British Museum (Natural History) Dept. of Zoology
Guide to the gallery of reptiles

GUIDE

TO THE

GALLERY

OF

REPTILIA

IN THE

DEPARTMENT OF ZOOLOGY

OF THE

ITISH MUSEUM (NATURAL HISTORY).

ILLUSTRATED BY 22 WOODCUTS AND 1 PLAN.

[*SECOND EDITION.*]

PRINTED BY ORDER OF THE TRUSTEES.
1886.

Price Twopence.

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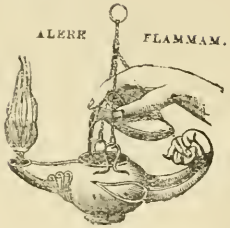

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PREFACE.

The exhibition of mounted specimens of Reptiles offers greater difficulties than that of the other classes of Vertebrate animals. Only the larger and hard-skinned forms, like Crocodiles and Tortoises, can be preserved in a dried state without distortion of their natural features; whilst every attempt at reproducing the finely moulded body of a Lizard or Snake, or at restoring the exquisite arrangement of their scales, has ended in failure. Neither has plastic art of ancient or modern times succeeded in producing a faithful or life-like representation of a Reptile.

Crocodiles and Tortoises are, therefore, represented in this Gallery by a comparatively much larger number of specimens than the two other orders, which comprise many more species. But in the present Guide, which has for one of its objects to give a general account of these animals, a more uniform treatment of the subject has been adopted. In its preparation I have been assisted by Mr. G. A. Boulenger, the assistant in charge of these Collections.

ALBERT GÜNTHER.

Keeper of the Department of Zoology.

British Museum, N. H.,
19 March, 1885.

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THE REPTILE GALLERY.

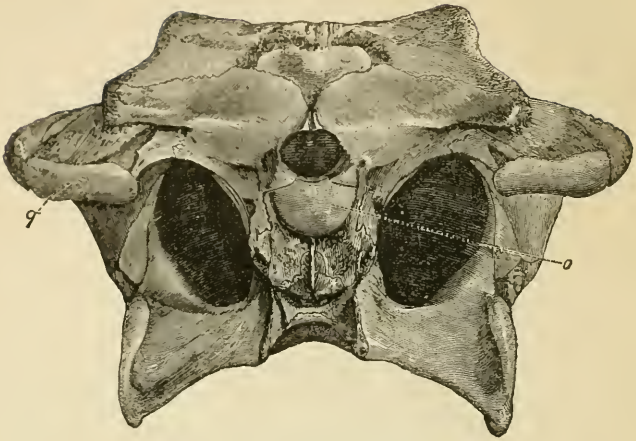
GENERAL NOTES ON REPTILES.

There is but a short step from the Class of Birds to that of Reptiles. No doubt, as regards external appearance, the dissimilarity between the living animals of these two classes is sufficiently great to allow of a sharp line of demarcation being drawn between them: Birds being shortly characterized as warm-blooded vertebrate animals clothed with feathers, Reptiles as cold-blooded, and covered with horny or bony shields, tubercles, or "scales." But there are numerous and important agreements between these two classes, especially in the structure of their skeleton, in their internal organs, and their mode of propagation; and their close relationship becomes still more apparent when fossil forms are examined, such as *Hesperornis* and *Archæopteryx*, of which a cast is placed in Case A, in the corridor leading from the Bird- into the Reptile-Gallery (see also the figure given on p. 35 of the Geological Guide).

Reptiles are termed "cold-blooded" because the temperature of their blood is raised but a few degrees above, and varies with, that of the outer atmosphere, owing to the imperfect separation of the divisions of their heart, which allows more or less of a mixture of the arterial and venous currents of the blood. Reptiles are oviparous or ovoviviparous; no important change takes place after exclusion from the egg; they breathe by lungs throughout life. Their skull articulates with the vertebral column by a single occipital condyle (see fig. 1), and their lower jaw with the skull by a separate bone (quadrate) (see figs. 1, 13, and 14).

The remains of the oldest known Reptiles, those found in the Permian formations, seem to belong to the Rhynchocephalian type,

Fig. 1.



Back view of skull of Crocodile.

o, single occipital condyle; *q*, quadrate bone.

of which only one representative is still living (in New Zealand). Reptiles flourished and attained their greatest development in the Secondary period—Pterosaurians (large flying Lizards, see Geological Guide, p. 39), Dinosaurians (huge terrestrial Reptiles far exceeding in size our largest Crocodiles), Dicynodonts, Ichthyosaurians, and Plesiosaurians (large marine creatures, Geological Guide, pp. 41, 45, 47), Crocodiles, Lizards, and Turtles lived in abundance; Snakes, however, did not appear before the Tertiary period. At present some 4000 species of Reptiles are known, which are unequally divided among five Orders, viz. *Crocodilia* (Crocodiles and Alligators), *Rhynchocephalia*, *Lacertilia* (Lizards), *Ophidia* (Snakes), and *Chelonia* (Tortoises and Turtles).

In this classification of Reptiles the naturalist is guided much more by the structure of the skeleton and the other internal organs than by the external appearance. In fact, in Reptiles, as in many other classes of the Animal Kingdom, outward similarity is deceptive as to the natural relationship—that is, as to the degree in which they are related to each other as descendants from a more or less remote common ancestor. Take, for instance, a Crocodile, a Lizard, a Slowworm, and a Snake. The observer who, like the

naturalists of the last and preceding centuries, is guided by external appearance only, would without hesitation place the Crocodile and Lizard together, and associate the Slowworm with the Snake; whilst a study of their internal structure shows the Lizard and the Slowworm to be most closely related to each other, and both nearer to the Snake than to the Crocodile.

Reptiles are most abundant in hot climates, become less numerous in higher latitudes, and are altogether absent in the Arctic and Antarctic regions.

In the Gallery—

Wall-Cases	1–10	contain the	Crocodilians.
,,	11	,,	Rhynchocephalians.
,,	11–22	,,	Lizards.
,,	23–27	,,	Snakes.
,,	28–44	,,	Tortoises and Turtles.

Large specimens are exhibited separately on stands placed on the floor of the Gallery.

Order I. CROCODILIA.

