Guide to the galleries of mammals in the Department of Zoology of the British Museum.

GUIDE

TO THE

GALLERIES

OF

MAMMALS

IN THE

DEPARTMENT OF ZOOLOGY

OF THE

BRITISH MUSEUM (NATURAL HISTORY).

ILLUSTRATED BY 65 WOODCUTS, 1 PLATE, AND 3 PLANS.

[*NINTH EDITION.*]

LONDON:
PRINTED BY ORDER OF THE TRUSTEES OF THE BRITISH MUSEUM.
1914.

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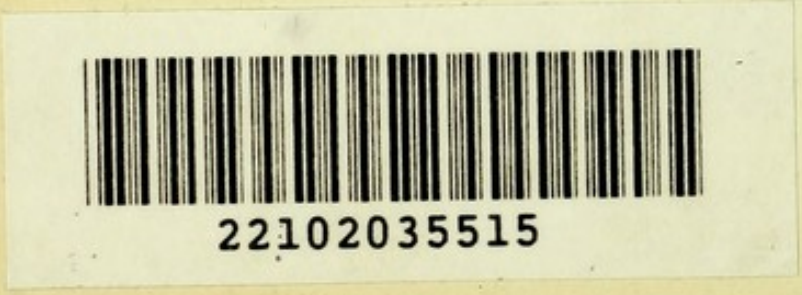

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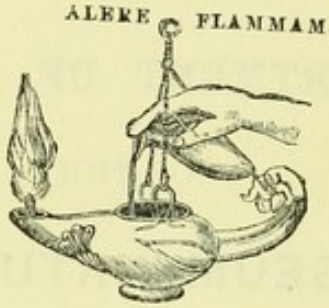

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PREFACE.

THIS Guide has been prepared with the object of being of service not only to those who endeavour to learn something from a cursory view of the collections on a single visit to the Museum, but also to those who desire, by closer study, to acquaint themselves with the general arrangement and principal features of the members of the class of animals of which it treats. As the Great Game Mammals (Ungulata) form the subject of a special Guide, they are treated briefly in the present work. As was the case with the 8th edition, the present Guide has been revised and brought up to date by Mr. R. Lydekker, F.R.S.

SIDNEY F. HARMER,
Keeper of Zoology.

BRITISH MUSEUM (NATURAL HISTORY),
CROMWELL ROAD, LONDON, S.W.
April 1914.

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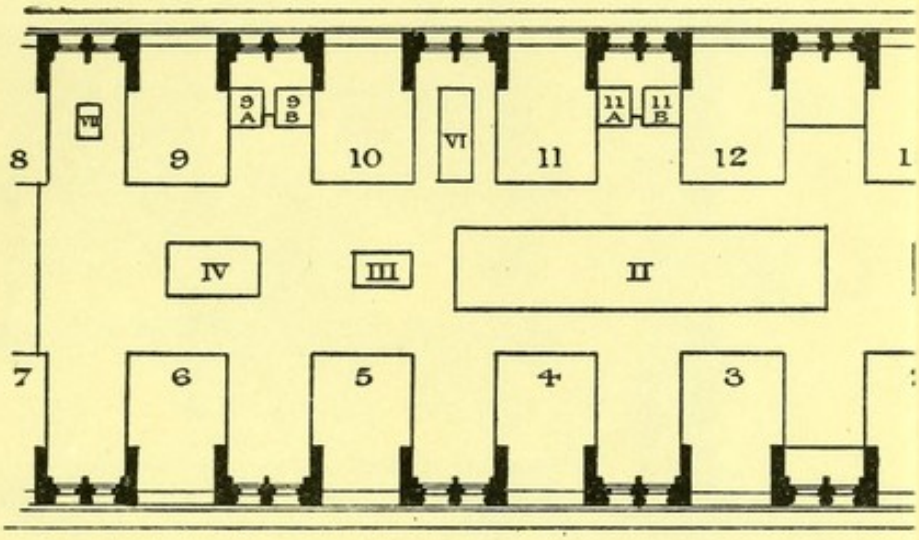

