter XVII; to Dr. E. S. Russell, O.B.E., for performing a like service in connection with parts of Chapters XIX and XX; and to Mrs. Tenison for assistance in the task of passing the proofs for press. Finally, I find it impossible to allow this opportunity to pass without recording the great debt which I owe to Dr. C. Tate Regan, F.R.S., the Director of the British Museum (Natural History); his very great knowledge of matters ichthyological has always been at my disposal, and the many valuable hints and suggestions that he has given me from time to time since my appointment to the museum have proved of the greatest assistance to me in my work there, and without them it is certain that the writing of this book would have proved a very difficult task.

J. R. NORMAN.

LONDON, 1931.

Certain sections of Chapters II, III, and XI have already appeared in the *Salmon and Trout Magazine*, and are reproduced here by permission of the Editor.

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CHAPTER I

INTRODUCTORY

Definition of a fish. Position in the animal kingdom. Difference between fish and Cetacean. Classes of fishes. Numbers of species and individuals. The science of ichthyology.

"These (the fishes) were made out of the most entirely ignorant and senseless beings, whom the transformers did not think any longer worthy of pure respiration, because they possessed a soul which was made impure by all sorts of transgression; and instead of allowing them to respire the subtile and pure element of air, they thrust them into the water, and gave them a deep and muddy medium of respiration; and hence arose the race of fishes and oysters, and other aquatic animals, which have received the most remote habitations as a punishment for their extreme ignorance."

PLATO.

It is of primary importance in a work of this nature to make it clear from the outset exactly what is meant by a fish, for in popular parlance the word "fish" is often used to include any animal living in the water, a definition which appears in all the older dictionaries. Although convenient, this can hardly be described as scientifically accurate, including, as it does, such diverse organisms as the Whales, Seals, Salmon, Oysters, Cuttle-fishes, Star-fishes, Jelly-fishes, and Sponges, creatures that differ from each other even more widely than do reptiles from birds or birds from mammals. The aquatic animals just mentioned, however, all fall naturally into two main categories in respect of one important bodily feature — those with a vertebral column or backbone and those with none. Man has a backbone, and so have all the mammals, birds, reptiles, amphibians, and fishes; all the others have no backbone. The backboned animals or vertebrates are better known to most people than the majority of the lower animals; indeed, with the exception of a few like the oyster and lobster which are eaten as delicacies, the invertebrate animals are regarded for the most part with lukewarm interest, in some cases with actual disgust. This attitude is partly explained by the superior size of the vertebrates, by the greater ease with which they can be observed and studied, and by the beauty of form and colour displayed by many of the birds and mammals. It has been

further fostered by the editors of popular works on natural history, who devote three-quarters of the available pages to the mammals and birds, crowding the unfortunate lower animals—every bit as interesting and quite often of extreme beauty—into a few short chapters at the end.

A fish, therefore, is a vertebrate, and one specially adapted for a purely aquatic life. But this definition is still inadequate,

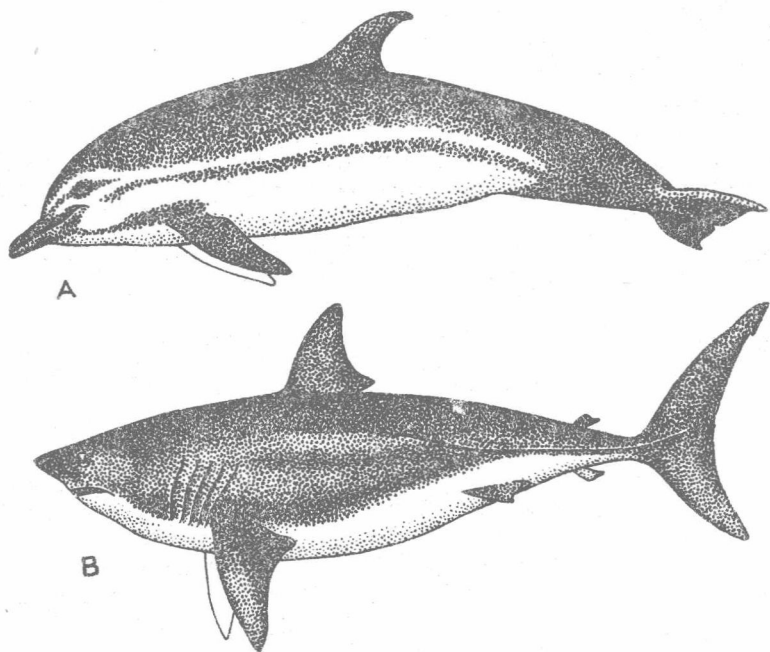


Fig. 1.—CETACEAN AND FISH COMPARED.

