THE ROYAL NATURAL HISTORY

EDITED BY

RICHARD LYDEKKER, B.A., F.R.S., ETC.

WITH PREFACE BY

P. L. SCLATER, M.A., PH.D., F.R.S., ETC.

SECRETARY OF THE ZOOLOGICAL SOCIETY OF LONDON

ILLUSTRATED WITH

Seventy-two Coloured Plates and Sixteen Hundred Engravings

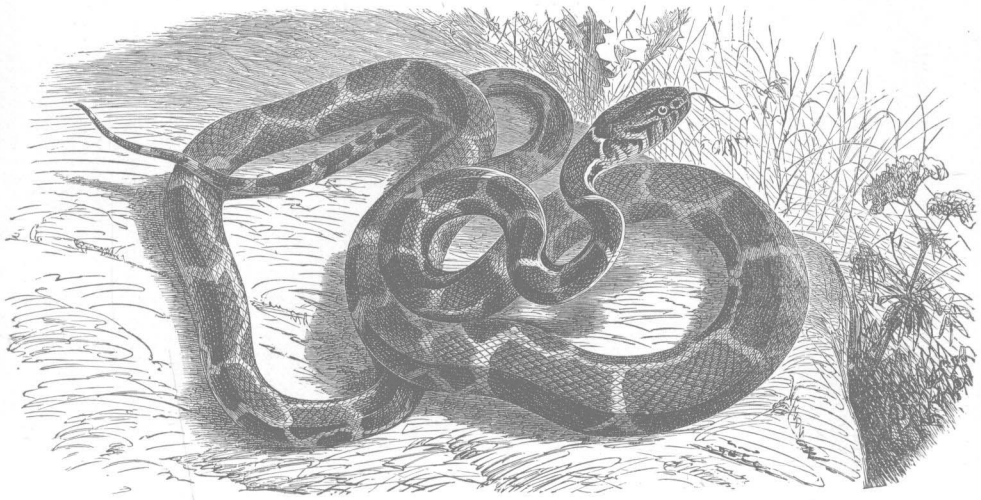
BY

W. KUHNERT, F. SPECHT, P. J. SMIT, G. MÜTZEL, A. T. ELWES, J. WOLF,
GAMBIER BOLTON, F.Z.S.: AND MANY OTHERS

ERRATA

PAGE

47. Line 18 from top, *after* "yet" *add* "except in the leathery turtle."
77. Line 4 from top, *for* "rib-process" *read* "rib-like process."
79. Lines 2 and 3 from top, *for* "the majority of the vertebræ of the tail have the articular cup behind and the ball in front" *read* "the nuchal bones give off rib-like processes underlying the marginals."
169. Line 6 from bottom, *for* "$3\frac{1}{4}$" *read* "$8\frac{1}{4}$."
178. Line 10 from bottom, *for* "African" *read* "Oriental."
180. Lines 21 and 22 from bottom, *transpose* "upper" and "lower."
186. Line 12 from bottom, *for* "New Island" *read* "New Ireland."
245. Line 7 from top, *for* "heavy" *read* "horny."
266. Line 4 from top, *for* "Australia" *read* "Papua."
273. Line 12 from bottom, *after* "and" *add* "almost."
274. Line 8 from top, *for* "vertical" *read* "horizontal."
302. Line 4 from top, for "*Hypnobius*" read "*Hynobius*"; line 22, *omit* "only."
333. In table, *delete* "(6) Suborder Isospondyli—*Leptolepis*"; and on p. 334, line 7 from top, *for* "eight" *read* "seven."
362, 397. The species of *Thyrsites* and *Sphyræna* are both termed "barracudas"; the latter may be distinguished as "barracuda-pikes." The account of the fishing of the latter refers to the former.
527. Line 29 from top, *for* "Iceland" *read* "Ireland."
532. Line 25 from bottom, *instead of* "four . . . five or six" *read* "five . . . six or seven."
534. Line 2 from top, *for* "developed" *read* "depressed."



