

Preface

In conformity with the generally accepted norms, at the present time, all those animals categorised into 'Vertebrate' are falling within the purview of 'Fishes' living in water, breathe air dissolved in water by means of gills or branchiae; whose heart comprises a single ventricle and single atrium; whose limbs, if present, are modified into fins, supplemented by unpaired, median fins, and whose skin is either naked, or covered with ossiferous plates or bucklers. Barring few exceptions, generally fishes are oviferous and oviparous. However, there are not a few members of this class which show a modification of one or more of these characteristics, as we shall observe from the various chapters contained herein, but, nevertheless, they cannot be separated from it. Indeed, the line of demarcation between the class of Fishes and that of Batrachians is vary narrow and their difference relegated to the background as insignificant.

The Branch of Zoology which provides a treatise on the internal and eternal of the fishes, their mode of life, and their distribution in space and time is known as "Ichthyology."

Chapter I deals with the history of, and literature on, Ichthyology—pointing out that the istory of Ichthyology coincides with that of the broad category of the subject Zoology. Reference is made to the world renowned Greek Philosopher, *Aristotle* (384-322 B.C.) who had possessed perfect knowledge of the general structure of the fishes.

Chapter II describes the topographical discription of the external paarts of fishes by nature itself, the scales of many fishes are modified for serving special purposes, expecially to form weapons of defence or a protective armour. The details are elaborated under the several families in which they ocur.

Chapter III lays down the terminology and topography of the skeleton, and provides detailed information pertaining to the modifications of the skeleton in the various sub-classes and groups of Fishes for proper comprehension by the readers.

Chapter IV deals with modifications of the skeleton, such as Branchiostoma, Petromyzon etc.; classification of bones into Cartilage Bones, of the Primordial Skull, Membrane Bones, Membrane Bones of the respiratory portion of the visceral skeleton of the skull, Dermal Bones of the skull and so on and so forth.

Chapter V generally highlights Myology—the study of muscles. In the study of muscles, a reference has been made to the Electric Organs contained in some varieties of fishes, notwithstanding the fact that it is a conjectural thesis to propagate that the electric organs have been developed out of the substance flowing from the muscles. The fishes endowed with matured electric organs—with the power of accumulating electric force and communicating it in the form of shocks to other animals are the Electric Rays, the Electric Steath-fish of Tropical Africa and the electric Eel of Tropical America. The structure and arrangement of the electric organ is vary different in these fishes and vary from species to species.

Chapter VI contains Neurology and suggests the study of Branchiostoma for the most simple condition of the nervous central organ. The features of nervous systems in the various fishes, particularly in regard to their position to brains, spiral cord etc. are explained and illustrated for clear understanding.

Chapter VII: Concerning the organs of sense, th most distinguishing characteristic in fishes is that it has no relation whatsoever to the respiratory function, with the exception of the Dipnoi wherein, very likely, part of the water received for respiration passes through nasal sac. The chapter emphatically points out that the olfactory organ is single in Branchiostoma and the Cyclostomes. In most fishes the organ of smell is double — one being on each side. In the Dipnoi the nasal sac opens downwards by two wide openings, within the boundaries of the cavity of the mouth. The walls of the sac are fortified by several small cartilages.

Chapter VIII Fishes are either carnivorous or herbivorous. Particularly, the carnivorous fishes are very voracious, and they are self-governed by the rule "eat or be eaten". The degree of their power is determined by the dimensions of the mouth and gullet and the strength of the teeth and jaws. It is precisely for this reason that they are able to overpower and swallow other fish larger than themselves.

Chapter IX provides information on the respiratory organs. Gill or branchiae help fishes breathe the air contained in water. It should be distinctly noted that the oxygen consumed by them is not that which forms the chemical constituent of the water (H_2O) but that contained in the air and dissolved in water. It is precisely for this reason that fishes—transferred into water from which the air has been driven out by a high temperature, or in which the air absorbed by them is not replaced—are quickly suffocated.

Chapter X: Barring an exception in the case of Petromyzon, the blood corpuscles of fishes are in elliptical shape. The circulatory system of Branchiostoma and of the Dipnoi shows essential differences from that of other fishes.

Chapter XI: describes the urinary organs of fishes. Surprisingly, no urinary organs have been found in Branchiostoma.

Chapter XII: Throws light on the reproductive organs of the fishes. Either the generative organ of one side was found to be male, that of the other female; or the organ of one or both sides developed partly into an ovary, partly into a testicle. In the European species, *Serranus*, a

testicle-like body is attached to the lower part of the ovary; decidedly, these are males having normally developed testicles only. The fact that very small quantity of semen being sufficient for effectual impregnation, of a number of ova dispersed in a considerable quantity of water, is an eloquent testimony to the likelihood of artificial impregnation.

Chapter XIII deals with growth and variation of fishes. The research conducted in the various parts of the world has a keen insight into the transformation occurring concomitant with growth in all fishes.

Chapter XIV gives information on a variety of subjects like (a) Domesticated and Acclimatized Fishes, Artificial Impregnation of Ova Tenacity of life and Reproduction of lost parts, Hybernation, Useful and Poisonous Fishes.

Chapter XV: The origin of the fishes with respect to their size, shape etc. and the particular species which originated from the very beginning are still existing or not are all shrouded in mystery; and as such research in future may throw some light thereon.

Chapter XVI; highlights the distribution of existing fishes—both Marine and Freshwater—around the world. On account of a large number of species, the line of demarcation between the two is increasingly different. The climate change/geological change at times cause salt water to become fresh water and many of the fishes inhabiting in such localities get themselves acclimatized into the changed circumstances over a considerably long period.

Chapter XVII: deals with the distribution of fresh water fishes emanating from, and shipped to, the various regions/zones of the world.

Chapter XVIII: deals with the fishes of the brackish water and those fishes which can survive both in fresh water and the coastal areas of the sea.

Chapter XIX: concerns the distribution of marine fishes—categorized into (a) shore fishes, (b) Pelagic fishes and (c) deep sea fishes.

Chapter XX: outlines the distribution of Pelagic fishes.

Chapter XXI: During the preceding decades much information on deep sea fishes has flowed in, especially from the North Atlantic regions where these fishes inhabit in great depth with their physical condition in strenuous situation.

In addition to the various chapters referred to herein, very useful and precious research-based technical information is provided in the part nomenclatured as *systematic and descriptive*. In addition to the celebrated Greek Philosopher, Aristotle, the fruits borne out of the efforts of the various scientists/historians have been outlined in the book. The world over research work has been intensified and the new findings and considered opinions are incorporated, from time to time, into the literature for updating the knowledge on fishes and fishing technology.

It is sincerely hoped that this book will meet the ever-growing requirements of the students and professionals; constructive suggestions, if any, are welcome.