Guide to the gallery of Reptilia and Amphibia : in the Department of zoology of the British museum (Natural history) / Illustrated by 76 text and other figures.

Contributors

British Museum (Natural History). Department of Zoology.
Lydekker, Richard, 1849-1915.

Publication/Creation

[London] : Printed by order of the Trustees, 1906.

Persistent URL

https://wellcomecollection.org/works/v3w8ttdh

License and attribution

GUIDE

TO THE

GALLERY OF

REPTILIA AND AMPHIBIA

IN THE

DEPARTMENT OF ZOOLOGY

OF THE

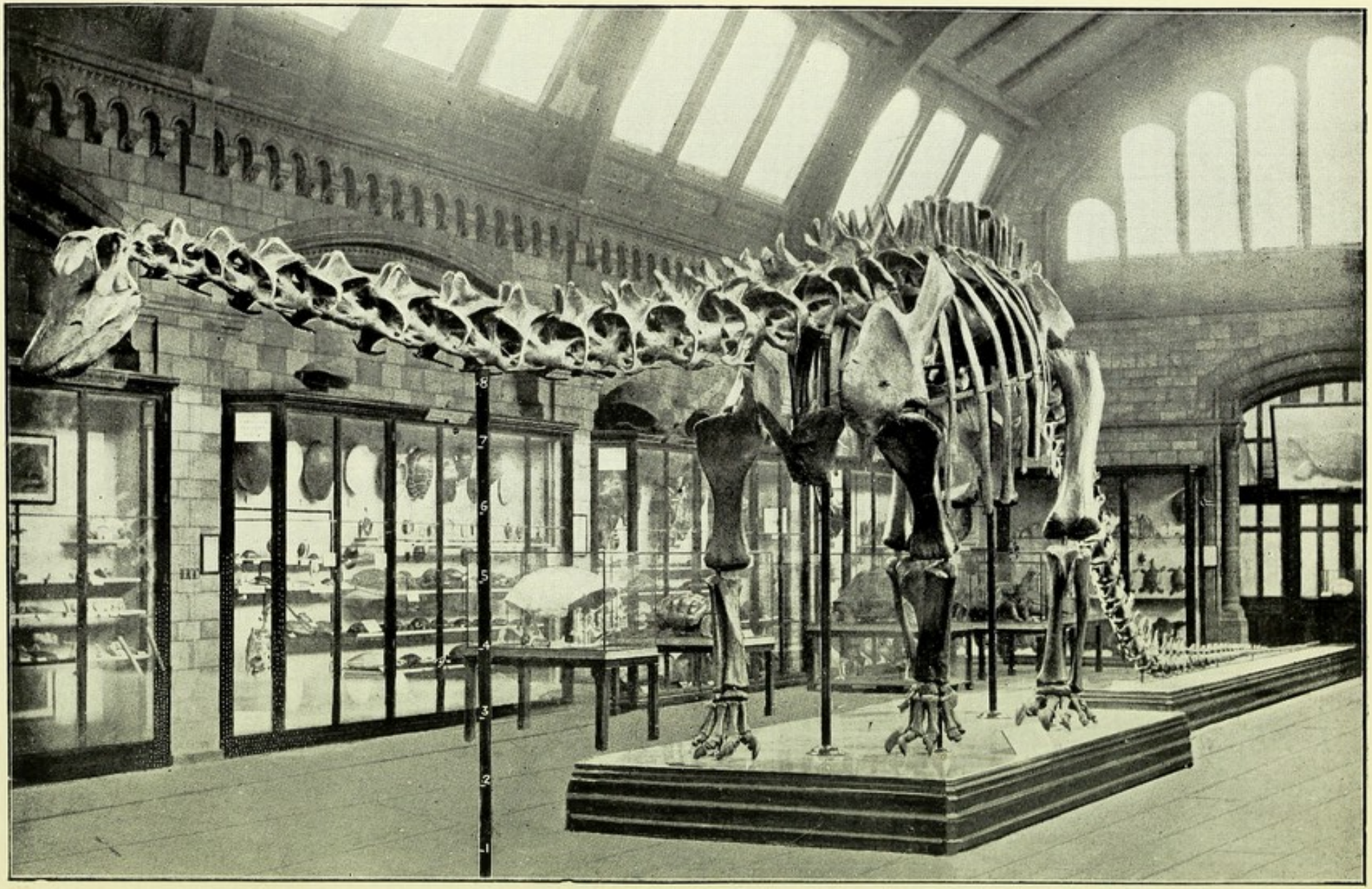
BRITISH MUSEUM (NATURAL HISTORY)

CROMWELL ROAD, LONDON, S.W.

ILLUSTRATED BY 76 TEXT AND OTHER FIGURES

LONDON
PRINTED BY ORDER OF THE TRUSTEES
1906

PRICE SIXPENCE



THE REPTILE GALLERY, VIEWED FROM THE SOUTH-EAST, SHOWING THE MODEL OF THE SKELETON OF *Diplodocus carnegii*.

GUIDE

TO THE

GALLERY OF

REPTILIA AND AMPHIBIA

IN THE

DEPARTMENT OF ZOOLOGY

OF THE

BRITISH MUSEUM (NATURAL HISTORY)

CROMWELL ROAD, LONDON, S.W.

ILLUSTRATED BY 76 TEXT AND OTHER FIGURES

LONDON
PRINTED BY ORDER OF THE TRUSTEES
1906

LONDON:
PRINTED BY WILLIAM CLOWES AND SONS, LIMITED,
DUKE STREET, STAMFORD STREET, S.E., AND GREAT WINDMILL STREET, W.

CORRIGENDA.

Page 9, line 16 from top, *for* fifth *read* ninth.
,, 23, ,, 6 ,, bottom, *for* All *read* Nearly all.
,, 35, ,, 18 ,, top, *for* All *read* Most.
,, 69, ,, 21 ,, top, *for* always *read* usually.

PREFACE

THE Reptilian Gallery in the Zoological Department of the Museum is primarily devoted to the exhibition of specimens of recent Reptilia and Amphibia, the extinct forms being displayed in a gallery in the Geological Department, to which there is a special guide-book. Recent Reptiles cannot, however, be understood without some knowledge of the extinct kinds; and it has accordingly been deemed advisable to exhibit specimens of a few characteristic examples of each of the more important extinct groups. In addition to these, from considerations of space, the skeleton of the great Dinosaur *Diplodocus* presented by Mr. Andrew Carnegie is exhibited in this gallery.

The specimens are numbered consecutively, commencing with the Crocodilia and going round the gallery to the Chamæleons. After the latter come the Amphibia. The groups are not described in quite the same sequence in this Guide; at the same time every specimen is numbered, and the corresponding number can be found in the Guide without any difficulty.

It must be remembered that only a few selected species are exhibited in this gallery, and that the bulk of the Museum collection of Reptiles and Amphibians is preserved in the spirit-house and

store-rooms, to which this Guide does not refer. The process-blocks are from photographs of actual specimens in the Museum, and were prepared under my immediate superintendence. The Guide has been written by Mr. R. Lydekker, F.R.S. Some of the woodcuts are borrowed from the 'Cambridge Natural History,' others are from publications already issued by the Trustees.

E. RAY LANKESTER,

DIRECTOR.

BRITISH MUSEUM (NATURAL HISTORY),
LONDON, S.W.
March 7th, 1906.

TABLE OF CONTENTS.

I.—THE REPTILE SERIES.

Class REPTILIA.

II.—THE AMPHIBIAN SERIES.

Class AMPHIBIA, or BATRACHIA.

GUIDE

TO THE

REPTILES AND AMPHIBIANS.

I.—THE REPTILE SERIES.

Class REPTILIA.

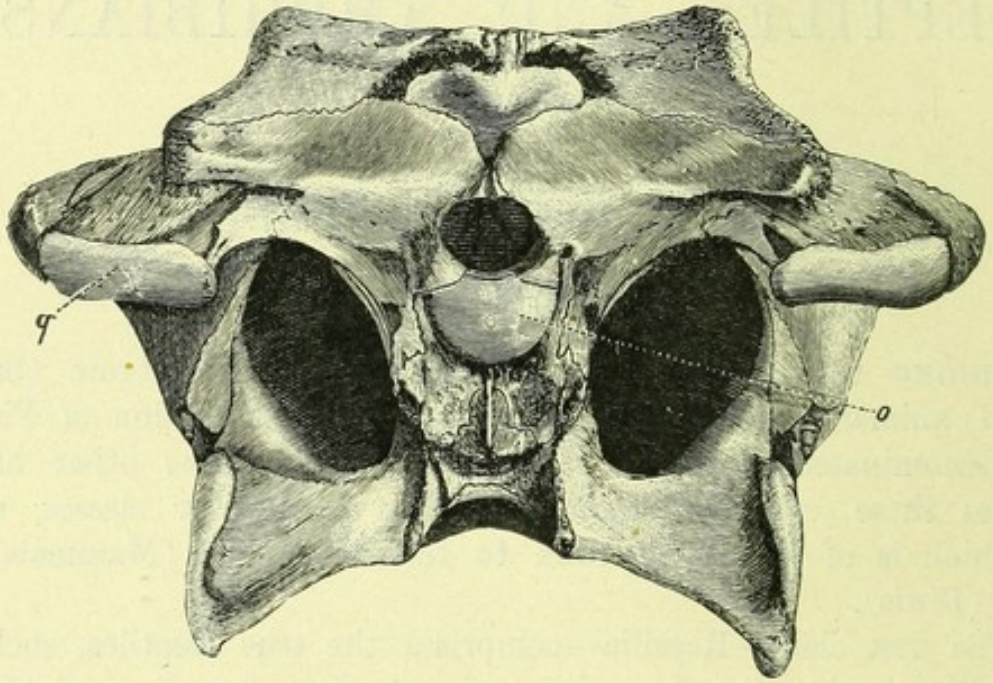
ACCORDING to popular ideas, all cold-blooded vertebrate (back-boned) animals which do not come under the designation of Fishes are denominated Reptiles. The naturalist, on the other hand, divides these creatures into two main groups or classes, each of which is of equivalent rank to the Mammalia (Mammals) or Aves (Birds).

The first class—Reptilia—comprises the true Reptiles, such as crocodiles, snakes, lizards, and tortoises, and is characterised by the fact that the young (whether hatched from eggs or born alive) resemble their parents in most things except size and, perhaps, some details of colouring, as soon as they come into the world and breathe atmospheric air. Another feature is that the skull is attached movably to the first joint of the back-bone, or first vertebra, by means of a single knob, or "condyle" (fig. 1, *a*), which usually consists of three separate portions, one in the middle and two at the sides. In the presence of this single knob Reptiles resemble Birds and differ from Mammals. They also agree with the former and differ from the latter in that the lower jaw consists of a number of separate pieces and is joined to the skull by means of an extra bone, the quadrate-bone (fig. 1, *q*).

The second class—Amphibia—includes, on the other hand, such creatures as newts, salamanders, frogs, and toads, in the great

majority of which the young come into the world as aquatic animals ("tadpoles"), breathing the air dissolved in water by means of gills, but subsequently undergo a marked change (metamorphosis) into the adult form, when atmospheric air is breathed by means of lungs. It is true that in some cases the gill-bearing tadpole form is retained throughout life (the creature breeding in this condition), and also that in other instances the animal comes into the world in the permanent air-breathing condition. In the latter case the larval stages are passed through within the body of the

Fig. 1.



Back view of Skull of Crocodile, without the lower jaw. To show the single knob, or "condyle" (*o*), by which the skull is articulated to the first joint of the back-bone, or vertebral column; and the quadrate-bone (*q*), to the lower end of which the lower jaw would be attached.

female parent or, more rarely, within the shell of an egg which is laid (Cæcilians). In existing Amphibians the skull is articulated to the first vertebra by means of two knobs, or "condyles," as in Mammals.

At the present day Reptiles and Amphibians are sharply distinguished from one another, and while the former show many decided relationships to Birds (still more emphasised in some of their extinct predecessors), the latter do not exhibit any such affinity.

When, however, extinct Reptiles and Amphibians are taken into

consideration, it is found that there are close approximations between the two classes, and that the one group is probably descended from the other. The descent is, however, not apparently to be traced through a single line. On the contrary, while the great majority of Reptiles seem to trace their origin to one extinct group of Amphibians (the Microsauria), one particular extinct group of the former, namely, the Theromorpha, shows evidence of descent from a second group of Amphibians (the Labyrinthodonta). From the first great branch of Reptilia, which includes all the "orders" in the following table except the last, Birds seem to have been derived; so that the whole assemblage may be termed the Bird-like Reptiles.

The tenth order of Reptiles, on the other hand, which has been long since extinct, exhibits remarkable indications of affinity with Mammals, this being displayed in the character of the teeth, of the skull, and of the limb-bones; and it is probable that this group represents the ancestral stock from which Mammals are derived. Indeed, there are certain South African fossils in regard to which it is difficult to say whether they should be referred to Reptiles or Mammals.

The following table exhibits the chief sub-divisions of the class Reptilia, that is to say, the orders and sub-orders under which the various families are arranged. Those groups which are extinct are indicated by a †; and it will be noticed that the proportion of these extinct groups is very large indeed—much larger than in the case of either Mammals or Birds. The explanation of this is that Reptiles are a very ancient group, which attained its maximum development when Mammals and Birds were in their infancy; hence the extinction of a large number of groups.

CLASSIFICATION OF REPTILIA.

	Order.	Sub-order.	Case.
Bird-like Reptiles.	I. †Ornithosauria (Pterodactyles.)	. . . . .	4
	II. †Dinosauria (Dinosaurs.)	1. Theropoda 2. Sauropoda 3. Ornithopoda	4
	III. Crocodilia, or Emydosauria (Crocodiles.)	1. Eusuchia 2. †Aëtosauria 3. †Parasuchia, or Phytosauria.	1–3

CLASSIFICATION OF REPTILIA—*continued.*

	Order.	Sub-order	Case.
Bird-like Reptiles.	IV. Rhynchocephalia (Tuateras.)	1. †Protorosauria. 2. Rhynchocephalia Vera 3. †Acrosauria	5
	V. †Pelycosauria		5
	VI. Squamata (Snakes and Lizards.)	1. Ophidia 2. Lacertilia 3. Rhiptogilossa 4. †Dolichosauria 5. †Pythonomorpha	11–20
	VII. †Ichthyopterygia (Ichthyosaurs.)		17
	VIII. Chelonia (Tortoises and Turtles.)	1. Athecæ 2. Cryptodira 3. Pleurodira 4. †Amphichelydia 5. Trionychoidia	6–10
	IX. †Sauropterygia (Pleriosaurs.)		16
	[†Placodontia]	Of uncertain position	5
Mammal-like Reptiles.	X. †Theromorpha (Anomodonts.)	1. Dicynodontia 2. Theriodontia 3. Cotylosauria 4. Pariasauria	5

In the gallery the larger specimens are arranged either on stands or in table-cases, and the rest in the wall-cases. Owing to differences in the sizes of the wall-cases, it has not, however, been found possible to make the serial arrangement of the various groups correspond exactly with the one adopted in this guide.

The following is a brief survey of the leading characteristics of the different orders and sub-orders of reptiles, and also of the more important family groups by which existing orders and sub-orders are represented.

Order I.—ORNITHOSAURIA (*extinct*).

(Case 4.)

Pterodactyles, as the members of this extinct order are called, flourished during the Mesozoic, or Secondary, epoch, and are distinguished by the modification of the fore-limbs into wings, the

Fig. 2.

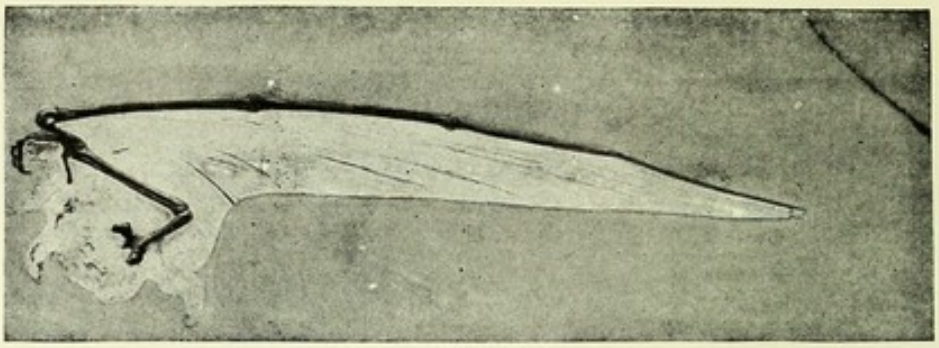


Fig. 3.

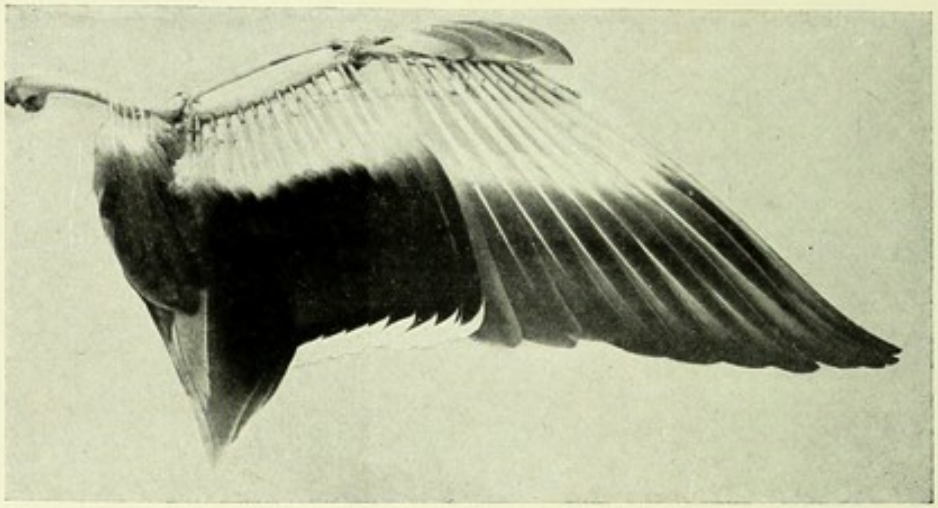
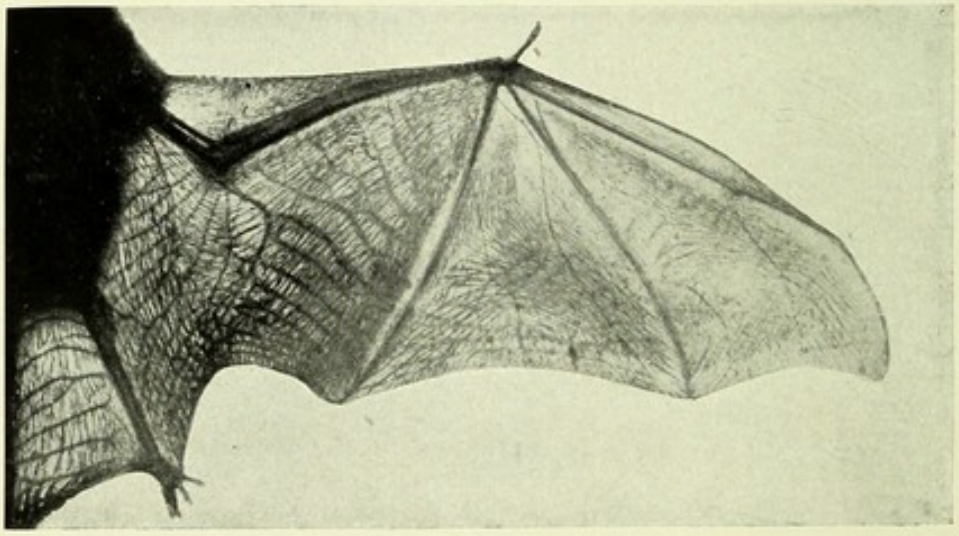


Fig. 4.

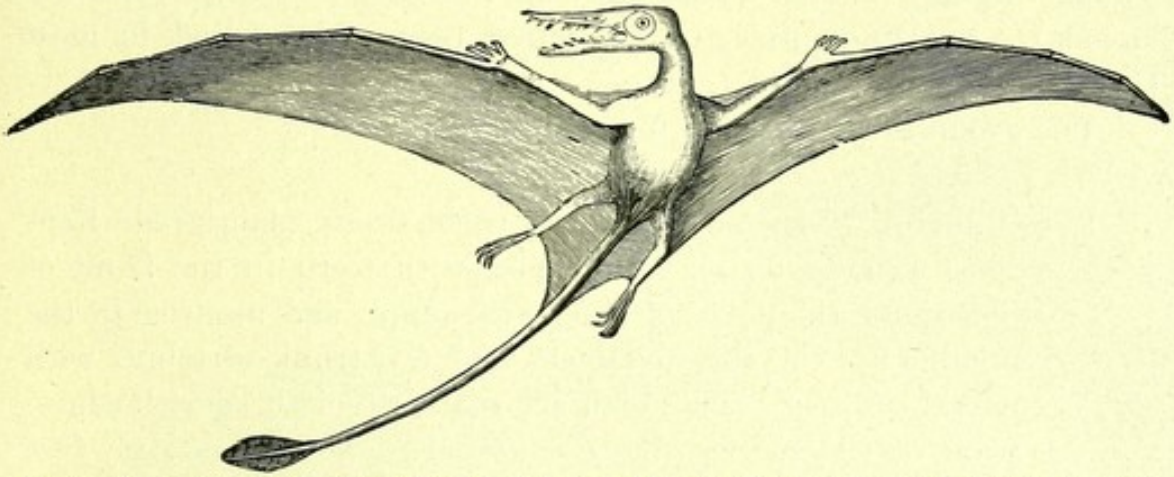


Figs. 2, 3, 4.—Right Wings of a Pterodactyle (2), a Bird (3), and a Bat (4).
To show difference in structure of Skeleton.
(From Lankester's "Extinct Animals.")

[*To face page 5.*

membrane of which was attached to the side of the body and supported by the elongated outermost digit, or finger (fig. 2). They are further characterised by the fixed quadrate-bone and the double temporal arches of the bird-like skull. The teeth, when present, are conical and implanted in distinct sockets confined to the margins of the jaws.

Fig. 5.



Restoration of a Long-tailed Pterodactyle (*Rhamphorhynchus phyllurus*), from the Upper Jurassic Lithographic Stone of Bavaria; one-seventh nat. size.

There are only four digits in the fore-limb, but five in the hind-one. Many of the bones are hollow. The tail is of variable length; in the long-tailed *Rhamphorhynchus* (**38**) it terminated in a racket-shaped membranous expansion. In *Pterodactylus*, *Rhamphorhynchus* (**36**), and *Scaphognathus* (**36** and **37**) teeth are present, but they are wanting in *Pteranodon* of the Cretaceous, some of the species of which had a wing-spread of twenty feet. In spite of certain resemblances, Pterodactyles have no affinity to Birds, as is shown by the difference in the structure of the wing (figs. 2 and 3).

Order II.—DINOSAURIA (*extinct*).

(Case 4 and middle of gallery.)

The members of this order, which includes the largest of all known land animals, are confined (in the main, at least) to the Mesozoic, or Secondary, period of geological history, and thus ceased to exist many thousands of years before man made his appearance on the globe. In most characters Dinosaurs are closely allied to Crocodiles, with the typical forms of which they agree in the fixed quadrate-bone and the double temporal arches of the skull, the restriction of the teeth, which may be implanted in distinct sockets,

to the margins of the jaws, the two-headed ribs, the absence of a perforation in the lower end of the humerus, and the adaptation of the limbs for walking.

They differ in that the ischia, or anterior elements of the lower part of the pelvis, unite in the middle line of the abdomen, and by the circumstance that when the vertebræ articulate by cup-and-ball joints, the cup (except occasionally in the tail) is behind (opisthocœlous). No Dinosaurs have the pitted bony plates found in most Crocodiles.

The group is divided into four sub-orders :—

I. Sauropoda.—Includes gigantic herbivorous, plantigrade Reptiles, walking on all four limbs, with teeth in the front of both jaws, the pubes of the pelvis simple and meeting in the middle line of the abdomen, and the trunk-vertebræ with lateral cavities. The teeth are spatulate, with smooth edges. Some of the species, like *Brontosaurus*, were about sixty feet in length and ten in height. Generally, as in *Cardiodon* (*Cetiosaurus*) and *Diplodocus* (**41**), the skull is small.

II. Theropoda.—The members of this group differ from the Sauropoda by their digitigrade feet, carnivorous habits, laterally-compressed and serrated teeth, and the absence of excavations in the trunk-vertebræ. Many of them, like *Megalosaurus* (**39**) and the diminutive *Compsognathus*, assumed the erect posture.

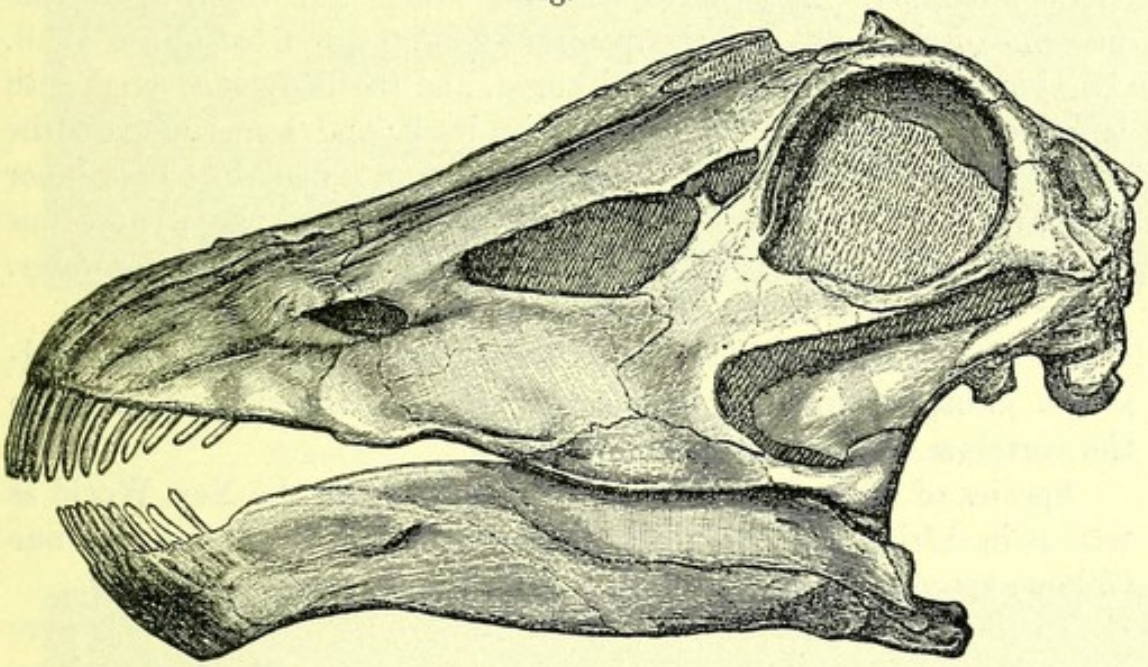
III. Ornithopoda.—The division of the pubis into a pre-pubic and a post-pubic branch, neither of which meets in the middle line of the abdomen, forms a distinctive feature of this group, in which the front of both jaws is devoid of teeth, while the lower jaw is provided with a distinct premandibular bone. Teeth complicated, seldom in separate sockets. All the forms are herbivorous. In one section (Stegosauria) the feet are plantigrade, with more than three toes, the limb-bones are solid, and bony plates and spines protect the body. *Scelidosaurus* (**42**), *Stegosaurus*, and *Hylæosaurus* are well-known genera. In a second section (Iguanodontia) the hind-feet are digitigrade, with three functional toes, the limb-bones hollow, and the body unarmoured. The group includes *Iguanodon* (**43**), *Camptosaurus*, *Trachodon*, etc., all bipedal.

IV. Ceratopsia.—Includes gigantic quadrupedal Reptiles, with a bony neck-shield, a premandibular and a prerostral bone, a

pubis with only a pre-pubic branch, meeting its fellow in the middle line, two-rooted teeth implanted in sockets, and plantigrade, five-toed limbs. Bony plates are dotted over the skin. *Triceratops*, of the North American Cretaceous, is a well-known type.

Casts of specimens of a few remains of different members of the group are exhibited in Wall-Case No. 4, in which there is also a miniature restoration of the species known as *Diplodocus* (**41**). Of the

Fig. 6.



Side view of Skull of a Sauropod Dinosaur (*Diplodocus*), from the Upper Jurassic strata of Colorado, U.S.A.; one-sixth nat. size. The cleft at the summit of the head is the nostril, and the large round vacuity the eye-socket. The diminutive brain-case is behind and partly between the eye-sockets. (No. **47**.)

latter animal, the cast of an entire skeleton, the gift of Mr. Andrew Carnegie, is mounted in the middle of the gallery (*see* Frontispiece).

Diplodocus is a representative of the Sauropod section, which includes the largest of all land-Reptiles, and flourished during the Jurassic and Lower Cretaceous epochs, that is to say, when the Oolites, Wealden, and Greensands were being deposited. These Reptiles walked on all fours; but, despite the light construction of the neck and trunk-vertebræ, were probably too heavy for much activity on land, and dwelt near the sea or lakes, where they lived in the shallows and fed on water-plants; the long neck and the position of the nostrils at the summit of the skull enabling them to breathe when wading at considerable depths. *Brontosaurus* and *Atlantosaurus*

are other American members of the group, which was represented in England by *Pelorosaurus*, *Cetiosaurus*, and *Hoplosaurus* or *Ornithopsis*. Remains of these are shown in the Geological Department.

Order III.—CROCODILIA.
(Cases 1–3.)

The existing Alligators, Crocodiles, and Gharials, collectively forming this order, are large, four-footed, long-tailed reptiles, with teeth implanted in separate sockets, which are confined to the margins of the jaws, and the quadrate-bone firmly fixed to the skull. The bones of the skull are sculptured, and the body is covered with large, horny shields, underlain on the back, and sometimes on the chest, abdomen, and limbs, by pitted bony plates. The inner aperture of the nostrils is situated very far back on the palate, thus enabling these reptiles to breathe while holding their prey under water. There are five toes to the fore-feet, and four to the hind-pair.

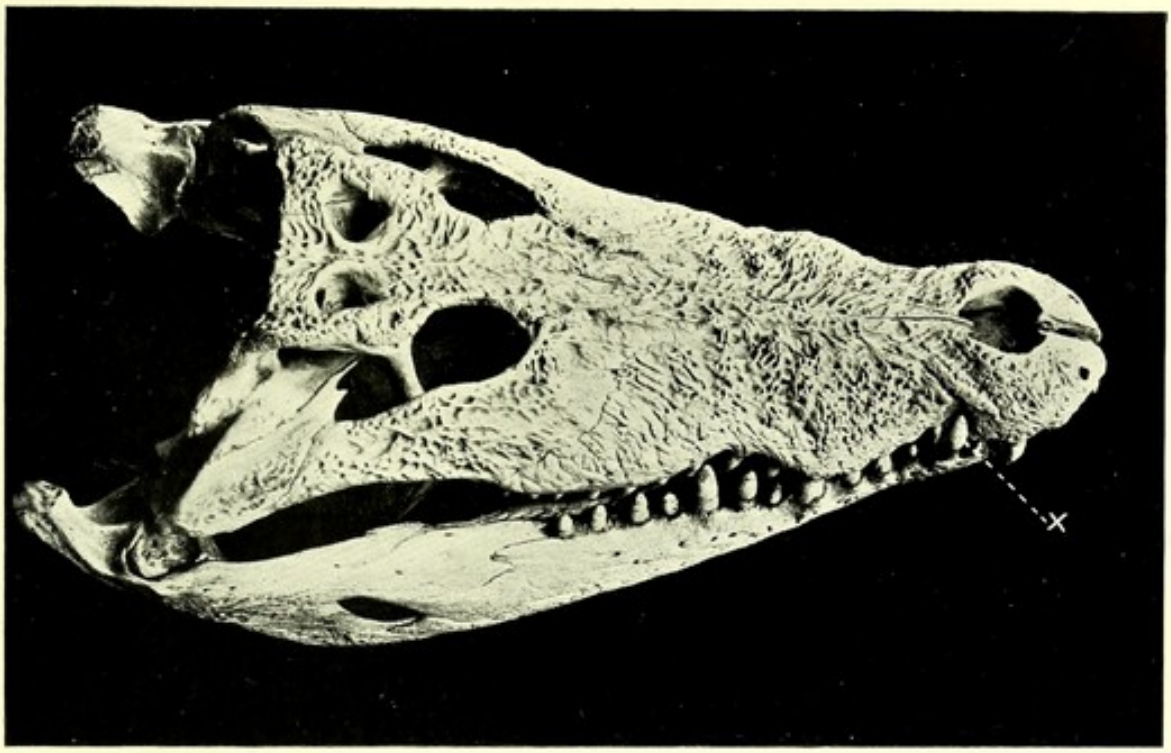
In the skeleton, the bodies of the vertebræ unite by a ball-and-socket joint, of which the ball is behind; and the ribs articulate to the vertebræ by two distinct heads.

Species of true Crocodiles are found living in the New World as well as in Africa and Asia; the Alligators, with the exception of one Chinese species, are American only, and the Gharials are Indian.

In the earlier extinct members of the group, most of which were marine, the inner aperture of the nostrils is situated less far back on the palate; and the vertebræ articulate with each other by nearly flat or slightly cupped surfaces. A few of the early forms—notably the Jurassic *Metriorhynchus* and *Geosaurus*—had no bony plates on the back. The early Crocodilia include long-snouted (*Pelagosaurus*, **2**) and short-snouted types (*Goniopholis*, **4**), which may perhaps have respectively given rise to the modern Gharials and Crocodiles. In these Jurassic Crocodiles the position of the posterior nostrils is intermediate between that obtaining in modern Crocodiles and the Triassic Parasuchia (*Phytosaurus*, **1**), in which last they open almost immediately below the external nostrils. These very primitive Crocodilia show such a decided approximation to the extinct Dinosauria as to indicate a close connection between the two groups; they are also related to the Rhynchocephalia.