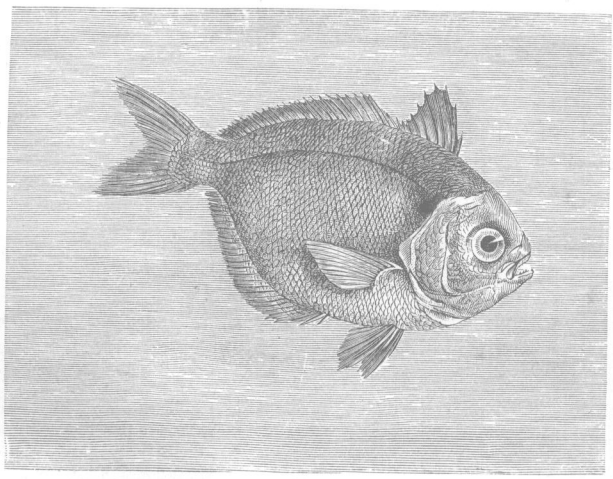
CONTENTS

REPTILES

AMPHIBIANS

FISHES

THE LOWEST VERTEBRATES AND THEIR ALLIES



LIST OF ILLUSTRATIONS

COLOURED PLATES

PAGE PLATES

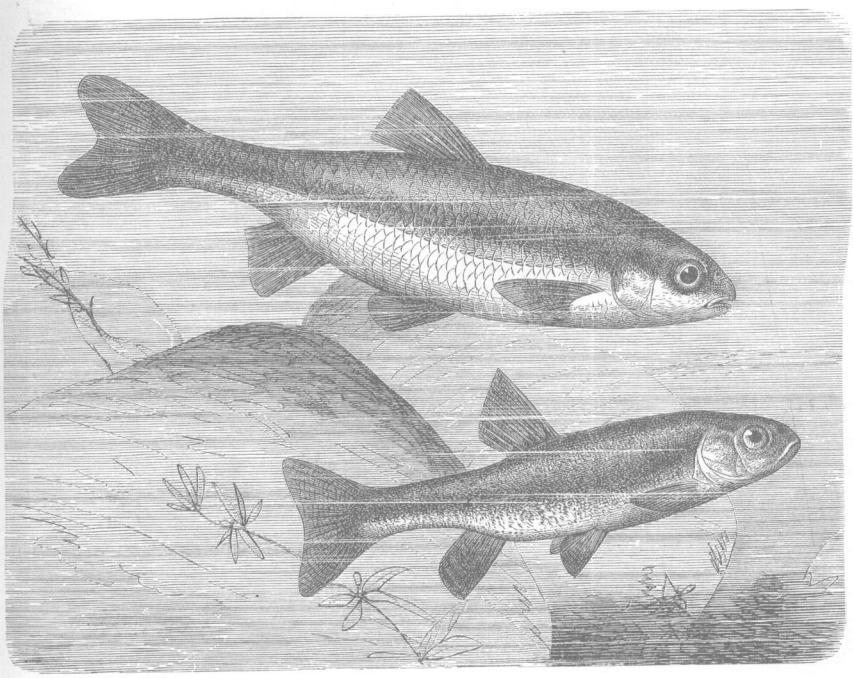
TEXT ENGRAVINGS

REPTILES

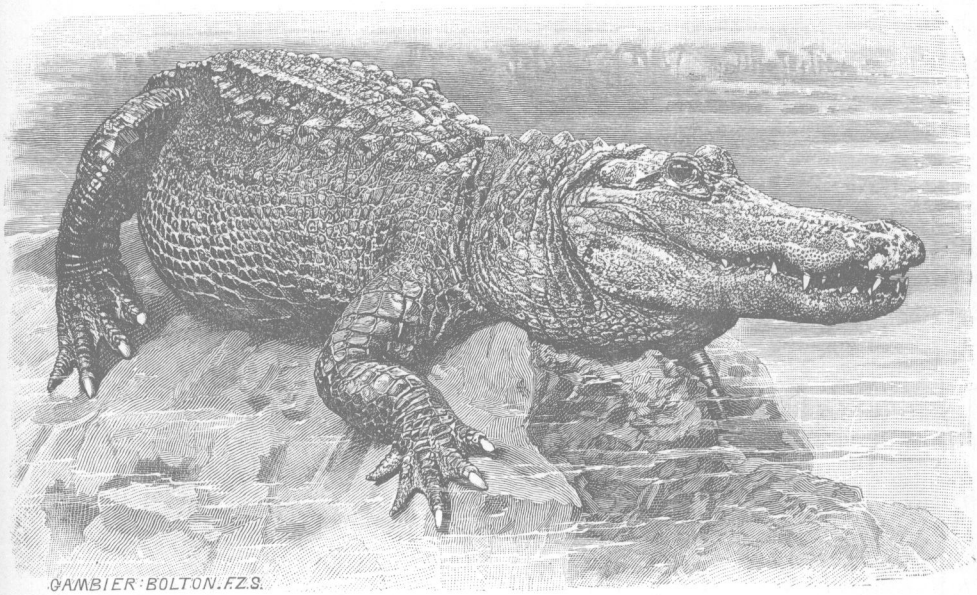
AMPHIBIANS

FISHES

THE LOWEST VERTEBRATES AND THEIR ALLIES



THE ROYAL NATURAL HISTORY.



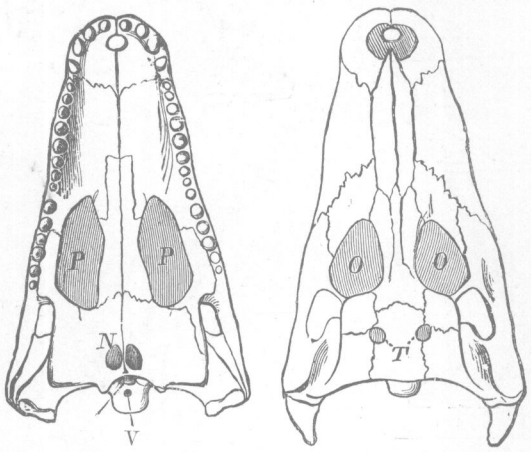
REPTILES.

CHAPTER I.

General Characteristics,—Class **Reptilia.**

In ordinary language the term Reptile is applied indifferently to such creatures as crocodiles, tortoises, lizards, snakes, frogs, and salamanders, but by the naturalist it is used in a more restricted sense, and includes only the first four of these, together with a host of extinct types; while the frogs and salamanders, with certain other forms, both living and extinct, on account of important structural differences, constitute a class by themselves, known as the Amphibians, and bearing the same rank as the class of Reptiles. To an ordinary observer there would seem but little in common between a scaled lizard or snake, a cuirassed crocodile, and a carapaced tortoise, on the one hand, and a feathered bird on the other. Nevertheless, as we have had occasion to mention at the close of the preceding volume, the connection between Reptiles and Birds is exceedingly intimate,—so close, indeed, that Professor Huxley has termed the latter greatly

modified Reptiles. At the present day the two groups are, indeed, somewhat widely sundered; and it is only by the study of forms long since extinct that we are enabled to grasp the intimate relationship that exists between them. That Birds are the descendants of Reptiles may accordingly be taken for granted, although we are still unacquainted with the immediate links connecting the two classes. In another direction Reptiles are, however, connected through other extinct forms with the Amphibians; while from these intermediate, half-Reptile, half-Amphibian creatures, it is probable, as elsewhere mentioned, that Mammals have originated. As we shall point out later on, Amphibians are also intimately connected with the class of Fishes, and we thus see how closely allied are all the classes of the Vertebrates, and how difficult is the task of the naturalist to distinguish them satisfactorily one from another when the whole of the extinct forms are taken into consideration. It is, indeed, solely from the still imperfect condition of our knowledge of the past that we are enabled to formulate any definitions at all, for had we the whole chain of organised nature before us, it will be obvious that no breaks would exist, but that every group would pass by imperceptible degrees into the earlier one from which it originated.