The Crocodilians differ in many anatomical characters from the Lacertilians, or true Lizards, with which they were formerly associated on account of their external resemblance. The organs of their chest and abdomen are separated from each other by a muscular diaphragm; their heart is divided into four cavities, as in the higher vertebrates. The ribs are provided with two heads for the articulation with the vertebræ, and with processes directed backwards; and their abdomen is protected by a series of transverse bones, as may be seen in the skeleton of the large Crocodile (Case E, opposite Wall-Case 5). The teeth are implanted in sockets, while in other recent Reptiles they are united to the jaws. The tongue is completely adherent to the floor of the mouth. The nostrils are situated close together at the upper side of the extremity of the snout; the eyes and the ears likewise are near to the upper profile of the head, so that the animal can breathe, see, and hear whilst its body is immersed in the water, the upper part of the head only being raised above the surface. When it dives, the [Case 1–10.]

nostrils are closed by valves, a transparent membrane is drawn over the eye, and the ear, which is a horizontal slit, is shut up by a movable projecting flap of the skin. The limbs are weak, the anterior provided with five, the posterior with four digits, of which three only are armed with claws, and which are united together by a more or less developed web. The tail is long, compressed, crested above, very powerful, and admirably adapted for propelling the body through the water. The back, tail, and belly are protected by a dermal armour formed of quadrangular shields, of which the dorsal and, in several Alligators, also the ventral contain true bone imbedded in the skin.

The Crocodilians are thoroughly aquatic in their habits, and the most formidable of all the carnivorous freshwater animals. Crocodiles and Alligators, when young, and the Gavials throughout their existence, feed chiefly on fish; but large Crocodiles attack every animal which they can overpower, and which they drown before devouring. The eggs, of which one (of *Crocodilus porosus*) is exhibited in Case 2, are oblong, hard-shelled, and deposited in holes on the banks of rivers and ponds. The flesh of these animals is not eaten, but their hides have lately been introduced as an article of commerce; a portion of the skin prepared for the trade may be seen in Case 5.

The large stuffed Crocodilians are arranged in two groups in the middle of the Gallery, that (C) nearest the entrance containing the Old-World forms, the other (D) the American kinds. The smaller specimens occupy Wall-Cases 1–9, and a series of skulls is exhibited in Case 10.

About 25 species are known.

Crocodiles proper (*Crocodilus*) are distinguished from the Alligators by having the fourth lower tooth passing into a notch at the lateral edge of the upper jaw. They inhabit Africa, Southern Asia, the tropical parts of Australia, Central America, and the West Indies. The Indian Crocodile (*Crocodilus porosus*) grows to a length of 30 feet, and is very common in the East Indies and Tropical Australia. A large specimen obtained in North-east Australia is exhibited in the middle of the Gallery. The African Crocodile (*Crocodilus vulgaris*) attains nearly to the same size as the Indian species. It was worshipped by the ancient Egyptians, and

was once common in Egypt proper. It has now been almost exterminated in the lower parts of the Nile, but infests in great numbers all the freshwaters of Tropical Africa; and it is believed that more people are killed by Crocodiles than by any other of the wild beasts of Africa.

The Gavials (*Gavialis*) may be readily recognized by their extremely long and slender snout. The Gavial of the Ganges (*G. gangeticus*), of which a large specimen (B) is mounted in the middle of the Gallery opposite to the entrance, is abundant in that river and its tributaries, and attains to a length of 20 feet. It feeds chiefly on fishes, for the capture of which its long and slender snout and sharp teeth are well adapted. Old males have a large cartilaginous hump on the extremity of the snout containing a small cavity for the retention of air, by which means these individuals are enabled to remain under water for a longer time than females or young.

In the Alligators (*Alligator*) the fourth lower tooth is received in a pit in the upper jaw, when the mouth is shut. With the exception of one species which has been lately discovered in China, they are found only in America. They do not grow to the large size of the true Crocodiles. The species most generally known is *A. mississippiensis*, which abounds in the southern parts of North America. The Black Alligator (*A. sclerops*) is common in South America as far south as 32° lat. S.

Order II. RHYNCHOCEPHALIA.

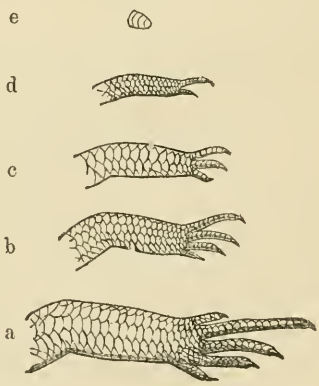
Of this Order, which seems in the Permian and subsequent formations to have been represented by various genera, one species only has survived to our period. It is the *Tuatera* of the Maoris, or *Hatteria* of naturalists. Case 11 contains an example of this interesting Reptile, with skeleton and skulls. It is the largest of the few Reptiles inhabiting New Zealand, but scarcely attains to a length of 2 feet. Formerly it was probably found in several parts of the northern island; but at present it is restricted to a few small islands in the Bay of Plenty, where it lives in holes feeding on other small animals. Externally there is nothing to distinguish the *Tuatera* from ordinary Lizards; but important differences obtain in the structure of its skeleton, viz. the presence of a double

horizontal bar across the temporal region, the firm connection of the quadrate bone with the skull and pterygoid bones, biconcave vertebræ (as in Geckos and many fossil Crocodilians), the presence of an abdominal sternum and of uncinate processes to the ribs (as in Birds).

Order III. LACERTILIA, or Lizards.

The Order of Lizards comprises not less than some 1700 species, which exhibit a great variety of form and structure. Some, like our common Lizards, possess four legs and a long tail, and are endowed with great rapidity of motion; others, like the Chamæleons, are arboreal, and have their limbs and tail adapted for climbing on the branches of trees; others, like the Geckos, can ascend smooth vertical surfaces, their toes being provided with special adhesive organs. The limbs may be rudimentary or disappear entirely, as in our common Slowworm, in which case the Lizard assumes the appearance of a Snake; but in all rudiments at least of both pectoral and pelvic bones are hidden under the skin. Lizards may be characterized as Reptiles with the skin covered with scales

Fig. 2.



Hind legs of Lizards, to show the gradual abortion.

a, *Seps ocellatus*; b, *Seps mionecton*; c, *Seps tridactylus*; d, *Rhodona*; e, *Seps monodactylus*.

or tubercles; with non-expansible mouth, the rami of the mandible being firmly united anteriorly by a suture; with four or two limbs, or at least rudiments of pectoral and pelvic bones; with teeth which are ankylosed to the jaws, and not implanted in sockets; with a transverse anal opening. Moveable eyelids and an ear-opening are usually present. If the limbs are developed, they are generally provided with five digits armed with claws; but as in some kinds the limbs get weaker and shorter, the number of toes is gradually reduced; and there are Lizards in which the little limb terminates in a single useless toe, or is even entirely toeless. The *tongue* offers very remarkable differences in form and function. It is simple, broad, short, soft in the Geckos, Agamas, and Iguanas, and is probably an organ of taste; in the majority of the other families it is narrow, more or less elongate, sometimes covered with scales, and with a more or less deep incision in front, assuming more and more the function of an organ of touch. It is of extraordinary length, worm-like, and terminating in two fine, long points in the Monitors, in which, as in Snakes, it acts as a feeler only. The tongue of the Chamæleons will be noticed subsequently.