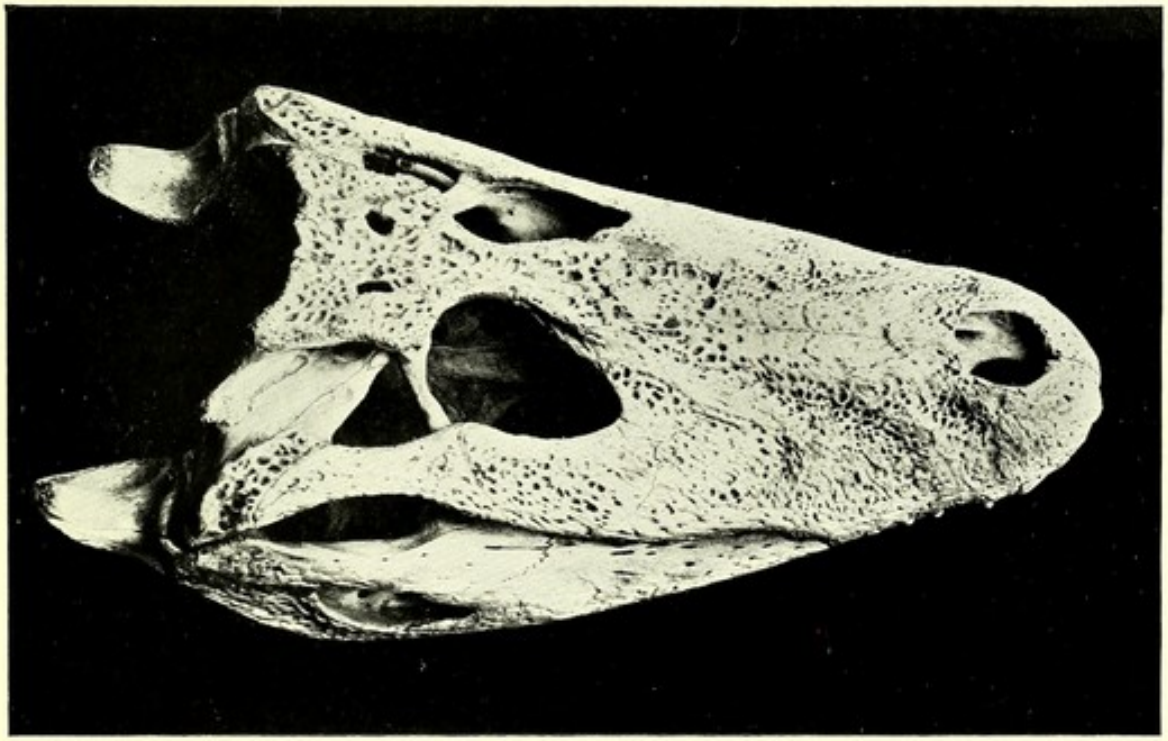
The family *Crocodilidæ* is taken to include all the existing members of the order Crocodilia. The group is characterised by the bodies of the neck-vertebræ articulating by cup-and-ball joints,

FIG. 7.



VIEW FROM ABOVE OF THE SKULL OF THE MUGGER OR INDIAN CROCODILE (*Crocodilus palustris*).
× Fourth lower tooth.
(Photographed from a specimen in the Museum.)

FIG. 8.



SIDE VIEW FROM ABOVE OF THE SKULL OF A S. AMERICAN ALLIGATOR (*Caiman niger*).
(Photographed from a specimen in the Museum.)

[*To face page* 8.

of which the ball is behind and the cup in front (*procœlous*). The nostrils are situated at the extremity of the snout, and their posterior openings (*choanæ*) carried back to the hinder extremity of the skull, the palatine and pterygoid bones developing inferior plates, which meet in the middle line and thus prolong the nasal passage. The armour consists of more than one pair of longitudinal rows of plates on the back; on the under surface of the body armour may or may not be present.

In common with Alligators and Caimans, true Crocodiles are distinguished by the shortness and breadth of the muzzle, which is either rounded-off or triangular, and the large and stout teeth, which interlock with one another and are less numerous than in the Gharials. The union (symphysis) between the two halves of the lower jaw is also short, and does not include the splenial bone; and the nasal bones enter the aperture of the nostrils. In Crocodiles the fourth lower tooth is received into a notch in the upper jaw (figs. 7 and 9), and the fifth upper tooth is the largest in the whole series. The number of upper teeth ranges from 16 to 19, and there are 14 or 15 lower teeth on each side. There is no bony armour on the under side of the body. Cases 1–2.

Crocodiles have a much wider geographical distribution than any other members of the order. Three species, *Crocodilus cataphractus* (**10**), *C. johnstoni* (**9**), and *C. intermedius*, have longer and more Gharial-like muzzles than the rest. Other species, like the American Crocodile (*C. americanus*, **16**), the Timsa, or Common African Crocodile (*C. niloticus*, **14**), and the Indian Estuarine Crocodile (*C. porosus*, **19**), have somewhat shorter and broader muzzles. In a third group, which includes the Muggar, or Indian Marsh-Crocodile (*C. palustris*, **20**), the muzzle is still broader and more Alligator-like, and the pits in the temples are smaller than in the other groups. One species, the West African *Osteolæmus tetraspis* (**3**), is assigned to a separate genus on account of the production of the nasal bones to divide the aperture of the nostrils.

Together with Alligators and Caimans, Crocodiles are the largest and most ferocious of living reptiles; the Indian *C. porosus* commonly attaining a length of from 15 to 20 feet, and occasionally reaching even larger dimensions. Most of the species frequent rivers, marshes, or pools, but *C. porosus* inhabits estuaries, and may be met with out at sea. Crocodiles are exclusively carnivorous, and generally seize their victims (other than human beings) by the nose as they are drinking. A large number of people—especially women, as they go to the rivers for water—are annually killed in India by

these Reptiles. Crocodiles bury their eggs in the sand, where they are hatched by the heat of the sun's rays.

Four large specimens are exhibited on a stand in the middle of the gallery, and the others in the wall-cases.

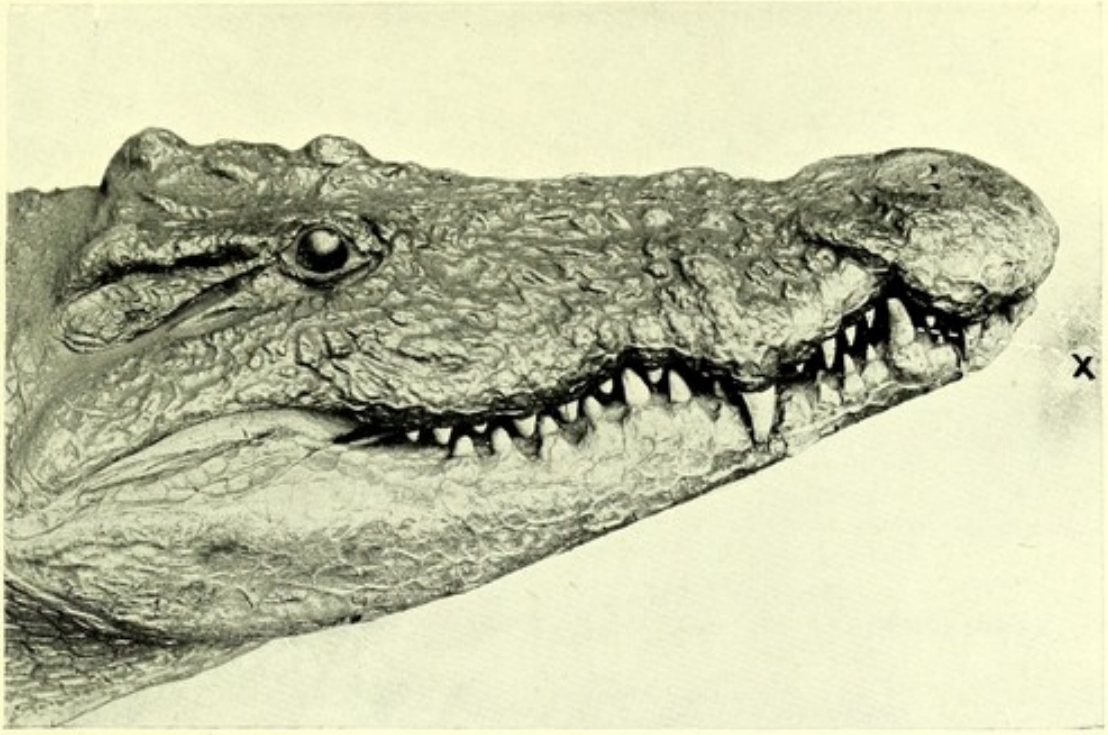
Case 3. In case No. 3, two specimens are placed side by side in order to show a notable difference between the skull of a Crocodile and an Alligator (figs. 7 and 8). In the former (**14** *a*) the fourth lower tooth is generally received into a notch on the side of the upper jaw, while in the latter (**28** *a*) it bites into a pit. Crocodiles have also fewer lower teeth than Alligators; the number in the former varying from 14 to 15, and in the latter from 17 to 22. In most Crocodiles the skull is narrower than in Alligators, with the pits in the temporal region (shown in the specimens in the upper part of the case) larger, but, as mentioned above, some species of the former approximate very closely to the latter in these respects.

Case 3. Alligators and Caimans are broad-nosed Crocodilians, distinguished from Crocodiles, as stated above, by the fourth lower tooth being generally received into a pit in the upper jaw, and the small size or obliteration of the pits in the temples; the number of teeth being from 17 to 20 in the upper, and from 17 to 22 in the lower jaw. In the true Alligators the nasal bones divide the aperture of the nostrils, the bony plates on the back are separate, and on the under surface these are either very thin or wanting. In the Caimans, or South American Alligators, on the other hand, the aperture of the nostrils is not divided by the nasal bones, the bony plates of the back are articulated together, and a full series of similar plates occurs on the lower surface of the body.

Of true Alligators, one (*Alligator mississippiensis*, **31**, fig. 10) is North American and the other (*A. sinensis*, **32**) Chinese—a distribution explained by the occurrence of allied forms in the Tertiary deposits of Europe. The Chinese species alone has thin bony plates on the under surface. Both kinds inhabit swamps. The female of the North American Alligator constructs a large nest, in which the eggs are deposited in layers. Some species of Caiman, which may reach 20 feet in length, make regular migrations, retreating to the flooded forests in the wet season, and returning to the rivers during the dry months. In some districts they are called Jacares.

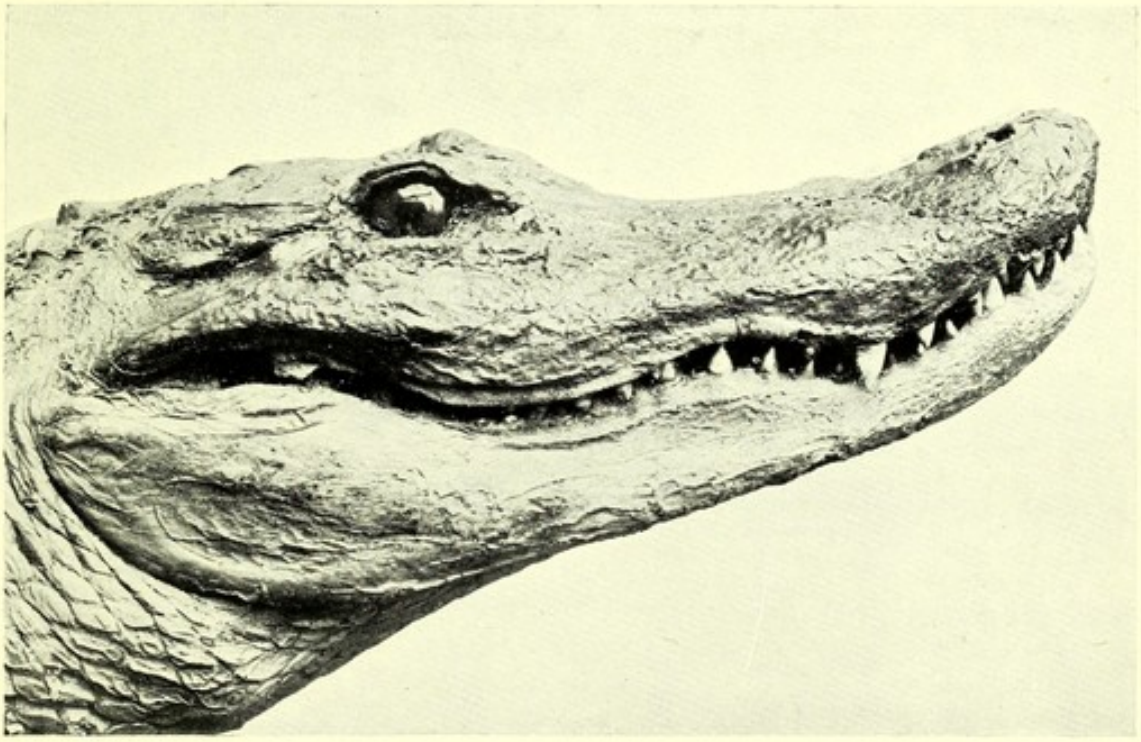
The Caimans (**25–27**) are peculiar in possessing a shield of bony plates in the skin of the under side of the body. On the under surface each plate consists of two distinct pieces, united by a transverse suture. In the species of which this armour is exhibited,

FIG. 9.



SIDE VIEW OF THE HEAD OF THE TIMSA OR NILE CROCODILE
(*Crocodilus niloticus*).
× Fourth lower tooth.
(Photographed from a specimen in the Museum.)

FIG. 10.



SIDE VIEW OF THE HEAD OF THE N. AMERICAN ALLIGATOR
(*Alligator mississippiensis*).
(Photographed from a specimen in the Museum.)

[*To face page* 10.

it is imperfectly developed, but in certain others the greater part of the tail is invested by complete bony rings—one to each vertebra—and the limbs are covered with small scutes of bone (**27** *a*).

One very fine specimen of the common Caiman, or Jacare-tinga (*Caiman sclerops*, **27**), is exhibited in a table-case.

The Gharial (*Gavialis gangeticus*, **5**), of the rivers of northern India and Aracan, and the False or Malay Gharial (*Tomistoma schlegeli*, **6**), of Malaysia, form a group of Crocodilians characterised by the length and narrowness of the muzzle, and the number and slenderness of the teeth. By most naturalists the group is included in the same family as the Crocodiles and Alligators (with which it agrees in the position of the inner aperture of the nostrils); but by others (who regard them as the direct descendants of the long-snouted Crocodilians of the Secondary period), Gharials are classed in a family by themselves. In addition to the length of the muzzle, Gharials are distinguished from Crocodiles and Alligators by the wide separation of the nasal bones from the aperture of the nostrils, and by the inclusion of the splenial bone in the long union (symphysis) between the two halves of the lower jaw. The true Gharial has from 27 to 29 pairs of lower teeth, none of the latter being received into pits in the upper jaw. The nasal bones are widely separated from the premaxillæ. In the False Gharial, on the other hand, the number of upper teeth is 20 or 21, and of lower teeth, 18 or 19; the tips of those on the sides of the lower jaw being received into pits in the upper jaw. The nasal bones are in contact with the premaxillæ. Gharials feed chiefly on fish, but large individuals of the Indian species will occasionally kill and devour human beings. In England the Gharial is frequently miscalled Gavial. Case 1.

The extinct *Phytosaurus* (or *Belodon*, **1**), of the Triassic formation of Europe, North America, and probably India, typifies a group of Crocodilians (the Parasuchia), which apparently indicates a primitive side-branch of this order. They are characterised by the bodies of the vertebræ having slightly cupped or nearly flat terminal articular surfaces; by the nostrils being situated far back on the skull, near the sockets of the eyes, and by the relatively forward position of the posterior openings of the nostrils, which are situated in front of the palatine bones. The armour consists of two rows of broad plates on the back, and several lateral rows of smaller ones. In the nearly allied *Steganolepis*, of the Trias of Elgin, there is armour on both the upper and lower surfaces of the body. *Parasuchus*, from the Trias of India, is a third genus. Case 1.

Order IV.—RHYNCHOCEPHALIA—TUATERAS.

(Case 5.)

The New Zealand Tuatera (**47**) is the sole surviver of a Triassic and Permian group, which is the most generalised of all Reptiles. In the skull the quadrate-bone is fixed ; there are two temporal arches, and teeth are present on the palate and the summits of the jaws, to which they are welded. The vertebræ have concave terminal faces, and intercentra are developed in the trunk, and chevron-bones in the tail. Each foot is five-toed ; the lower end of the humerus is perforated on the inner side, and the abdomen is protected by a series of small bones.

The order is divided into :—

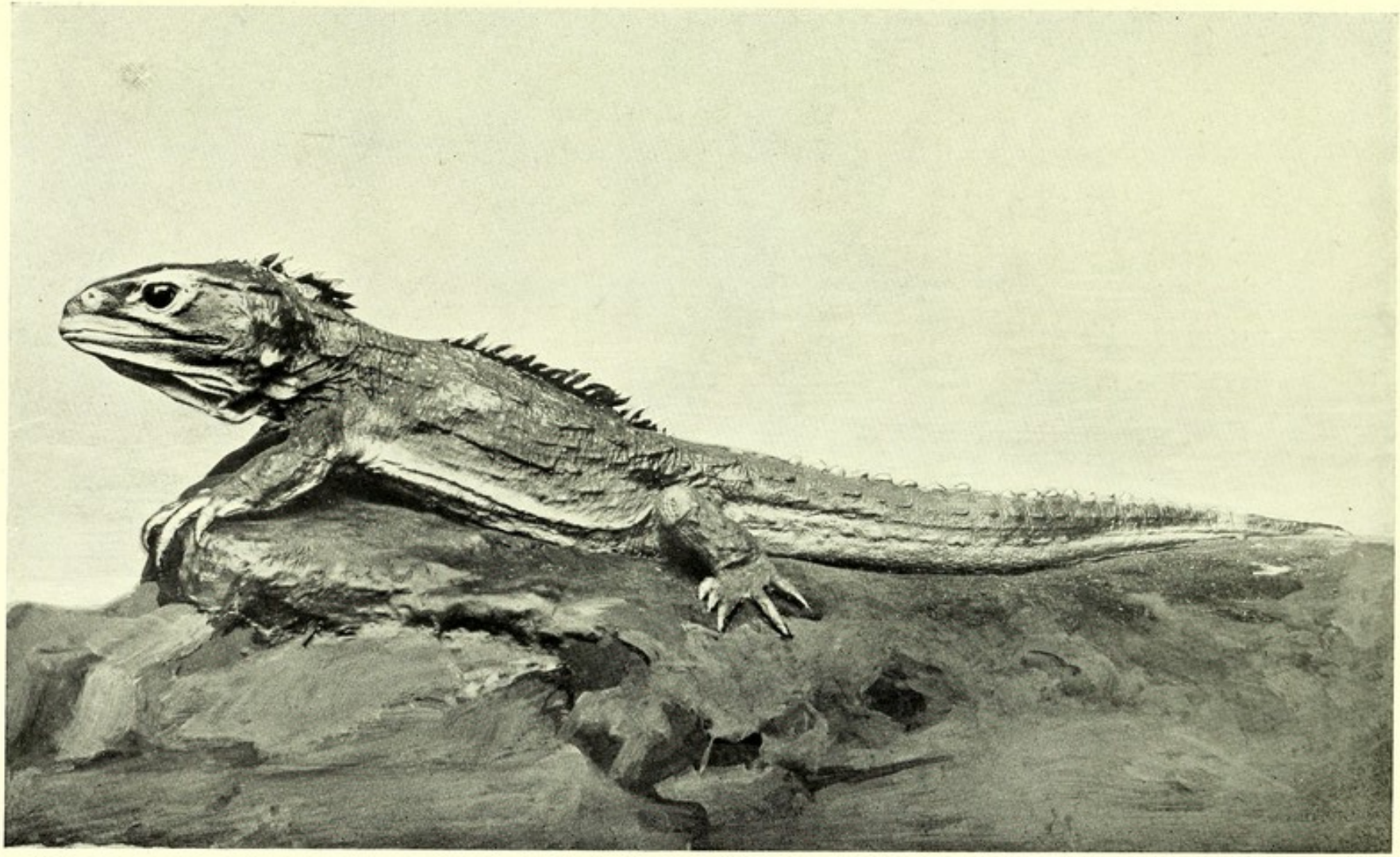
I. Rhynchocephalia Vera, in which the abdominal bones are closely packed, with three elements in each transverse series, and there are two sacral vertebræ, the intercentra being sometimes suppressed.

II. Protorosauria, in which each series of abdominal bones consists of a number of elements, and the intercentra are fully developed. This group passes into the Microsauria, among the Stegocephalan Amphibia, in which the body is armoured, the vertebræ are completely ossified, and the ribs retain two heads.

Case 5. The Tuatera itself (*Sphenodon punctatus*, **47**, fig. 11) is a burrowing lizard-like reptile, now confined to a few small islands off the New Zealand coast, having been exterminated from the mainland by pigs. These Reptiles share their burrows with birds—shear-waters, or petrels. They feed entirely upon small living animals, and deposit their eggs in a chamber, forming one side of the extremity of the burrow, the shear-water occupying the opposite side.

Casts of skulls of the extinct *Rhynchosaurus* (**50**) from the Trias of Shropshire, and of *Hyperodapedon* (**49**) from the same formation in both England and India, are exhibited in the case. Both were near allies of the Tuatera, but in *Hyperodapedon* the teeth formed a kind of pavement on the palate. Casts of the skeletons of *Sapheosaurus* (**46**), from the Oolite of Bavaria, an allied type, and of *Protorosaurus lincki* (**48**) are shown.

FIG. 11.



THE TUATERA LIZARD (*Sphenodon punctatus*). New Zealand.
(From a specimen in the Museum.)

[*To face page* 12.

Order V.—PELYCOSAURIA (*extinct*).

(Case 5.)

Although at one time classed with the Theromorpha, the extinct Permian Pelycosauria are now regarded as a distinct group, more nearly allied to the Rhynchocephala, which they resemble in possessing two temporal arches to the skull. The dentition generally approximates to that of the Theriodont Theromorphs. Well-known genera are *Clepsydrops*, *Dimetrodon*, *Embolophorus*, and *Naosaurus*; the three latter being characterised by the tall upright spines of the trunk-vertebræ, which in some cases were equal in length to the entire skeleton, and during life probably supported a fin-like expansion of skin, as shown in the coloured sketch (**46***a*) exhibited in the case.

Order VI.—SQUAMATA.

Snakes and Lizards.

(Cases 11–15 and 18–20.)

Snakes and Lizards form at the present day the most numerous representatives of the reptilian class. They are characterised by the circumstance that the quadrate-bone (which forms the articulation of the lower jaw) is more or less movably attached to the skull, as well as by the presence of only one lateral bar (temporal arch) in the latter, and by the teeth being welded to the jaws. The body is usually covered with horny scales; and the aperture of the vent is transverse.

The existing members of the group are divided into three sub-orders:—

I. Ophidia, or Snakes. Characterised by the fibrous union of the right and left halves of the lower jaw, or mandible, the absence of functional limbs, of which (at most) only minute vestiges remain, and the elongated form of the body. The single eye-lid cannot be moved, and is transparent. Cases 11–15.

II. Lacertilia, or Lizards. In this group the right and left halves of the lower jaw are connected by a bony union. The great majority possess functional limbs, movable eyelids, and horny scales; but a considerable number have a more or less completely snake-like form, with the reduction or loss of one or both pairs of limbs; and in some cases the eye-lids Cases 18–20.

are transparent and fixed as in Snakes, while the scales may be rudimentary or wanting. In some of the limbless burrowing forms the quadrate-bone has become more or less fixed.

Case 20. III. RHIPTOGLOSSA, or CHAMÆLEONS. These differ from Lizards in several particulars; notably the separation of the toes into two groups of three and two respectively, so that the feet form most efficient grasping organs, and the long extensile, club-shaped tongue. The skeleton lacks clavicles and interclavicle; and there are several osteological peculiarities in the skull, which is casque-shaped and often studded with tubercles.

In addition to the above, there are the two following extinct sub-orders, the members of which were marine.

Shown in Geological Department. IV. DOLICHOSAURIA. Includes several snake-like forms typified by *Dolichosaurus* of the English Chalk, which was over a yard in length, with the two halves of the lower jaw united by a bony suture, two sacral vertebræ, a long neck, and the limbs partially modified into paddles.

V. PYTHONOMORPHA. Typified by the gigantic *Mosasaurus* of the Upper Cretaceous, and characterised by the ligamentous union of the right and left halves of the lower jaw, the presence of only one sacral vertebra (with which the pelvis has no connection), and the completely paddle-like form of the limbs.

The following are the sub-divisions of the

Order SQUAMATA.*

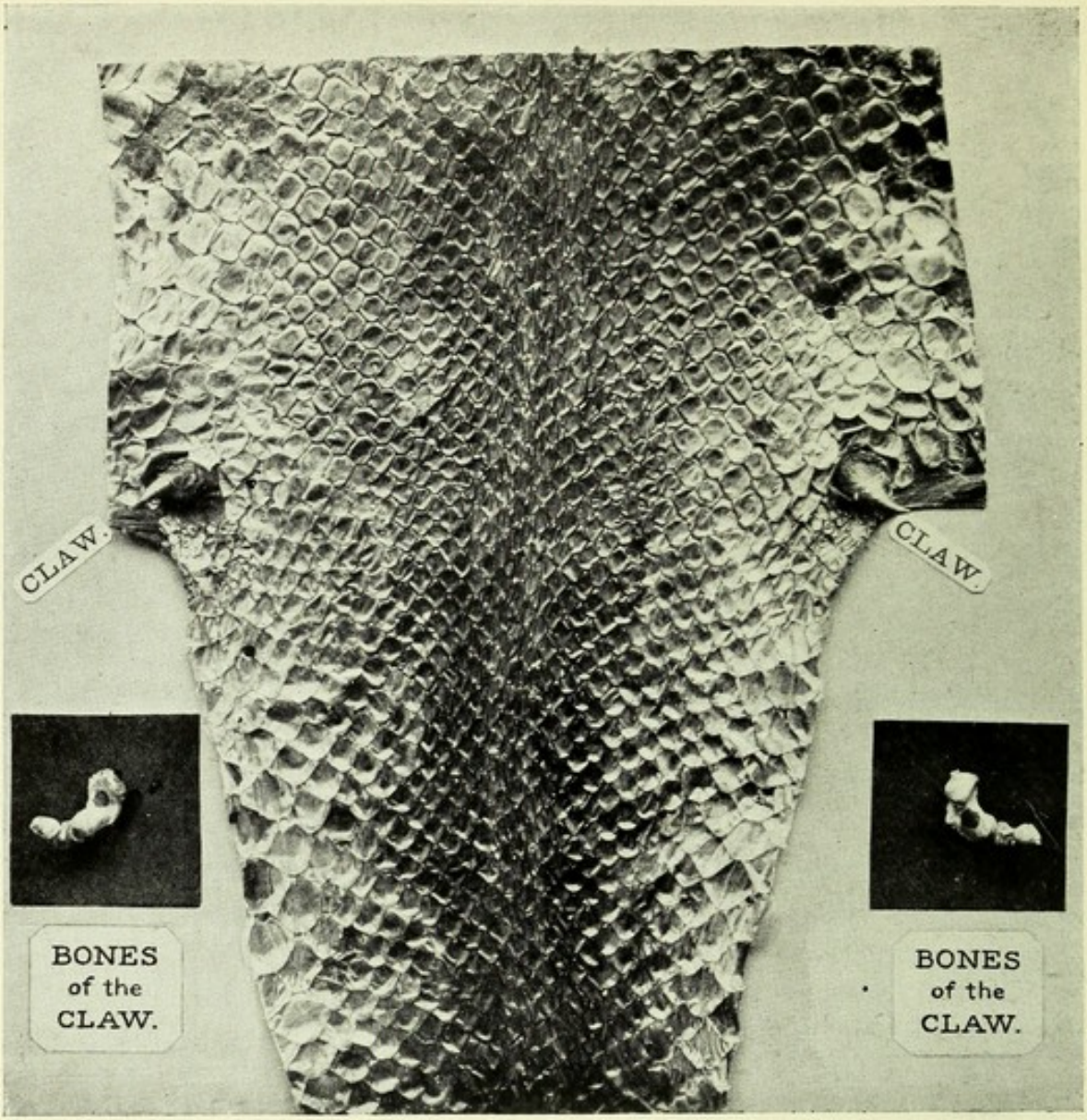
a. Sub-order OPHIDIA.

Family *Boidæ*.
„ *Typhlopidæ*.
„ *Glauconiidæ*.
„ *Ilysiidæ*.
„ *Uropeltidæ*.
„ *Xenopeltidæ*.
„ *Colubridæ*.
„ *Amblycephalidæ*.
„ *Viperidæ*.

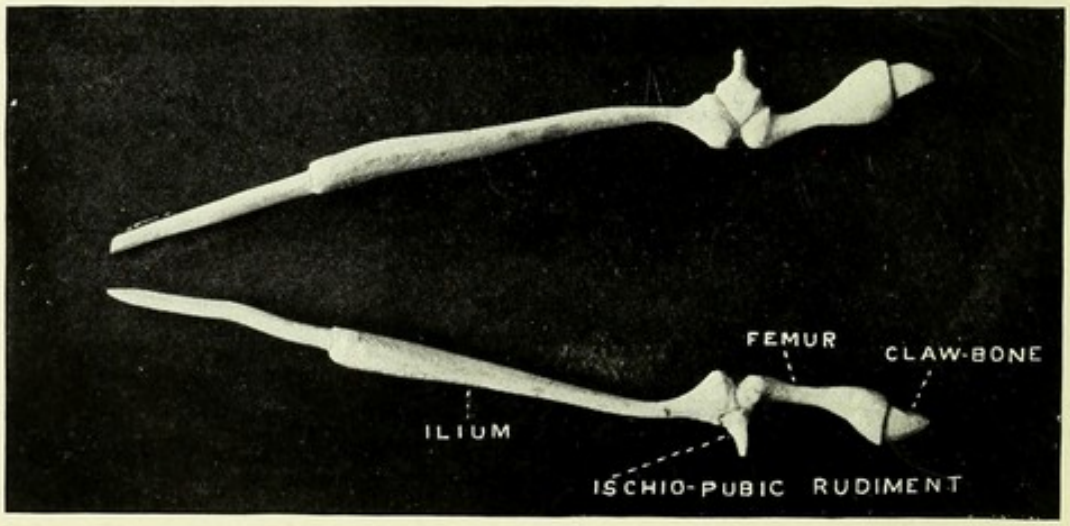
b. Sub-order LACERTILIA.

Family *Geckonidæ*.
„ *Eublepharidæ*.
„ *Uroplatidæ*.
„ *Pygopodidæ*.
„ *Agamidæ*.
„ *Iguanidæ*.
„ *Xenosauridæ*.
„ *Zonuridæ*.
„ *Anguidæ*.

* In consequence of the Cases not being all of a uniform depth, it has been found impossible to adhere strictly to this arrangement of the families.



A.—Part of the flattened skin of an African Python (*Python sebæ*). Showing Claws representing Hind-Limbs, together with their supporting bones.



B.—Complete Bones of the Hinder Limb-Girdle of another Specimen.

Rudimentary Limbs of Pythons.

[*To face page* 15.

Order SQUAMATA—*continued.*

b. Sub-order LACERTILIA (*continued*).
Family *Anniellidæ.*
„ *Helodermatidæ.*
„ *Varanidæ.*
„ *Xantusiidæ.*
„ *Teiidæ.*
„ *Amphisbænidæ.*
„ *Lacertidæ.*
„ *Gerrhosauridæ.*
„ *Scincidæ.*

b. Sub-order LACERTILIA (*continued.*)
Family *Anelytropidæ.*
„ *Dibamidæ.*

c. Sub-order RHIPTOGLOSSA.
Family *Chamæleontidæ.*

d. Sub-order PYTHONOMORPHA. (Extinct.)
Family *Dolichosauridæ.*
„ *Mosasauridæ.*

Sub-order I.—OPHIDIA—SNAKES.

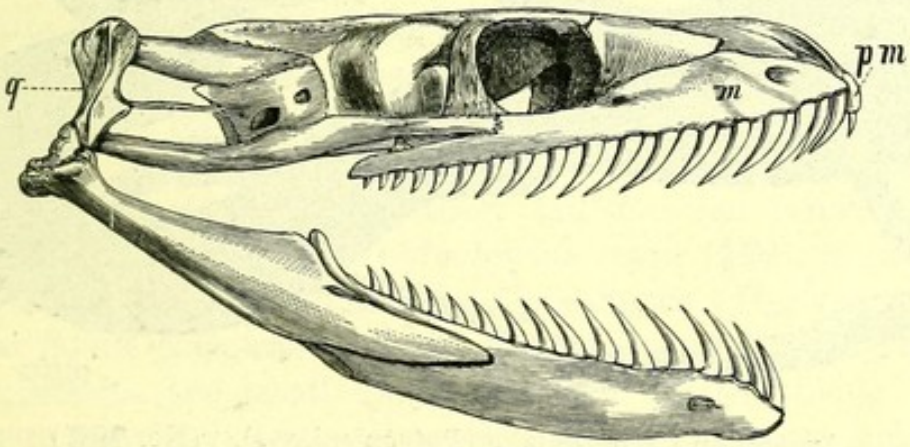
(Cases 11–15.)

Case 14.

As the distinctive characteristics of this group have been already given under the heading of the order Squamata, we may at once pass to a brief survey of the more important families.

The first family is that of the *Boidæ*, or Boas and Pythons, among which are included the largest of living Snakes. The skeleton retains vestiges of the pelvis and hind-limbs, and the latter are represented externally by small claw-like spurs near the vent (fig. 12). On the upper surface the scales are usually small and smooth, but those on the lower aspect form two broad series in advance of the tail, and either a double or single row on the tail itself. In the

Fig. 13.



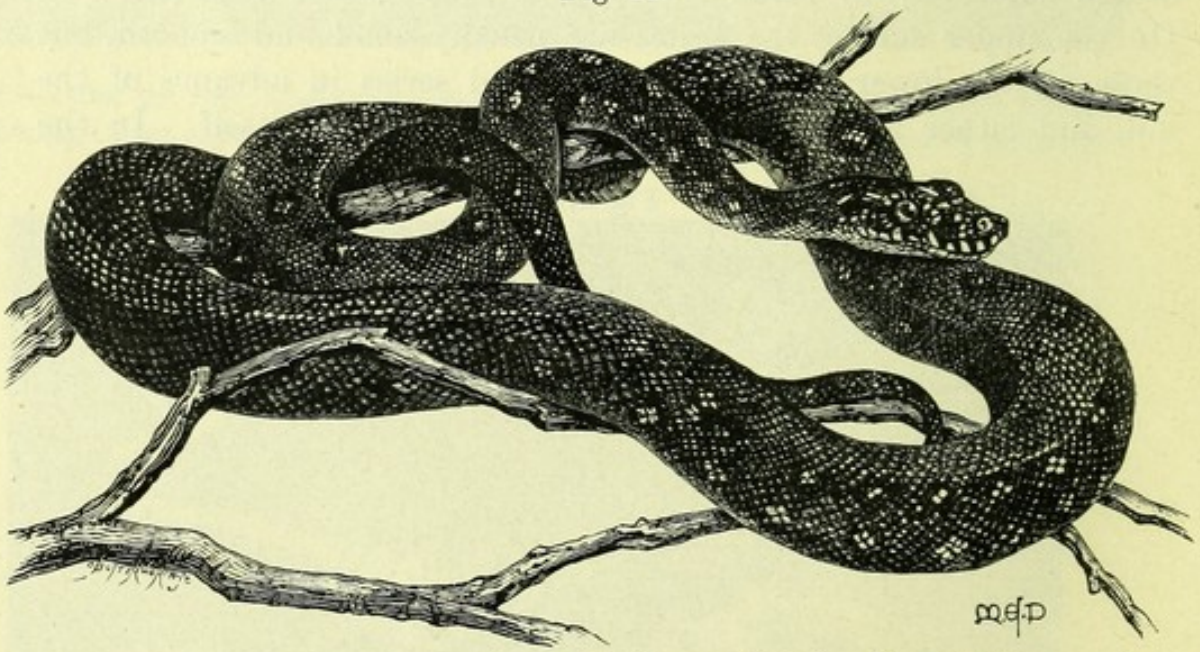
Skull of a Python; ½ nat. size. (No. **291**.)

m, maxillary; *pm*, premaxillary; *q*, quadrate-bone.

skull the quadrate-bone is supported by the horizontally extended squamosal, which rests loosely on the side of the occipital region. Teeth are carried in the lower jaw, and on the pterygoid, palatine, and maxillary bones of the skull; while in some of the Pythons (*Pythoninæ*), as distinct from the Boas (*Boinæ*), they are also borne on the premaxillæ. In the Boas there is a pair of supra-orbital bones, which are wanting in the Pythons, and the scales on the under side of the tail generally form a single (instead of a double) row. None of the members of this family are poisonous. The larger kinds inhabit forests, where they climb trees by the aid of the short and partially prehensile tail. They feed by choice on warm-blooded animals, the bodies of which they crush in their coils before swallowing them. Although a large Python could crush an animal as large as a red deer, it is quite evident that it could not swallow the carcase. The bodies of small deer are reduced by crushing to the condition of a sausage before being swallowed. Most Pythons lay masses of eggs, which the female protects by coiling herself upon them.