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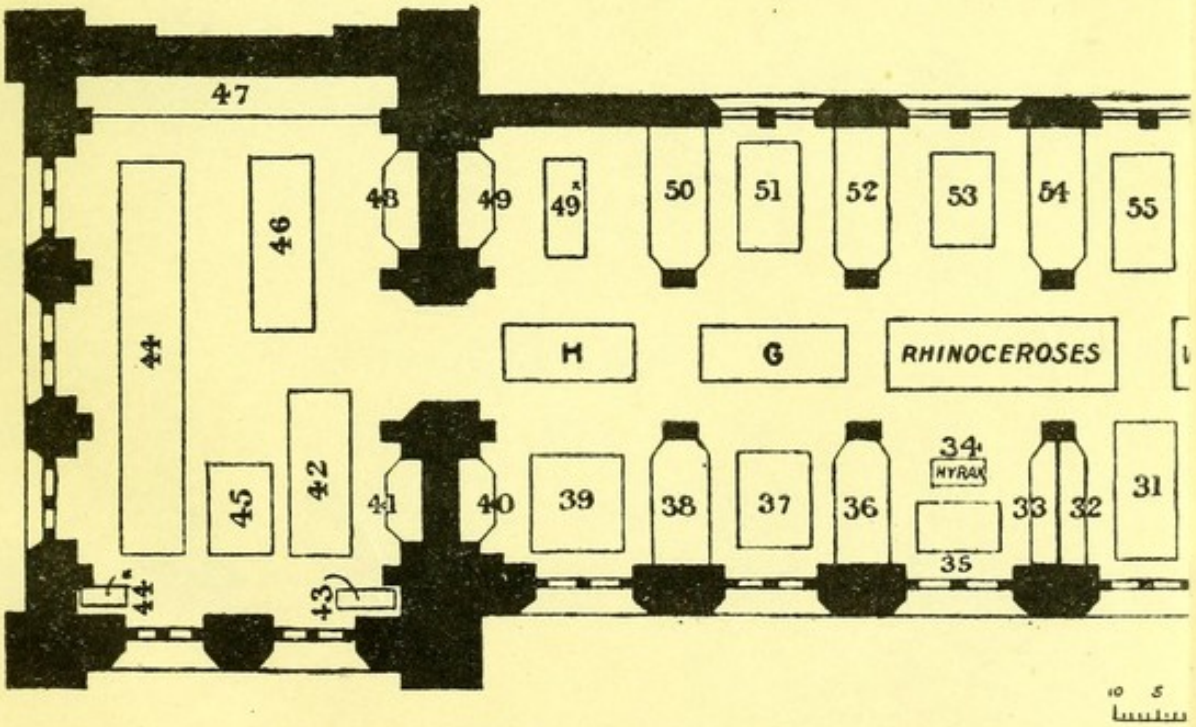
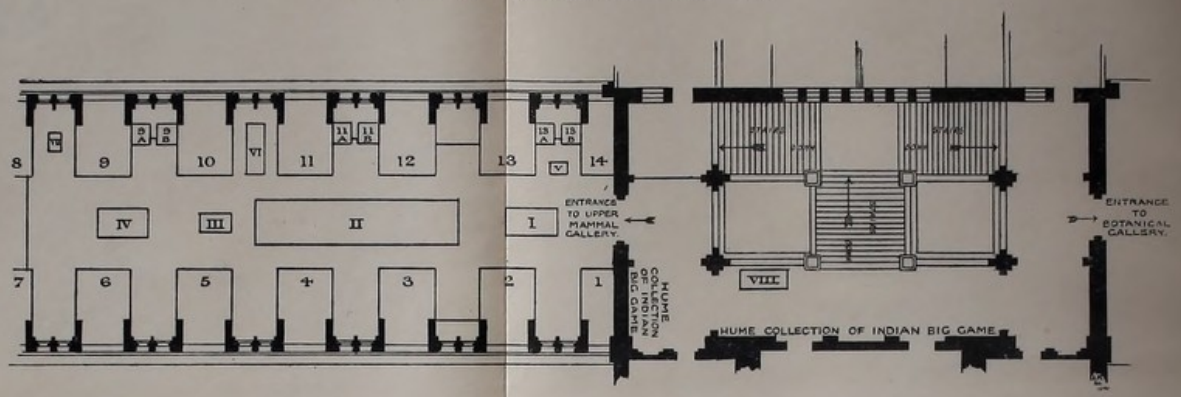


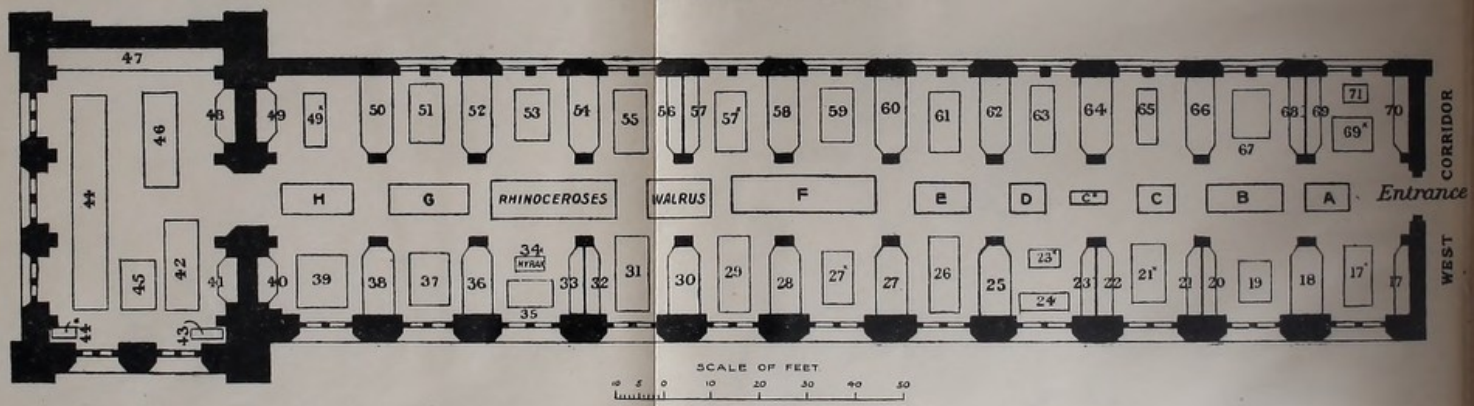
SECOND FLOOR.