Lizards are spread over the whole world except the very cold regions, and are, like all other Reptiles, most numerous, both as regards species and individuals, between the tropics. They are divided into many families, some of which can be alluded to here by name only:—

Families—1. *Geckotidæ.* 2. *Trachydermi.* 3. *Monitoridæ.* 4. *Tejidæ.* 5. *Amphisbænidæ.* 6. *Lacertidæ.* 7. *Xantusiidæ.* 8. *Zonuridæ.* 9. *Chalcididæ.* 10. *Cercosauridæ.* 11. *Chamæsauridæ.* 12. *Gymnophthalmidæ.* 13. *Pygopodidæ.* 14. *Aprasiidæ.* 15. *Lialidæ.* 16. *Scincidæ.* 17. *Acontiidæ.* 18. *Typhlinidæ.* 19. *Iguanidæ.* 20. *Agamidæ.*

The last family, the *Chamæleontidæ*, is so distinct from all the others that some herpetologists would remove it from the Lacertilia altogether.

The majority of Lizards, especially the smaller kinds, are not suitable objects for exhibition in a dry state; they must be preserved in spirit; consequently only a selected series is exhibited in this Gallery.

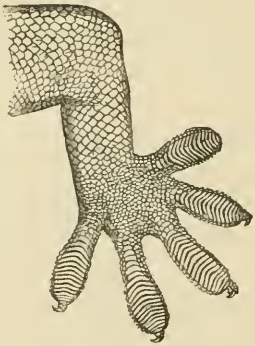
11.] The *Geckotidæ*, or Geckos, are Lizards of small size, the largest measuring about a foot, and have always attracted attention by their possessing the faculty of ascending smooth surfaces, or even of running on the ceilings of rooms like a fly. For this purpose the

Fig. 3.

Head of *Gecko verticillatus* (East Indies).

lower surface of their toes is provided with a series of moveable plates or disks, by the aid of which they adhere to the surface over which they pass. Geckos are found in almost every part of the globe between and near the tropics, frequenting houses, rocks, and trees.

Fig. 4.



Hind leg of *Gecko verticillatus*.

With few exceptions they are nocturnal, and consequently large-eyed, animals, the pupil being generally contracted in a vertical direction. Geckos are extremely useful in destroying insects, and, though greatly feared by those not acquainted with their habits, are perfectly harmless. Nearly all Geckos possess a voice; and the

large *Gecko verticillatus*, which is extremely common in the East-Indian Archipelago, utters a shrill cry, sounding like "tokee" or "tock."

The *Monitoridæ*, or Water Lizards, are the largest of Lizards, some exceeding a length of six feet. A few (*Varanus scincus*, Case 11) are terrestrial, but the majority semi-aquatic, the former having a rounded, the latter a compressed tail, with a sharp saw-like upper edge, which assists them greatly in swimming, and at the same time constitutes a formidable weapon with which these powerful animals can inflict deep wounds on the incautious captor. They range all over Africa, the Indian region, and Australia. Their prey consists of other vertebrate animals—small mammals, birds, frogs, fishes, and eggs. In India they are well known under the misnomer "Iguanas" as dangerous neighbours to poultry-yards. Among the species which grow to the largest size may be mentioned the gigantic Monitor (*Varanus giganteus*, Case 16), from N. Australia; the two-streaked Monitor (*V. salvator*, Cases 15–17), common in the East-Indian Archipelago; the common Indian Water-Lizard (*V. dracæna*); and the African Monitor (*V. niloticus*), ranging over the whole of Tropical Africa (Case 14). [Ca 11–17

The *Trachydermi* contain a single genus, the remarkable *Heloderma horridum*, an inhabitant of the western parts of Mexico. As far as is known at present, it is the only Lizard whose bite is poisonous. Its teeth are fang-like, provided with a deep groove as in some Snakes, and the submaxillary gland is enormously developed and secretes the poisonous fluid. It is about two feet long. [Case

The *Tejidæ* (bottom of Case 18) are the American representatives of the Lizards proper, from which they somewhat differ in their dentition. The Teguexins (*Tupinambis teguexim* and *nigropunctatus*) are the largest, attaining to a length of about four feet, and found in most parts of the South-American continent. The *Dracæna guianensis* is a rare Lizard, found in the Guianas and Brazil, and was considered a kind of Crocodile by old authors, who saw a distinct resemblance to those animals in its compressed, keeled tail, as well as in the large tubercles which are arranged pretty regularly on its back. [Case

Of the *Amphisbænidæ*, singular worm-like Reptiles, a few [Cas

specimens and a skeleton are exhibited. All their external characters testify to their mode of life; they are burrowing animals, passing the whole of their existence under ground in loose soil, sand, or ant-heaps. The skin is not protected by either scales or scutes, but divided by circular and longitudinal folds into quadrangular segments arranged in rings. The colour of the skin is either whitish, reddish, or greyish, without any ornamentation. Legs are absent (with the exception of the genus *Chirotes*, in which a pair of very short fore legs are developed). The head and tail are both short; and the superficial similarity of the two extremities in some of the species has led to the belief that they could progress backwards and forwards with equal facility. Their eyes are quite rudimentary, hidden below the skin; ear-openings are likewise absent. The Amphisbænians are inhabitants of hot countries—Africa, America, and the countries round the Mediterranean. About 50 different species are known.

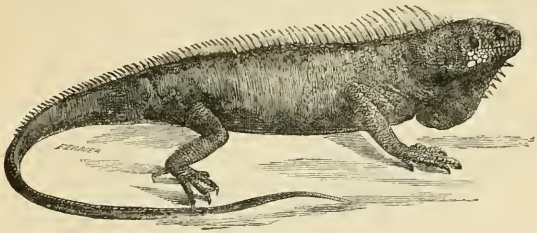
8.] Lizards proper (*Lacertidæ*) are confined to the Old World, and found in Europe, Asia, and Africa. They seldom reach a length of eighteen inches (*Lacerta ocellata*), and feed on small animals only, insects and worms being the principal diet of most kinds of Lizards. The Common British Lizard is *Lacerta vivipara*; the Sand Lizard (*L. agilis*) and Green Lizard (*L. viridis*) being more locally distributed in the Southern Counties and the Channel Islands, but very abundant in various parts of the continent of Europe.

8.] The *Zonuridæ* include limbed as well as limbless forms; of the latter the Glass Snake, or Sheltopusik (*Pseudopus pallasii*), common in South-eastern Europe and Western Asia, is an example.

8.] The *Scincidæ* or Skinks, recognizable by their round imbricate scales, also include forms in which the limbs are rudimentary or absent. Of the limbless species, the Slowworm or Blindworm (*Anguis fragilis*), common in Great Britain, is the best known. The largest forms of this family are Australian, as *Cyclodus gigas* and *nigroluteus*, *Tropidolepisma*, and *Trachydosaurus*, the last remarkable for their rough scales and short tail, somewhat resembling the cone of a fir-tree. A very curiously shaped form, also from Australia, is *Silubosaurus* (*S. stokesii*), with its short conical tail armed with dagger-pointed, spinous scales.