Two magnificent specimens of the Malay Python (*Python reticulatus*, **291**) are exhibited, one measuring 24 feet 11 inches in length. Among the smaller species, mention may be made of the Australian Carpet-Snake, or Diamond-snake (*P. spilotes*, **288**, fig. 14).

Fig. 14.



Australian Carpet-Snake (*Python spilotes*). (No. **288**.)

The *Boa constrictor* (**300**) is an example of a genus common to Tropical America and Madagascar. Specimens of part of the skin

of a Python (**287**) and a Boa Constrictor (**300**) are exhibited to display the claw-like vestiges of the hind limbs and the rudimentary supporting bones (fig. 12). Eggs of *Python sebæ* (**287**) are also exhibited.

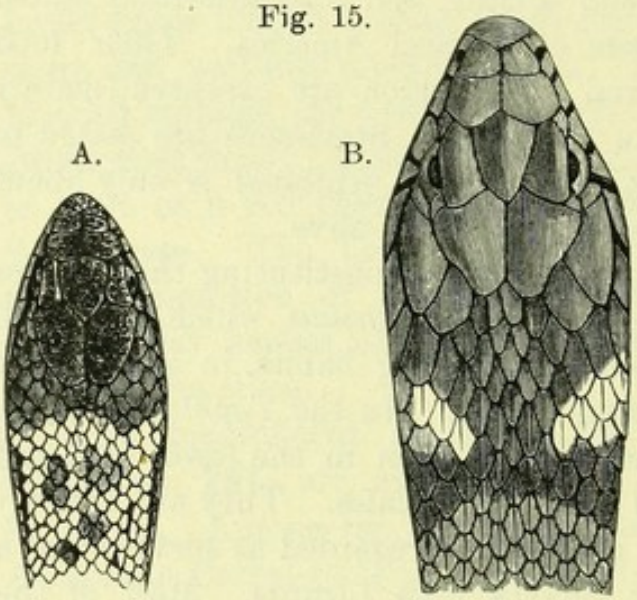
The huge Anaconda (*Eunectes murinus*, **281**) differs from the members of the genus *Boa* chiefly by the circumstances that the innermost of the three nasal shields of the head is in contact with its fellow, and likewise by the absence of small scales between the labial shields and the eye. Moreover, the muzzle is covered with large shields instead of small scales. During life the pupil of the eye is vertical. Anacondas are both arboreal and aquatic, and thus admirably suited to a life in the flooded forests of tropical America. Their food consists chiefly of mammals and birds, which are captured (mainly at night) both on land and in the water. Specimens are stated to attain a length of over 30 feet; but the one exhibited is only about $18\frac{3}{4}$ feet. These Snakes produce their young alive. Table-case.

We next come to the Burrowing Snakes, constituting the families *Typhlopidæ*, *Glauconiidæ*, *Uropeltidæ*, and *Ilysiidæ*, which are small Snakes of more or less completely burrowing habits, in all but the third of which traces of the pelvis remain. In the *Typhlopidæ* (**303**, **304**) the eyes are vestigial, there are no teeth in the lower jaw, and the body is uniformly covered with small scales. They are entirely burrowing and insectivorous; and may be regarded as survivors of a generalised group connecting Snakes with Lizards. Most of the species belong to *Typhlops* (**303**, **304**). The *Glauconiidæ* differ chiefly by having teeth only in the lower jaw; the pelvis and hind-limbs are less aborted than in any other Snakes. In the Shield-tails, or *Uropeltidæ* (**297–299**), which take their name from the large shield terminating the tail, the eyes are very small, the head is not distinct, and the scales on the lower surface of the body are but little enlarged. The *Ilysiidæ* (**296**) differ by the eyes being generally free, although sometimes covered with scales. There are vestiges of the pelvis and hind-limbs, the latter visible externally as spur-like claws by the vent. Teeth (as in the *Uropeltidæ*) are present in both jaws, but the short tail does not terminate in a shield. Of the few species, *Cylindrophis rufus* (**296**), is exhibited, while one of the best known is the Coral-Snake (*Ilysia scytalis*) of tropical South America. All the members of this family feed on worms, insects, and small *Typhlopidæ*, and produce living young. The more completely burrowing species of this group are not unlike large worms in appearance and habits, for which, indeed, they are not infrequently mistaken. Case 14.

Cases 11, 12, and 15.

With the family *Colubridæ* we reach the typical Snakes, which comprise some nine-tenths of the Ophidia, and may be roughly defined as normal Snakes which are neither Pythons (*Boidæ*) nor Vipers (*Viperidæ*). In other words, they are Snakes with well-developed eyes, without vestige of hind-limbs, and with normal upper jaws, usually carrying numerous teeth. The following are some of the chief characteristics of the family: A median longitudinal groove divides the shields on the chin; the squamosal bone of the skull is horizontally elongated and movable; and the pterygoid

Fig. 15.



Heads of the Smooth Snake (*Coronella austriaca*), A (No. **261**), and the Common Snake (*Tropidonotus natrix*), B (No. **240**).

Fig. 16.

Head of the Viper (*Vipera berus*). (No. **318**.)

Heads of the three British Snakes.

bone reaches the quadrate. The family is divided into three series and eight sub-families, as follows:—

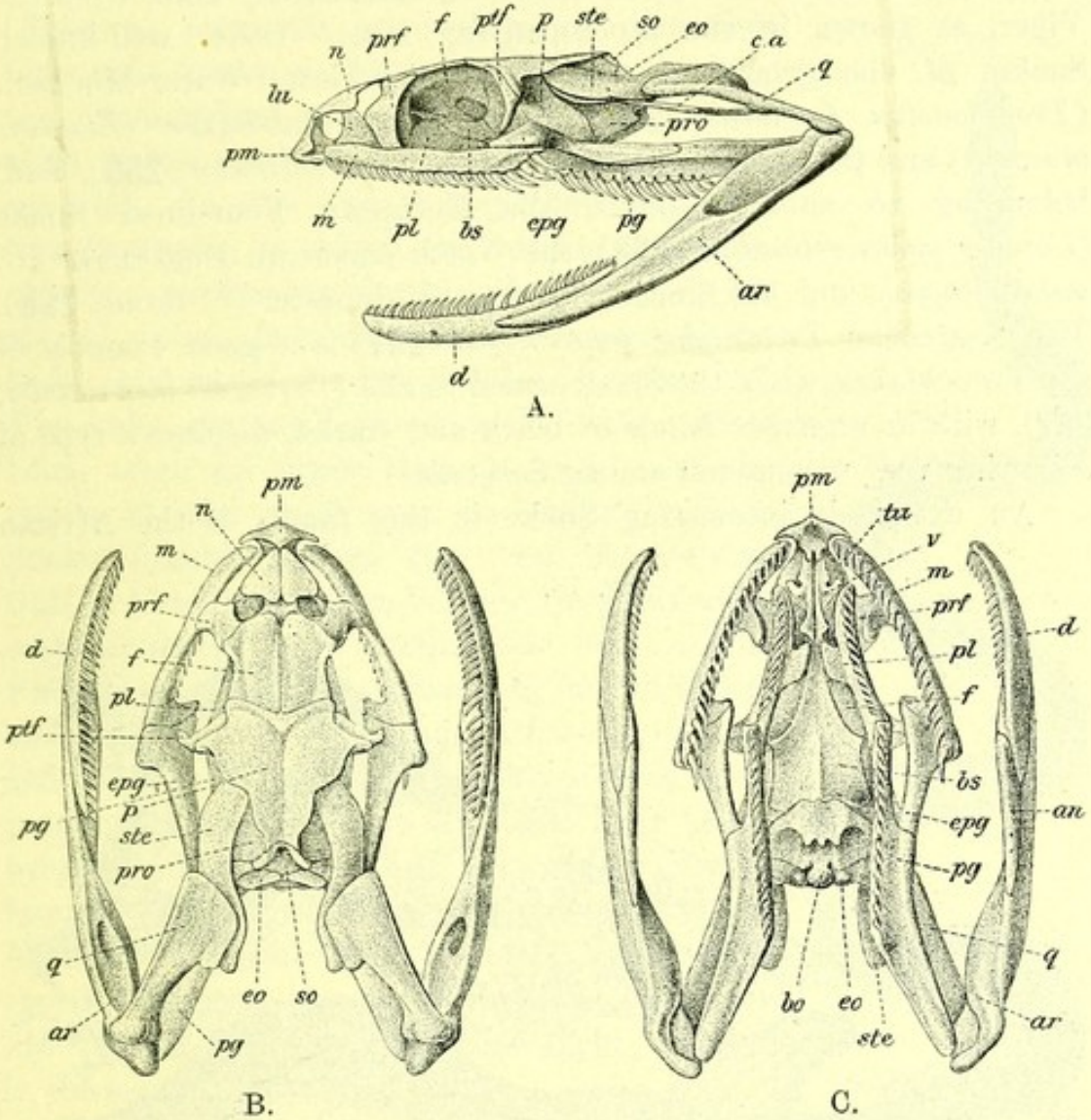
A. Aglypha. The teeth solid and ungrooved.
- Sub-family 1. *Acrochordinæ*.
- „ 2. *Colubrinæ*. Common Snake, Rat-Snake, etc.
- „ 3. *Dasypeltinæ*. African Egg-eating Snake.

B. Opisthoglypha. One or more of the hinder teeth in the upper jaw grooved.
- Sub-family 4. *Dipsadomorphinæ*. Indian Tree-Snakes.
- „ 5. *Elachistodontinæ*. Indian Egg-eating Snake.
- „ 6. *Homalopsinæ*. Oriental Water-Snakes.

C. Proteroglypha. The front upper teeth grooved or perforated.
- Sub-family 7. *Elapinæ*. Cobras and Kraits.
- „ 8. *Hydrophiinæ*. Sea-Snakes.

The majority of the members of series *A*. are harmless, but the saliva of the Indian Rat-Snake affects small mammals; most of series *B*. are venomous, but not dangerously so; but all the species

Fig. 17.



Skull of the Common Snake (*Tropidonotus natrix*). (No. **240**.)

From the left side (A), above (B), and below (C).

an. Angular.
ar. Articular.
bo. Basioccipital.
bs. Basisphenoid.
ca. Columella auris.
d. Dentary.
eo. Exoccipital.
epg. Ectopterygoid.
f. Frontal.
m. Maxillary.
n. Nasal.
p. Parietal.
pl. Palatine.
pm. Præmaxillary.
prf. Præfrontal.
pro. Prootic.
pg. Pterygoid.
ptf. Postfrontal.
q. Quadrate.
so. Supraoccipital.
ste. Supratemporal.
v. Vomer.

included in *C*. are deadly. Among the more noticeable specimens belonging to the first group, reference may be made to the common British Snake (*Tropidonotus natrix*, **240**) and a continental variety

(**241**) of this species distinguished by the absence of black patches at the back of the head. The other harmless British species is the Smooth Snake (*Coronella austriaca*, **261**), found in England only in the south, and there but seldom. Both these Snakes have large, shield-like scales on the top of the head, and thereby differ from the Viper, as shown in the accompanying cuts. Other well-known Snakes of the group are the North American Water-Mocassin (*Tropidonotus fasciatus*, **242**), the Indian Rat-Snake (*Zamenis mucosus*) and the American Black Snake (*Z. constrictor*, **250**), and, belonging to another genus, the European Four-lined Snake (*Coluber quatuor-lineatus*, **253**), the North American Bull-Snake (*C. melanoleucus*), and the South American Bushmaster (*C. corais*, **255**). The Australian *Dendrophis punctulatus* (**257**) is a good example of the Tree-Snakes, while the Small-scaled Snake (*Coronella micropholis*, **262**), with its alternate bands of black and scarlet, displays a type of colouring very uncommon among Serpents.

An extremely interesting Snake in this family is the African

Fig. 18.

African Egg-eating Snake (*Dasypeltis scabra*); ½ nat. size. (No. **272**.)

Egg-eating Snake (*Dasypeltis scabra*, **272**, fig. 18), which typifies a sub-family (*Dasypeltinæ*) by itself. Its greatest peculiarity is that the

lower spines of the neck-vertebræ pierce the gullet, on the upper surface of which they form tooth-like knobs adapted for crushing the eggs on which this Snake feeds. An individual of a foot in length is capable of swallowing a pigeon's egg.

Sea-Snakes (*Hydrophiinæ*, **308–313**) and the Cobra group (*Elapinæ*) form the assemblage of venomous *Colubridæ* known as Proteroglypha (see p. 18), and characterised by the grooving of the front teeth in the maxillary bone, while those behind are solid. In this respect they differ from the Opisthoglypha, in which the reverse condition obtains. Sea-Snakes (fig. 19), of which there are several genera, have the tail, and sometimes the body, compressed, for the purpose of swimming. The scales are small, those on the lower surface being often no larger than the rest; and the pupils of the small eyes are round. These Snakes inhabit tropical seas from the Persian Gulf to Central America, but one species (*Distira semperi*) dwells in a fresh-water lake in the Philippines. They are often seen far out at sea, and die if kept long on land. All are viviparous, and feed on fishes, which are killed with their poison. Indian fishermen are occasionally bitten by these Snakes, the bite sometimes proving fatal. The largest species is the orange and black *Hydrus major* (**308**), of which an example is shown. Most of these snakes are coloured very like mackerel in order to render them invisible in the sea.

Cases 14–15.

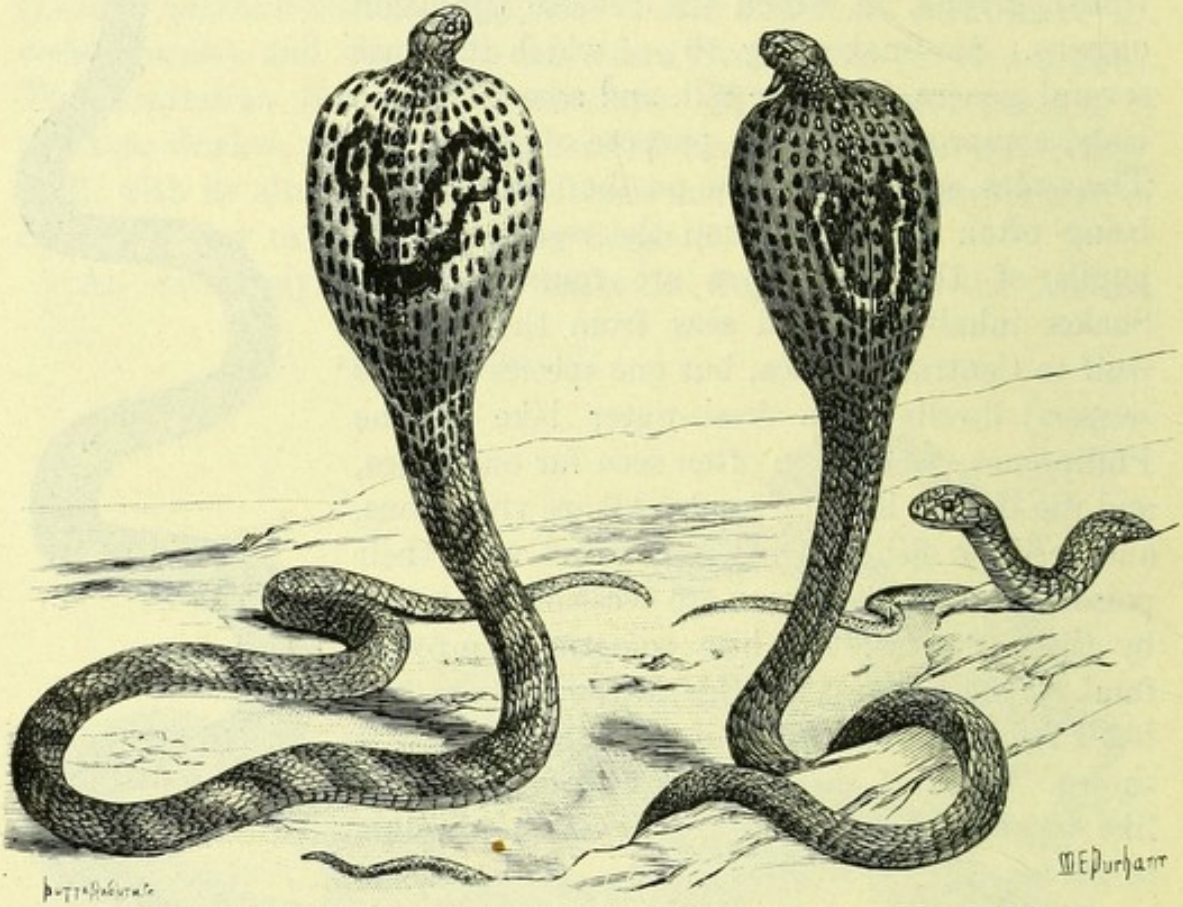
Fig. 19.

A Sea-Snake (*Hydrophis platurus*) from the Indian Ocean. (No. **312**.)

The Cobras and Kraits of the Old World, together with the species of the American genus *Elaps*, represent the *Elapinæ*, or second sub-family of the group Proteroglypha, which is distinguished from the *Hydrophiinæ* by the cylindrical tail. There are numerous genera of *Elapinæ*; and the sub-family includes the majority of Australian Snakes and all the venomous ones. The various species of Cobras (an abbreviation of *cobra di capello*—"the snake with the hood") are characterised by the power of inflating the neck into a hood-like expansion by an outward and forward movement of the

ribs. These Snakes are exceeding deadly. Well-known species are the Indian Cobra (*Naia tripudians*, **276**), the African Cobra, or "Asp" (*N. haie*, **277**), and the Giant or King Cobra (*N. bungarus*, **274**). The Ringhals ("banded neck"), *Sepedon hæmachates*, is another South African hooded Snake. The Kraits differ by the lack of the hood; the true Krait (*Bungarus cæruleus*) causes more deaths in India than any other Snake, but the Banded Krait (*B. fasciatus*, **273**), although larger, reaching five feet in length, does less mischief. The Death-Adder (*Acanthophis antarcticus*), easily

Fig. 20.



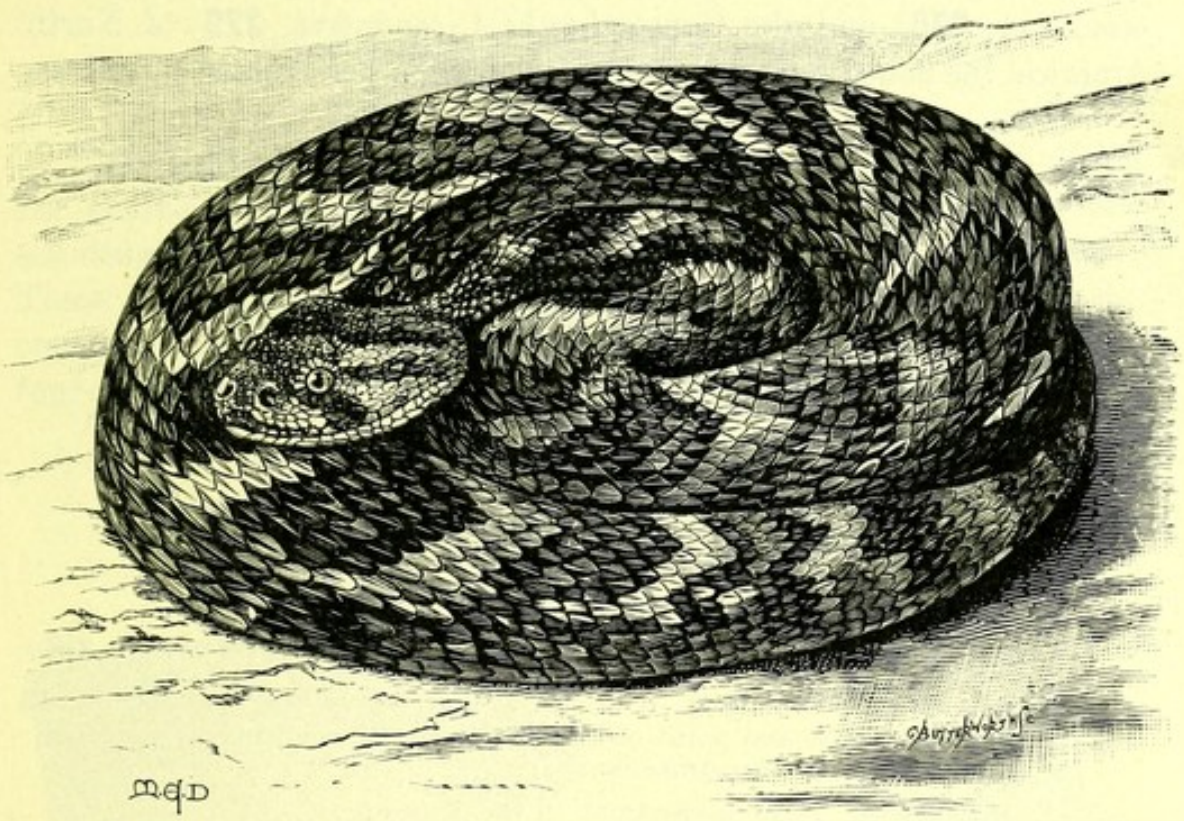
The Indian Cobra (*Naia tripudians*); $\frac{1}{5}$ nat. size. (No. **276**.)

recognised by the spines to its tail, is one of the most deadly of Australian Snakes. The South American *Elaps corallinus* is conspicuous for its alternating bands of black and scarlet, separated by narrow rings of yellow.

In this group are exhibited the ordinary and the black phases of the Indian Cobra (*Naia tripudians*, **276**, fig. 20), the great Indian King Cobra, or Hamadryad (*N. bungarus*, **274**), and the African Ringed Cobra (*N. haie annulifera*, **277**). Of the still more venomous and deadly Indian Kraits, the yellow and black banded species (*Bungarus fasciatus*, **273**) is shown.

It is a common notion that Vipers, Rattle-Snakes, and their like (family *Viperidæ*) are the only poisonous Snakes. This is a mistake, the Cobra, which is one of the most deadly Snakes, not being a member of the Viper family. It is, however, a fact that all the representatives of that group are deadly. The Vipers and their kindred may be distinguished by the following features. In the fore part of the mouth is a pair of poison-fangs, supported by the short and otherwise toothless maxillary bones, which are capable of being vertically erected; the scales on the under surface of the body

Fig. 21.



The Puff-Adder (*Bitis arietans*); ¼ nat. size. (No. **315**.)

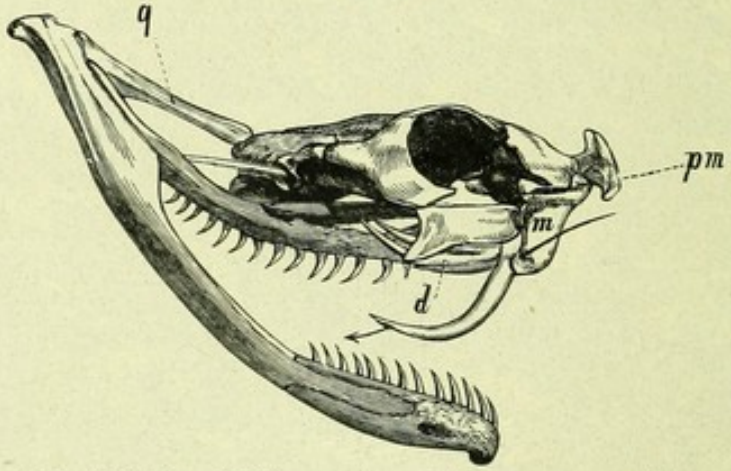
are transversely elongated; and the eyes are well developed. The poison-fangs are tubular, having a broad hole at the front of the base in connection with the poison-gland. Successional teeth are developed behind the fangs in use, and take the place of the latter when they are broken off or worn out. All the species are viviparous as well as poisonous. The family is divided into two groups—True Vipers and Pit-Vipers.

The True Vipers (*Viperidæ*) are confined to the Old World and have no pit between the eye and the nose. Among familiar forms may be mentioned the Common Viper, or Adder (*Vipera berus*, **318**,

fig. 16), the Indian Russell's Viper (*V. russelli*, **320**), and the African Puff-Adder (*Bitis arietans*, **315**), Gaboon Puff-Adder or Viper (*B. gabonicas*, **317**), and Horned Puff-Adder (*B. nasicornis*, **316**). All these African Vipers are brilliantly coloured, but the Horned Viper (*Cerastes cornutus*) of North Africa is coloured to correspond with the desert-sand.

The Pit-Vipers (*Crotalinæ*) take their name from the presence of a pit, which probably subserves some sense-function, between the eye and nose. The typical American forms (*Crotalus*) are called Rattle-snakes from the presence of a number of loose horny rings at the end of the tail. Other kinds are the Water-Viper (*Ancistrodon piscivorus*, **330**) and the Copper-head (*A. contortrix*, **329**) of North America, the South American and West Indian Fer-de-lance (*Lachesis*

Fig. 22.



Skull of Horned Puff-Adder (*Bitis nasicornis*), a venomous Serpent. (No. **316**.)

m, maxillary, with poison-fang; a bristle is inserted in the openings of the channel at the base and point of the tooth; *d*, undeveloped poison-fangs; *pm*, premaxillary; *q*, quadrate bone.

From a specimen in the Museum.

lanceolatus, **326** A), the Indian Green Viper (*L. gramineus*), the green Wagler's Viper (*Lachesis wagleri*, **327**) of Malaysia, which lives in trees, and the great black and orange Curucucu (*L. mutus*, **328**) of Surinam.

The American Rattle-Snakes (*Crotalus* and *Sistrurus*), as already mentioned, have at the end of the tail a rattle composed of a number of horny rings or bell-like structures which fit into one another. The oldest, or terminal, bell is really the horny sheath of the tail-tip; and with each casting of the skin the youngest bell becomes loose, but is held in place by the new covering. An ever-increasing number of loosely-attached bells is thus produced; but

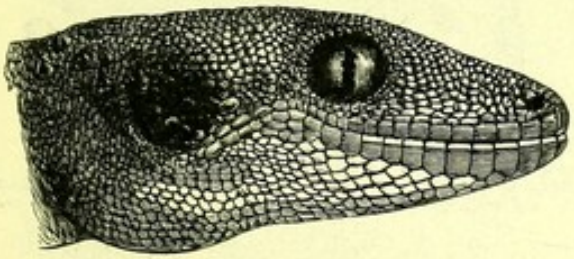
occasionally most of the bells (perhaps when worn out) drop off, and a new set is developed. Rattles with a dozen or more bells are very rare, especially at the present day. No indication of a Snake's age can be drawn from the number of bells in the rattle. Most Rattle-Snakes have numerous small scales on the head and are included in *Crotalus*, but in one species, constituting the genus *Sistrurus*, there are nine large shields on the top of the head.

Specimens of the ordinary North American Rattle-Snake (*Crotalus horridus*, **325**) and of a much larger South American species (*C. confluentus*, **323**) are exhibited.

Sub-order II.—Lacertilia.—Lizards.
(Cases 18–20.)

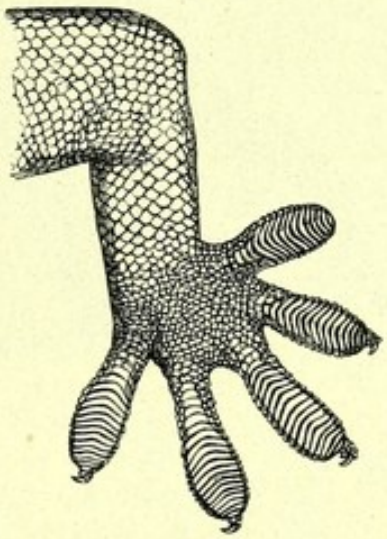
The first representatives of the sub-order Lacertilia (of which the characteristics will be found on page 13) are the Geckos, constituting the families *Geckonidæ*, *Eublepharidæ*, and *Uroplatidæ*. These reptiles take their name from the cry, "Geck-ko," of the common Turkish species. The members of the typical family are four-footed lizards, without movable eyelids, and with a broad fleshy Case 18.

Fig. 23.



Head of Indian Gecko (*Gecko verticillatus*), to show form of eye.

Fig. 24.

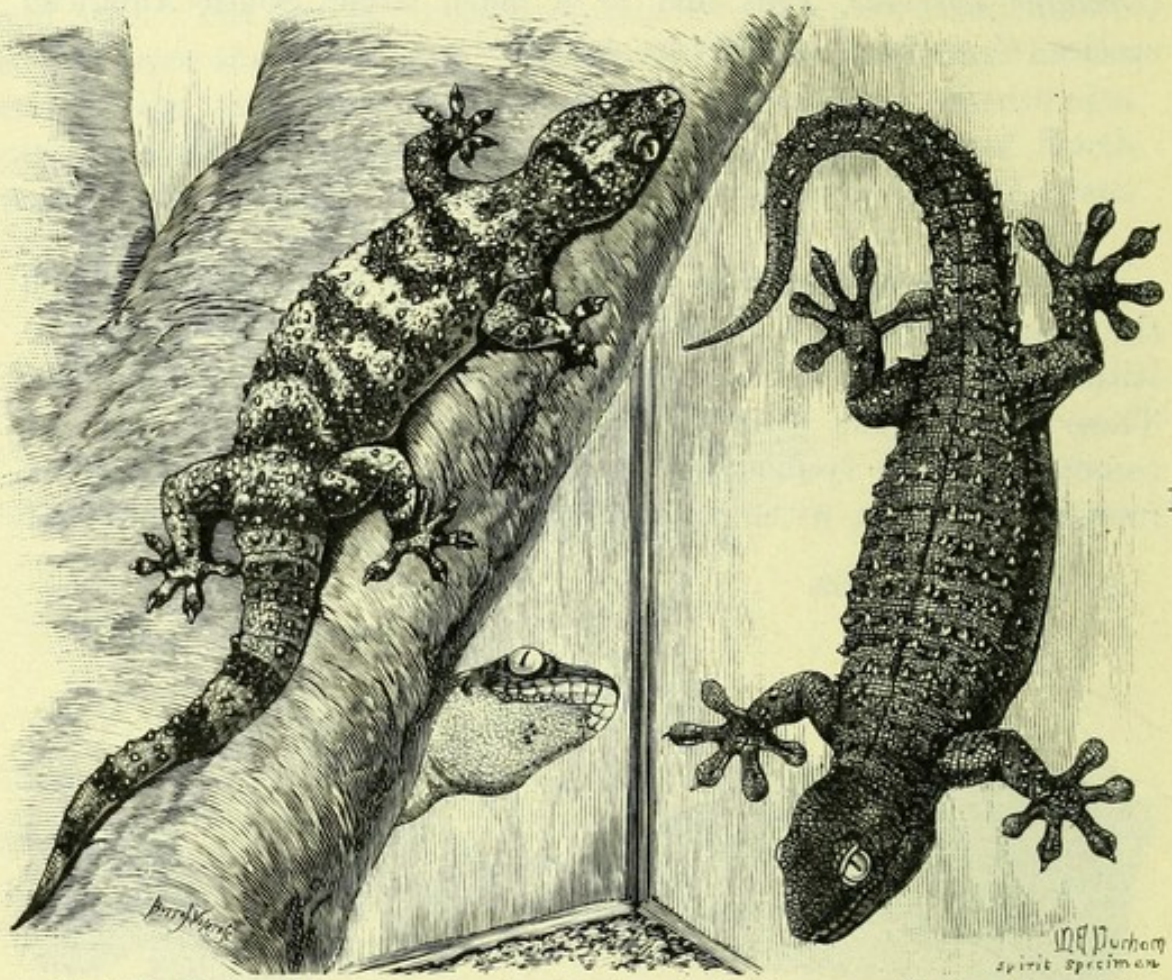


Hind-leg of Indian Gecko, from the lower surface, to show the adhesive pads formed by parallel transverse plates.

tongue, slightly notched at the tip, and capable of being protruded from the lips. The dentition is of the pleurodont type, that is to say, the teeth are attached to the inner side of the outer parapet of

the margin of the jaws. In the skeleton the bodies of the vertebræ are cupped at both ends (amphicœlous); the clavicles (collar-bones) are dilated and perforated near their junction with the breast-bone; and the parietal bones of the skull are separate. In the second family the vertebræ articulate by ball-and-socket joints, the eyes have movable eyelids, and the parietals are united. The members of the third family show no expansion of the clavicles.

Fig. 25.



A, Turkish Gecko (*Hemidactylus turcicus*), and B, Common Gecko (*Tarentola mauritanica*).

The tail varies, being in some cases of ordinary form, and in others trowel-shaped. Many species have the toes expanded and furnished with adhesive structures, by means of which they are able to climb window-panes and adhere to ceilings (fig. 24). The eggs, which are nearly spherical and usually two in number, have hard shells. Geckos feed on animal matter, chiefly insects, and are quite harmless, and for the most part nocturnal. In a limited degree they have the power of changing colour according to the nature of their surroundings.

FIG. 26.

A.

B.

MALAGASY BARK-GECKOS.

A.—THE LICHEN BARK-GECKO (*Uroplates fimbriatus licheni*).