UPPER MAMMAL GALLERY AND CORRIDORS.



FIRST FLOOR.

LOWER MAMMAL GALLERY.



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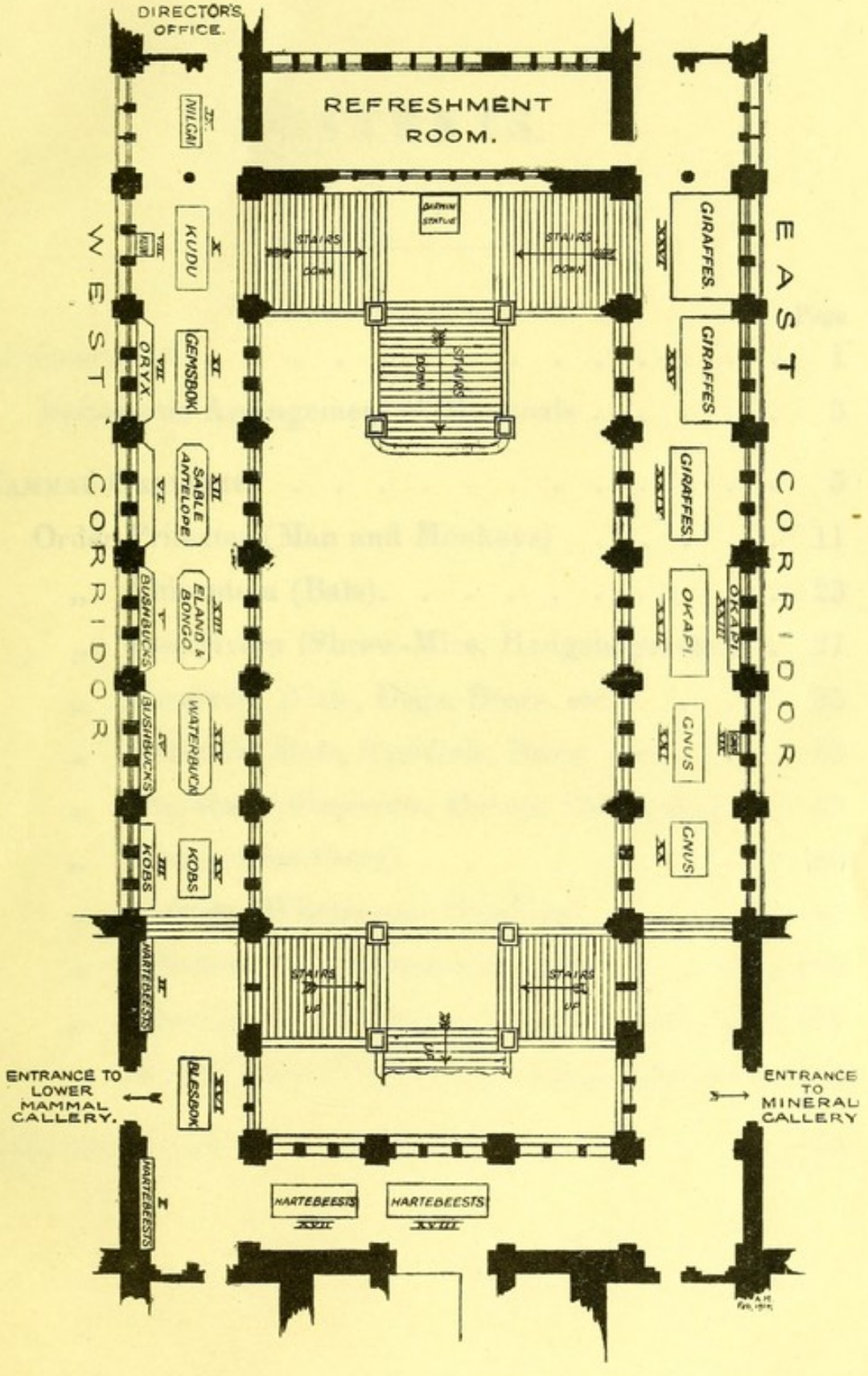