The *Iguanidæ* are American pleurodont Lizards (see Fig. 7) exhibiting an astonishing variety of form. The largest and best known are the Iguanas (*Iguana rhinolophus* and *tuberculata*, Case 20), found [Cas 19–21.]

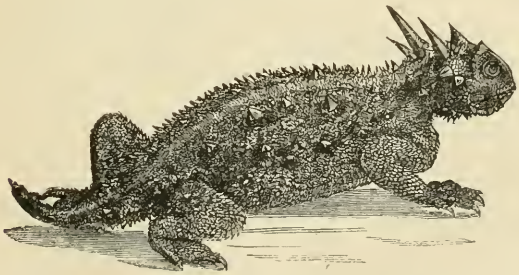
Fig. 5.



Iguana tuberculata (Brazil).

in the forest-regions of Tropical America only, in the neighbourhood of water, into which when frightened they jump from the overhanging branches of trees, to escape capture by swimming and diving. Feeding exclusively on leaves or fruits, they are themselves highly esteemed as food, and their eggs also are eagerly sought for by the natives. Iguanas grow to a length of five feet. The marine Iguanas (*Oreocephalus cristatus* and *subcristatus*, Case 19) are inhabitants of the Galapagos Islands, living on the rocks of the shore and feeding on seaweeds. No other Lizard enters sea-water. Among the smaller representatives of this large family may be mentioned the *Anolis*, extremely numerous in Tropical America, and especially the West Indies—small, slender, agile, thoroughly terrestrial Lizards,

Fig. 6.

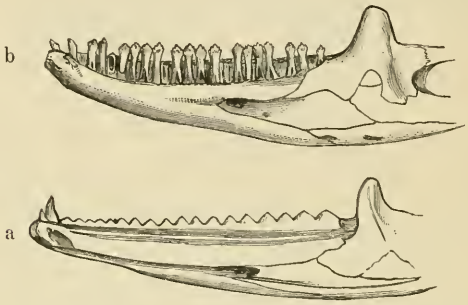


Californian "Toad" (*Phrynosoma cornutum*).

of rare beauty and variety of colour, and forming a striking contrast to the species of *Phrynosoma* (Case 19) of North America and Mexico, which, on account of their shape and sluggish habits, have earned the name of Horned or Californian Toads (Fig. 6).

22.] The *Agamidæ* represent the Iguanas in the Old World. They are distinguished by the acrodont dentition, the teeth being anky-

Fig. 7.



Lower jaws, showing the acrodont (*a*) and pleurodont (*b*) dentition.

losed to the upper edge of the jaws, an arrangement which occurs also in the Rhynchocephalians, some Amphisbænians, and the Chamæleons. Lizards of this family are most abundant in the Indian and Australian regions, showing a great variation of form analogous to that of the preceding family. The perhaps most highly specialized Agamoid is the genus *Draco,* small winged Lizards from the East Indies (Fig. 8). The Dragons are tree-lizards, and possess a peculiar additional apparatus for locomotion: the much-prolonged five or six hind ribs are connected by a broad expansive fold of the skin, the whole forming a subsemicircular wing on each side of the body, by which they are enabled to take long flying leaps from branch to branch, and which are laid backwards at the sides of the animal while it is sitting or merely running.

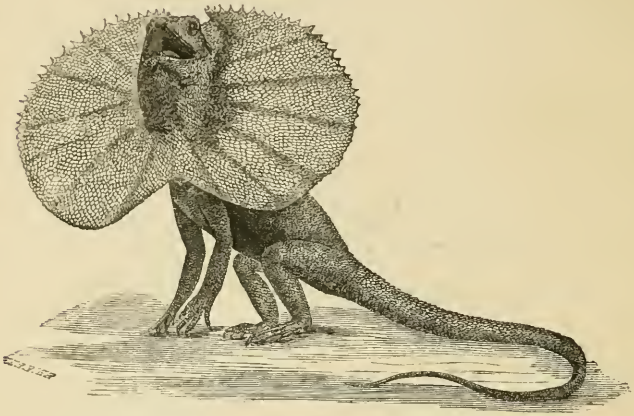
The Frilled Lizard (*Chlamydosaurus kingii*) is an Australian Agamoid, growing to a length of two feet. It is provided with a frill-like fold of the skin round the neck, which, when erected,

Fig. 8.

Dragon (*Draco tæniopterus*); Siam.

resembles a broad collar, not unlike the gigantic lace-ruffs of Queen Elizabeth's time. When startled, this Lizard is said to rise with

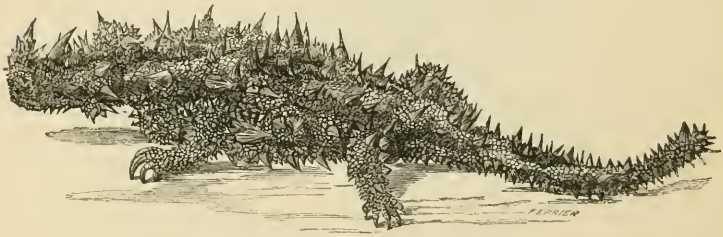
Fig. 9.



Frilled Lizard from Australia (*Chlamydosaurus kingii*).

the fore legs off the ground, and to jump in kangaroo-fashion. An extraordinary creature is the Moloch (*Moloch horridus*), also from

Fig. 10.

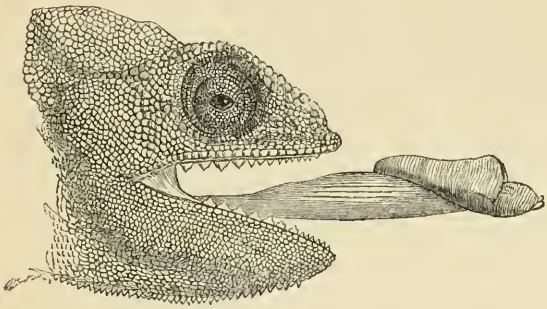


Moloch horridus (Australia).

Australia; the tubercles and spines, with which it is entirely covered, give it a most repulsive appearance; but it is perfectly harmless. Other Lizards of this family are the Australian *Grammatophora* and the African and Asiatic *Uromastix*.

The *Chamæleontidæ*, or Chamæleons, are almost peculiar to Africa, and most numerous in Madagascar; one (the common) species extends into India and Ceylon. No other member of the Order of Lizards shows such a degree of specialization as the Chamæleon. The tongue, eyes, limbs, tail, skin, lungs are modi- [Case 2

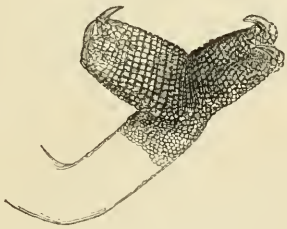
Fig. 11.