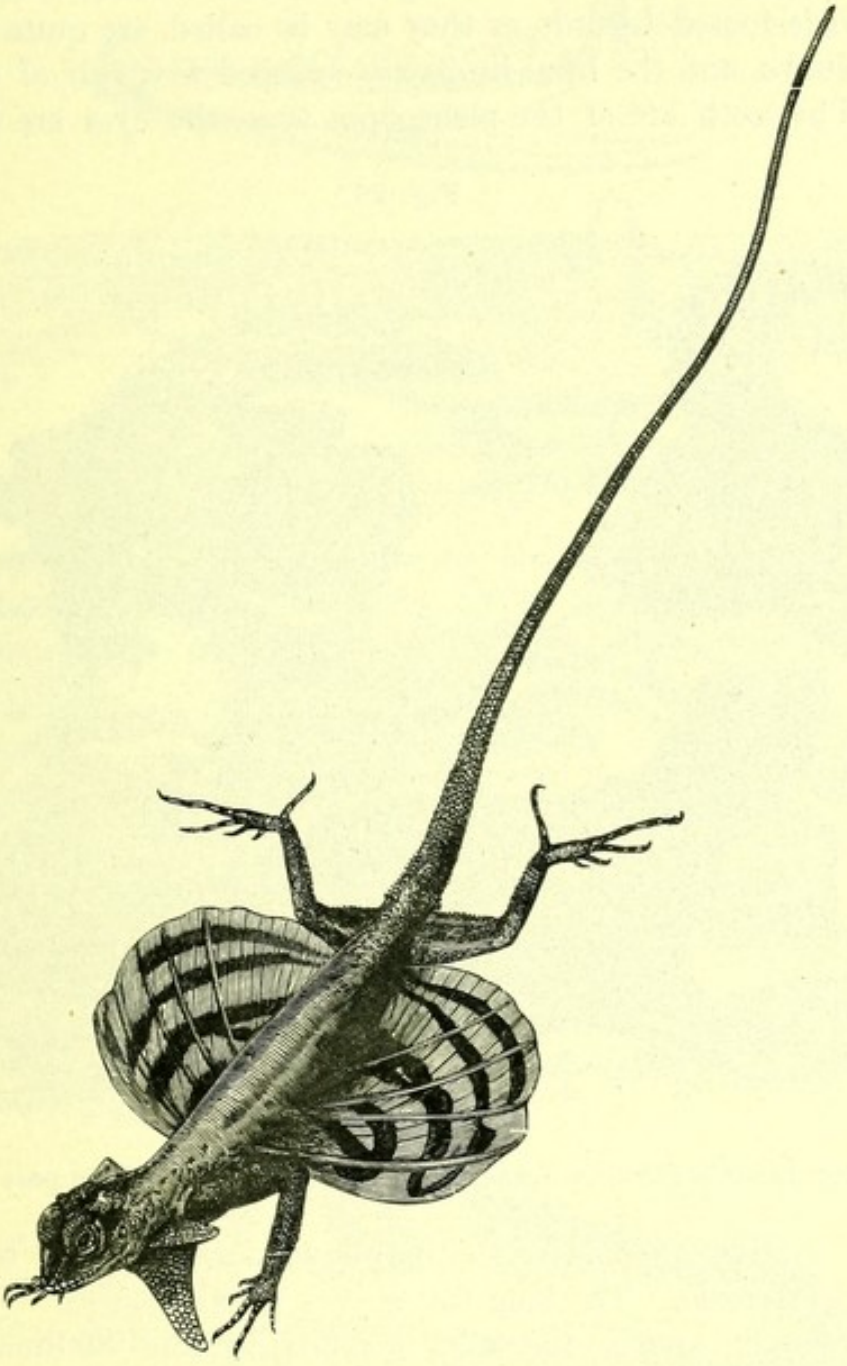
B.—THE COMMON BARK-GECKO (*Uroplates fimbriatus*).

(From specimens in the Museum.)

[*To face page* 26.

One of the most remarkable instances of protective resemblance in this group is afforded by the Lichen Bark-Gecko (*Uroplates fimbriatus licheni*, **365**, fig. 26 *a*), which clings to the bark of lichen-

Fig. 27.



A Flying Lizard, or "Flying Dragon" (*Draco taeniopterus*). (Compare No. **366**.)

clad trees. The close resemblance presented by the Lizard to the bark is well exhibited by the specimen in the case. Other species shown include the Common Gecko (*Tarentola mauritanica*, **355**, fig. 25 *b*), the Fringed Gecko (*Ptychozoon homocephalum*, **359**) of the

Malay countries, and the curious Short-tailed Gecko (*Nephurus lævis*, **357**) of Australia.

Case 18. A small number of snake-like Lizards constitute the family *Pygopodidæ*, of which *Pygopus lepidopus* (**386**) and *Lialis burtoni* (**385**) are the best-known. Examples of each are shown in the case. These Scale-footed Lizards, as they may be called, are quite destitute of fore-limbs, and the hind-limbs are reduced to a pair of scale-like flaps. The teeth are of the pleurodont type, the eyes are devoid of

Fig. 28.

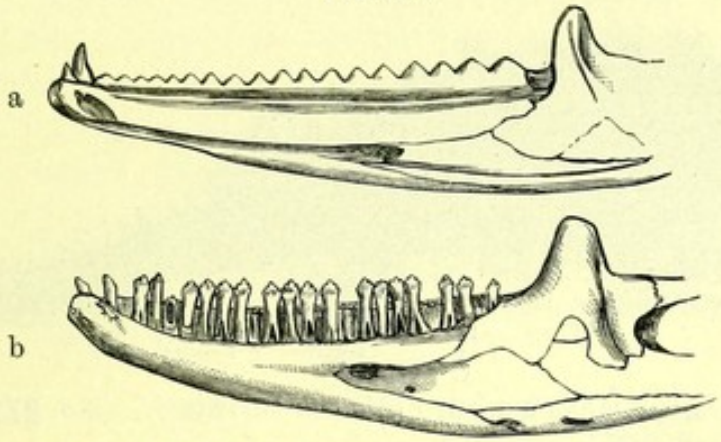
Spine-tailed Lizards (*Uromastix acanthurus*); ¼ nat. size. (Compare No. **377**.)

movable eyelids and have the pupil vertical, and the tongue is cleft and extensile. The long tail is very brittle.

Case 18. The family group *Agamidæ*, typified by the Stellion Lizard (*Agama stellio*, **370**) of southern Europe, comprises a large assemblage of Lizards differing from nearly all others in that their dentition is of the acrodont type, that is to say, the teeth are attached to the summits of the jaws (fig. 29 *a*). Other features are the broad and short tongue, and the absence of bony plates or nodules in the skin; but spines, especially on the head and tail, are often present. There

are about 200 species, arranged in some 30 genera, all confined to the Old World. The majority have depressed bodies and are terrestrial; but some, in which the body is compressed, are arboreal.

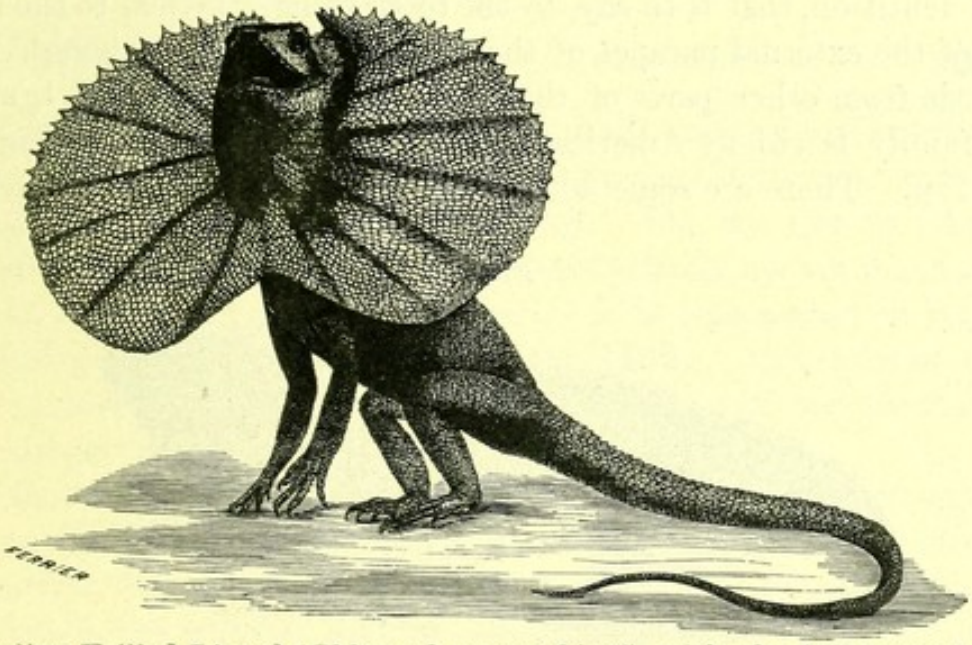
Fig. 29.



Right half of the Lower Jaw of a Stellion Lizard (a), to exhibit the acrodont dentition, and of an Iguana (b), to show the pleurodont type of dentition.

Most of the species are insectivorous, but certain kinds of *Agama* have a mixed diet, and *Uromastix* (**377**, fig. 28) and some of its allies feed entirely on fruits and herbs. In the Flying-Dragons

Fig. 30.

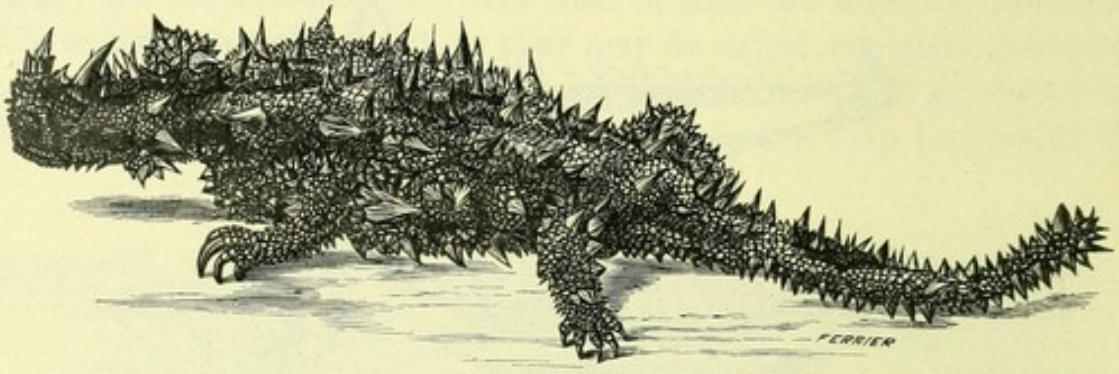


Australian Frilled Lizard (*Chlamydosaurus kingi*), with the frill expanded in the "terrifying" attitude. (No. **379**.)

(*Draco*, **366**, fig. 27) the sides of the depressed body carry wing-like membranes supported by expansions of the ribs, by means of which these reptiles pass from bough to bough, although they are incapable

of true flight, like that of a bird. The Frilled Australian Lizard, *Chlamydosaurus kingi* (**379**), which can run on its hind-legs in a semi-upright posture, has an expansible frill round the neck (fig. 30).

Fig. 31.

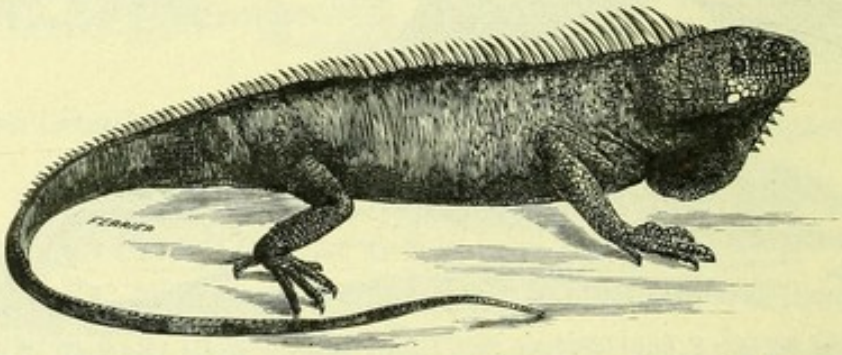


Australian Moloch Lizard (*Moloch horridus*). (No. **372**.)

In the Indian and African *Uromastix* (**377**, fig. 28) the tail is spiny, and in the Australian *Moloch* (**372**, fig. 31) the whole head and body are covered with spines of different sizes, the body being remarkably depressed and expanded.

Case 18. The Iguanas, family *Iguanidæ* (**381–403**), are the New World representatives of the *Agamidæ*, from which they differ by the pleurodont dentition, that is to say, by the teeth being attached to the inner side of the external parapet of the jaws (fig. 29 *b*). Although large Lizards from other parts of the world are often miscalled Iguanas, the family is chiefly American, with representatives in Madagascar and Fiji. There are some 300 species, arranged in about 50 genera,

Fig. 32.

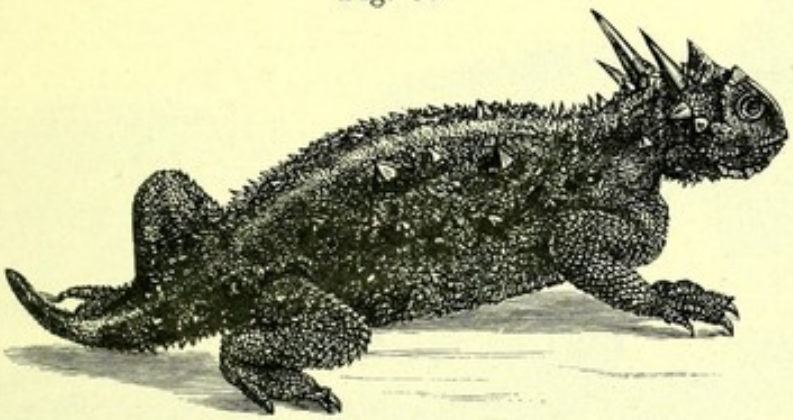


Tuberculated Iguana (*Iguana tuberculata*). (No. **381**.)

which display considerable variation in form and habits. Some are arboreal, others terrestrial or burrowing, and others semi-aquatic, one of the latter resorting to the sea. Many of the species are

herbivorous, but others subsist on insects. Of the true Iguanas, such as *Iguana tuberculata* (**381**, fig. 32), the flesh is often eaten; the species grows to between 5 and 6 feet. *Polychrus* (**402**) has the chamæleon-like power of changing its colour. Many species, notably the partially aquatic *Basaliscus* (**387**), have spines or fin-like expansions running down the middle line of the back; and in the so-called Californian Toad (*Phrynosoma cornutum*, **396**, fig. 33) and its relatives the whole body is spiny. The last-named Lizards have the peculiar power of squirting jets of a red fluid supposed to be blood from their eyes. In their depressed form and spine-clad skin, these Lizards present a curious parallelism to the Moloch Lizard in the *Agamidæ*. It will be noticed that in the more typical Iguanas,

Fig. 33.



Spiny Iguana, or Californian Toad (*Phrynosoma cornutum*). (No. **396**.)

which are arboreal in their habits, the body and tail are much compressed, and the prevailing colour is green, to harmonise with the foliage among which these reptiles dwell. The Sea-Iguana (*Amblyrhynchus cristatus*, **389**), of the Galapagos Islands, spends much of its time in the sea, and feeds on sea-weed. It is represented on land by the nearly allied *Conolophus subcristatus* (**403**). Examples of other genera, such as the Fijian *Brachylophus* (**398**) and the short-tailed *Hoplocercus* (**401**) of Brazil, are also shown.

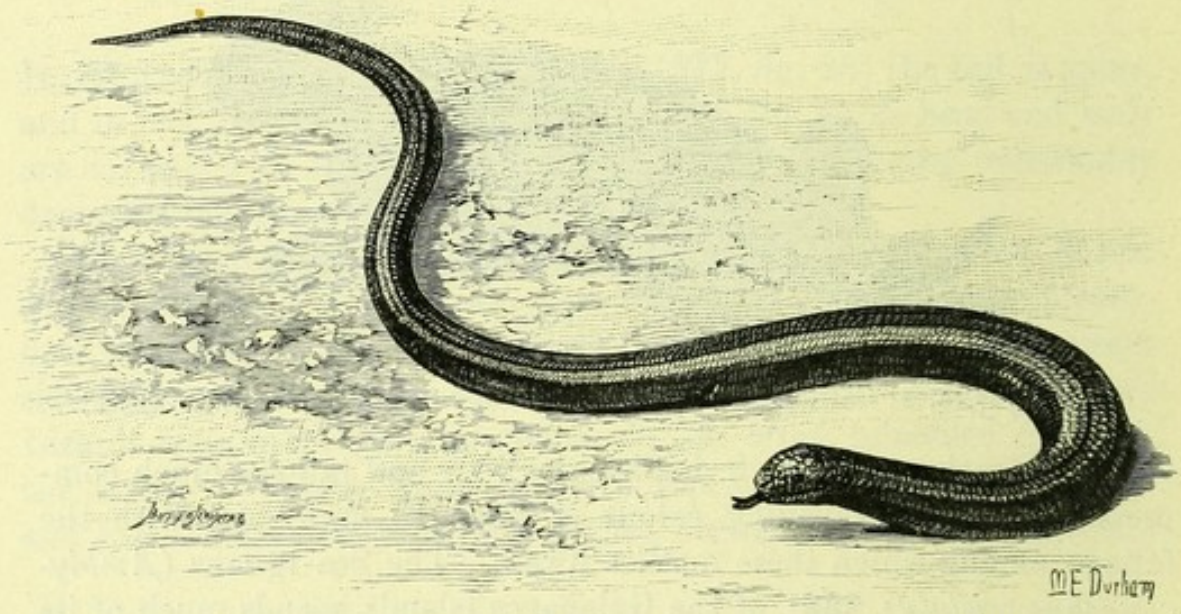
The two families *Zonuridæ* (**426–428**) and *Xenosauridæ* serve to connect the *Iguanidæ* with the *Anguidæ*. In both the dentition is pleurodont, but the teeth are solid only in the *Xenosauridæ*. In that family the anterior part of the tongue is retractile (as in the *Anguidæ*), and bony nodules are developed in the skin of the body. On the other hand, the *Zonuridæ* have short non-retractile tongues like those of the *Iguanidæ*, but bony nodules are developed at least in the skin of the head, where they roof over the temporal region. The second family is represented only by a single species from South

Case 20.

Mexico ; but the first has about 12 species, grouped in 4 genera, and ranging over South and Tropical Africa. In the typical genus *Zonurus* (**426–427**), the whole of the body and tail is encased in bony plates, the horny coverings of which form sharp spines, especially on the tail. These Lizards inhabit desert districts. Specimens of several species are exhibited in the case.

Case 20. The group of Lizards (family *Anguidæ*) typified by the English "Slow-Worm" has a pleurodont dentition, with the teeth solid. The tongue consists of two portions, of which the front half is notched and capable of being withdrawn into the basal half. Bony plates are developed in the skin of the body and head, and roof over the temporal region of the skull. There is a marked tendency

Fig. 34.



The Slow-Worm (*Anguis fragilis*) ; ½ nat. size. (No. **429**.)

throughout the family to a reduction of the limbs, culminating in their complete loss in the Slow-Worm. Traces of the shoulder and pelvic girdles always persist. The long, brittle tail is readily replaced. All the species (40 or so in number, and arranged in seven genera) are terrestrial and feed on animal substances ; and some at least, like the Slow-Worm, produce living young. In the American genus *Gerrhonotus* there is a pair of folds running along the sides of the body, and the limbs are well developed. Similar folds occur in the Glass-Snakes (*Ophisaurus*, **431**), but the limbs are represented only by a pair of flaps in the neighbourhood of the vent. In the Slow-Worm (*Anguis fragilis*, **429**, fig. 34) no external trace of the fold or limbs remains ; the notion that the creature is venomous

is entirely erroneous. Fine specimens of the South European Scheltopusik, or Glass-Snake (*Ophisaurus apus*, **431**) are exhibited.

The so-called Gila Monster (*Heloderma suspectum*, **424**, fig. 35) of Mexico and an allied species from New Mexico and Arizona, alone constitute a family (the *Helodermatidæ*, or Poisonous Lizards) characterised by the presence of recurved fang-like teeth loosely attached to the lower jaw, which discharge poison through open grooves secreted by special glands. The dentition is pleurodont, the tongue is cleft at Case 19.

Fig. 35.

The Gila Monster (*Heloderma suspectum*); $\frac{1}{5}$ nat. size. (No. **424**.)

the tip, and the bony plates in the skin are small, and communicate the peculiar granular texture to the upper surface. The Gila Monster is a creature of lethargic and nocturnal habits, crawling about in the evening in search of worms, frogs, centipedes, and Iguanas' eggs. Frogs are paralysed, if not killed, by the bite, which is also dangerous to human beings, although rarely productive of death. In captivity these Lizards eagerly break eggs and lap up the contents. During the hot season they become torpid.

A very rare Bornean Lizard (*Lanthanonotus borneensis*) is nearly allied to the *Helodermatidæ*, from which it is distinguished by the

absence of grooved teeth (and therefore probably of poison-glands) and of bony granules in the skin.

Case 19. The members of the family *Varanidæ* (**407–420**), which include the largest of all Lacertilia, derive their common name of "Monitors," or "Warning Lizards," from a confusion between "Ouaran," the Arabic designation of a Lizard, and the English word "warning." Agreeing with many other members of the sub-order in having the teeth attached to the inner side of the outer parapet of the jaws (pleurodont type), Monitors are specially characterised by the long, smooth, and forked tongue, which can be protruded and withdrawn in the same manner as that of Snakes; and they are further distinguished by the absence of plates of bone in the skin of the head and body. The group is confined to the warmer parts of the Old World (inclusive of Australia), although unknown in Madagascar. All the species are included in the genus *Varanus*, of which the largest living representative is the Kabara-goyu (*V. salvator*, **409**) of the Singalese. This attains a length of 7 feet, and, like some of the other species, is partially aquatic; but it was considerably exceeded in size by a fossil Monitor from N. India which, in its turn, was a dwarf to the extinct Giant Monitor of Queensland, of which a vertebra (**419**) is shown in the case. All the Monitors are carnivorous, many of them being in the habit of feeding largely on birds' eggs, which they hold and crack in their mouths while their heads are raised.

It will be noticed that the Monitors differ markedly from the typical arboreal Iguanas, both in shape and colouring; their bodies being depressed, instead of compressed, and their colour usually a mixture of black, brown, olive, and yellow. The reason of these differences is that these Lizards are terrestrial, and live among bushes, grass, rice, and other covert, to which their type of colouring assimilates them. By Europeans in India and Africa Monitors are generally mis-called Iguanas.

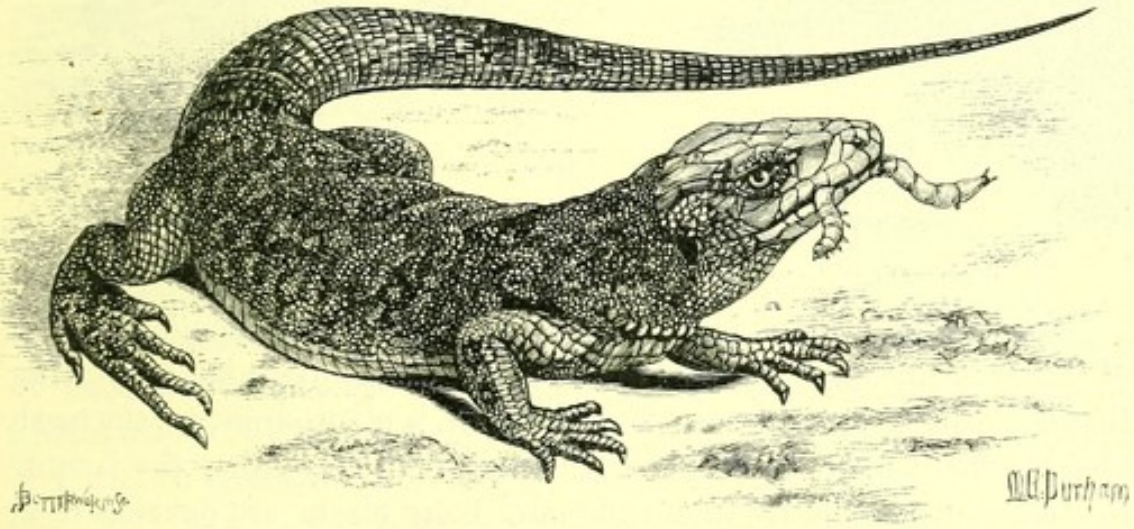
Case 19. The American Lizards typified by the Tejus (family *Teiidæ*) are characterised by the solid teeth, which are almost of the acrodont type, by the long and deeply cleft tongue, furnished with numerous papillæ, and the absence of bony plates or granules in the skin. Occasionally the limbs are somewhat reduced. The members of this family are arranged in nearly forty genera, and display great variety of form and habit. Some dwell in forests and are aboreal, others frequent hot and dry plains, while yet others are limbless, Blind-worm-like creatures. The largest member of the family is the Great

Teju (*Tupinambis teguixin*, **421**), which reaches a yard in length. *Dracæna guianensis* is peculiar in having cheek-teeth of a molar-like type. *Ameiva dorsalis* (**423**) is a smaller West Indian species.

The Amphisbænas (family *Amphisbænidæ*, **436–437**) are worm-like and for the most part limbless tropical Lizards which take their name from their power of progressing either forwards or backwards. They are degraded, or perhaps specialised types ; and are characterised by having the body covered with soft skin, which forms numerous rings and shows only vestiges of scales. The genus *Chirotes* alone retains short and four-clawed front-limbs. About a dozen generic types are recognised, of which the typical *Amphisbæna* (**436**) contains the greatest number of species. Amphisbænas lead an underground burrowing existence, like worms ; and are often found in ants' nests and refuse heaps. Their movements are worm-like, the soft, ringed skin enabling them to move with equal facility in either direction. Unlike other limbless Lizards and Snakes, which move in lateral undulations, Amphisbænas crawl in a straight line with slight vertical folds of the body. All are Tropical American. Case 20.

The common English Lizard and its allies are the types of a family (*Lacertidæ*, **440–445**) characterised as follows : The teeth are pleurodont, *i.e.* attached to the inner side of the margin of the jaws ; the long tongue is forked, with either tubercles or folds ; there are bony plates on the head ; and the temporal region of the skull is roofed Case 20.

Fig. 36.



The Eyed Lizard (*Lacerta ocellata*) ; ⅓ nat. size. (No. **441**.)

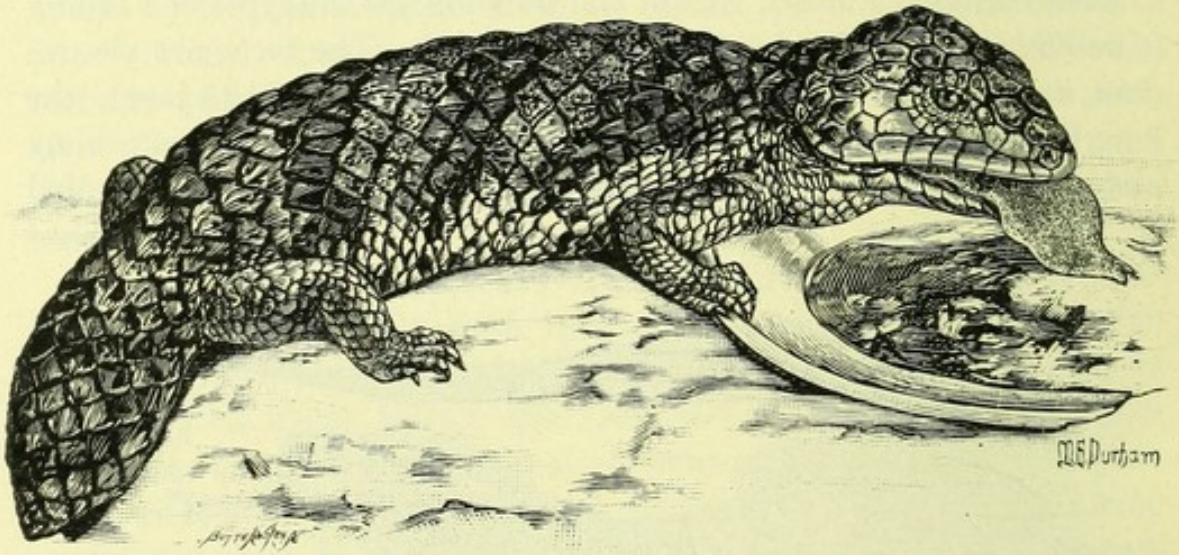
with bone. The family is restricted to the Old World and includes less than a score of genera. The most familiar forms of the typical

family are the Common Lizard (*Lacerta vivipara*), in which the young (from 6 to 12 in number) burst the eggs just before or just after they are laid, the Sand-Lizard (*L. agilis*, **443**), the Green Lizard (*L. viridis*, **442**), the Wall-Lizard (*L. muralis*, **444**), and the beautiful Eyed Lizard (*L. ocellata*, **441**, fig. 36). All of these are European, but only the first two occur in England. The Spanish Lizard (*Psammodromus hispanicus*) represents a genus distinguished by the absence of a semi-lunar collar of enlarged scales on the front of the neck.

Variation in the South European Wall-Lizard (*Lacerta muralis*) is illustrated by coloured figures.

The family *Gerrhosauridæ* (**438, 439**) comprises a small assemblage of African and Malagasy Lizards characterised by their pleurodont dentition, the long and slightly cleft tongue, which is furnished with tubercles, and the presence of bony plates in the skin of the head and body, roofing over the temporal region of the skull. In addition to the typical *Gerrhosaurus* (**439**), there are the genera *Tetradactylus*, *Cardylosaurus*, *Zonosaurus* (**438**), and *Tracheloptychus*.

Fig. 37.



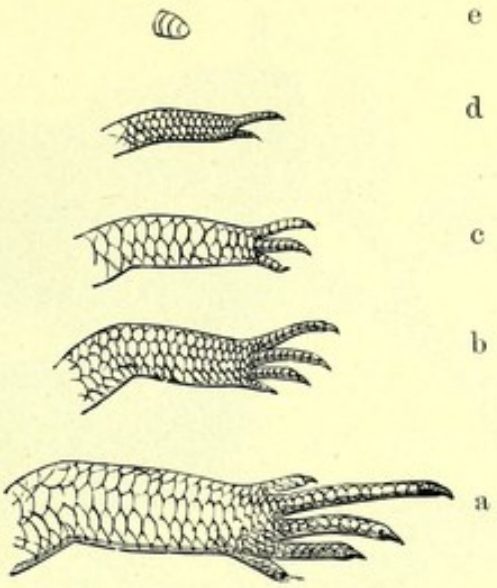
Stump-tailed Skink (*Trachysaurus rugosus*); ⅓ nat. size. (No. **374**).

Case 20.

The Common Skink is the type of a large and cosmopolitan family of Lizards known as *Scincidæ* (**455–474**), or Skinks, and presenting the following characteristics. The dentition is pleurodont, *i.e.* the teeth are attached to the inner side of the margin of the jaws; the tongue is scaly and but slightly notched; and bony plates are developed in the skin of the head and body. Skinks prefer dry sandy ground, on which they move rapidly and in which they burrow; the frequent reduction or even loss of the limbs being connected with the burrowing habit. Most produce their young alive; the usual hard

egg-shell being frequently absent. About 400 species are known, which have been grouped in nearly 30 genera. The family attains its greatest development in the Australasian region.

Fig. 38.



Hind-legs of Skinks, to show the gradual abortion.

a, *Chalcides ocellatus.*
b, *Chalcides mionecton.*
c, *Chalcides tridactylus.*
d, *Lygosoma lineo-punctulatum.*
e, *Chalcides guentheri.*

One of the most remarkable types is the Stump-tailed Skink (*Trachysaurus rugosus*, **474**, fig. 37), recognisable by its large and rough scales and short tail. The Australasian *Tiliqua* (**457–458**) includes large species with stout button-shaped teeth. The True Skinks have 5-toed limbs with the lateral toes serrated; the common species (*Scincus officinalis*, **463**), which grows to about 8 inches, has a perfectly smooth skin, and wedge-like head. It was once esteemed a sovereign remedy for many diseases. *Mabuia* (**456**), with about 40 species, is remarkable for including one semi-aquatic form (*M. vittata*). The Eyed Skink (*Chalcides ocellatus*, **462**) of the Mediterranean countries, which grows to 10 inches, is a member of a genus in which the lower eyelid has a transparent "window," the scales are smooth and shiny, and the limbs short or rudimentary (fig. 38). A series of specimens illustrating the degradation of the limbs is shown.

Sub-order III.—Rhiptoglossa.—Chamæleons.

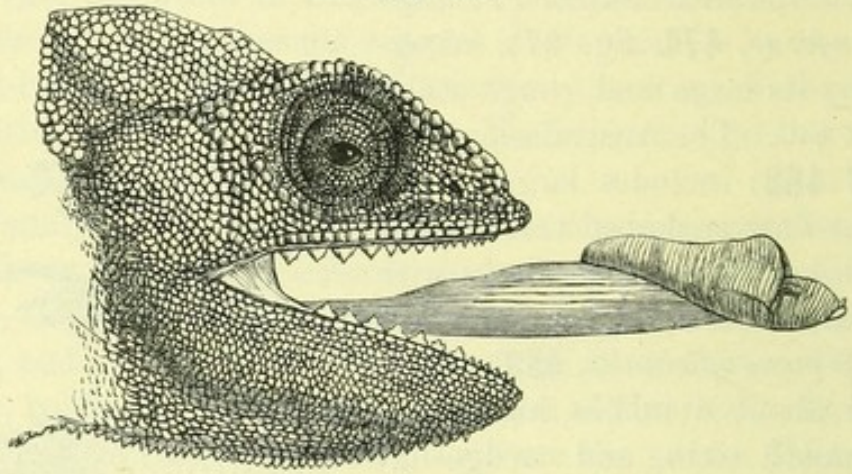
Chamæleons (**446–454**) constitute by themselves not only the family *Chamæleontidæ*, but also the sub-order Rhiptoglossa—a group of equal value with the Lacertilia. From Lizards Chamæleons are distinguished by the structure of the tongue, which is club-shaped, and can be extended to a length equal to that of the whole body (fig. 39); and by the form of the head, which is somewhat helmet-shaped. There is no tympanum, or drum, to the ear, and no tympanic cavity. The long limbs are also of a peculiar type, having two of the toes opposed to the other three, so as to form an effective grasping foot (fig. 40). Clavicles, or collar-bones, as well as an

Case 20.

inter-clavicle, are absent. The long tail, which is not of a brittle and renewable type, is prehensile and curled downwards when used as a grasping organ.