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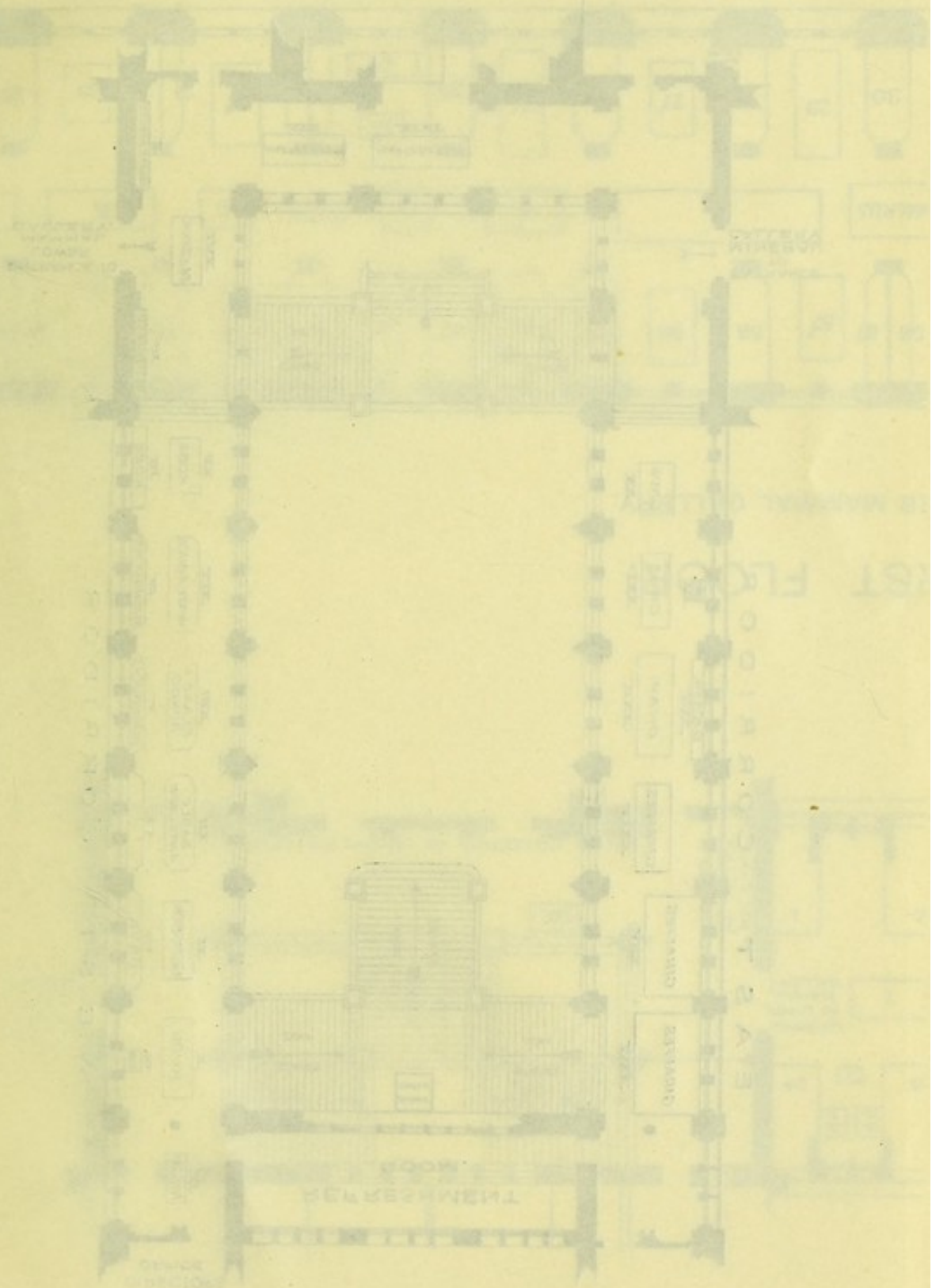


CONTENTS.

INTRODUCTORY.

MAMMALS may be defined as vertebrated * air-breathing warm-blooded animals, generally more or less clothed with hair, in which the females are provided with mammary, or milk, glands—these being also present, though small and functionless, in the males. With the exception of the Australasian Monotremes, which lay eggs, the young are brought forth alive. The limbs are usually four in number, the hind pair being, however, sometimes modified into swimming-paddles or suppressed altogether, while the front ones are in some cases developed into wings, and in others into flippers. The tail may be rudimentary, as in Man and the higher Apes; long and simple, as in Cats; prehensile †, as in the American Monkeys and Opossums; provided with a long tassel for driving away insects from the skin, as in Elephants, Cattle, &c.; or, finally, modified into a swimming-organ, either by the outgrowth of broad "flukes" as in Whales, or by being flattened vertically as in Beavers, or from side to side as in the Musk-rat, the African *Potamogale*, and others.

The heart of Mammalia consists of two completely separated divisions, each with an upper and lower chamber (auricle and ventricle). The blood has a high temperature, except in some of the lowest forms, such as the Spiny Anteaters, or Echidnas, of Australasia.

* *I. e.* with a backbone.

† *I. e.* with the power of curling round and grasping objects.