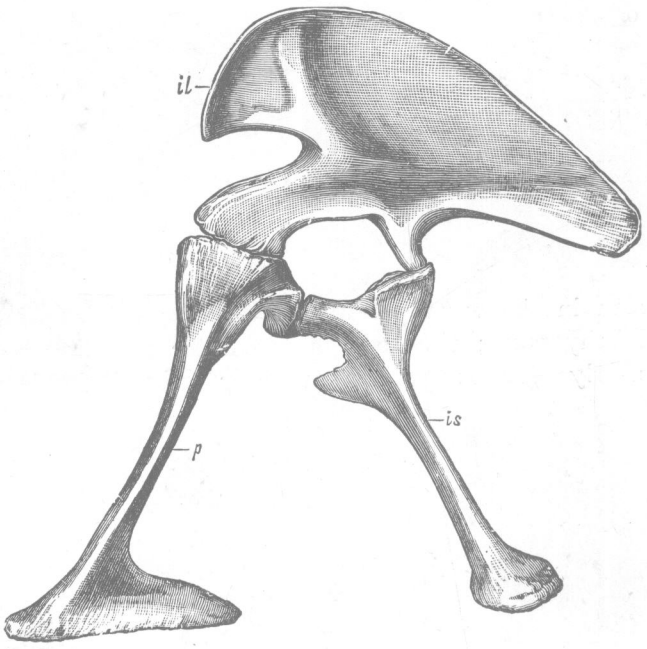
LOWER AND UPPER SURFACES OF THE SKULL OF A CROCODILE.

N, aperture of the internal or posterior nostrils; *O*, sockets of the eyes; *P*, vacuities of the palate; *T*, frontal vacuities, or fossæ; *V*, condyle of the occiput.

Proceeding to the consideration of what constitutes a Reptile, as distinct from any other animal, we may first point out some of the features in which Reptiles agree with Birds, and thereby differ from Mammals. In the first place, the skull articulates with the first vertebra by a single knob, or condyle (*V* of the figure); while each half of the lower jaw is composed of several distinct bones; and the whole lower jaw articulates with the skull by the intervention of a separate quadrate-bone.[1] Then, again, both agree in that the appendages developed from the outer layer of the skin never take the form of hairs, while the young are not nourished by means of milk secreted by special glands on the body of the female parent, neither are gills developed at any period of life, throughout which respiration is effected by means of lungs. A further resemblance is shown in the position of the ankle-joint between the upper and lower rows of small bones entering into the composition of that part of the skeleton. In producing their young from eggs (sometimes retained within the body of the parent until hatched), Reptiles resemble not only Birds, but likewise the lowest Mammals; with which they also agree in the nature of the investments surrounding the embryo. As regards the distinction between the two groups, Reptiles are broadly

[1] In the figure the quadrate-bones are the prominences at the hinder external angles on either side of the letter *N*.

separated from Birds by the absence of feathers; the appendages of the outer layer of the skin being in the form either of overlapping horny scales, or of large shields uniting by their opposed edges. Moreover, all known Reptiles differ from Birds in having more than three digits in the fore-limb; while in no cases are the collar-bones fused into a furcula, as they are in all flying Birds. A further distinction is to be found in connection with the circulatory system, the blood of all existing Reptiles being cold, while the aorta, or great propelling blood-vessel of the heart is double, and crosses both branches (instead of only the left branch) of the windpipe. It will be obvious, however, that these two last characters cannot be verified in the case of extinct Reptiles, among which it is quite probable that there may have been some in which the blood was warm. A similar remark will apply to the absence among living Reptiles of those ramifications of the bronchial tubes throughout the body, which form such a characteristic feature in the structure of Birds. As additional features in the skeleton, it may be noticed that Reptiles never have the terminal faces of the vertebræ saddle-shaped; while in those forms in which the number of toes in the hind-limb is reduced to three, the metatarsal bones do not unite to form a cannon-bone in conjunction with the lower row of bones belonging to the ankle-joint. Then, again, with the exception of one remarkable extinct group, Reptiles, as a rule, are characterised by the three bones of the pelvis remaining distinct from one another through life; whereas in all existing birds they are welded together. There are likewise differences in regard to the form and structure of the breast-bone and sacrum, into the consideration of which it will be unnecessary to enter in this work.