The skin is covered with granules in place of scales; and the

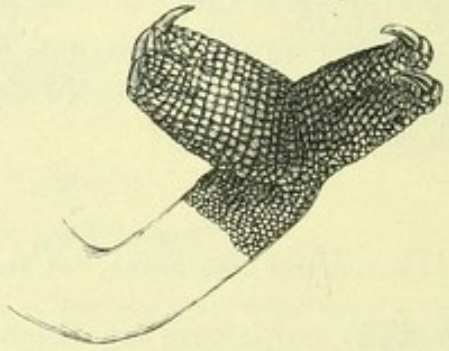
Fig. 39.



Head of the Common Chamæleon (*Chamæleon vulgaris*), with the tongue partially protruded.

eyes are very large, with the eyelids united into one fold, having a minute central opening. Each eye can be moved independently; and the movements of the limbs are slow and sluggish. As in all arboreal Lizards, the body of the Chamæleons is much compressed

Fig. 40.



Fore-foot of a Chamæleon.

laterally. Chamæleons are famed for the capacity of changing colour according to the nature of their surrounding—a power which they share, however, with certain Lizards such as those of the genus *Calotes*. They feed on flies and other insects, which are caught at a distance of several inches on the sticky end of the protrusile tongue (fig. 39). Most species lay eggs, but a few are viviparous.

In the majority the prevailing colour is brown or green, but in the

Arabian *Chamæleon calyptratus* (**451**), of which a specimen is exhibited, the body is marked by vertical bands of blue and yellow. All the species are confined to the warmer parts of the Old World.

Fig. 41.

The Common Chamæleon (*Chamæleon vulgaris*); $\frac{2}{3}$ nat. size. (No. **446**.)

Order VII.—ICHTHYOPTERYGIA (*Extinct*).
(Case 17.)

The Ichthyosaurs were Whale-like marine Reptiles which flourished from the period of the New Red Sandstone, or Trias, to that of the Chalk. The limbs are modified into paddles, in which the bones of the digits exceed the normal number, and are more or less shortened and broadened so as to form a pavement-like structure. The teeth, which are generally fluted, are implanted in grooves in the long jaws. A ring of overlapping bones is developed in the white (sclerotic) of the eye. The bodies, or centra, of the vertebræ are short, doubly-cupped, and separate from the neural arches.

The Triassic *Merriamia* and *Mixosaurus* were comparatively small Reptiles, in which the ribs of the trunk are single-headed, the radius

and ulna of the front-paddle (like the tibia and fibula in the hind-limb) are elongated and separated by a wide cleft, while the other bones of the paddles are also somewhat elongated, often notched on

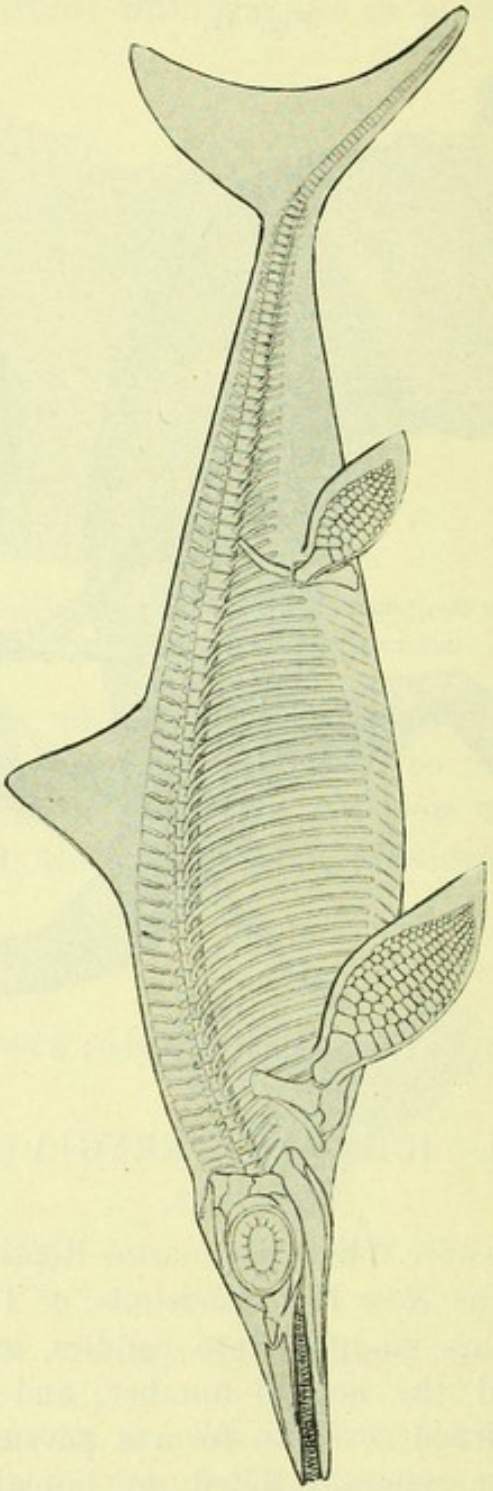


Fig. 42. Skeleton of *Ichthyosaurus communis*, with outline of body and fins indicated in shading, from the Lower Lias of Lyme Regis; about one-thirtieth nat. size.

one or both borders, and arranged in three rows. In *Ichthyosaurus* (**347**, **348**), on the other hand, the radius and ulna are transversely expanded and in apposition, while the other bones of the paddle are also very short and broad, and the ribs are two-headed. In certain species, the paddle-bones are arranged in three longitudinal rows,

with notches on the outer border of those of the front row ; but in another group there are five or more longitudinal rows of these bones, which are generally without marginal notches. In *Ophthalmosaurus* (**351**), of the Kimmeridge Clay, a third bone (the pisiform) articulates with the humerus, an analogous condition obtaining in the hind-limb. Both in *Ophthalmosaurus* and the allied American *Baptanodon* the teeth were rudimentary.

Order VIII.—CHELONIA.

Tortoises and Turtles.

(Cases 6 to 10.)

Tortoises, Terrapins, and Turtles, which collectively constitute this order, are distinguished from all other Reptiles by the toothless horn-covered jaws, and the enclosure of the body in a bony shell, which may or may not be covered with horny shields. The shell, which consists of an upper half, or carapace, and a lower portion, or plastron, is supported by the spines of the vertebræ and the ribs ; and consequently Chelonians present the unique peculiarity that the shoulder and pelvic girdles are situated within the ribs. The limbs, which are five-toed, may be adapted for walking (Tortoises) or modified into paddles (Turtles). Each rib articulates with the vertebræ by a single head, and the quadrate-bone is firmly united to the skull. This order dates from the Triassic epoch.

Chelonians are arranged in two main divisions : the Athecæ and the Thecophora. In the former group, now represented by the Leathery Turtle, or Luth, the vertebræ and ribs are free from the carapace (fig. 45), which is composed of small polygonal plates like mosaic, and covered with horny skin. In the second group, the vertebræ and ribs are fused with the carapace (fig. 44), which is composed of a number of bony plates of variable size, the names and relations of which are shown in case 6. In this group, as shown in the figure on page 52, the number and size of the horny shields do not accord with those of the underlying bones.

The Thecophora are subdivided into the following three groups :

1. Cryptodira, or those in which the head is retracted in a vertical plane by an S-like flexure of the neck (fig. 55), and the pelvis is not attached to the plastron.
2. Pleurodira, or those in which the head is retracted in a horizontal plane by a lateral flexure of the neck (fig. 56), and some of the bones of the pelvis are welded to the plastron.

3. TRIONYCHOIDEA, or those with very flat oval or almost round shells, covered with soft leathery skin, and broadly webbed limbs, of which only the three middle toes are clawed.

The following table shows the chief sub-divisions of the group :

Order CHELONIA.

I. Section ATHECÆ.
Family *Sphargidæ*, or *Dermochelydidæ*.

II. Section THECOPHORA.

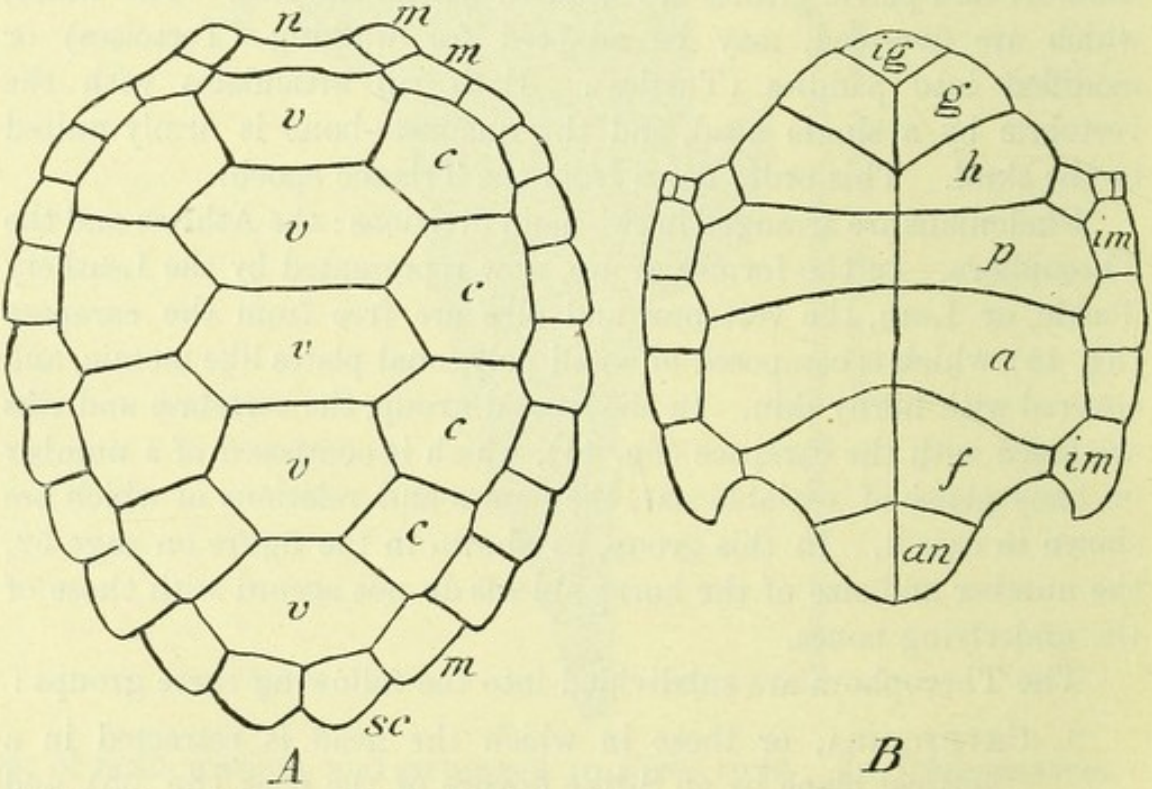
i. Sub-order CRYPTODIRA.
Family *Chelydridæ*.
,, *Dermatemydidæ*.
,, *Cinosternidæ*.
,, *Platysternidæ*.
,, *Testudinidæ*.
,, *Chelonidæ*.

ii. Sub-order PLEURODIRA.
Family *Pelomedusidæ*.
,, *Chelydidæ*.
,, *Carettochelydidæ*.
,, *Plesiochelydidæ*. } Extinct.
,, *Miolaniidæ*. }

iii. Sub-order AMPHICHELYDIA.
Family *Pleurosternidæ* (extinct).

iv. Sub-order TRIONYCHOIDEA.
Family *Trionychidæ*.

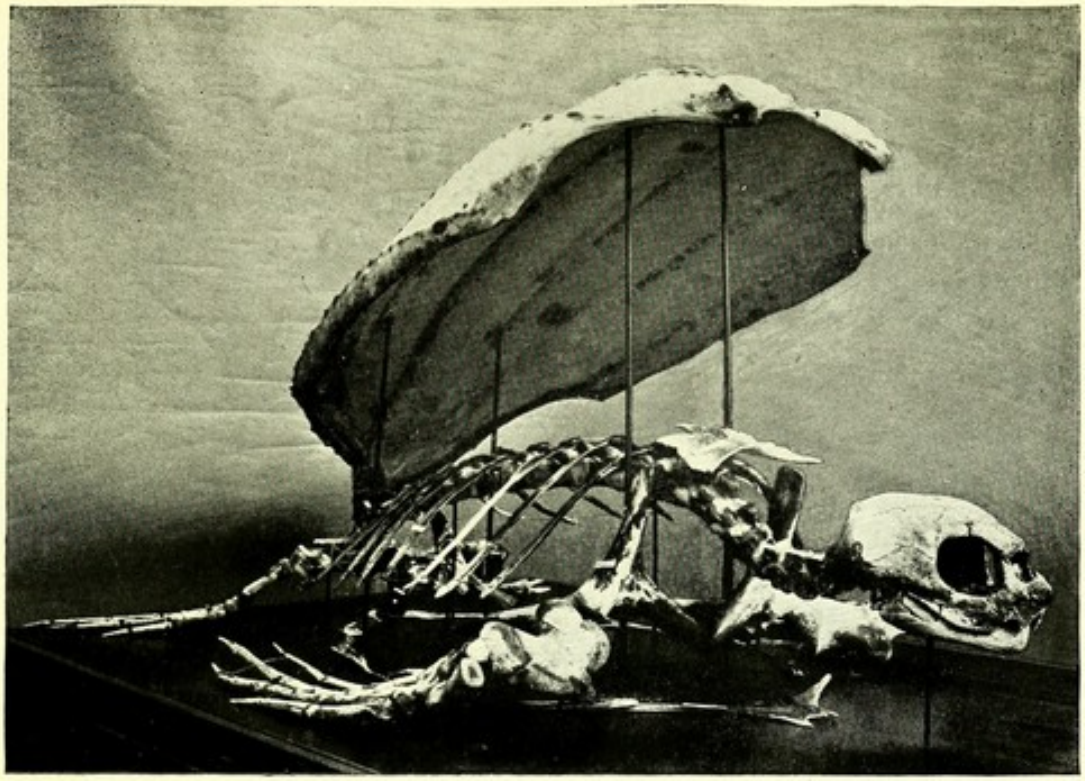
Fig. 43.



Upper (*A*) and Lower (*B*) Shells of the Green Turtle (*Chelone mydas*), to show arrangement of the horny plates.

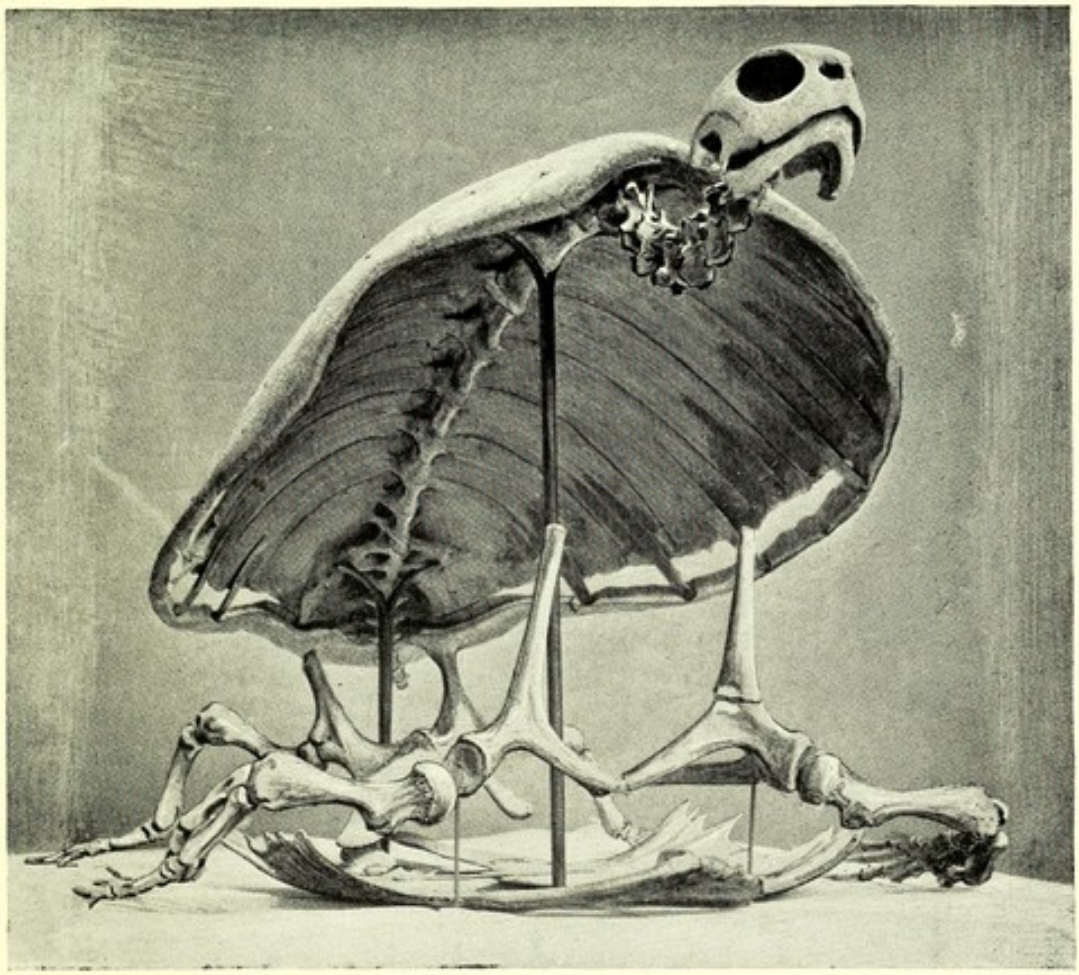
n. Nuchal.
v. Vertebral.
c. Costal.
m. Marginal.
sc. Supracaudal.
im. Inframarginal.
ig. Intergular.
g. Gular.
h. Humeral.
p. Pectoral.
a. Abdominal.
f. Femoral.
an. Anal.

Fig. 44.



Skeleton of Luth or Leathery Turtle (*Dermochelys coriacea*).
To show complete separation of shell from the ribs. (No. 186A.)

Fig. 45.



Skeleton of Green Turtle (*Chelone mydas*).
To show union of shell with ribs. (No. 182.)
(From specimens in the Museum.)

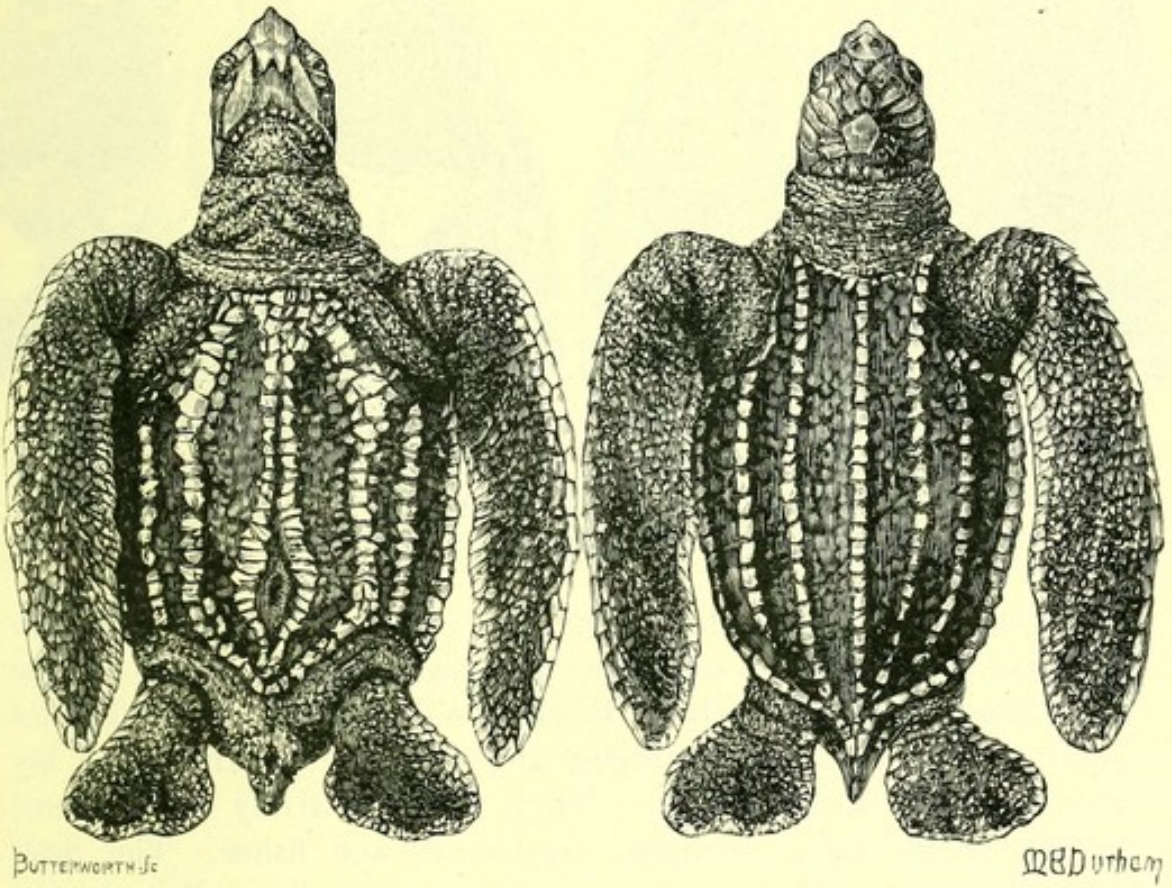
[*To face page* 42.

Section ATHECÆ.

Leathery Turtles.

The only living representative of this group is the Luth or Leathery Turtle (*Dermochelys coriacea*, **180**, fig. 46), the largest of Table-case.

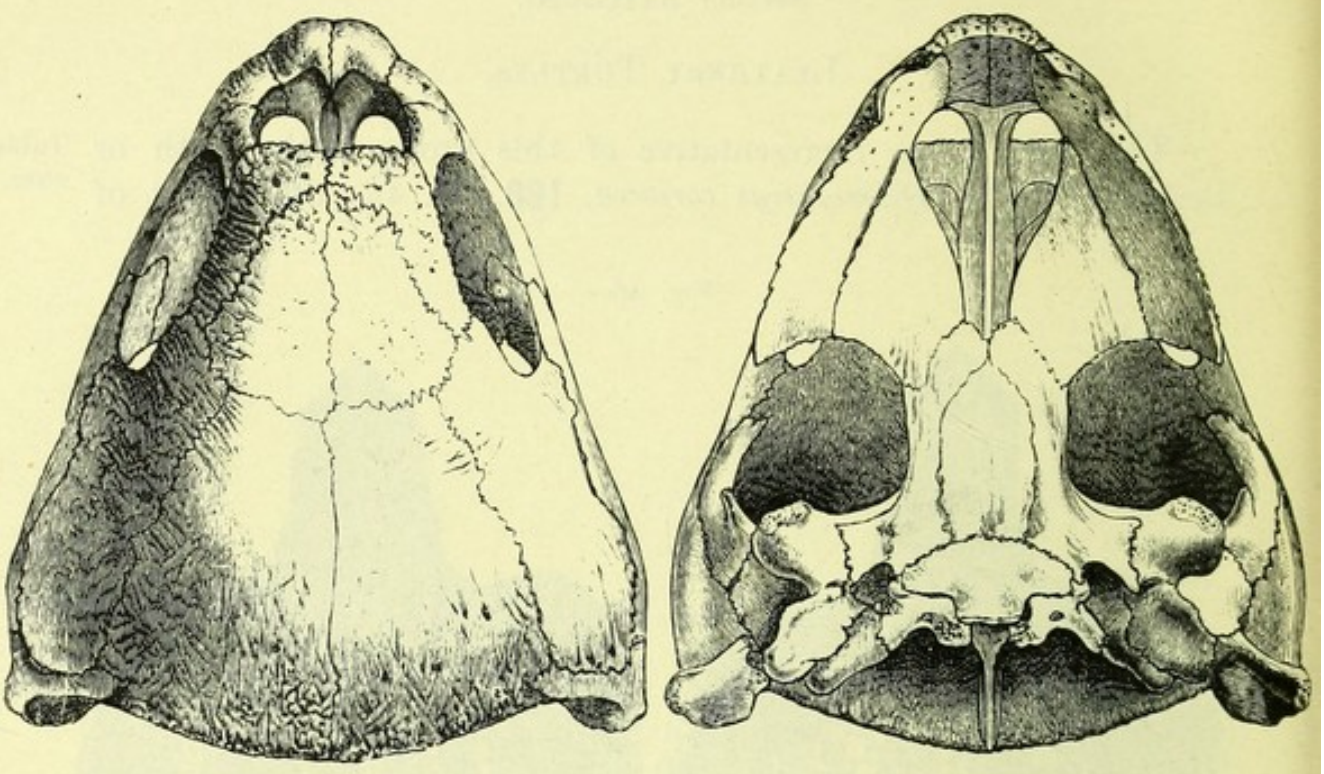
Fig. 46.



Luth, or Leathery Turtle (*Dermochelys coriacea*); young specimens; lower and upper view. (No. **180**.)

existing Chelonians, which sometimes measures as much as six and a half feet from the muzzle to the hind border of the carapace, the length of the shell being about four feet. Such a specimen would weigh about half a ton. In common with a number of allied extinct Turtles, mostly referable to the family *Sphargidæ*, or *Dermochelydidæ*, the Luth is characterised by the vertebræ and ribs being free from the carapace, which is composed of small polygonal plates of bone, covered with a continuous leathery skin. The limbs are in the form of paddles, and the neck cannot be withdrawn into the shell; there

Fig. 47.

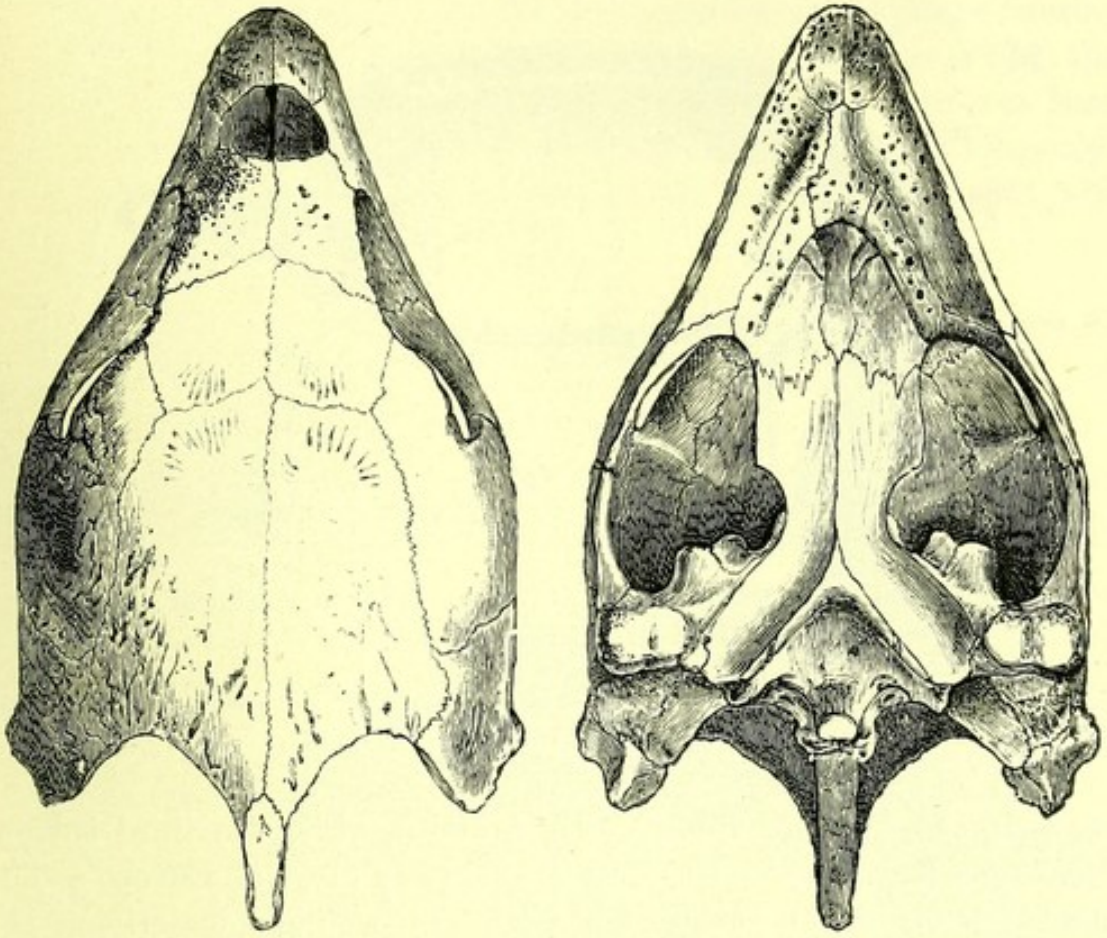


Upper and Lower views of Skull of Luth, or Leathery Turtle (*Dermochelys coriacea*), showing the absence of a secondary floor to the palate and the consequent forward position of the posterior nostrils.

is no plastron. The Luth is met with in all tropical seas, though it is everywhere rare ; specimens are occasionally carried by the Gulf Stream as far north as England. In spring these Turtles resort to the Bahamas, Tortugas, and the coast of Brazil, to lay their eggs on sandy shores. They are exclusively carnivorous, feeding chiefly upon mollusks, crustaceans and fishes. The flesh is unwholesome. This species is represented in the gallery by the cast of a fine specimen (**180**) caught on the coast of Trevandrum, Travancore, India, and presented by the director of the Trevandrum Museum, and also by the skeleton shown in fig. 45. Remains of a much larger extinct species (*Eosphargis gigas*) occur in the London clay.

The accompanying illustrations (figs. 47 and 48) are intended to show the remarkable difference of the bony palate of the Luth from that of ordinary Turtles.

Fig. 48.



Upper and Lower views of Skull of Hawksbill Turtle (*Chelone imbricata*), showing the presence of a secondary floor to the palate and the consequent backward position of the posterior nostrils.

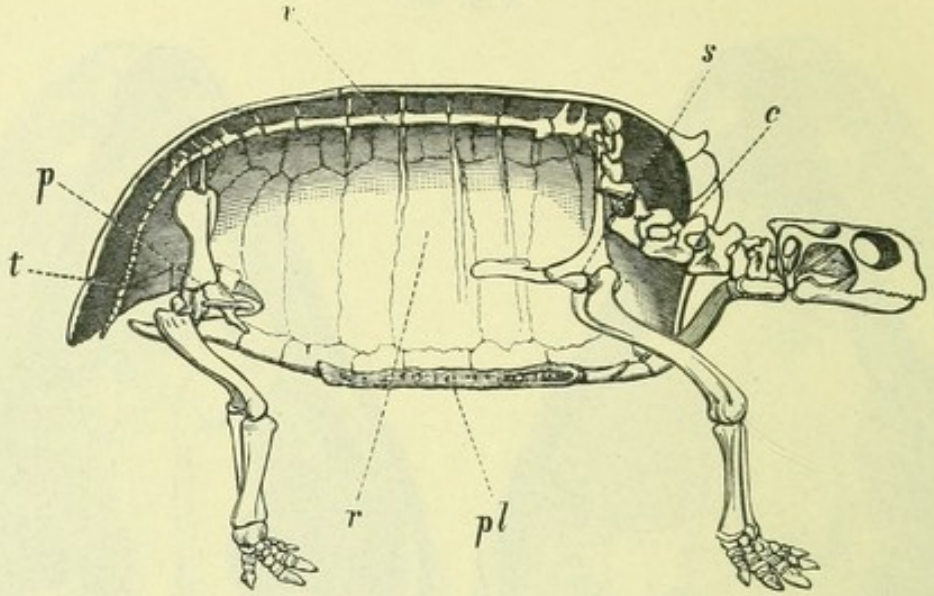
Section THECOPHORA.

Sub-order I.—Cryptodira (S-necked Tortoises).

The Cryptodira, or S-necked Tortoises, which constitute the majority of living Chelonia, are characterised, as already mentioned, by the head being drawn in by an S-like bending of the neck in a vertical plane so that the head occupies the centre of the front of the shell (fig. 55). Unlike the Pleurodira, in which the bones of the pelvis are welded to the upper and lower shells, their bones are free. Specimens are exhibited in case 9 to illustrate the essential differences between the Cryptodira and Pleurodira.

Of the three living representatives of the family *Chelydridæ* (**75–77**), Case 6.

Fig. 49.



Skeleton of a Land Tortoise, in a vertical section through the carapace, showing the mode of retracting the neck in a vertical plane.

c, neck; *v*, dorsal vertebræ; *t*, tail; *r*, costal plates of carapace; *pl*, plastron; *s*, shoulder-bones; *p*, pelvis.

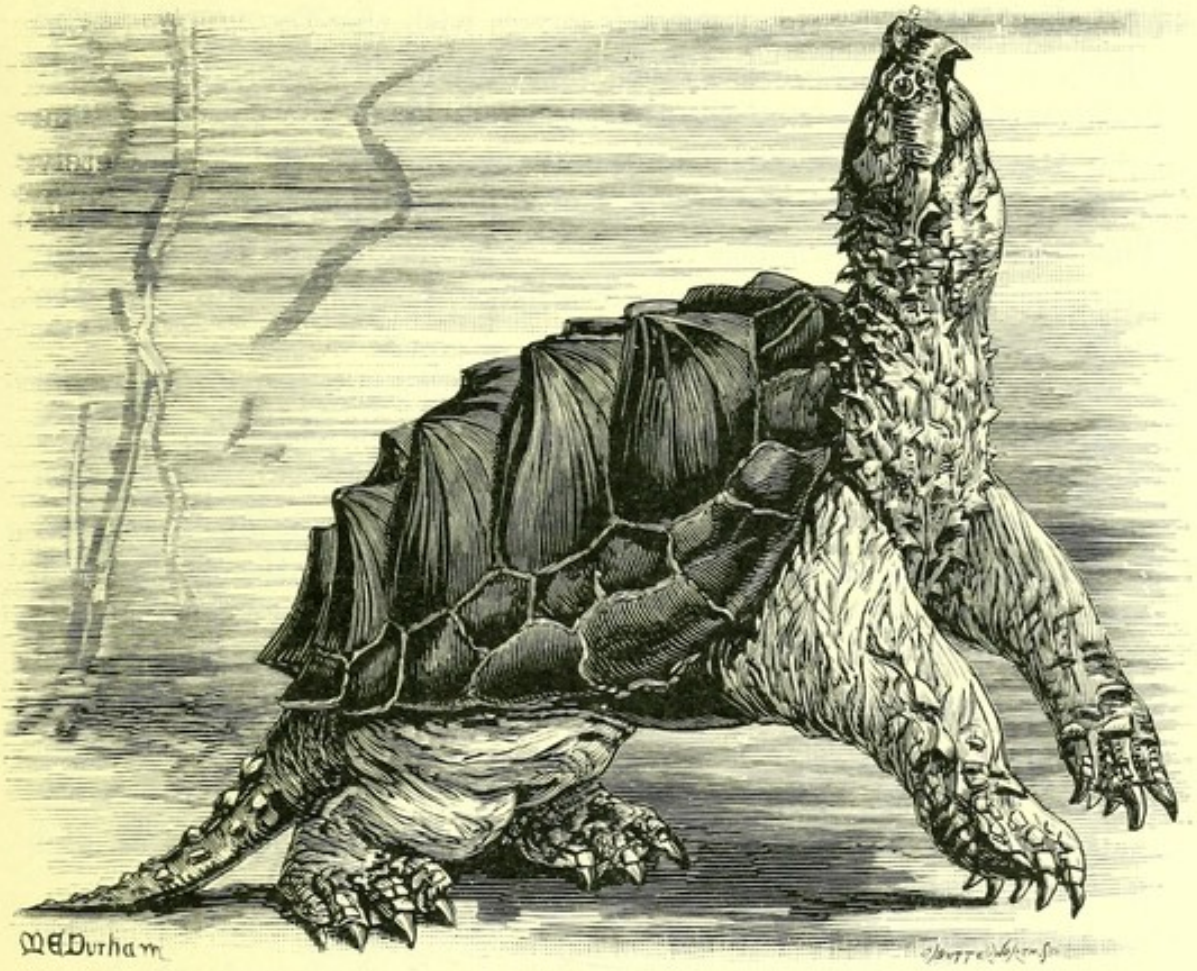
or Snappers, two are from North America, while the third is from Ecuador; fossil species occur in the Tertiary rocks of Europe. The nuchal bone of the carapace has rib-like processes underlying the costals. The large head (which is furnished with a beak) and neck cannot be withdrawn into the shell; and the temporal region of the skull is partially roofed. The long tail has the articular surfaces of most of the vertebræ cupped behind. Inframarginal horny shields separate the marginals of the carapace from the abdominals of the plastron, which is cruciform and united to the carapace by a narrow bridge. Temminck's Snapper (*Macroclemmys temmincki*, **75**, fig. 50) has a ridged, while the two species of *Chelydra* (**76** and **77**) have a smooth shell.