Mammals, which appear to be descended from the extinct Mammal-like Anomodont Reptiles of the Permian and Trias, make their first appearance so far back as the Triassic or early part of the Secondary or Mesozoic period ; a few minute teeth, representing some small species, have been found in the upper part of that formation in Germany and England. Later than these are the early Jurassic or Middle Mesozoic Mammals, found at Stonesfield in Oxfordshire, where several more or less incomplete lower jaws have been discovered, such as those named *Amphitherium* and *Phascolotherium*, figured in the 'Guide to the Fossil Mammals and Birds.' In Upper Jurassic times also a number of small Mammals lived in Britain, as is demonstrated by remains found at Swanage. Jaws of allied Mammals have been found in the Jurassic and Cretaceous strata of North America.

At the commencement of the Tertiary period "Placental" Mammals were already abundant, many of them resembling living types—a fact which shows how imperfect is our knowledge of the intermediate time, during which these creatures must have been gradually developed from their Mesozoic ancestors. The Eocene, the earliest of the Tertiary periods, has, for example, yielded remains of Bats, Insectivora, Carnivora, Rodentia, many Ungulata, and Sea-Cows.

The Mammals of the Miocene, Pliocene, and Pleistocene periods, for which the visitor is referred to the 'Guide to the Fossil Mammals and Birds,' have increased in number and variety to the present day. In many instances the extinct predecessors of our small living mammals were gigantic ; but the African Elephant, if we except certain extinct members of the same group, attains as large a size as any extinct terrestrial Mammal, and the evidence of fossil remains does not show that Whales have existed in past times larger than those which now swim in our seas.

The subjoined Table shows the manner in which the Mammals are classified and arranged in the galleries devoted to their exhibition :—

Systematic Arrangement of the Existing Groups of the Class Mammalia.

Subclass I. **PLACENTALIA.**

MAMMAL GALLERIES.

In addition to the Elephants and Sea-Cows, which are shown in the Geological Department and the Central Hall, existing Mammals are exhibited in these galleries :—

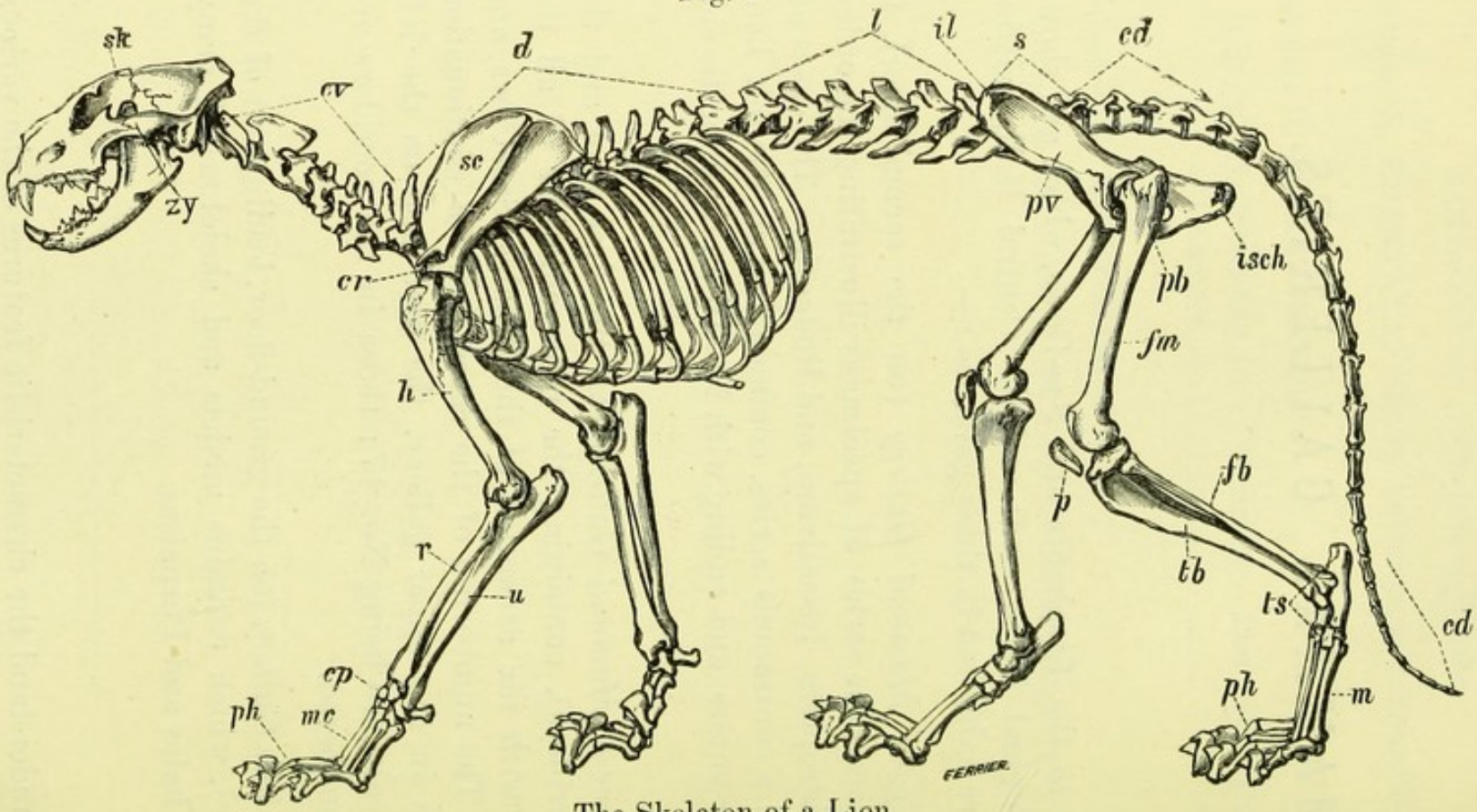
1. The *Upper Mammal Gallery* (on the second floor), in which are placed the series of specimens illustrating the orders Primates, Chiroptera, Insectivora, and Rodentia. The cases are numbered in a continuous series, commencing on the left hand as the visitor enters, and ending with No. 16 on the opposite side of the door.