Common Chamæleon.

fied in a most extraordinary manner to serve special functions in the peculiar economy of these animals. They lead an exclusively arboreal life: each of their feet is converted into a grasping hand,

Fig. 12.



Hand of Chamæleon.

by means of which, assisted by a long prehensile tail, they hold so fast to a branch on which they are sitting that they can be dislodged only with difficulty. Their movements are slow and awkward on the ground, and still more so in the water, where they

are nearly helpless. The tongue is exceedingly long, worm-like, with a club-shaped viscous end; they shoot it out with incredible rapidity towards insects, which remain attached to it, and are thus caught. The eyes are almost entirely covered by a thick lid, pierced with a small central hole, and not only can be moved in any direction, but each has an action independent of the other—one eye may be looking forwards, whilst an object behind the animal is examined with the other. The faculty of changing colour, which they have in common with many other Lizards, is partly dependent on the degree in which the lungs are filled with air, and different layers of chromatophores* are pressed towards the outer surface of the skin. The adult males of some of the species possess long horns or other excrescences on the head. The largest species attain a length of 18 and 20 inches.

Order IV. OPHIDIA, or Snakes.

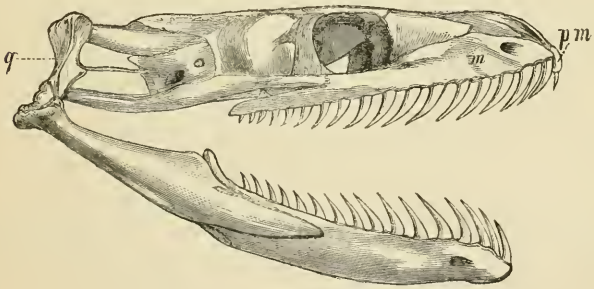
The Snakes, or Ophidians, are scaly Reptiles, with exceedingly elongate, limbless body, without sternum, without, or with only rudiments of, a pelvis, with the mandibles united in front by an elastic ligament. The ribs are articulated moveably with the vertebral column. The jaws are armed with sharp, fang-like teeth, which are ankylosed to the bone. The peculiar mobility of the jaw-bones enables these animals to extend the gape in an extraordinary degree, and to work their prey (which generally is much thicker than the Snake itself and always swallowed whole) through the throat into the stomach. The tongue is narrow, retractile into a basal sheath, and terminates in two long thread-like points; it is frequently and rapidly exserted when the animal is excited or wants to touch an object. Snakes have no eyelids; but the part of the epidermis which covers the eye is transparent, convex, and has the shape of a watch-glass, behind which the eye moves. There is no ear-opening. The scales are not isolated formations, as in fishes, but merely folds of the outer skin, which is cast off in a single piece several times every year. The head is generally covered with large, symmetrical, juxtaposed plates (see figs. 15 & 16), and the

* Cells in the skin in which the colouring-pigment is deposited.

belly with large transverse shields. The organs of locomotion for the exceedingly elongate body of the Snakes are the ribs, the number of which is very great, nearly corresponding to that of the vertebræ of the trunk. Although the motions of Snakes are in general very quick, and may be adapted to every variation of ground over which they move, yet all the varieties of their locomotion are founded on the following simple process. When a part of their body has found some projection of the ground which affords it a point of support, the ribs, alternately of one and the other side, are drawn more closely together, thereby producing alternate bends of the body on the corresponding side. The hinder portion of the body being drawn after, some part of it finds another support on the rough ground or a projection, and the anterior bends being stretched in a straight line, the front part of the body is propelled in consequence. During this peculiar kind of locomotion, the numerous broad shields of the belly are of great advantage, as, by means of the free edges of those shields, they are enabled to catch the smallest projections on the ground, which may be used as points of support. Snakes are not able to move over a perfectly smooth surface.

Non-venomous Snakes have generally two rows of short, thin

Fig. 13.



Skull of Snake (Python).

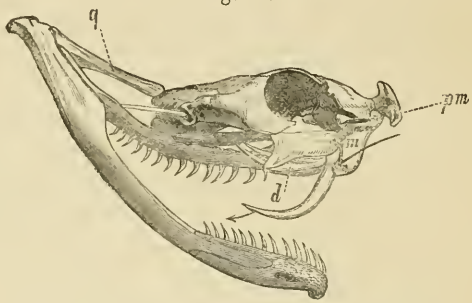
m, maxillary; *pm*, premaxillary; *q*, quadrate bone.

teeth, pointed like a needle, on each side of the upper jaw, and one in the lower; sometimes one or two of the anterior teeth are

longer than the rest, but they are not grooved or perforated, nor do they communicate with a poison-gland.

The poisonous Snakes are armed with a long canaliculated tooth in front of the upper jaw; the channel terminates in a small slit at the extremity, and is in connection with a duct which carries

Fig. 14.



Skull of Poisonous Snake (*Vipera nasicornis*).

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.

the poisonous fluid from a large gland to the tooth. This venom-gland is situated on the side of the head, above the angle of the mouth, and invested by a dense fibrous sheath, which is covered by a layer of muscular fibres. At the moment the Snake opens its mouth to bite, the muscles compress the gland, and force its contents through the excretory duct into the channel of the venom-tooth, whence it is ejected into the wound. The force with which the gland is compressed is shown by the fact that irritated animals have been seen to spout the poison from the aperture of the tooth to a considerable distance. The venom-apparatus serves these creatures not only for defence, but also, and chiefly, for the purpose of overpowering their prey, which is always killed before they commence to swallow it.

The dental apparatus is not the same in all poisonous Snakes. The venom-tooth is always fixed to the maxillary bone; but in some this bone is as long, or nearly as long, as in the non-venomous Snakes, and generally bears one or more ordinary teeth on its hinder portion. This venom-tooth is always more or less erect,

not very long, and its channel generally visible as an external groove. Poisonous Snakes with such a dentition resemble also in other respects the non-venomous Serpents, and are designated as *Venomous Colubrine Snakes.*

In the other venomous Snakes the maxillary bone is extremely short, and does not bear any ordinary teeth, only an exceedingly long curved fang, perforated in its entire length. Although this tooth also is fixed to the bone, the bone itself is very mobile; so that the tooth, which is laid backwards when at rest, can be erected the moment the animal prepares to strike. The tooth is occasionally lost; but others, in different stages of development, lie in the gum behind it, ready to take the place of the lost tooth.

Most Snakes feed on living animals, a few only on eggs. They are oviparous or ovoviviparous. They number about 1800 species, and are spread over all temperate regions, but are most numerous between the tropics. They are absent in New Zealand. The Order is divided into three Suborders and numerous minor groups.

Suborder I. Ophidii Colubriformes.

(Innocuous Snakes.)