Snapping Turtles live in deep pools or sluggish streams, keeping mostly to the bottom, although rising from time to time to breathe, and occasionally landing. They are carnivorous, feeding on fish and waterfowl, and inflict dangerous bites.

Case 6. The Tortoises of the small Central American family *Dermatemydidæ* (**73** and **74**), for which there is no collective English name, resemble the *Chelydridæ* in that the nuchal plate of the carapace gives off a pair of rib-like processes underlying the costals; and also by the pectoral shields of the plastron being separated from the marginals by a

series of inframarginals. They differ by the open temporal region of the skull, as well as by the small size or absence of the gular shields, and the short tail. Some of the hinder costal plates overlap the neurals so as to meet in the middle line. In *Dermatemys* (**74**) the large plastron, which is firmly joined to the carapace, carries at least eleven shields, and there are four inframarginals. In *Staurotypus* (**73**) the plastron is cruciform, with the front flap movable, and

Fig. 50.



Temminck's Snapper, or Alligator-Terrapin (*Macroclemmys temminckii*); $\frac{1}{6}$ nat. size. (No. **75**.)

seven or more shields; the number of inframarginals being two. Nothing is known of the habits of either group.

The Mud-Terrapins (family *Cinosternidæ*, **66–72**) resemble the *Chelydridæ* and *Dermatemydidæ* in the presence of rib-like processes to the nuchal bone of the carapace, but differ from these and all other Chelonia in the absence of an entoplastral bone to the plastron, which thus has eight, in place of the usual nine, bones. The neck can be completely retracted within the shell, the temporal region of the

Case 6.

skull is completely open, and the tail is short, with the bodies of the vertebræ cupped in front. Some of the neural plates of the carapace are hidden by the costals meeting in the middle line. Inframarginal shields are present, but do not completely cut off the marginals from the abdominals. In some species, the plastron has two transverse hinges, so that the shell can be completely closed.

The Burmese Casked Terrapin (*Platysternum megacephalum*, **68**), representing the family *Platysternidæ*, differs from the three preceding families by the absence of rib-like processes to the nuchal bone of the carapace. In this respect it agrees with the *Testudinidæ*, from which it is distinguished by the presence of inframarginal shields between the marginal and the abdominal shields of the plastron. The head is very large, and the temporal region of the skull completely roofed over by bone, in a manner unknown in any other Terrapin. The tail is long, with the articular ends of most of the vertebræ cupped behind. Except that it is aquatic, nothing is known of the habits of this rare and curious Terrapin.

Cases 6–7. In the more typical Tortoises and Terrapins, constituting the large family *Testudinidæ* (**78–175**), the nuchal bone of the carapace lacks rib-like processes; and, owing to the absence of inframarginals, the abdominal shields of the large plastron abut on the marginals. The head, limbs, and tail can be drawn within the shell; the temporal region of the skull is open, and the articular ends of the vertebræ of the short tail are cupped in front. From the terrestrial herbivorous Tortoises to the aquatic carnivorous Batagurs there is a transition through the Terrapins. The former have the shell vaulted and lay spherical eggs; while in all the aquatic forms the shell is depressed, the feet are webbed and have longer claws, and the eggs are oval.

Case 6. The Hinged Tortoises (*Cinyxis*, **141**, **142**) of Tropical Africa are unique in having the hinder part of the carapace movable, the hinge passing between the 7th and 8th marginal and the 4th and 5th costal plates. There is no hinge in the plastron. In some species the margins of the carapace are smooth, but in others they are serrated and turned up. Of the latter type is *Cinyxis erosa* (**142**), a species further remarkable for the absence of a nuchal shield to the carapace, and the prolongation of the front of the plastron, which forms a fork, covered by the intergular shields. This species lives on vegetable substances, and is said to be partly aquatic, but *C. belliana* (**141**) is believed to be entirely terrestrial. The Spider-Tortoise (*Pyxis arachnoides*, **143**) of Madagascar is a purely terrestrial species, without any joint in the

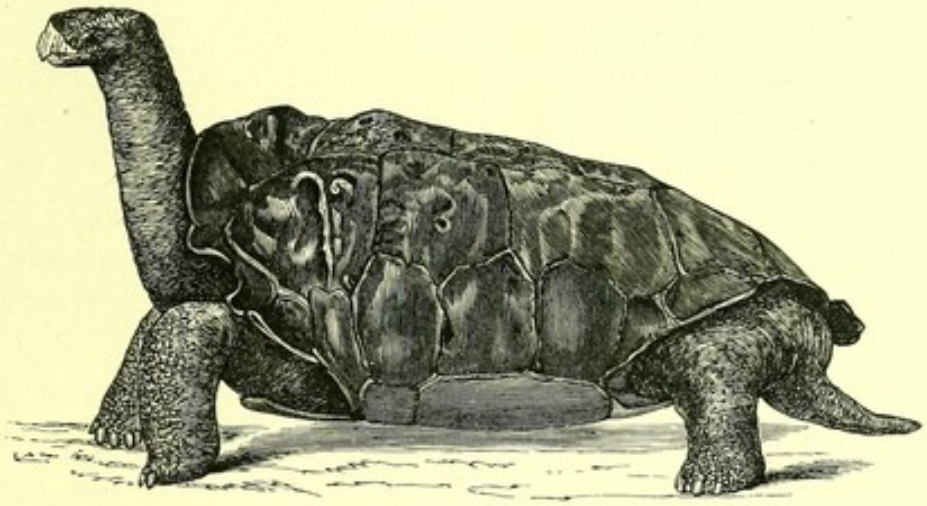
carapace, but with a hinge in the plastron. It does not exceed four inches in length.

The typical Land Tortoises included in the genera *Testudo* (**147–176**) and *Homopus* (**144, 145**) are characterised by their vaulted shells, in which the plastron is normally without a hinge and firmly united by a strong bridge to the carapace. The feet, of which the hind-pair are club-shaped, are not webbed, and have not more than two joints to each toe. On the front of the fore-limbs the skin carries stout horny shields, sometimes underlain by bony nodules, and large shields cover the head. The tail is short. Usually the neural bones of the carapace are alternately quadrangular and octagonal, but they may be hexagonal, with the shorter lateral surfaces posterior; the costals are alternately wide and narrow at the ends. Generally the supracaudal shield is single. Tortoises of the genus *Testudo* range throughout the warmer parts of the world except Australasia and some of the Malay Islands. Case 7.

The majority of existing Land Tortoises are of small or medium size, but a number of island species attained much larger dimensions.

Within historic times the distribution of species of *Testudo* large enough to be called gigantic has been restricted to two areas. These are the Galapagos (Tortoise) Islands, on the Equator off the west coast of South America, and certain islands on the western side of Case 7 and adjacent table-cases.

Fig. 51.



The Abingdon Island Saddle-backed Tortoise (*Testudo abingdoni*), remarkable for the thinness of its shell, from the Galapagos group. (No. **153**.)

From a specimen in the Museum.

the Indian Ocean, including the Mascarenhas (Réunion, Mauritius, and Rodriguez), the Aldabra group, the Amirantes, and the

Seychelles. From Madagascar they disappeared at an earlier date; earlier still Giant Tortoises inhabited most of the continents. Formerly the Tortoises swarmed on the above-named islands in the Indian Ocean; but they were carried off by the ship-load for food, and some of the species are only known by specimens which had been transported from their native homes. These Tortoises are vegetable-feeders, and in the Galapagos subsist chiefly upon succulent cactuses, leaves, and berries. At certain times of the year they collect at particular pools and springs, to which they travel long distances, forming regular, well-trodden paths. They ascend the volcanic cones to a height of 4000 feet. These Tortoises live to a great age. For instance Marion's Tortoise (*Testudo sumeirei*), living in 1902 at Port Louis, Mauritius, was brought to that island in 1766 from the Seychelles, of which it is a native; at the time of transport it was probably a century old. The North Aldabra Tortoise (*T. gigantea*, **148**) survives only in the Seychelles, but the South Aldabra species (*T. daudini*, **152**) is still found in its native island. Specimens of the former weigh between 350 lbs. and 400 lbs. In some of the species, as in *T. ephippium* (**149**) and *T. abingdoni* (**153**, fig. 51) of the Galapagos, and the extinct *T. vosmæri* of Rodriguez, the bony shell is extremely thin, being reduced to detached plates in the two former.

The largest specimen exhibited is that of the North Aldabra *T. gigantea* (**148**); the shell of an extinct species from Madagascar (*T. grandidieri*, **154**) is shown alongside.

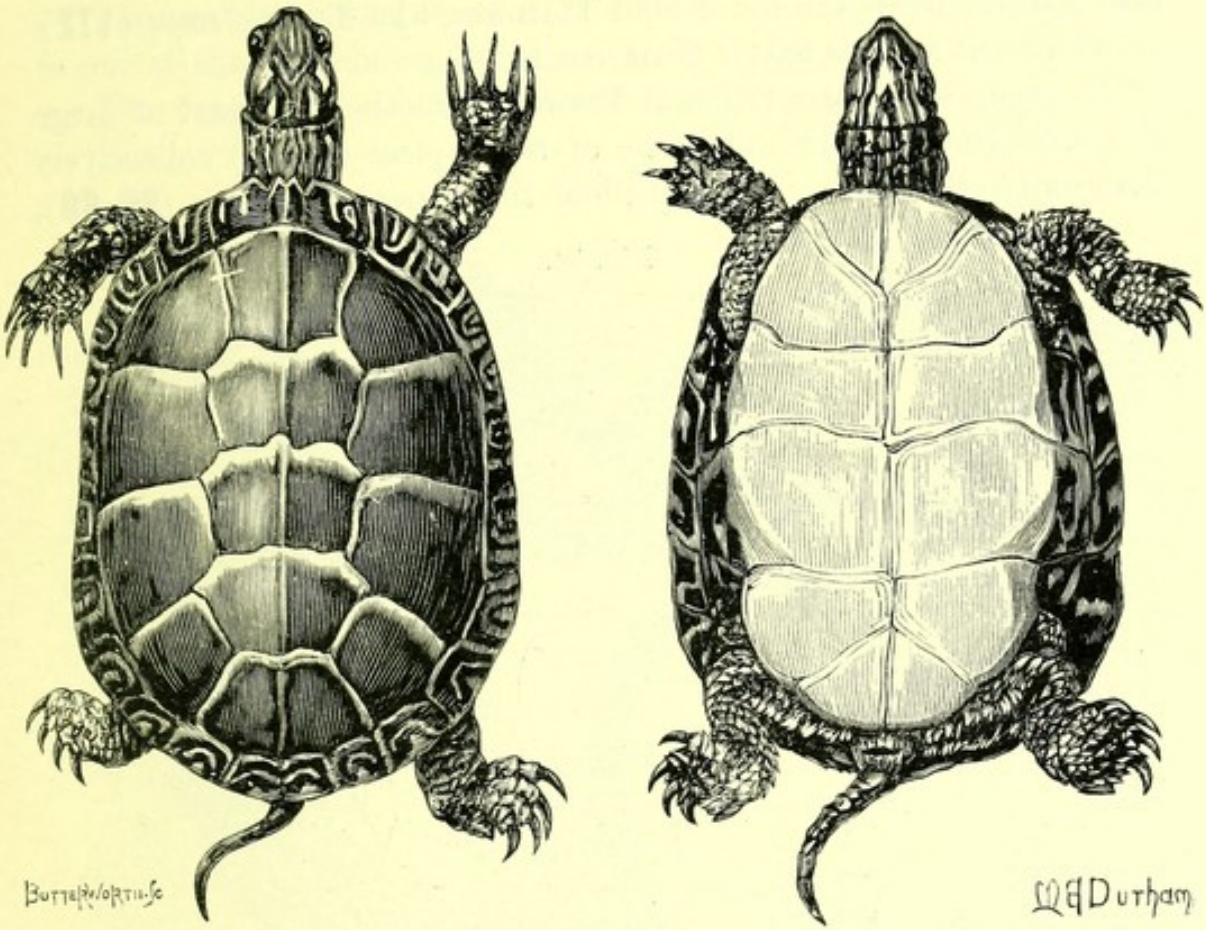
The two North American species of Box-Tortoise (*Cistudo*, **138–140**) take their name from the circumstance that the plastron (which is attached to the carapace by ligament) is divided by a transverse hinge into two movable lobes in such a manner that, when the head, limbs, and tail are withdrawn, the shell can be completely closed. The carapace is vaulted, the toes are almost completely free, and the tail is short.

Case 6. Box-Tortoises are really Terrapins which have taken to a life on land, and to this they are so thoroughly adapted, that they are drowned if thrown into water. The shape of the head, the vaulting of the shell (which is black and yellow or orange-brown in colour), and the short front-toes are adaptations to terrestrial life. On the other hand, the long hind-toes and broad feet, the smooth covering of the head, the mainly carnivorous habit, and the oval eggs proclaim descent from aquatic forms. The Carolina species varies greatly in colour, the eyes being red in the males

and brown in the females. Box-Tortoises are kept as pets in the United States, and attain a great age.

The Pond-Tortoises (*Emys*, **109**, **110**) are the typical and least specialised members of a large number of, for the most part aquatic, genera, which diverge in one direction into the thoroughly aquatic Batagurs and in the other into the land Tortoises. They have more or less depressed shells and generally webbed feet ; and the majority are carnivorous. The distinctions between the different genera are Case 6.

Fig. 52.



The Painted Terrapin (*Chrysemys picta*) ; ½ nat. size. (No. **86**.)

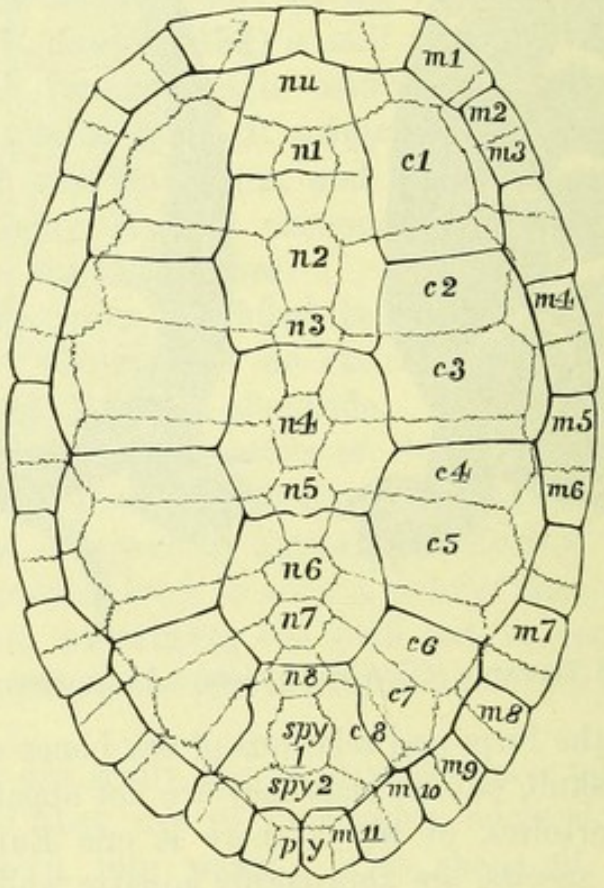
chiefly based on the form and relations of the bones of the shell, the structure of the skull, etc., so that they are not apparent externally.

The Pond-Tortoises, of which there is one European and one North American species, are thoroughly aquatic, and feed on small fishes, worms, etc. ; during winter they bury themselves in the mud. Nearly allied is *Clemmys* (**111–115**), one European species (*C. leprosa*, **115**) of which is characterised by its offensive smell and the growth of a fungus on the shell. The well-known salt-water Edible Terrapin (*Malacoclemmys terrapin*, **91**), of the United States, belongs to a kindred genus distinguished by the breadth of the palatal surface of

the upper jaw. The Painted Terrapin (*Chrysemys picta*, **86**, fig. 52) typifies another North American genus, most of the members of which are distinguished by their bright colouring and the elaborate patterns on the shell especially when young. *Ocadia* (**101**) is now exclusively Chinese, although fossil species occur in the Tertiary rocks of Europe. *Bellia* (**102**, **103**) and *Damonia* (**105–108**) are Indian, the former easily recognised by the balloon-shaped vertical shields of the carapace. Another Indian genus is *Geoëmyda* (**127–130**), the members of which are to a great extent terrestrial, and thus indicate a transition towards those species of land Tortoises, like *Testudo emys* (**172**), in which the shell is flatter than usual.

Case 6. A group of aquatic Oriental Tortoises, for the most part of large size, are (from the Indian name of the typical species) collectively designated Batagurs. They include the genera *Kachuga* (**96–99**),

Fig. 53.

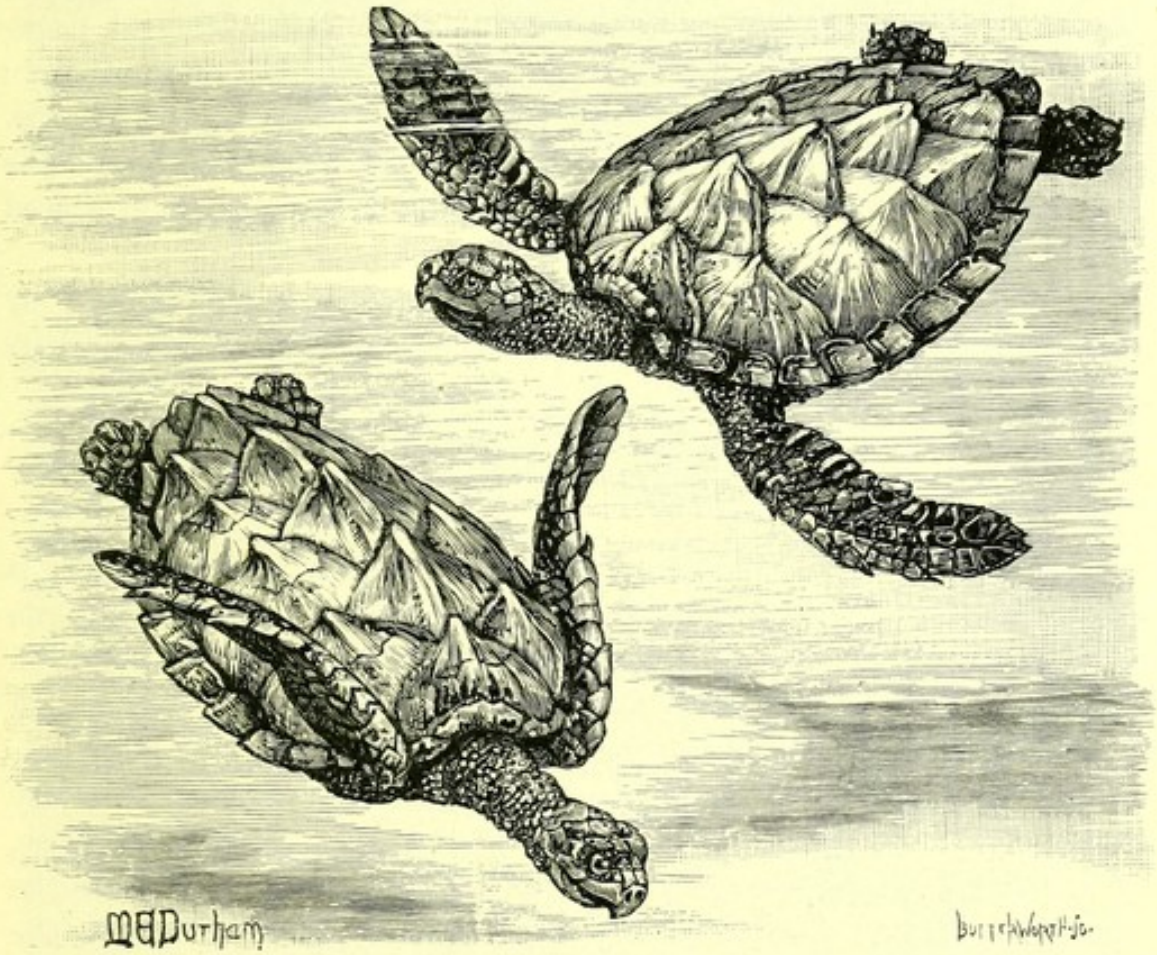


Carapace of the Thurgi Batagur (*Hardella thurgi*), with the horny shields removed much reduced in size. The wavy lines show the divisions (or sutures) between the bones; the firm lines indicate those between the overlying horny shields. *c.* 1–8, costal bones; *m.* 1–11, marginal bones; *n.* 1–8, neural bones; *nu.* nuchal bone; *py.* pygal bone; *spy.* 1, 2, suprapygal bones. (No. **131**.) Note that the horny plates do not correspond with the bony ones.

Callagur (**94**), *Batagur* (**78**), *Hardella* (**131**, fig. 53), *Brookia* (**100**), and *Liemys* (**93**), of which the two latter are confined to Borneo. They are characterised by the strength of the buttresses connecting the upper with the lower shell, which project as vertical partitions into the shell. In *Kachuga* the 4th vertebral shield is so elongated as to cover 4 or 5 of the subjacent neural bones; and in the small *K. tectum* the middle line of the vaulted shell forms a ridge terminating in a protuberance on the 3rd vertebral. Of the other three Indian genera, *Batagur* is distinguished by having two ridges on the palate (in place of one), and only four claws in the fore-limb. *Kachuga tectum* (**96**) is one of the commonest Tortoises in the dykes about Calcutta.

The true Turtles, family *Chelonidæ*, have paddle-like limbs, and a Case 8.

Fig. 54.



Young Hawksbill Turtles (*Chelone imbricata*); ½ nat. size. (No. **181**.)

flattened heart-shaped carapace, composed of comparatively few bones, firmly welded to the ribs and vertebræ, and covered with horny shields. The short neck cannot be completely drawn into the shell, and the temporal region of the skull is roofed with bone (fig. 48). There is no

rib-like process to the nuchal plate of the carapace ; the entoplastron of the lower shell (as in the *Chelydridæ*) is dagger-shaped. Each flipper has one or two claws. The existing members of the family are marine, but the females come ashore on sandy coasts to lay their spherical eggs. In the edible Green Turtle (*Chelone mydas*, **182**) the horny shields, of which there are four costal pairs, do not overlap, and there are vacuities between the costal and marginal bones of the carapace. The Hawksbill (*C. imbricata*, **181**, fig. 53), the chief source of commercial "tortoise-shell," is distinguished by the circumstance that, except in old age, the shields of the carapace overlap like slates on a roof. The Loggerhead (*Thalassochelys caretta*, **179**), the largest of all, differs from the others by having at least five pairs of costal horny shields on the carapace, as well as by the obliteration of vacuities in the latter when adult. Of extinct forms, the Eocene and Cretaceous *Lytoloma* has the secondary bony floor of the palate prolonged backwards so as to cause the posterior nostrils to open near the occiput ; the symphysis of the lower jaw being also extended backwards. *Allopleurum hofmanni*, a gigantic species of the Upper Cretaceous, is allied to *Chelone* in the structure of the shell ; specimens are exhibited in the Geological Department.

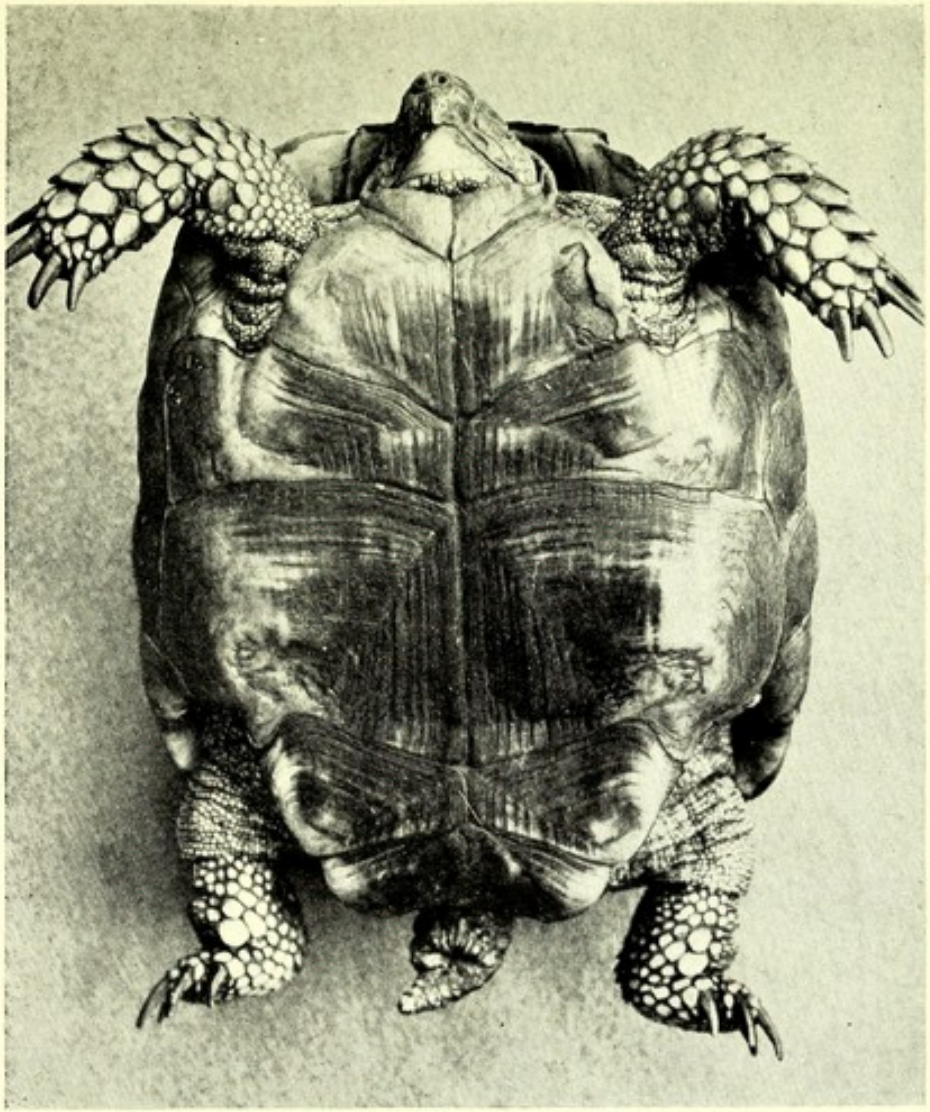
Commercial tortoise-shell of the best quality is yielded only by the Hawksbill ; specimens are exhibited to show this product in its raw state and when polished.

Sub-order II.—Pleurodira (Side-necked Tortoises).

The chief distinctive characteristics of this group, which is confined at the present time to the southern hemisphere, are given above on page 41. The most easily seen of these is the manner in which the head is withdrawn into the shell by a lateral movement of the neck, as shown in fig. 56.

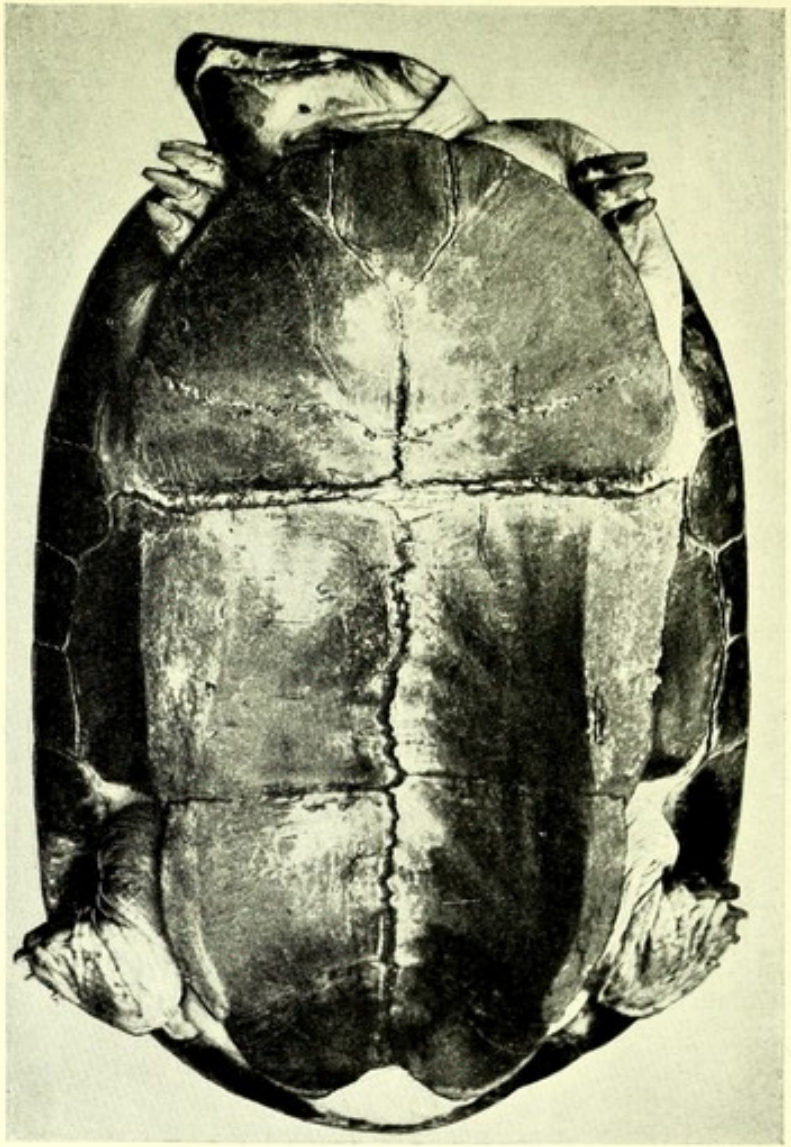
Case 9. The family *Pelomedusidæ* is typified by the African and Malagasy genus *Pelomedusa* (**210**), but also includes the Great Arrau Tortoise, or "Turtle," *Podocnemis expansa* (**204**), of the Amazons. In all the members of this group the neck is completely retractile within the shell, and the plastron has eleven bones, in consequence of the presence of a pair of mesoplastral elements (fig. 57), which, however, meet in the middle line only in *Sternothærus* (**212**). *Podocnemis* differs from *Pelomedusa* by the roofing-over of the temporal region of the skull. The female of the Great Arrau Tortoise is much larger than the male. To the natives of Amazonia this species is of great commercial

Fig. 55.



A Cryptodiran Tortoise (*Homopus arcolatus*).
To show how the head is withdrawn by an **S**-like curve of the neck in a vertical plane.

Fig. 56.



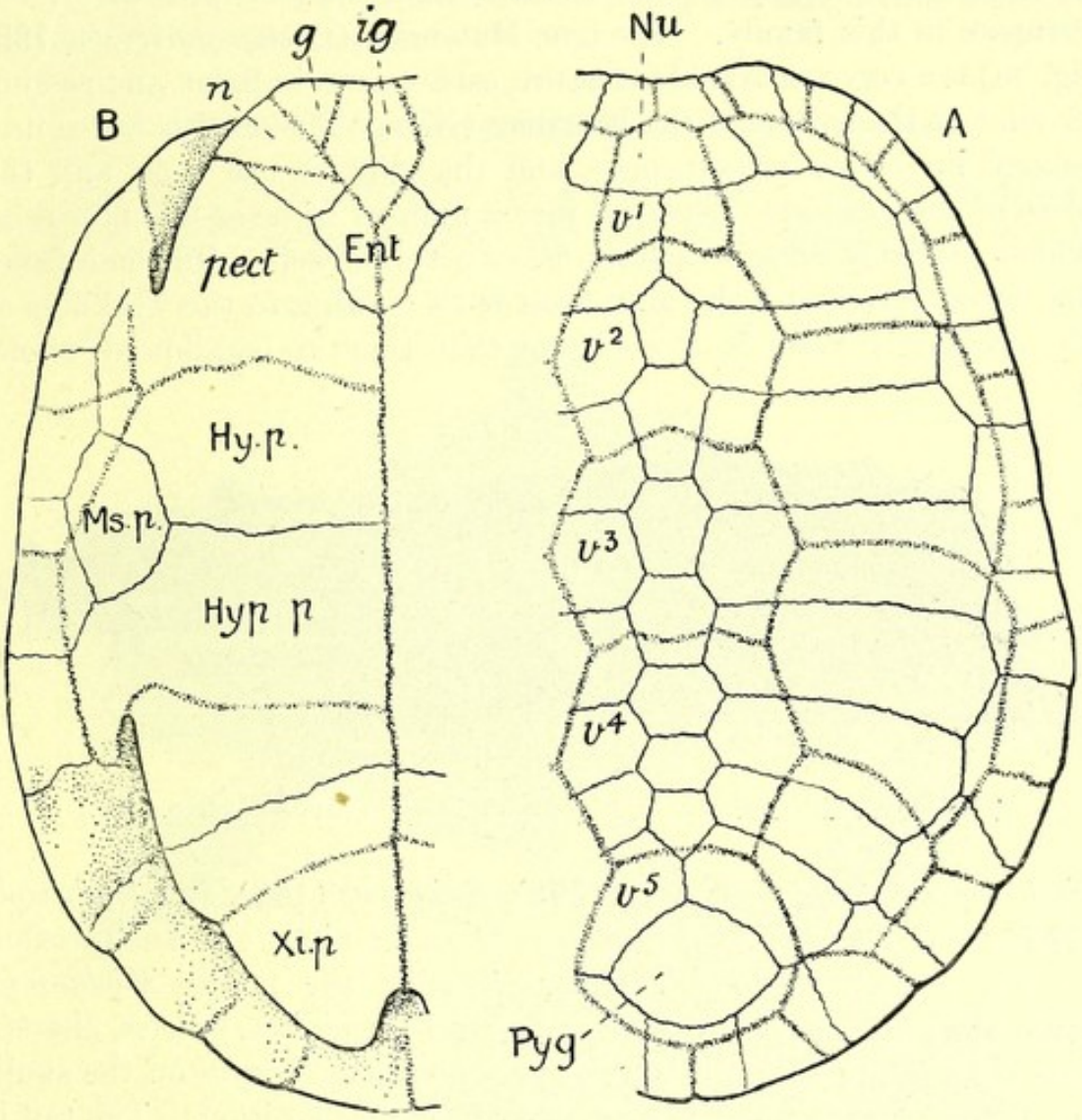
A Pleurodiran Tortoise (*Sternothærus niger*).
To show mode of retracting the head by a lateral flexure of the neck.