2. The *Lower Mammal Gallery* (on the first floor and the adjacent corridors), containing the representatives of all the other orders with the exception of the Whales, Sea-Cows, and Elephants. The numbering of the cases forms a continuation of the series in the upper gallery, the first case on the left side of the entrance being No. 17; those in the corridors are separately numbered.

3. The *Whale Gallery* (on the ground-floor, leading out of the Bird Gallery), which contains models and skeletons of many species of Whales and Porpoises.

In order to understand the characteristic features of the various groups into which Mammals are divided, it is essential that the visitor should have some acquaintance with the names and relations of the bones forming the skeleton. To aid in this a

Fig. 1.



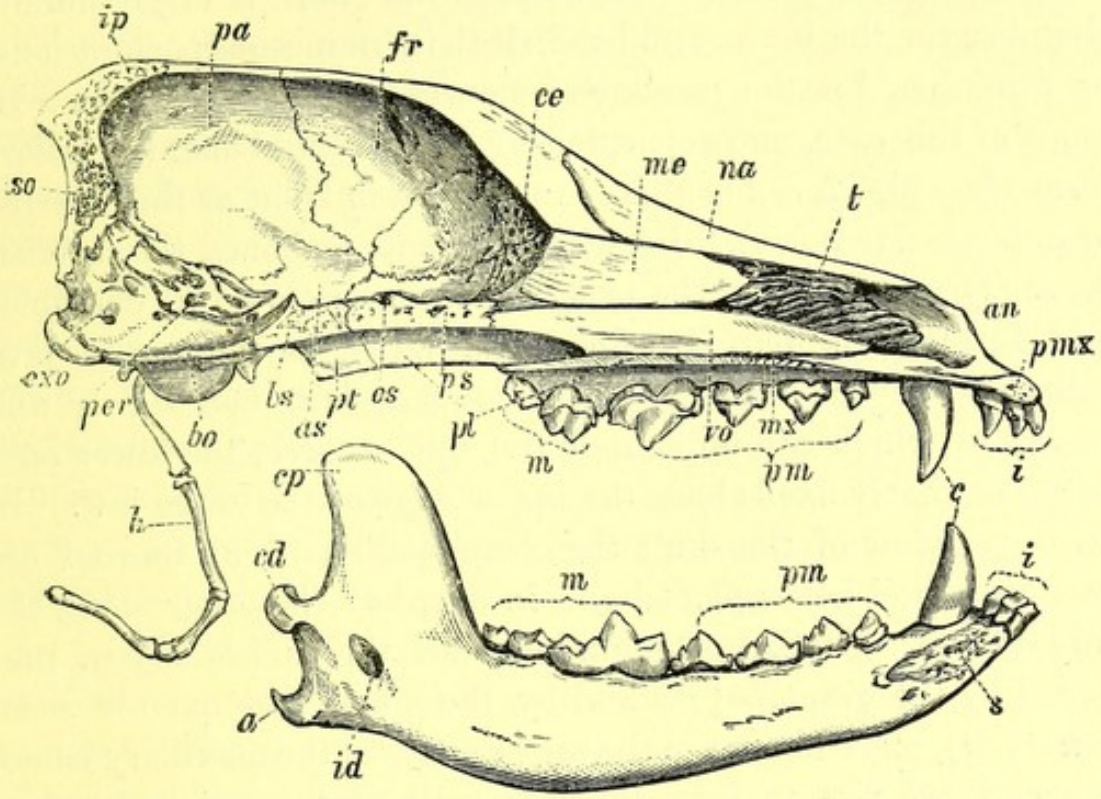
The Skeleton of a Lion.

cd, caudal vertebræ; *cp*, carpus; *cr*, coracoid; *cv*, cervical vertebræ; *d*, dorsal vertebræ; *fb*, fibula; *fm*, femur; *h*, humerus; *il*, ilium; *isch*, ischium; *l*, lumbar vertebræ; *m*, metatarsus; *mc*, metacarpus; *p*, patella; *pb*, pubis; *ph*, phalanges; *pv*, pelvis; *r*, radius; *s*, sacral vertebræ; *sc*, scapula; *sk*, skull; *tb*, tibia; *ts*, tarsus; *u*, ulna; *zy*, zygomatic arch.

few notes and explanatory figures are given before coming to the proper subject of this Guide.