Typhlopidæ (Burrowing or Blind Snakes); *Stenostomatidæ, Tortricidæ, Xenopeltidæ, Uropeltidæ, Calamariidæ, Oligodontidæ, Colubridæ, Homalopsidæ* (Freshwater Snakes); *Psammophidæ* (Sand-Snakes); *Dendrophidæ* (Tree-Snakes); *Dryiophidæ, Dipsadidæ, Scytalidæ, Lycodontidæ, Amblycephalidæ, Pythonidæ, Boidæ, Erycidæ, Acrochordidæ.*

Suborder II. Ophidii Colubriformes venenosi.

(Venomous Colubrine Snakes.)

Cobras and Coral Snakes (*Elapidæ*) and Sea-Snakes (*Hydrophidæ*).

Suborder III. Ophidii Viperiformes.

(Viperine Snakes.)

Vipers (*Viperidæ*), Pit-Vipers, and Rattlesnakes (*Crotalidæ*).

Snakes are most unsuitable objects for preservation in a dry state, as no method is known by which the singularly regular

arrangement of their scales, and their sometimes beautiful coloration and lustre can be preserved. Therefore only a small proportion of the collection is exhibited, of which the following deserve particular notice:—

The Burrowing or Blind Snakes (*Typhlopidæ* &c.) are small worm-like species, with teeth in one of the jaws only, and without enlarged ventral plates. They are numerous in Africa and India, though occurring also in tropical America and Australia; one species is found in South-eastern Europe.

e 26.] The *Colubridæ* form the great bulk of the Order, and are found in every part of the temperate and tropical regions, but are only scantily represented in Australia and the islands of the

Fig. 15.

Smooth Snake (*Coronella lævis*).

Fig. 16.

Common Snake (*Tropidonotus natrix*).

Pacific. To this group belong the Smooth Snake (*Coronella lævis*), found in the southern parts of England, and the Common or Ringed Snake (*Tropidonotus natrix*). *Spilotes* and *Ptyas* are known by the name of Rat-Snakes.

The Freshwater Snakes (*Homalopsidæ*) are thoroughly aquatic, several of them even entering the sea. In some points of their organization they approach the truly marine *Hydrophidæ*. They feed on fish, and belong chiefly to the Indian region.

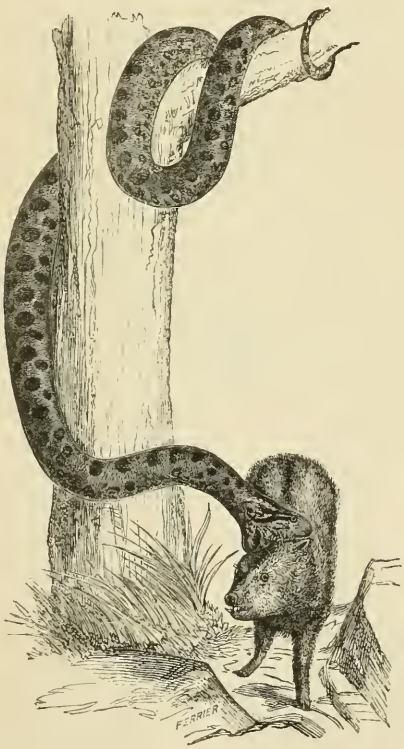
se 26.] The Tree- or Whip-Snakes (*Dendrophidæ* and *Dryophidæ*) are exceedingly slender and elongate, and some are exquisitely

coloured, green being the predominant hue. They feed chiefly on tree-lizards and birds, and are found in all the tropical regions. *Bucephalus capensis* is from South Africa.

The *Pythonidæ*, or Rock Snakes, are found in the hottest parts of Africa, Asia, and Australia, and attain a very large size (from 8 to 24 feet). They climb as well as swim, most of them preferring the neighbourhood of water. Like the Boas, to which they are closely related, and from which they differ chiefly in the presence of intermaxillary teeth, they overpower their prey by constriction. The Pythons of Africa and Asia and the *Morelia* of Australia represent this family.

The *Boidæ*, or Boas, are restricted to the tropical parts of

Fig. 17.



Anaconda, from Tropical America (*Boa murina*).

the New World. The Anaconda (*Boa murina*), of which a specimen (F) measuring 29 feet is exhibited in a separate glass case, and represented in the act of seizing a Peccary (which frequently falls a prey to this species), is the largest Snake known, the true *Boa constrictor* being a much smaller species (Case 24).

The *Erycidæ* (Case 23) are small Snakes, closely allied to the Boas, but differing by possessing a very short nonprehensile tail; their habits are terrestrial, or even burrowing. *Cliftia fusca* and *Erebophis asper*, the latter from New Britain, belong to this family.

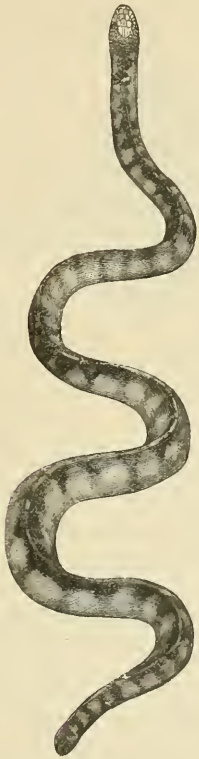
se 26.] The *Acrochordidæ* are distinguished by their small, wart-like, not imbricate, tubercular or spiny scales. *Acrochordus javanicus*, from Java and the Malayan peninsula, grows to a length of 8 feet.

se 27.] The *Elapidæ* are poisonous Snakes, with the physiognomy of the harmless Colubrine Snakes: they occur in all the tropical regions, and are most abundant in species in Australia, where they form almost the entire Snake-fauna. The Indian Cobra (*Naja tripudians*) and the African Cobra (*Naja haje*) are two of the best known and most dreaded Ophidians. They possess the remarkable faculty of expanding their neck when irritated, by raising the elongated ribs of this region, and thus stretching the skin outwards on each side; the dilatable portion is frequently ornamented on the back by a figure resembling a pair of spectacles. The Hamadryad, *Ophiophagus elaps*, is allied to the Cobra, but attains to a much larger size, and is one of the most dangerous venomous Snakes, as it is well known to frequently attack people. It feeds on other Snakes, and occurs in many parts of the Indian continent and archipelago. A specimen, 13 feet long, is exhibited in a spirit-tank opposite the wall-case. The true *Elaps*, or Coral-Snakes, are small, brilliantly-coloured Snakes, and their very small mouth renders them much less dangerous to man.

se 27.] The Sea-Snakes, *Hydrophidæ*, are inhabitants of the tropical parts of the Indian and Pacific Oceans, and most abundant in the East-Indian archipelago and in the seas between Southern China and North Australia. They pass their whole life in the sea. Their tail, which is compressed and paddle-shaped, answers all the purposes of the same organ in a fish, and their motions in the water are almost as rapid as they are uncertain and awkward on land.

These Snakes are highly poisonous; their dentition resembling that of the preceding family. Their food consists entirely of fish.

Fig. 18.