(Both figures from living specimens.)

[*To face page* 54.

importance, on account of the food-supply afforded by its flesh and eggs. Most of the eggs are converted into oil, which is used either for food or for burning. The soft-shelled eggs are laid in holes dug

Fig. 57.



Right halves of Upper (*A*) and Lower Shells (*B*) of an extinct Egyptian Side-necked Tortoise (*Stereogenys cromeri*) to show presence of a mesoplastral bone (*Ms.p.*).

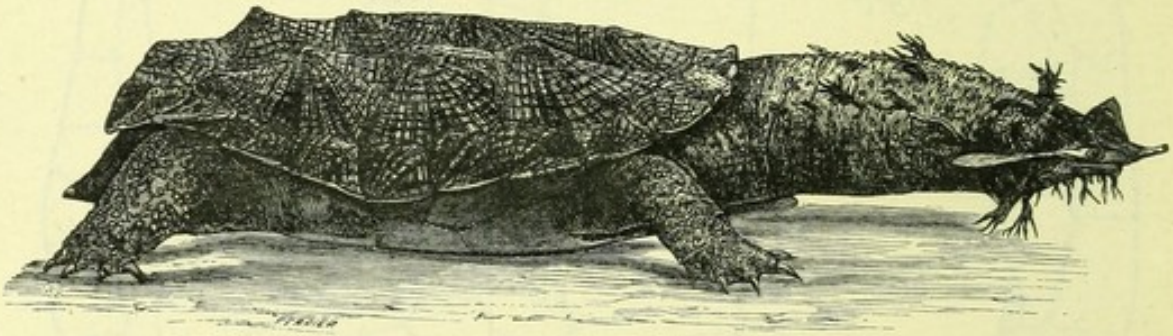
ig. intergular; *g.* gular; *n.* humeral; *pect.* pectoral shields; *nu.* nuchal; v.[1]–v.[5] vertebral; *Pyg.* pygal; *Hy.p.* hyoplastral; *Hyp.p.* hypoplastral; *Ent.* entoplastral bones.

by the females in the sand. The adults, which are mainly aquatic, subsist chiefly on fruits falling from the overhanging trees into the water.

The Matamatas, as the members of the family *Chelydidæ* may be collectively called (although that name properly belongs only to the Case 8.

typical South American species), differ from the *Pelomedusidæ* by the circumstance that the neck cannot be completely withdrawn into the shell, and likewise by the absence of a mesoplastral element in the plastron, which thus includes only nine bones. A nuchal shield, which is invariably wanting in the *Pelomedusidæ*, may be present on the carapace in this family. The true Matamata (*Chelys fimbriata*, **185**, fig. 58) is a very remarkable creature, carnivorous in habit, and passing its time at the bottom of the Brazilian rivers. The shell is raised into several knob-like prominences, and the skin of the neck and the sides of the head are developed into a number of moss-like processes, which probably serve to attract fishes within reach. On these fishes and other vertebrates the Matamata feeds; owing to the weakness of the creature's jaws, it is probable that they are swallowed whole.

Fig. 58.



The Matamata Tortoise (*Chelys fimbriata*); reduced. (No. **185**.)

Hydromedusa (**202**), *Platemys* (**200**), *Rhinemys* (**195**), and *Hydraspis* (**192**) are also South American, but the other kinds are Australasian.

Case 8. The extinct Horned Tortoises forming the family *Miolaniidæ* (**193**, **194**) are gigantic, and apparently Pleurodiran, species, characterised by the presence of large flanges and prominences on the skull, one pair of which resembles horns in form and position. The tail is also invested in a bony armour recalling that of the Armadillos among Mammals. The geographical distribution of the family is very remarkable, species of the typical and only genus occurring in Australia and Lord Howe Island on the one hand, and in Patagonia on the other.

Sub-order III.—Amphichelydia (*extinct*).

Family *Pleurosternidæ*.

Case 9. The extinct Oolitic Tortoises of this family, like *Pleurosternum bullocki* (**203**), resemble the living *Sternothærus* among the *Pelome-*

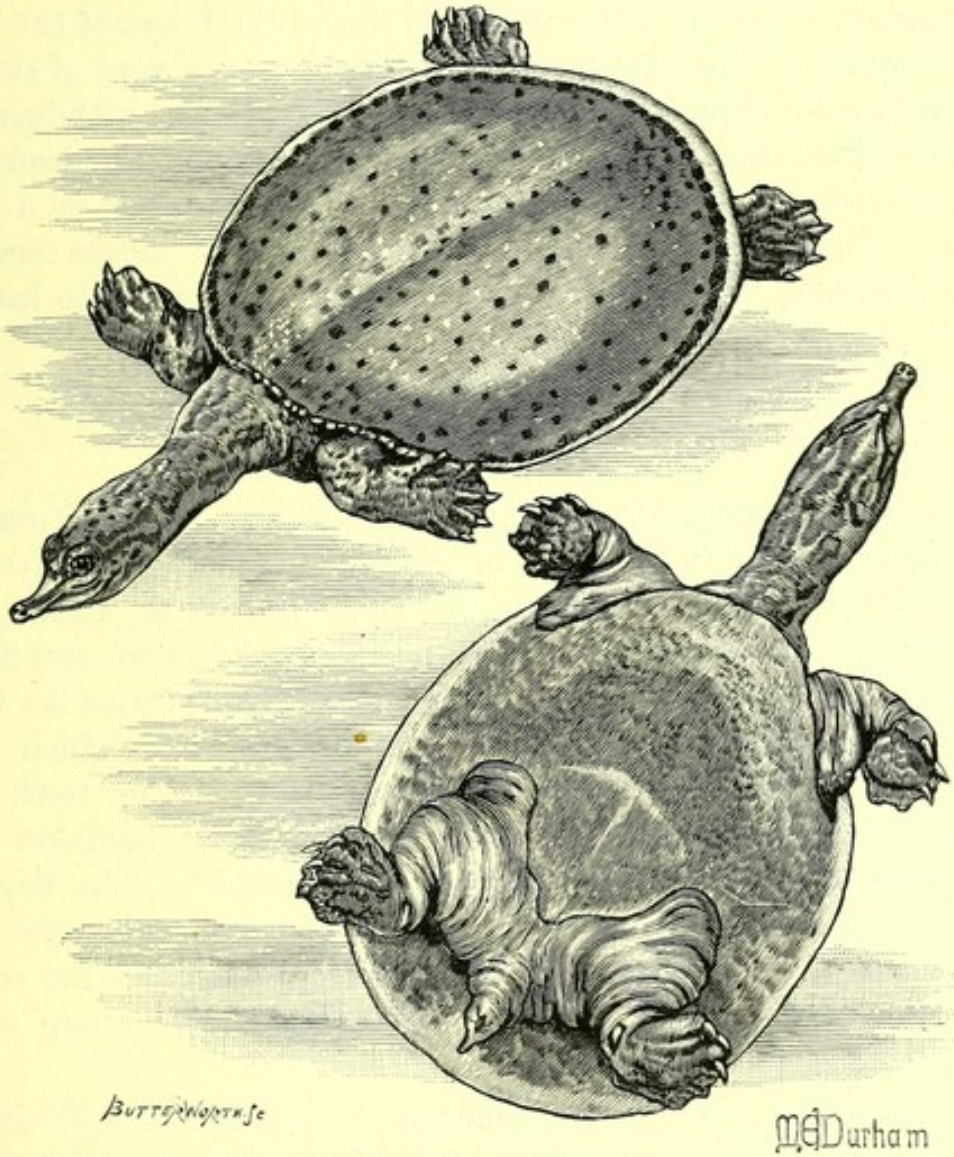
dusidæ in having mesoplastral bones (fig. 57) which extend completely across the lower shell to meet in the middle line. They differ from living Pleurodira in that when the pubic bones of the pelvis articulate with the xiphiplastral elements of the plastron, the union is not by suture or anchylosis; hence they are assigned to a distinct group, the Amphichelydia.

Sub-order IV.—Trionychoidea (Soft Tortoises).

The Soft River Tortoises, or Mud-Turtles (family *Trionychidæ*, fig. 59), which retract the head and neck in a vertical plane with an

Case 10.

Fig. 59.



Young American Soft Tortoises (*Trionyx ferox*). (No. **226**.)

S-like flexure, after the manner of the Cryptodira, constitute a group of equal rank with the latter. They are characterised by the flatness

of the oval or nearly round shell, which is sculptured externally, and covered with leathery skin instead of horny shields. The toes are extensively connected by webs, but only the three inner ones on each foot are clawed. In the plastron the entoplastral is chevron-shaped. Soft Tortoises are carnivorous, and widely distributed; they date from the Cretaceous epoch.

Most of the species belong to the typical genus *Trionyx* (**222–230**), nearly allied to which are the Oriental genera *Chitra* (**220**) and *Pelochelys* (**221**), the former distinguished by the elongated skull and forward position of the eyes, and the latter by an intermediate condition in these respects. The African *Cycloderma* (**217**) and *Cyclanorbis* (**216**), together with the Indian *Emyda* (**219**), differ not only in the nature of the sculpture and the form of the bones of the lower shell, or plastron, but likewise in possessing a pair of flaps of skin on the lower surface beneath which the hind-limbs can be withdrawn.

Many of the species have curious eye-like spots on the back, and the long extensile neck is often marked with yellow spots on a green ground. Indeed, the native Indian name *Chitra* means spotted. These Tortoises, when of large size, are highly dangerous to bathers.

Order IX.—SAUROPTERYGIA (*extinct*).

(Case 16.)

The larger marine Plesiosaurs may be distinguished from the Ichthyopterygia by the absence of a ring of bones in the eye, and by the structure of the paddles, in which the bones, although in excess of the usual number, are more or less elongated, and do not articulate to form a pavement. In the more typical forms the upper arches of the vertebræ are welded to the bodies, with which alone (in all cases) the single-headed ribs articulate. The teeth have separate sockets, and there is but one (the lower) temporal arch. Abdominal ribs are developed on the under surface. The bones of both shoulder-girdle and pelvis develop large ventral plates; the coracoids and sometimes even the scapulæ meeting in the middle line. The skin appears to have been naked. The group ranges from the Trias to the Chalk.

In the typical *Plesiosaurus* (**336**, fig. 60) of the Lias the head is comparatively small and the neck elongated, similar features occurring in the Jurassic *Cryptoclidus* (**340**) and *Muræenosaurus* and the Cretaceous *Cimoliosaurus*, which are distinguished by the structure of the shoulder-girdle and pelvis. In the gigantic *Pliosaurus* (**339**) of the

Oxford and Kimmeridge Clays the head is large and the neck short, while the teeth may be trihedral instead of conical. The upper arches of the vertebræ were loosely attached to the bodies.

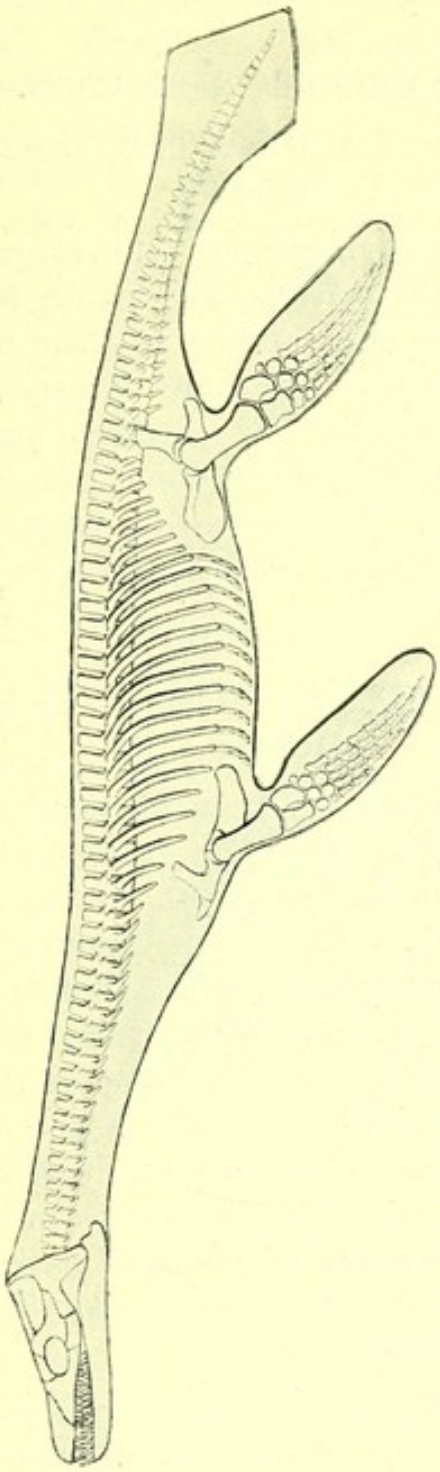


Fig. 60.

Skeleton of a typical Plesiosaur (*Plesiosaurus macrocephalus*) with outline of body and tail-fin indicated in shading, from the Lower Lias of Lyme Regis; about one-eighteenth nat. size. (Compare No. **338**.)

The smaller Triassic representatives of the group, such as *Neusticosaurus* (**343**) and *Lariosaurus* (**342**), were probably amphibious or terrestrial, and had limbs of a more normal structure. They approach the primitive Rhynchocephalia.

In some restorations, Plesiosaurs are represented with the neck

curved in a swan-like fashion ; but from the fact that the vertebræ of the neck articulate with one another by means of slightly concave surfaces (instead of by ball-and-socket joints), such a curvature was apparently impossible.

OF UNCERTAIN POSITION.

Group PLACODONTIA (*extinct*).

(Case 5.)

In this place may be mentioned the extinct Triassic reptiles known as *Placodus* and *Cyamodus* (**51**), mainly represented by their skulls. These skulls are characterised by their broad and flattened shape, and by the presence on the palate of a small number of bean-like teeth, evidently adapted for crushing hard substances ; in addition to which there are two or three pairs of chisel-like teeth in the front of the jaws. The systematic position of these reptiles is still a matter of uncertainty. The cast of a fine skull of *Cyamodus* is exhibited.

Order X.—THEROMORPHA (Mammal-like Reptiles—*extinct*).

(Case 5.)

The members of this extinct group are confined to the Permian and Triassic epochs, and are abundant in South Africa and Russia. They are connected on the one hand with the Stegosaurian Amphibia, and on the other with the Monotreme Mammalia, to the latter of which they exhibit resemblances in the structure of the skeleton, and of which they seem to have been the ancestors. In the skull the quadrate is fixed, and there is a large parietal foramen ; the pubis and ischium of each side of the pelvis meet in the middle line to form a symphysis ; the shoulder-girdle consists of three bones, and the humerus has a perforation (entepicondylar) at the lower end. The two temporal arches of the skull have coalesced into one, corresponding to the cheek-arch of Mammals. The group is divided into the following sub-orders :—

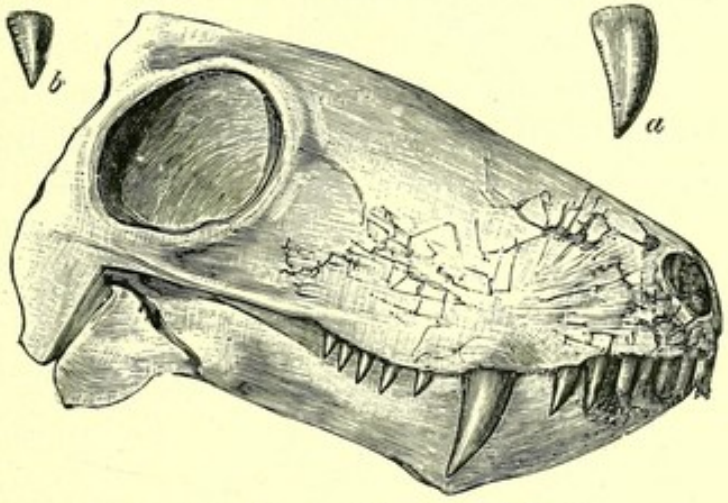
I. Pariasauria.—The skull is completely roofed over by sculptured bones, so that the only vacuities on the upper surface are formed by the nostrils, eye-sockets, and parietal foramen. The teeth are relatively small, and form an even series. *Pariasaurus* (**52**) was a large uncouth reptile, measuring nearly 8 feet in length (inclusive of the short tail) and between 2 and 3 feet in height.

II. Cotylosauria.—Typically a North American group, distinguished by the roofing-over of the temporal region of the skull (sometimes with a small foramen), the presence of more than 2, 3, 3, 4, 3 joints to the toes (the number in the Pariasauria). *Procolophon* (**59**) and *Empedias* (**58**) are well-known genera, in which the cheek-teeth have transversely elongated molar-like crowns.

III. Theriodontia.—The temporal region of the skull shows large vacuities, and the single temporal (zygomatic) arch in some cases (*Cynognathus*, **54**) exhibits a vacuity indicative of its double origin. The teeth are typically differentiated into incisors, tusks, and a cheek-series; the lower tusks biting in front of the upper pair. *Galesaurus* (**57**) and *Cynognathus* (**54**) are typical forms. The position of *Tritylodon* (**56**), in which the teeth are of a different type, and those of the cheek-series extremely Mammal-like, is uncertain; the skull has the pre-frontal and post-frontal bones of Reptiles.

IV. Dicynodontia.—In this group the teeth are reduced to a pair of long permanently-growing upper tusks, or are altogether wanting; and the jaws were probably sheathed in horn. The quadrate-bone is greatly elongated, and thus forms a pedicle for the support of the lower jaw. *Dicynodon* (**63**), *Udenodon*, and *Ptychosiagum*, are well-known examples.

Fig. 61.



Right side of Skull of a Theriodont (*Ælurosaurus felinus*), two-thirds nat. size, with two upper teeth nat. size (*a*, *b*), from the Triassic Formation, Cape Colony. Behind the large socket of the eye the skull is broken away. (No. **53**.)

Casts of skulls and other parts of the skeleton of several of the more striking forms, such as the theriodonts *Cynognathus* (**54**) and *Ælurosaurus* (**53**, fig. 61), as well as *Dicynodon* (**63**) and *Pariasaurus* (**52**), are exhibited.

II.—THE AMPHIBIAN SERIES.

Class AMPHIBIA, or BATRACHIA.

(*Table-Case in Middle Line of Gallery.*)

As already mentioned, Frogs, Toads, Newts, and Salamanders are commonly regarded as Reptiles; but, together with certain allied creatures, they differ, as a whole, from true Reptiles by several well-marked features, and they are accordingly assigned to a separate class, the Amphibia, or Batrachia. A general feature of this class is the marked difference between the young (commonly called tadpoles) and the adults; the former living in water and breathing by external gills, while the latter are largely terrestrial and breathe by lungs. Some types, such as the Olm, are, however, permanently aquatic and gill-breathing; while in certain Frogs the transformation process is hurried through within the eggs from which full-formed Frogs emerge. In the living kinds the skin is mostly smooth, clammy, and devoid of scales. The skull articulates with the first vertebra by two knobs or condyles instead of by one, as in Reptiles. The hind-limbs (when present) are nearly always five-toed in the adult, but the front-limbs are very generally four-toed.

The following table exhibits the orders and families into which the class is divided.

Order I.—ANURA (Frogs and Toads).

AGLOSSA.

I.

Family *Pipidæ*.
„ *Dactylethridæ*.

II. PHANEROGLOSSA.

A. *Arcifera*.

„ *Discoglossidæ*.
„ *Pelobatidæ*.
„ *Bufonidæ* (Toads).
„ *Hylidæ*.
„ *Cystignathidæ*.

B. *Firmisternia*.

„ *Dyscophidæ*.
„ *Engystomatidæ*.
„ *Dendrobatidæ*.
„ *Ranidæ* (Frogs).

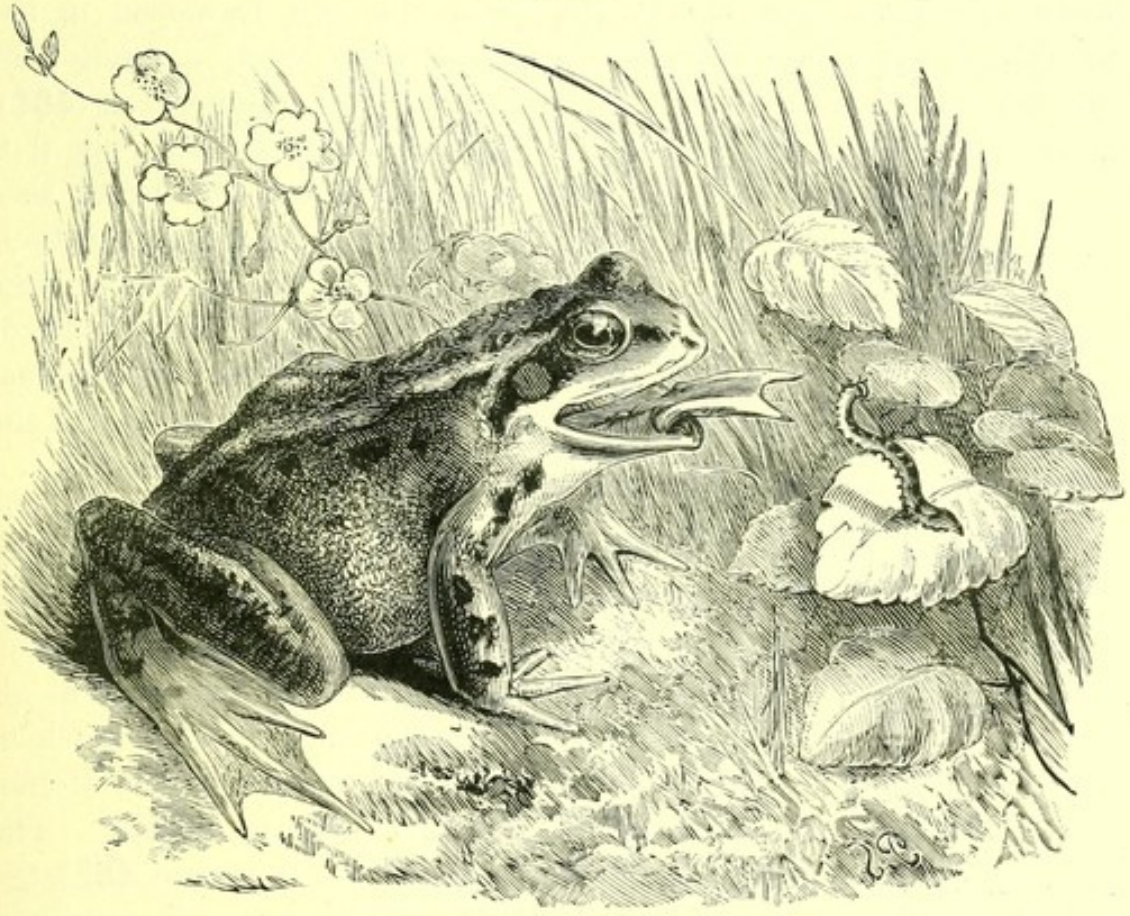
Order II.—URODELA . . . (Salamanders and Newts.)	Family *Amphiumidæ*.
	„ *Salamandridæ*.
	„ *Proteidæ*.
	„ *Sirenidæ*.
„ III.—APODA . . . (Cœcilians.)	„ *Cæciliidæ*.
„ IV.—STEGOCEPHALA . (*Extinct.*)	„ *Labyrinthodontidæ, etc.*

Order I.—ANURA.

Frogs and Toads.

The members of this order are sufficiently characterised by the fact that in the fully adult condition the tail is completely absent,

Fig. 62.



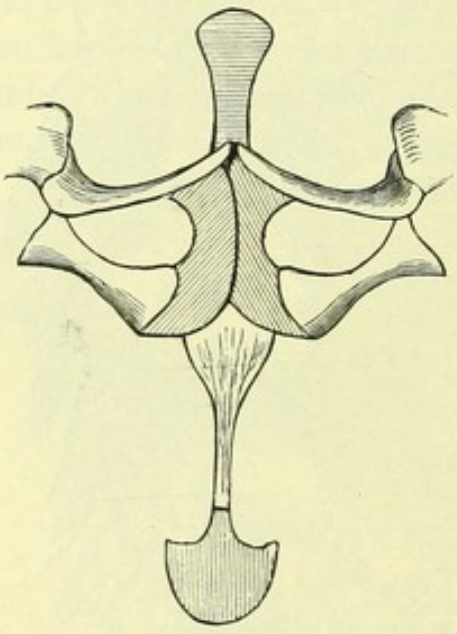
The Common Frog (*Rana temporaria*). (No. **442**.)

in addition to which may, however, be mentioned the peculiar but well-known form of the body, and the more or less marked elongation of the hind limbs. In the skeleton the spinal column is very short, and terminates posteriorly in a long spine from behind the point where the pelvis is articulated to the transverse processes of the several

vertebræ. There are four front toes. Owing to the absence of ribs, Frogs, like other Amphibians, can only breathe by swallowing air.

The order is divisible into three main groups, the first of which, forming the section Firmisternia, includes the Typical Frogs, or *Ranidæ* (**480–493**), the *Dendrobatidæ* (**499–500**), *Engystomatidæ* (**494–498**), and *Dyscophidæ* (**401**, **402**). All these are characterised by the presence of a tongue and by the union of the two inferior bones of the shoulder-girdle, or coracoids, in the middle line of the chest to form a firm bar. In the *Ranidæ* the transverse processes of the sacral vertebra form simple rods, and there are typically teeth only in the upper jaw, although in Günther's Frog (*Ceratobatrachus guentheri*, **490**) of the Solomon Islands, these are developed in both jaws. The *Dendrobatidæ* have both jaws toothless. The *Engystomatidæ* and *Dyscophidæ* differ by the expanded sacral transverse processes. In the former teeth are lacking in both jaws, but in the latter they are developed in the upper one, while in *Genyophrys*, which may represent a family, the lower jaw is alone toothed. Some *Ranidæ*, like *Rhacophorus* (**491**), are arboreal and have adhesive toe-pads and webbed feet, but it is untrue that they use the latter as a parachute. Certain species deposit their eggs enveloped in foam in mud or grass on the banks of ponds. Many kinds of *Rana*, like the Bull-Frog, have internal or external dilated vocal sacs. All the American *Dendrobatidæ* live in trees.

Fig. 63.



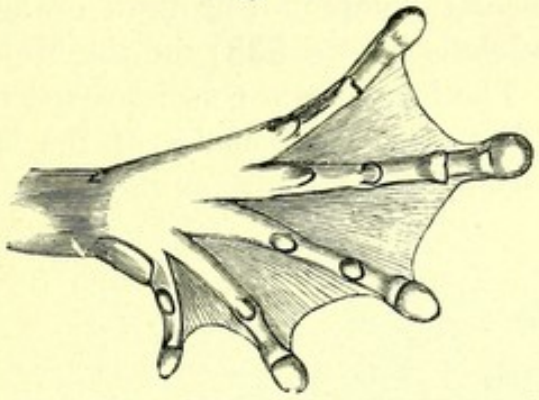
Bones of the chest of Goliath Frog (*Leptodactylus pentadactylus*) to show structure characteristic of the Toad group.

The largest representative of the group is the huge *Rana guppyi* (**483**), of the Solomon Islands; of this Frog both the mounted skin and the skeleton are shown. Another well-known, although much smaller, species of which a specimen is exhibited is the Indian Tiger-Frog, *R. tigrina* (**487**). The Common Frog (*R. temporaria*, **482**), the continental Edible Frog (*R. esculenta*, **485**), and the American Bull-Frog (*R. catesbiana*, **488**), are also shown in the case.

The Toads (*Bufonidæ*, **413–420**) may be regarded as the typical representatives of the section Arcifera, which also includes the families *Discoglossidæ* (**435–439**), *Pelobatidæ* (**440–442**), *Hylidæ*

527–534), and *Cystignathidæ* (**507–512**), and is characterised by the circumstance that the coracoid bones overlap one another on the chest instead of meeting by their edges in the middle line (fig. 63). The

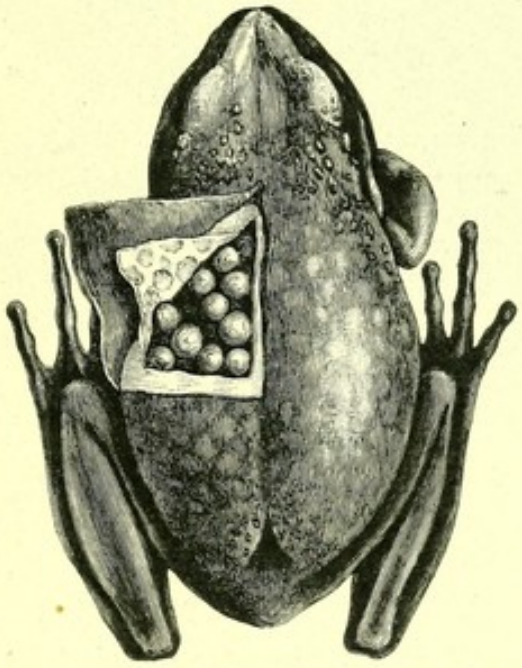
Fig. 64.



Hind Foot of a Tree Frog (*Hylobates palmatus*) to show expanded tips of the toes.

Common Toad (*Bufo vulgaris*, **515**) and the great Brazilian Water-Toad (*B. marinus*, **520**) are shown. The *Cystignathidæ* differ from the other families in having the transverse processes of the sacral vertebra cylindrical, instead of expanded at the extremities. Of the

Fig. 65.



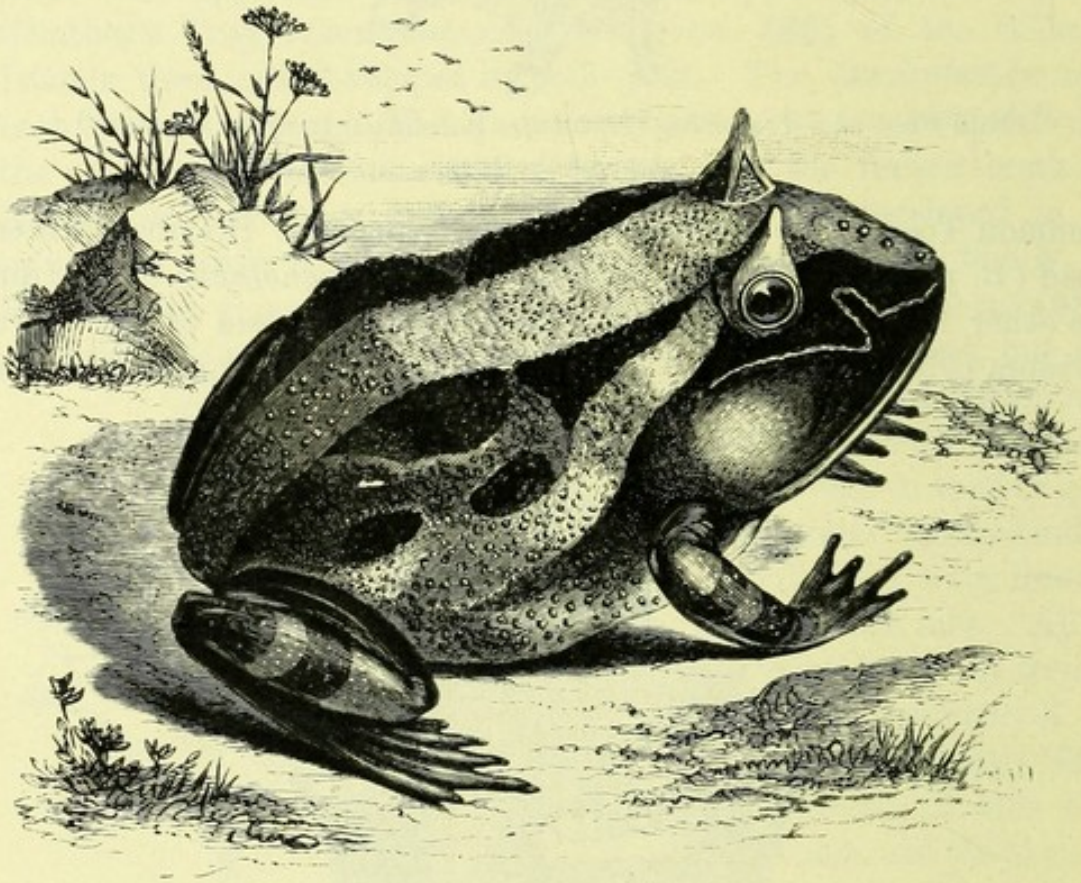
The Pouched Frog (*Nototrema marsupiatum*), with eggs in pouch. Ecuador. (No. **533**.)

four families in which these processes are expanded, the *Hylidæ* are distinguished by having claw-shaped terminal toe-bones. Of the three families without claw-shaped terminal toe-bones, the *Discoglos-*

sidæ are characterised by the presence of ribs and of teeth in the upper jaw, while the *Bufonidæ* have neither ribs nor teeth, and the *Pelobatidæ* are distinguished by the absence of ribs coupled with the presence of teeth in the upper jaw.

Of the *Discoglossidæ* common European examples are the Fire-bellied Toad (*Bombinator igneus*, **538**) and the Mid-wife Toad (*Alytes obstetricans*, **537**). The former is a poisonous species, protected by its bright "warning" colours. The males of the latter species carry the spawn coiled round their limbs, as shown by a specimen in the

Fig. 66.



