FISH SKULLS

A STUDY OF THE EVOLUTION OF NATURAL MECHANISMS

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PREFACE

THE vast and scattered literature of ichthyology contains hundreds of figures and descriptions of the skulls of teleost fishes, both recent and fossil. Monographs of outstanding value such as those of Allis, Starks, Ridewood, Jungersen, Kishinouye and many others have been devoted to the anatomy and osteology of particular types or groups of teleosts, while every systematist has used skull characters in his definitions of the swarming orders, suborders, families, genera and species. Nevertheless it has seemed worth while to bring into existence the present collection of drawings of teleost skulls and to attempt a new review of the field as a whole, with special reference to problems of evolution.

The specimens studied are for the most part in the American Museum of Natural History, New York, but not a few were kindly placed at my disposal in the British Museum (Natural History), through the courtesy of Director Tate Regan and Mr. J. R. Norman. For many oceanic and deep-sea forms I am indebted to the generosity of Dr. William Beebe, Director of the Department of Tropical Research of the New York Zoological Society, who, during our long voyage on the *Arcturus* and in his laboratory at Bermuda, gave me every facility for the study of his collections.

During the years 1926–1928 Mrs. Louise Nash made, under the author's direction and for the present work, a considerable number of drawings of teleost skulls representing many of the orders and suborders. In these semi-diagrammatic, largely free-hand drawings the artist has, it seems, successfully seized the more salient characteristics; but precision in measurements is not claimed for them. In 1929, 1930, 1931 and 1932, Mrs. Helen Ziska contributed to the series a still larger number of carefully measured drawings.

The number of illustrations prepared for the present paper is doubtless inadequate to set forth the protean modifications of the fish skull. A thousand illustrations would still permit only a sparse selection of the principal types. But rather than defer publication indefinitely, I have thought it more useful to bring together and publish the somewhat scant material now in hand.

The aphorism "Analysis must precede synthesis" was long since adopted as the official motto of American ichthyology and has gradually been accepted as binding by ichthyologists the world over. As a result, however, analysis has so far outrun synthesis that recently even the great monographs have been concerned almost exclusively with the routine discrimination of families, genera, species and subspecies, and with the construction of ingenious artificial keys. These of course are indispensable, since they enable one to sit down quickly and write more or less correct labels for large numbers of new specimens, without having to bother at all about the real relationships of any of the fishes in hand. Two or three recent papers, however, which are of broader scope, raise the hope that more ichthyologists may become actively interested in the relationships as well as in the differences between fishes, and that the unfortunate and unnecessary separation of taxonomy, from both phylogeny and the study of nature's mechanisms, may be completely abolished in this country and abroad.

WILLIAM K. GREGORY
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CONTENTS