The skeleton of a Mammal consists of two portions: one containing the bones belonging to the central axis of the body, viz. the skull, backbone, ribs, and breast-bone; and a second portion, comprising those which form the limbs, and the girdles of bone by which the latter are attached to the backbone.

Fig. 2.



The Skull of a Dog, divided down the middle line to show the internal structure.

a, angular; *an*, nostril; *as*, alisphenoid; *bo*, basioccipital; *bs*, basisphenoid; *c*, canine teeth; *cd*, condyle of lower jaw; *ce*, cribriform plate; *cp*, coronoid process; *exo*, exoccipital; *fr*, frontal; *h*, hyoid; *i*, incisor teeth; *id*, inferior dental canal; *ip*, interparietal; *m*, molar teeth; *me*, mesethmoid; *mx*, maxilla; *na*, nasal; *os*, orbitosphenoid; *pa*, parietal; *per*, periotic; *pl*, palatine; *pm*, premolar teeth; *pmx*, premaxilla; *ps*, presphenoid; *pt*, pterygoid; *s*, union of two halves of lower jaw; *so*, supraoccipital; *t*, turbinal; *vo*, vomer. (*From Sir W. H. Flower.*)

The skull is the portion of the axial skeleton by far the most important to the systematic naturalist, who bases in great part his classification of Mammals on the variations presented by the

skull and teeth ; the latter of which, although really no part of the internal skeleton, have, from their intimate relation with the skull, to be treated as though they belonged to that element.

The skull consists of three parts—(1) the brain-case, or *cranium*, a complicated framework of bones united to form a case for the brain, and a support and protection to the organs of smell, sight, hearing, and taste ; (2) the lower jaw, or *mandible* ; and (3) the *hyoid arch*, or tongue-bones.

The brain-case forms in its posterior half a large hollow chamber for the brain, and has in its base numerous perforations, or *foramina*, for the passage of nerves and blood-vessels. In front of this case, and separated by a sieve-like bone, the *cribriform plate* (fig. 2, *ce*), is a bony tube, open in front at the nostrils, or *anterior nares* (*an*), filled with light spongy bones, the *turbinal bones* (*t*), and forming the nose-chamber. Below this chamber, and forming in part its floor and walls, is the upper jaw, composed of the *maxillary* and *premaxillary* bones (*mx* and *pmx*), in which are implanted the upper teeth, the lower ones being similarly fixed along the upper edge of the lower jaw. In an upper view of the skull the component parts of its roof are seen as paired bones placed one in front of the other along the middle line. Of these the hindmost are the *parietals* (*pa*), preceded by the *frontals* (*fr*) and by the small and narrow *nasal bones* (*na*), placed between the upper edges of the maxillary bones, where these rise to form the side-walls of the nasal chamber. External to these bones are the *cheek*, or *zygomatic*, *arches* (fig. 1, *zy*), which serve to support and protect the biting-muscles, and are more or less developed in direct proportion to the biting-power of their owners. The hindmost part of the skull is made up of the *supraoccipital* (fig. 2, *so*), a pair of *exoccipitals* (*exo*), and the *basioccipital* (*bo*), surrounding the large opening —the *foramen magnum*—through which passes the spinal cord.

The lower jaw consists simply of a pair of solid bones, joined together in front, where they form the chin, but widely separate behind; each having a high projecting branch, the *coronoid process* (*cp*), for the attachment of the jaw-muscles, and an articular process, the *condyle* (*cd*), which forms part of the hinge on which the jaw works. This hinge is generally transverse to the general

axis of the skull; but in some orders, such as the Rodentia, the condyle is lengthened from front to back, and works in a corresponding longitudinal depression in the base of the cranium.

The tongue-bones, or hyoid apparatus (*h*), consist of a series of small bones suspended from the posterior part of the cranium, and supporting the larynx and root of the tongue.

The dentition of Mammals is of two kinds. In some few groups all the teeth are of one type or pattern, as in the Sloths, Armadillos, Dolphins, &c.; but the great majority are provided with teeth of several different types. Thus in the Dog's skull (fig. 2) the three small teeth fixed on each side in the premaxilla (*pmx*) are the incisors, or cutting-teeth (*i*); next follows a long and powerful tooth known as the canine (*c*). Behind this there are four cutting-edged premolars (*pm*) and two flattened true molars (*m*). In the lower jaw the same types of teeth are represented, there being in the Dog three incisors, one canine, four premolars, and three molars. These numbers vary greatly in the different orders of Mammals, and for convenience of description the "dental formula" has been invented as a means of representing the number of each sort of tooth present in any animal. That of the Dog would be—I. $\frac{3}{3}$, C. $\frac{1}{1}$, P. $\frac{4}{4}$, M. $\frac{2}{3} \times 2 = 42$, the letters indicating the sort, and the numerals the number of the teeth present on one side of the upper and lower jaws.