The Horned Toad (*Ceratophrys cornuta*), Brazil; reduced. (No. **511**.)

case. The Claw-heeled Toad (*Pelobates fuscus*, **540**) is a familiar continental representative of the *Pelobatidæ*. Of the *Bufonidæ* there are two British species, the Common Toad (**515**) and the Natterjack (**513**); the largest species being the Brazilian Water-Toad. The *Hylidæ*, or Tree-Frogs, are brilliantly coloured arboreal forms. Some of these, like the Pouched Frog (*Nototrema marsupiatum*, **533**, fig. 65), carry their eggs in a pouch in the loins, and others adhering to the skin of the back. The *Cystignathidæ*, which may be regarded as the South American representatives of the Frogs, include the

Goliath Frog (*Leptodactylus pentadactylus*, **508**), the Horned Toad (*Ceratophrys cornuta*, fig. 66) of Brazil, and the smaller Esquerzo (*C. ornata*, **510**) of Argentina. The latter is a fierce creature, attacking and killing animals as large as rats, and uttering a bell-like note.

The members of the families *Dactylethridæ*, **543** (or *Xenopodidæ*), and *Pipidæ* differ from other Frogs and Toads by the absence of the

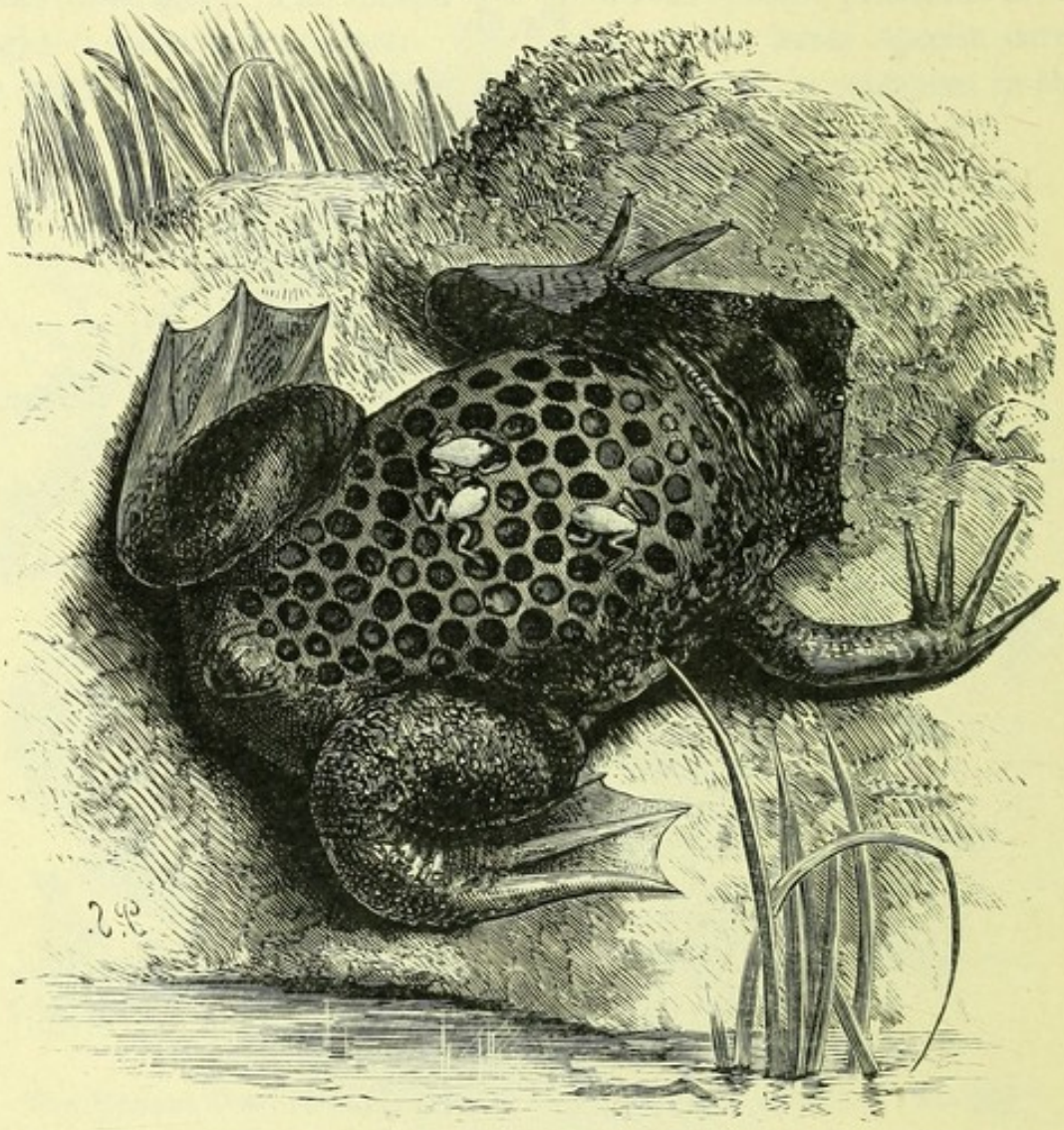
Fig. 67.

The Clawed Toad (*Xenopus lævis*), Tropical Africa. (No. **543**.)

tongue. They are consequently arranged in a sub-order (Aglossa) of equal value to a second (Phaneroglossa) which includes the sections Firmisternia and Arcifera. The Clawed Toads (*Xenopus*, **543**, fig. 67), which are the typical representatives of the family *Dactylethridæ*, have teeth in the upper jaw and sharply pointed toes, of which the front ones are free, while those on the hind-feet are united by webs. These toads are entirely aquatic. The Surinam Toad (*Pipa ameri-*

cana, **544**, fig. 68), representing the *Pipidæ*, is quite toothless, and has each front-toe terminating in a kind of star ; the fore-toes being free and the hind-ones webbed. The shape of this Toad is very peculiar, the head being depressed and triangular, and the eyes minute. In both sexes the skin is covered with tubercles ; and in the breeding

Fig. 68.



A Female Surinam Toad (*Pipa americana*) with young emerging from the brooding pouches of the back. (No. **544**.)

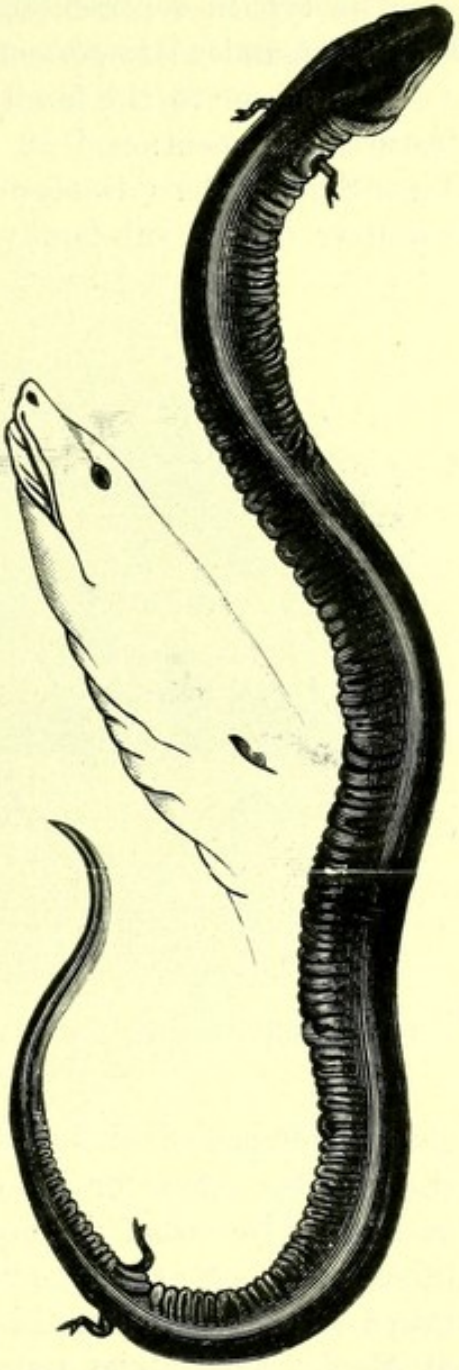
season the skin of the back of the female assumes a spongy structure and forms pouches for the reception of the eggs, which are put in position by the male. Eventually each egg becomes completely concealed in its pouch, which is furnished with a lid ; and in these pouches the young undergo their development, until they make their appearance as fully-formed Toads. In habits the Surinam Toad is completely aquatic.

Order II.—URODELA.

Salamanders and Newts.

The members of this group, which are chiefly confined to the more northern countries of the Northern Hemisphere, are characterised by the possession in the adult state of a tail and at least the front pair of limbs, whence they are termed Tailed Amphibians. Of the four families, the *Amphiumidæ* and *Salamandridæ* have maxillary bones in the skull; the second of these families differing from the first by the presence of movable eyelids. The *Proteidæ* are distinguished from both the above by the absence of maxillæ, and the permanent retention of external gills; while the *Sirenidæ*, in which the gills are also persistent, differ from all the rest by the lack of hind-limbs. The larvæ are always aquatic, but the adults may be terrestrial. Occasionally, as in the Axolotls of Mexico, the larval condition is permanent, although the reproductive functions become fully developed.

Fig. 69.



The Three-toed Salamander (*Amphiuma means*). (No. **550**.)

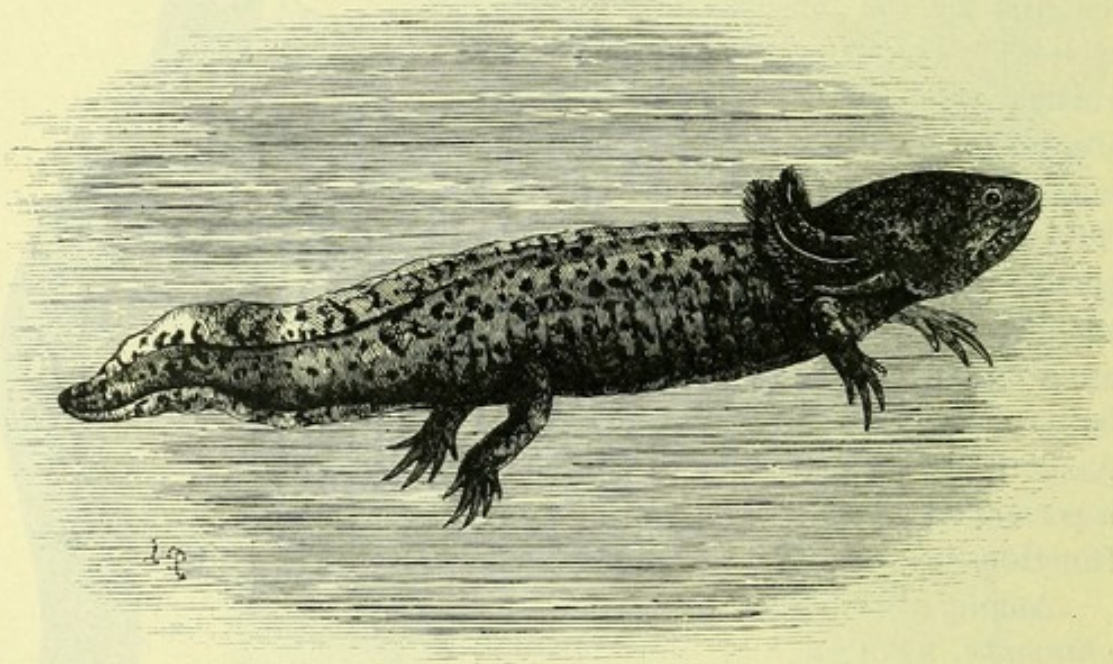
Among the members of the *Amphiumidæ*, mention may first be made of the Giant Salamanders, a group which now contains only two species, the North American "Hellbender" (*Cryptobranchus alleghaniensis*, **549**) and the Giant Salamander of Japan and China (*Megalobatrachus maximus*, **548**), the latter of which grows to a length of 5 feet, and differs from the former by the absence of a gill-opening. It is solely on this difference that the two species are assigned to genera apart. A third species occurs in the Miocene Tertiary strata of Europe. Both the living forms are carnivorous. The Japanese species lives

in small mountain-streams, where it lies concealed under stones, etc., and feeds on fishes, amphibians, worms, and insects. Like its American relative, it will readily take a bait, and it is caught for food by the natives. It does not appear ever to leave the water. A specimen has lived in captivity for over 50 years.

The typical representative of the family is the eel-like Three-toed Salamander (*Amphiuma means*, **550**, fig. 69) of North America.

Passing on to the family *Salamandridæ*, of which the distinctive features are mentioned on page 69, we have the North American Tiger-Salamander (*Amblystoma tigrinum*, **552**) as the typical representative of the sub-family *Amblystomatinæ*, which includes seven

Fig. 70.

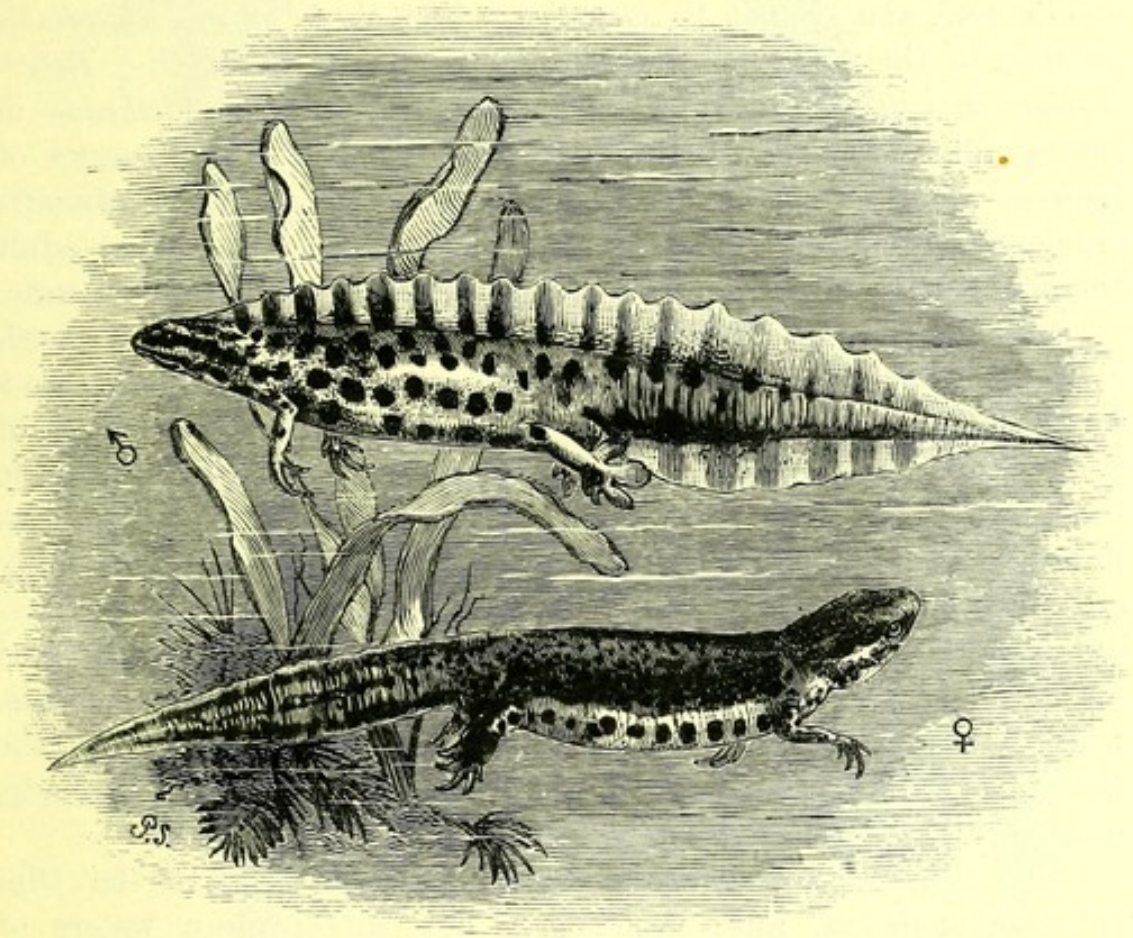


The Axolotl; the egg-laying larval form of *Amblystoma tigrinum*, Mexico. (No. **552**.)

genera, characterised by the grouping of the palatal teeth and the number (four or five) of hind-toes. Ordinarily *A. tigrinum* undergoes the usual development and transformations, commencing life as an aquatic creature with external gills, and passing when adult into a terrestrial air-breathing Salamander. In the lakes near the city of Mexico the species remains, however, permanently in the aquatic gill-bearing condition (fig. 70), reproducing its kind while in this state. To the natives these permanent larvæ are known by the name of Axolotl. They are frequently brought to this country and reproduce in the gill-bearing phase, but occasionally, even in captivity, have been seen to leave the water and change into gill-less Salamanders.

The Spotted Salamander is the type of a sub-family (*Salamandrinæ*) distinguished from the *Amblystomatinæ* by the palatal teeth forming a double series diverging behind. In the true Salamanders these teeth form a pair of Ss, while in the Newts they are ∧-shaped, as a rule. Of *Salamandra* there are three species, the Spotted (*S. maculosa*, **561**), the Alpine (*S. atra*, **562**), and the Caucasian Salamander (*S. caucasica*). They all have five hind-toes and a rounded tail. The young are aquatic, but the adults live under moss or stones.

Fig. 71.



The Common Smooth Newt (*Molge vulgaris*). Male and female.

The spotted species exudes a poisonous fluid from the skin, which, together with its peculiar colouring, has probably given rise to the legend of its being fire-proof. The young are born alive. The Newts (*Molge*, **558–560**), of which there are some eighteen species, have the tail compressed, and frequently furnished, at least during the breeding-season, with an upright fin. They frequent cool moist situations, and during the breeding-season take to the water, where the tadpoles are born ; in winter, like Salamanders, they hibernate.

There are three British species. They all have five hind-toes, but in the genus *Salamandrinæ* these are reduced to four.

The Slimy Salamander (*Plethodon glutinosus*) is the type of a sub-family (*Plethodontinæ*) of which all the members except the Sardinian Salamander (*Spelerpes fuscus*, **554**) are American. They are characterised by the transverse arrangement of the palatal teeth, and the presence of teeth-bearing plates on the parasphenoid, or basal bone of the hinder part of the skull. In *Spelerpes* (with five hind-toes) and *Manculus* (with four) the tongue is attached only by a central stem ; in the other three genera it is fixed along the whole middle line, and cannot be protruded. Of these latter, *Anäides* is peculiar in the small number and large size of its teeth ; *Batrachoseps*, in addition to its slender form, differs from *Plethodon* in having four, in place of five hind-toes. Many of the species of *Spelerpes* lay their eggs under stones, in water ; but those of *Anäides* are deposited in the crevices of the bark of trees, where the adult Salamanders also dwell, and the young are born in an advanced state.

Two remarkable North American Salamanders (the Mud-eel, *Siren lacertina*, **565**, fig. 73, and *Pseudobranchus striatus*) constitute a family (*Sirenidæ*) characterised by the retention of three pairs of fringed gills, the eel-like form, the absence of hind-limbs, and the short fore-limbs, which are either three- or four-toed. The eyes have no lids, but shine through the transparent skin. Curiously enough, the external gills of the young shrivel up, but are re-developed later. In the adult *Pseudobranchus* the gills are covered with skin, so as to be useless. *Siren* is found in ditches and ponds, where it burrows in the banks, but is said to occasionally leave the water. When swimming, the limbs are closely pressed to the body, movement being effected by the tail.

The typical representative of the family *Proteidæ* is the Olm (*Proteus anguinus*, **564**, fig. 72) of the subterranean waters of Carniola, Carinthia, and Dalmatia, which is carnivorous and lives in total darkness. Three pairs of fringed external gills persist throughout life ; and there are three front and two hind-toes. The eyes are buried beneath the opaque skin, which turns black after long exposure to light.

The subterranean waters of Texas are the home of a very similar creature (*Typhlomolge rathbuni*), with longer limbs, of which the front pair has four and the hind pair five toes.

The ancestral type from which both the above are derived is doubtless represented by the North American Four-toed Salamander

(*Necturus maculatus*, **462**), in which the eyes are functional and each limb is four-toed. The thick stalks of the three pairs of external

Fig. 72.

Fig. 73.

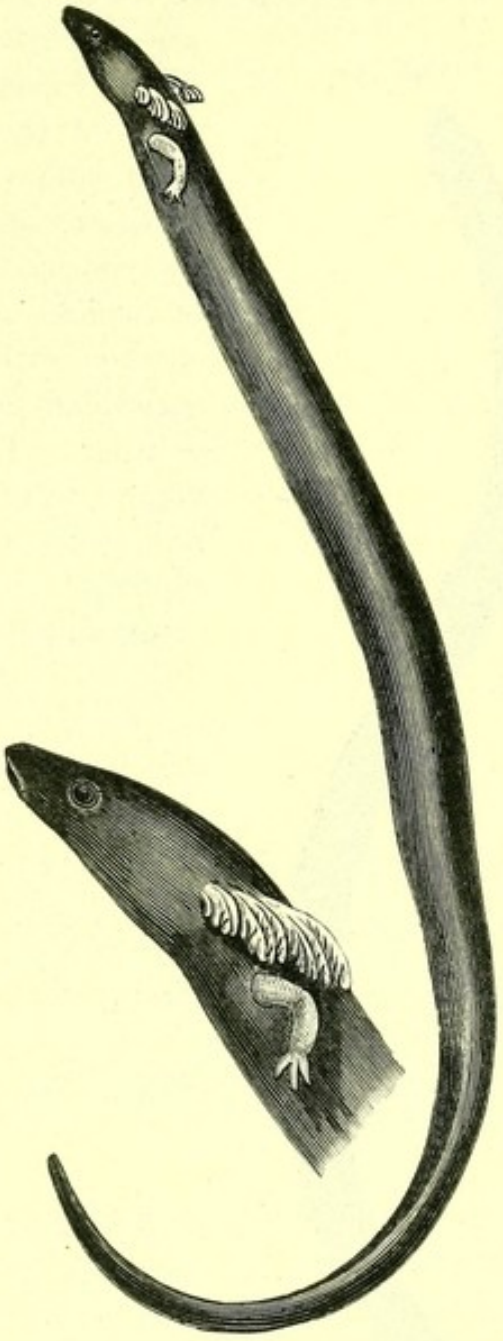


Fig. 72. The Olm (*Proteus anguinus*), from the caves of Carniola. (No. **564**.)
Fig. 73. The Mud-eel (*Siren lacertina*), from North America. (No. **565**.)

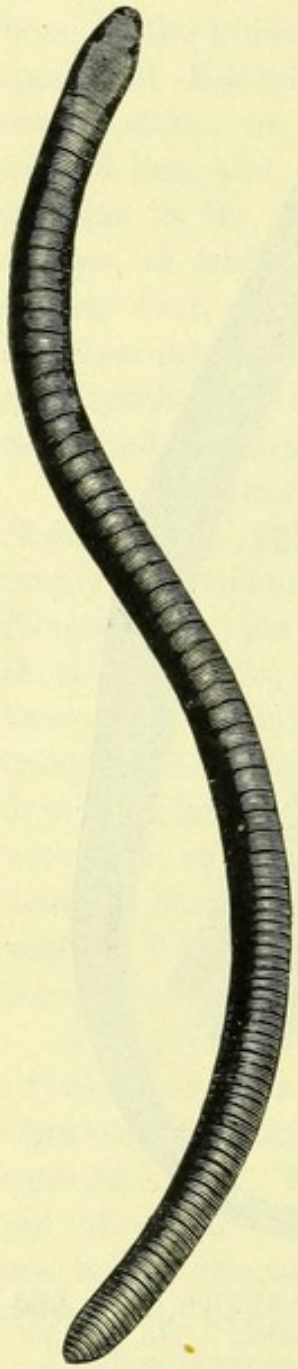
gills are brown, but the terminal fringes during life are blood-red. A specimen is exhibited.

Order III.—APODA.

Limbless Amphibians.

The few representatives of this group (often known as Cœcilians) are worm-shaped burrowing creatures (**568**) from Tropical America and some of the warmer parts of the Old World (fig. 74). Limbs and their supporting girdles are lacking, the tail is short, and the vertebræ, which articulate by concave surfaces, carry long ribs, none of which meet a breast-bone. The body is covered with a slimy skin, which may contain embedded scales, thrown into transverse folds or rings. The skull is solid, with much of the upper surface roofed in by bone, although this roof is not comparable with that of the Stegocephala. In some species, at any rate, the external gills are shed while in the egg, but the larva inhabits the water, although the burrowing adult is so completely terrestrial that it will drown in that element. The eggs of some Indian and African species are ranged in a cluster, round which the parent coils herself. Cœcilians feed on worms, etc. Some kinds are viviparous, and their larvæ do not enter water.

Fig. 74.



A Limbless Amphibian (*Uræotyphlus africanus*).

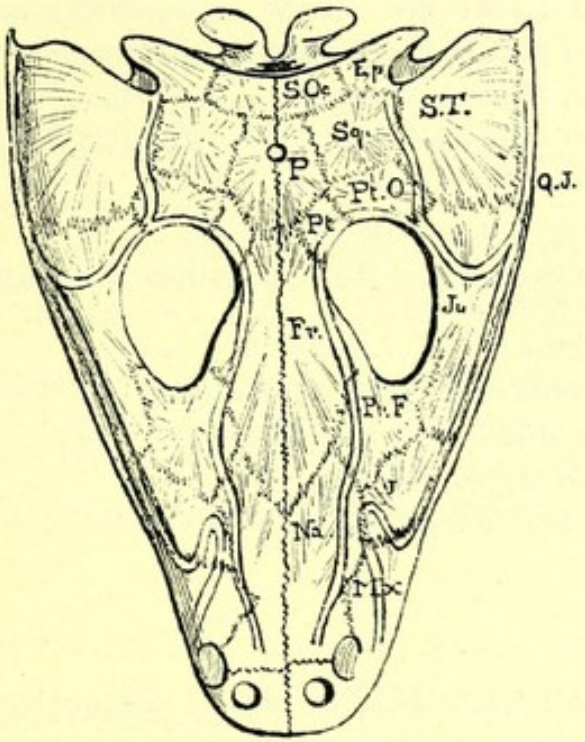
Order IV.—STEGOCEPHALA (*extinct*).

Labyrinthodonts.

The earliest known terrestrial four-footed creatures occur in the Carboniferous strata, and are succeeded by allied types in the Permian and Trias. They take their name of Stegocephala from the circumstance that the whole upper surface of the skull is roofed in by membrane-bones, which are frequently sculptured. The complicated internal structure of the teeth in one group has given rise to the name Labyrinthodonts, by which they are also known. Although

displaying many signs of affinity with Reptiles, they resemble Amphibia in having two condyles to the skull (when any are present), and the vertebræ are of a simple type. The chest was in many cases protected by a shield formed of three sculptured bony plates, of which the middle one appears to represent the interclavicle and the lateral pair the clavicles of other vertebrates. In form they were mostly salamander-like. The order is divided into

Fig. 75.



The Skull of a Labyrinthodont (*Mastodonsaurus giganteus*), upper view with sculpture omitted, from the Lower Keuper of Würtemberg; about one-eighth nat. size. *Ep.* lateral supratemporal: *Fr.* frontal; *Ju.* jugal; *L.* lachrymal; *Mx.* maxilla; *Na.* nasal; *P.* parietal; *Pr.f.* prefrontal; *Pt.* postfrontal; *Pt.o.* postorbital; *Q.J.* quadratojugal; *S.T.* prosquamosal; *S.Oc.* inner supratemporal; *Sq.* squamosal. The double lines indicate slime canals.

four groups: (I.) Branchiosauria, typified by the minute *Protriton*, or *Branchiosaurus* of the Permian; (II.) the snake-like Aistopoda, of the Carboniferous and Permian; (III.) Microsauria, represented by *Hylonomus* of the Carboniferous and *Hyloplesion* of the Permian, both small forms approximating to the Rhynchocephalian Reptiles; and (IV.) Labyrinthodonta, which includes the larger forms, such as *Mastodonsaurus* (fig. 75), *Loxomma* (**572**), and *Rhytidosteus* (**573**), and ranges from the Upper Carboniferous to the Trias. Other specimens exhibited are *Brachyops* (**570**) from India and *Capitosaurus* (**571**) from England.

GUIDE-BOOKS.

(*To be obtained only at the Museum.*)

General Guide to the British Museum (Natural History), 8vo. 3*d*.

Guide to the Galleries of Mammalia, 8vo. 6*d*.

——— Gallery of Birds, 4to. 2*s*. 6*d*.

——— General Series of Birds, 4to. 6*d*.

——— Nesting Series of British Birds, 4to. 4*d*.

——— Shell and Starfish Galleries, 8vo. 6*d*.

——— Coral Gallery, 8vo. 1*s*.

——— Fossil Mammals and Birds, 8vo. 6*d*.

——— Fossil Reptiles, Amphibians, and Fishes, 8vo. 6*d*.

——— Fossil Invertebrates and Plants, in two parts, at 6*d*. each.

——— Mineral Gallery, 8vo. 1*d*.

Index to the Collection of Minerals, 8vo. 2*d*.

An Introduction to the Study of Minerals, with a Guide to the Mineral Gallery, 8vo. 6*d*.

——— to the Study of Rocks, 8vo. 6*d*.

——— to the Study of Meteorites, 8vo. 6*d*.

Guide to Sowerby's Models of British Fungi, 8vo. 4*d*.

——— the British Mycetozoa, 8vo. 3*d*.

——— an Exhibition of Old Natural History Books, 8vo. 3*d*.

CATALOGUES, Etc. (Selection).

Catalogue of Monkeys, Lemurs, and Fruit-eating Bats. Woodcuts. 1870, 8vo. 4*s*.

——— Carnivorous Mammalia. Woodcuts. 1869, 8vo. 6*s*. 6*d*.

——— Seals and Whales. 2nd edition. Woodcuts. 1866, 8vo. 8*s*.

———. Supplement. Woodcuts. 1871, 8vo. 2*s*. 6*d*.

List of the Specimens of Cetacea. 1885, 8vo. 1*s*. 6*d*.

Catalogue of Ruminant Mammalia (Pecora). Plates. 1872, 8vo. 3*s*. 6*d*.

——— Marsupialia and Monotremata. Plates. 1888, 8vo. £1 8*s*.

——— Birds. Vols. VI.–XXVII. Woodcuts and Coloured Plates. 1881-99, 8vo. 14*s*. to 36*s*. a volume.

Hand-list of Birds. Vols. I.–IV. 1899–1903, 8vo. 10*s*. each.

Catalogue of Birds' Eggs. Vols. I.–IV. Coloured Plates. 1901–5, 8vo. 25*s*. to 30*s*. a volume.

——— Chelonians. Woodcuts and Plates. 1889, 8vo. 15*s*.

——— Lizards. 2nd edition. Vols. I.–III. Plates. 1885–87, 8vo. 20*s*. to 26*s*. each.

——— Snakes. Vols. I.–III. Woodcuts and Plates. 1893–96, 8vo. 17*s*. 6*d*. to £1 6*s*. each.

——— Fishes. 2nd edition. Vol. I. Woodcuts and 15 Plates. 1895, 8vo. 15*s*.

CATALOGUES (Selection)—*continued.*

Catalogue of Spiders of Burma. 1895, 8vo. 10*s.* 6*d.*

———— the Leech Collection of Palæarctic Butterflies. Two Coloured Plates and Portrait. 1902, 4to. 20*s.*

———— Moths (Lepidoptera Phalænæ). Woodcuts and Coloured Plates. Vols. I.–V. 1898–1905, 8vo. Text 15*s.* to 18*s.* a volume. Plates issued separately at 15*s.* or 16*s.* a volume.

Monograph of the Culcidæ, or Mosquitoes. Vol. III. Text illust. 1903, 8vo. £1 1*s.*

———— Tsetse-Flies. Woodcuts and Coloured Plates. 1903, 8vo. 15*s.*

Synonymic Catalogue of Orthoptera. Vol. I. 1904, 8vo. 10*s.*

Catalogue of British Hymenoptera. 2nd edition. Pt. I. New Issue. Plates. 1891, 8vo. 6*s.*

———— British Echinoderms. Woodcuts and Plates. 1892, 8vo. 12*s.* 6*d.*

———— Madreporarian Corals. Vols. I.–V. Plates. 1893–1905, 4to. 18*s.* to 35*s.* a volume.

Illustrations of the Botany of Captain Cook's Voyage round the World in H.M.S. 'Endeavour' in 1768–71. Pt. I. 101 Copper Plates. 1900, fol. 25*s.* Pt. II. 142 Copper Plates. 1901, fol. 35*s.* Pt. III. 77 Copper Plates. 1905, fol. 25*s.*

Catalogue of African Plants. Vol. I., in 4 parts. 1896–1900, 8vo. 4*s.* to 7*s.* 6*d.* a part. Vol. II., in 2 parts. 1899–1901, 8vo. 6*s.* a part.

Monograph of British Lichens. Part I. 74 Woodcuts. 1894, 8vo. 16*s.*

———— the Mycetozoa. 78 Plates and 51 Woodcuts. 1894, 8vo. 15*s.*

History of the Collections. Vol. I. Libraries; Botany; Geology; Minerals. 1904, 8vo. 15*s.*

Catalogue of the Books, Manuscripts, etc., in the British Museum (Natural History). Vols. I., II. 1903–4, 4to. 20*s.* a volume.

First Report on Economic Zoology. Woodcuts. 1903, 8vo. 6*s.*

Second ———— 1904, 8vo. 6*s.*

Report on the Zoological Collections made .... during the Voyage of H.M.S. 'Alert,' 1881–82. 54 Plates. 1884, 8vo. £1 10*s.*

———— Collections of Natural History made in the Antarctic Regions during the voyage of the 'Southern Cross.' 53 Plates. 1902, roy. 8vo. £2.

A Monograph of Christmas Island (Indian Ocean). Woodcuts and Plates. 1900, 8vo. 20*s.*

Handbook of Instructions for Collectors. 3rd edition. 1906, 8vo. 1*s.* 6*d.*

The foregoing publications can be purchased of Messrs. LONGMANS & Co., 39 *Paternoster Row;* Mr. QUARITCH, 15 *Piccadilly;* Messrs. KEGAN PAUL, TRENCH, TRÜBNER & Co., *Dryden House*, 43 *Gerrard Street*, *Soho;* and Messrs. DULAU & Co., 37 *Soho Square;* or at the NATURAL HISTORY MUSEUM, *Cromwell Road*, *London*, *S.W.* A more detailed list can be obtained on application to the DIRECTOR of the Museum.

BRITISH MUSEUM (NATURAL HISTORY).

DAYS AND HOURS OF ADMISSION.

The Exhibition Galleries are open to the Public, free, every week-day in

January,	from 10 A.M. till 4 P.M.
February,	" " " " 4.30 "
March,	" " " " 5.30 "
April to August,	" " " " 6 "
September,	" " " " 5.30 "
October,	" " " " 5 "
November and December	" " " " 4 "

Also, from May 1st to the middle of July, on Mondays and Saturdays only, till 8 P.M.,

and from the middle of July to the end of August, on Mondays and Saturdays only, till 7 P.M.

The Museum is also open on Sunday afternoons throughout the year.

The Museum is closed on Good-Friday and Christmas-Day.

By Order of the Trustees,

E. RAY LANKESTER,

Director.