Sea-Snake (*Hydrophis*), from the Indian Ocean.

The greatest size to which some species attain is about 12 feet. *Pelamys bicolor* and *Hydrophis* are examples of this family.

The Vipers (*Viperidæ*) and Rattlesnakes (*Crotalidæ*) are Snakes with the most perfect poison-apparatus; the latter family being distinguished from the former by the presence of a deep pit on the side of the snout, between the eye and the nostril. These Snakes have generally a short thick body and a broad head, are

slow in their movements, and nocturnal; some live on bushes, most of them on the ground. They are viviparous. The true Vipers are chiefly African, a few species only occurring in Europe and Asia. The common British Viper is one of the smallest of

Fig. 19.

Common Viper (*Vipera berus*).

this group; the Puff-Adder (*Clotho arietans*), the most dangerous Snake of South Africa.

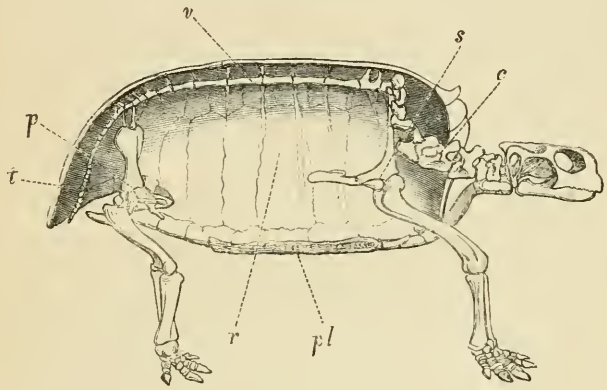
The Pit-Vipers and Rattlesnakes are found only in Asia and America, most abundant and reaching a larger size in the latter part of the world. The true Rattlesnakes (*Crotalus*) are distinguished by the "rattle" at the end of the tail, formed by several horny rings, which the animal shakes when irritated, producing a peculiar sound. It is stated that the length of the "rattle" indicates the age of the individual; and it is a fact that rattles of such a length and so many joints (twenty-one), as are exhibited in Case 27, are now of extremely rare occurrence, as these dangerous creatures, with the advance of cultivation, have now but rarely the chance of surviving to a very old age.

Order V. CHELONIA (Tortoises and Turtles).

The Chelonians, or Tortoises and Turtles, are distinguished from all other Reptiles by the more or less ossified case or "shell" which encloses the body, and into which most of the species can

retract their head and limbs. This armour consists of two shields united by their lateral margins; the upper, or carapace, is formed by the expansion and union of the vertebræ and ribs; the lower, or plastron, by dermal bones only. In most of these animals the carapace presents three series of central bony plates—the vertebral medially, and the costal laterally—and they are surrounded by a series

Fig. 20.



Skeleton of Tortoise, in a vertical section through the carapace.

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

of marginal plates; the plastron bones are generally nine in number, one median and four pairs. Horny epidermic plates cover the carapace and plastron; their arrangement is also symmetrical, but by no means corresponds to that of the underlying bones; they constitute what is called the "Tortoise-shell," which in some species has great commercial value. The jaws are toothless, covered by a horny bill, rarely hidden under fleshy lips. The four limbs are always well developed, and modified according to the mode of life of the species,—the terrestrial Tortoises having short, club-shaped feet furnished with blunt claws; the freshwater Turtles, digits distinct, armed with sharp claws, and united by a more or less developed membrane or web; and, finally, the marine

Turtles having their limbs transformed into regular paddles, resembling those of Cetaceans. The tail is constantly present, but frequently extremely short; in a few forms only it attains to a considerable length. Chelonians are oviparous, and the eggs are generally covered with a hard shell.

The Chelonians form only a small part of the Class Reptilia, the number of species amounting to about 300. If they occupy in this Gallery almost half of the wall-cases, it is because they are more suited than the other Reptiles for being preserved and exhibited in a dried state.

Chelonians are divided into the following Suborders:—

1. *Sphargidæ*, or Leather-Turtles.
2. *Cheloniidæ*, or Sea-Turtles.
3. *Trionychidæ*, or Freshwater Turtles.
4. *Emydidæ* and *Chelydidæ*, or Freshwater Tortoises.
5. *Testudinidæ*, or Land Tortoises.

In the first three several important characters remind us of other orders of Reptiles, especially Crocodilians, whilst the two last are farthest removed from the ordinary Reptilian type.

9.] 1. The *Sphargidæ* are a geologically ancient type, in which the formation of a protecting bony carapace has made but little advance. The skin, which in a fresh state is flexible, like thick leather, contains bony deposits arranged like mosaic; but this dermal shield is not united to the vertebræ and ribs, which remain free, and are not particularly dilated, as may be seen in the large skeleton (G) exhibited opposite to Case 29. In this arrangement the dermal shield and skeleton are in the same relation to each other as in the Crocodiles. The structure of the limbs is the same as in the marine Turtles, with which the Leather-Turtle agrees in its mode of life; the bones of the paddles, however, are still more simple, merely rods, and claws are entirely absent. Only one species exists in our time (*Sphargis coriaceus*), which seems to become gradually rarer, although it is found occasionally throughout all the seas of the tropical and temperate regions, specimens having strayed now and then to the British coast. This Turtle is, perhaps, the largest living Chelonian, exceeding a length of 6 feet, and is said to be herbivorous.

2. *Cheloniidæ* or Marine Turtles. Their feet are transformed into long compressed fins, the anterior pair considerably longer than the posterior, the digits being enclosed in a common skin, out of which only one or two claws project; the carapace is broad and much depressed, but large interspaces between the extremities of the ribs remain unossified; it is covered with symmetrical horny plates. These Turtles are thoroughly marine animals, their fin-like feet and their light shell rendering them the best swimmers in the class of Reptiles. They sometimes live hundreds of miles distant from the shore, to which, however, they periodically return in order to deposit from 100 to 250 soft-shelled eggs, which are buried in the sand. The food of some species (*Chelone*) consists exclusively of algæ; others (*Caretta, Caouana*) subsist upon fish and mollusca. They are found in all the intertropical seas, but sometimes they travel far into the temperate regions, specimens being occasionally captured on the British coasts. The flesh and eggs of all the species are edible, the Green Turtle (*Chelone viridis*) being the most esteemed. The Hawk's-bill Turtle (*Caretta imbricata*) furnishes the commercial tortoise-shell; the finest sort comes from Celebes, whence it is exported to China. Specimens of polished shell from the Indian Ocean and Jamaica are exhibited. A common Atlantic species is the Loggerhead Turtle (*Caouana caretta*), which forms an exception to all other Chelonians in having five instead of four epidermic plates on the side (costals).