A. Common Dolphin (*Delphinus delphis*); B. Mackerel Shark (*Isurus oxyrinchus*). Both much reduced.

for all the vertebrates living in the water are not fishes. What of the Whales, Seals, Otters, Newts, and Frogs? In my official capacity I am sometimes asked to settle arguments, occasionally backed by substantial stakes, as to whether or no a Whale is a fish. Here there is the same fish-like body, the fin-like fore limbs or paddles, and often a fin in the middle of the back (Fig. 1A). Nevertheless, a Whale is not a fish, but a mammal. A close examination of its skin reveals the presence of a few vestigial hairs in the region of the muzzle, the structure of the paddle is quite unlike that of the fish's fin (Fig. 2), being in all

its essential parts just like that of the human hand, and the so-called dorsal fin is nothing more than a ridge of fatty tissue. Furthermore, although a Whale is able to remain under water for considerable periods of time, it is forced to come to the surface at intervals to empty its lungs of air and to inhale a fresh supply of oxygen — the familiar process of spouting or blowing. Whales also bring forth their young alive, and after birth suckle them just like any other mammal. In short, a Whale is a mammal which has left its kindred and exchanged a terrestrial life for one passed entirely in the water, a change

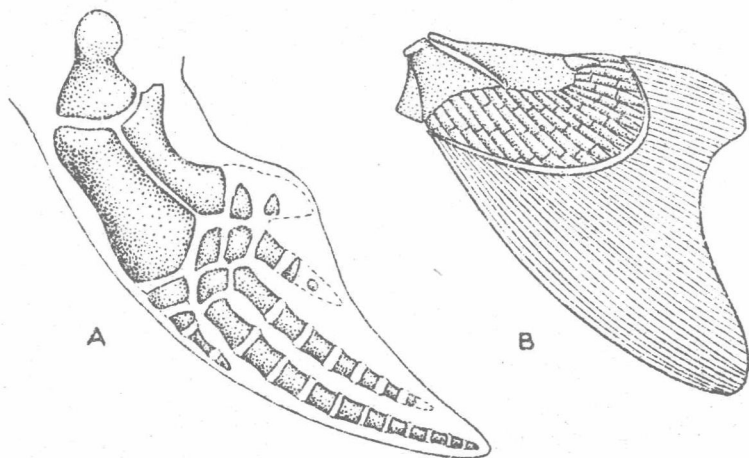


Fig. 2.—PECTORAL LIMB OF CETACEAN AND FISH COMPARED.

A. Skeleton of paddle of the Common Dolphin (*Delphinus delphis*) ; B. Skeleton of pectoral fin of the Comb-toothed Shark (*Heptranchias perlo*). Both much reduced.

which has led to the fore limbs being converted into paddles for swimming, while the hind limbs have completely disappeared. The Seals give us some idea how this change has come about, representing, as it were, a half-way stage between a typical walking mammal and a specialised swimming one. A Seal is amphibious; that is to say, it is equally at home on land or in the water; but the hind limbs have lost a great deal of their power of supporting the body on *terra firma*, and the fore limbs are becoming more and more paddle-like, the shape of the body tapering and fish-like, and the external ears have more or less disappeared. The form of the tail provides a rough-and-ready means of distinguishing at a glance any

member of the Whale tribe (*Cetacea*) from a large fish such as a Shark; in the Cetaceans the flukes or lobes of the tail are horizontal, in the fishes they are vertical (Fig. 1). It is of some interest to note that Aristotle (384-322 B.C.) was well aware of the differences between fishes and aquatic mammals, whereas many of the writers in historical times classed them all together as fishes. The distinctions between the two groups do not appear to have been generally understood until the later part of the seventeenth century, and ignorance as to the real nature of the Cetaceans must often have led our pious ancestors to break Lent, since they enjoyed steaks and cutlets of Whale, Porpoise, or Seal on fast days under the fond delusion that they were consuming fish!

The *Ichthyosaurus*, an extinct aquatic reptile, exhibits the same general fish-like form and paddle-like limbs, but these have clearly been acquired independently, as in the Whales, as a result of the adoption of a life in the water (Fig. 3).

There is yet another creature, common in all our ponds and streams during the spring months, often confused with the fishes in the popular mind, namely the tadpole, which is, of course, the young stage of a Frog or Toad. The Newts, Salamanders, Frogs and Toads belong to a class of vertebrates known as Batrachians or Amphibians, the latter name referring to the fact that they are not only amphibious in the popular sense, living partly in the water and partly on dry land, but are also actually adapted during the early part of their life to breathe under water by means of gills like the fishes, and at a later period to breathe air by means of lungs like the reptiles. But some amphibians never breathe under water at any stage of their existence, not even when immature, and others retain their gills throughout life. How, then, is it possible to distinguish any amphibian from any fish? By the organs of locomotion. In all amphibians the paired limbs are legs in the adult state, in fishes they are fins.

To summarise, a fish may be defined as a vertebrate adapted for a purely aquatic life, propelling and balancing itself by means of fins, and obtaining oxygen from the water for breathing purposes by means of gills. Fishes, thus defined, were formerly regarded as representing a single class of the great sub-kingdom of vertebrates, a class equivalent to the birds (*Aves*) or the reptiles (*Reptilia*); but a more thorough knowledge of their anatomy and evolutionary history has led to a different conclusion. The Lampreys and their allies