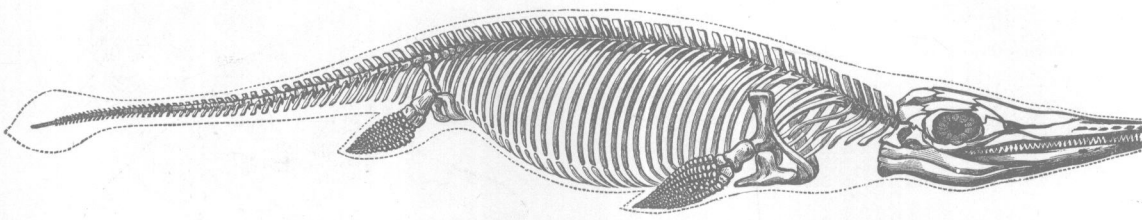
THE BONES OF THE LEFT SIDE OF THE PELVIS OF AN EXTINCT DINOSAURIAN REPTILE ($\frac{1}{12}$ nat. size).

il, ilium; *p*, pubis; *is*, ischium.—After Marsh.

Diversity of Form and Structure.

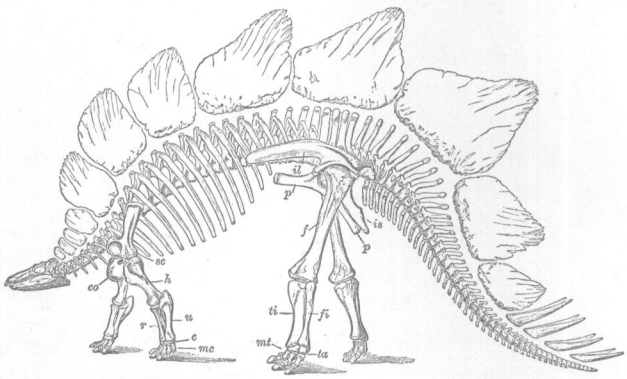
In marked contrast to the uniformity in appearance and structure characterising Birds, the various groups of Reptiles differ widely from one another, both as regards external form and internal structure. Externally, a lizard, a snake, and a tortoise present the most marked differences in general appearance among living members of the order; while among extinct types there were some which walked on their hind-limbs alone, after the manner of Birds, and others having their fore-limbs modified into wings and the digits connected

by a leathery membrane like that of bats. In a typical Reptile, such as a lizard or crocodile, both pairs of limbs are well developed, and of approximately equal length; but in the snakes all external traces of limbs have disappeared; while in the extinct flying dragons, or Pterodactyles, the fore-limbs much exceed the hind ones in size, and in many of the so-called Dinosaurs, which are likewise extinct, the excess in size falls to the share of the hinder pair of limbs. In other cases, again, the limbs may be modified into paddles, adapted for progres-



SKELETON OF FISH-LIZARD, OR ICHTHYOSAUR.

sion in the water, as in the existing turtles, and the extinct fish-lizards or Ichthyosaurs; the body in the latter assuming a somewhat fish-like form. In nearly all cases Reptiles have long and well-developed tails; although in some of the flying dragons these become rudimentary.



RESTORED SKELETON OF ARMOURED DINOSAUR (about $\frac{1}{60}$ nat. size).

sc, shoulder-blade, or scapula; *co*, coracoid; *h*, upper arm-bone, or humerus; *r*, *u*, bones of fore-arm, or radius and ulna; *c*, wrist or carpus; *mc*, metacarpus; *il*, haunch-bone, or ilium; *p*, pubis; *is*, ischium; *f*, thigh-bone, or femur; *ti*, *fi*, bones of lower leg, or tibia and fibula; *ta*, ankle, or tarsus; *mt*, metatarsus.—After Marsh.

A large number of Reptiles are characterised by the development of bony plates within the deep layer of the skin; such plates, which are well displayed in existing crocodiles, being overlain by horny shields, and thus corresponding in every respect with those forming the carapaces of the armadilloes among Mammals. Among certain extinct Dinosaurs these bony plates attain a development unparalleled at the present day; and in some they are believed to have occupied the extraordinary position shown in the accompanying figure.

Still more remarkable differences exist with regard to the form and structure of the teeth; which, instead of being, as in the two preceding classes, strictly confined to the borders of the jaws, may be spread over the entire palate. In spite, however, of this diversity of form, the teeth of Reptiles differ from many of those of the majority of Mammals in that they are never implanted in the