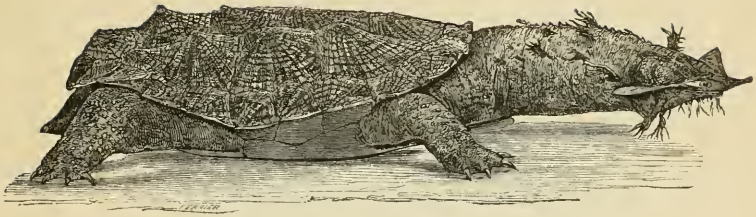
3. *Trionychidæ*, Freshwater Turtles, with much depressed shell, which is covered with soft skin, and not with epidermic plates; the digits are movable, strongly webbed, and each foot has only three sharp claws, belonging to the three inner digits, exactly as in Crocodiles. The jaws are covered with fleshy lips, and the snout is produced in a short tube bearing the nasal orifices, and enabling the animal to breathe while the rest of the head is submerged under water. These animals are thoroughly aquatic and carnivorous, and inhabit the hotter parts of Asia, Africa, and North America. We may note the Javanese and Gangetic Trionyx (*Trionyx javanicus* and *gangeticus*), and the Nilotic Trionyx (*T. niloticus, T. africanus*), as showing the largest size attained by these Turtles.

4. The *Emydidæ*, or Freshwater Tortoises, possess a perfectly ossified carapace covered with epidermoid plates, and movable digits furnished with sharp claws. The mode of life of some is aquatic, of others almost terrestrial; the former having their shell least convex, and a more or less developed web between the toes. Thoroughly aquatic are the Alligator Terrapens of North America (*Chelydra*, Case 33), in which the tail attains to a great length, and is furnished with a crest resembling that of a Crocodile; *Chelydra temminckii* is the largest freshwater Tortoise. The East-Indian *Batagur* (Case 34) approach in their physiognomy and habits and in size the Freshwater Turtles. The smaller forms are most abundant in North America, and sometimes beautifully marked (*Emys picta, rivulata, ornata*, &c., Case 36). The European species (*Lutremys europæu*, Case 38) is abundant in South Europe, and found, less frequently and locally, in Germany as far north as Berlin; its fossil remains have been found in the fen-country. *Pyxidea, Geoemyda, Lutremys* live as much on land as in water; and, finally, we have an example of an exclusively terrestrial Emydoid in the Box-Tortoise (*Cistudo carolina*, Case 38), which lives in the woods of the southern parts of the United States, and possesses, like other Freshwater Tortoises, a hinge in the lower shield, rendering its anterior portion movable. A lid is thus formed by which the posterior opening of the shell can be completely closed.

The following Freshwater Tortoises differ from the preceding in not being able to retract the head and neck, but in bending it sideways under the shell, as the American *Podocnemys expansa* (Case 31), of which a fine skeleton is exhibited, and the Australian *Chelodina*. But the most remarkable form of this group is the Mata-Mata Tortoise (*Chelys fimbriata*, Case 31), a native of Brazil and the Guianas. Its head and neck are fringed with warty appendages, floating in the water like some vegetable growth, whilst the rough, bossed carapace resembles a stone,—an appearance which evidently is of as great use to this creature in escaping the observation of its enemies as in alluring to it unsuspicious animals on which it feeds.

5. *Testudinidæ*, or Land Tortoises, with very convex carapace, and with feet adapted for progression on land only. They are

Fig. 21.

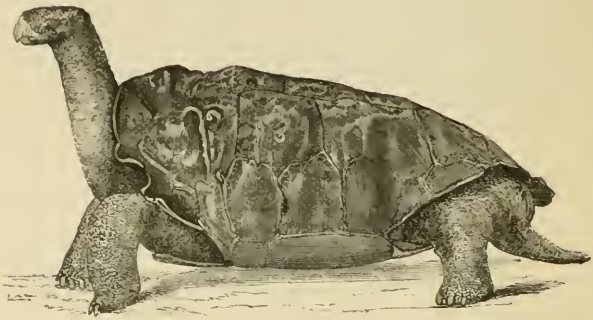


The Mata-Mata (*Chelys fimbriata*); British Guiana.

vegetable-feeders, and inhabit the hotter parts of the Old as well as New World, but are absent in Australia. The greater part are referable to the genus *Testudo*, of which one species occurs in Southern Europe (*Testudo græca*, Case 42); another closely allied species is *T. mauritanica*, extremely abundant in Morocco and Algiers, and imported in great numbers into England. But the most interesting forms of this group are the Gigantic Tortoises (Cases 39–41), which were formerly found in great numbers in the Mascarene and Galapagos islands. At the time of their discovery these islands were uninhabited by man or any large mammal; the Tortoises therefore enjoyed perfect security, and this, as well as their extraordinary degree of longevity, accounts for their enormous size and the multitude of their numbers. They could be captured in any number with the greatest ease within a few days, and proved to be a most welcome addition to the stock of provisions. They could be carried in the hold of a ship, without food, for months, and were slaughtered as occasion required, each Tortoise yielding, according to size, from 80 to 300 pounds of excellent and wholesome meat. Under these circumstances, the numbers of these helpless creatures decreased so rapidly, that in the beginning of this century their extermination was accomplished in the Mascarenes; and now only a few remain in a wild state in Aldabra and some of the islands of the Galapagos group. We may note particularly the gigantic Land Tortoise of Aldabra (*Testudo elephantina*); the large male specimen (H) exhibited weighed 870 pounds, and although known to have been more than 80 years

old, was still growing at the time of its death; the gigantic Land Tortoise of Abingdon Island (*T. abingdonii*), remarkable for its

Fig. 22.



Testudo abingdonii. The Tortoise of Abingdon Isl., Galapagos.

long neck and its thin shell, which may be easily pierced by a knife. The specimens exhibited were obtained by Commander W. E. Cookson during the visit of H.M.S. 'Petrel' to the Galapagos Islands in 1875, and were probably the last survivors of their race.

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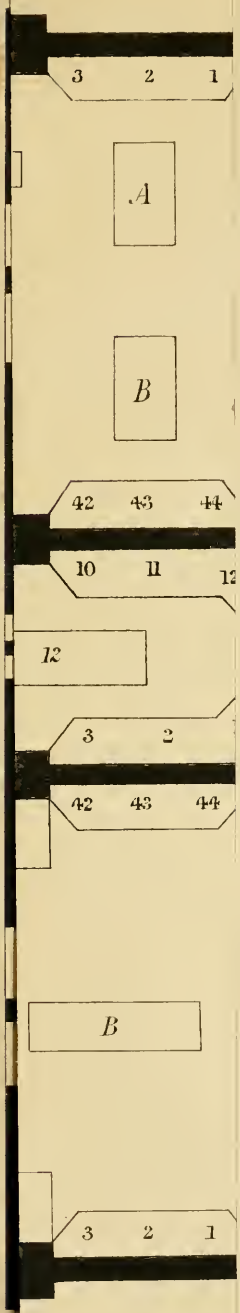
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