A second dental division of the Mammals is founded on the fact that in a few groups there is only a single set of teeth, whilst in others the adult dentition is preceded by an earlier set, named the "milk" dentition, on account of its generally being present during the period in which the young animal is nourished by the milk of its mother, although its duration does not coincide with that of the latter, the milk-teeth being in some cases shed or absorbed by the time the animal is born. Dolphins, Sloths, and some Armadillos are examples of animals with only a single set of teeth during their lives; but the great majority of Mammals, like Man, have two fully-developed sets, viz. the milk and the permanent dentition, the latter succeeding the former in a vertical direction.

The backbone, or vertebral column, consists of a variable

number of ring-shaped bones placed end to end, so as to form a long tube for the reception of the spinal cord. The vertebræ are divided into five groups (fig. 1), viz. :—the *cervical* (*cv*), or those of the neck, almost invariably seven in number ; the *dorsal* (*d*), those of the back. to which the ribs are attached ; the *lumbar* (*l*), or loin, vertebræ ; the *sacral* (*s*), or those to which the hip-bones are fixed ; and the *caudal* (*cd*), or those of the tail, ranging from 3 (in some Bats) to 47 (in the Insectivore *Microgale longicaudata*, the longest-tailed Mammal known).

The ribs are curved rods of bone, from 9 to 24 pairs in number, attached to the sides of the dorsal vertebræ, and passing round the body ; the greater part of them join the breast-bone, or *sternum*, in front, while the remainder, known as the floating or false ribs, have their ends free.

Passing to the limb-skeleton, the first for notice is the shoulder-girdle, which in Mammals consists generally of two separate bones—the *clavicle* or collar-bone, often absent or imperfectly developed, and the *scapula* (*sc*) or shoulder-blade, to which is firmly united a small projection of bone, the *coracoid* (*cr*), representing a third bone, completely separate in Birds, Reptiles, and also in the Monotremes or Egg-laying Mammals.

The *scapula* is a more or less flattened triangular bone placed outside the ribs, but not attached to them by bone, with its narrow end directed towards the ventral side of the body. At this narrow end there is a hollow socket, into which the head of the upper arm-bone fits. Along the middle of the scapula on its outer surface runs a long prominent ridge, terminating below in a prolonged process (*acromion*), to the tip of which the collar-bone, when present, is attached ; the other end of this bone is united to the upper part of the breast-bone.

The *humerus* (*h*), or upper arm-bone, is the powerful bone placed between the shoulder and elbow, articulating above with the scapula by a ball-and-socket joint and below with the *radius* (*r*) and *ulna* (*u*), the bones of the fore-arm, by a simple hinge-joint allowing motion in one direction only.

The two bones of the fore-arm are joined below to the wrist-

bones, collectively called the *carpus* (*cp*), and succeeded first by the *metacarpals* (*mc*), or palm-bones, and then by the *phalanges* (*ph*), or finger-bones, usually three to each properly developed finger.

The posterior girdle or *pelvis* (*pv*) is comparatively strong and rigid, firmly attached to the sacral part of the backbone. Originally it consists of three distinct bones on each side—the *ilium* (*il*), *ischium* (*isch*), and *pubis* (*pb*), corresponding, the first to the scapula, and the two latter together to the coracoid ; but these soon unite so completely as to form a single bone.

The hind-limbs consist of a similar set of bones to those of the anterior pair, viz. the *femur* (*fm*), or thigh-bone, corresponding to the humerus, followed by the *tibia* (*tb*) and *fibula* (*fb*), or shin-bones, representing the radius and ulna ; the *tarsus* (*ts*), or ankle-bones, corresponding to the carpus, and the *metatarsals* (*m*) and toe-bones (*ph*) to the metacarpals and finger-bones.

The digits never exceed five in number on each limb, and are often less numerous, being in some cases, as in the Horse-group, reduced to one.

Order I. PRIMATES.

(Upper Gallery, Cases 1 to 9, and I to IV.)

The Primates consist of Man, Monkeys, and Lemurs. The Monkeys most nearly allied to Man are the so-called Man-like Apes (the Gorilla, Chimpanzee, Orang-utan, and Gibbons), which in many points of their internal structure approach more nearly to Man than to other Monkeys, though their resemblance to him, both in osteological and external characters, is far greater in their infancy than after they have attained maturity.

The Primates, in their osteological characters, are distinguished from other Mammals by the eye-socket, or orbit, being surrounded by a bony plate ; by having clavicles or collar-bones ; by the presence, with few exceptions, of five digits on each extremity—the thumb being sometimes, and the great toe

almost always, freely opposable to the other digits and very largely developed. There are never more than two incisors on each side of each jaw, and canines are almost invariably present. Man, Apes, and Monkeys constitute the suborder Anthropoidea.

Fig. 3.

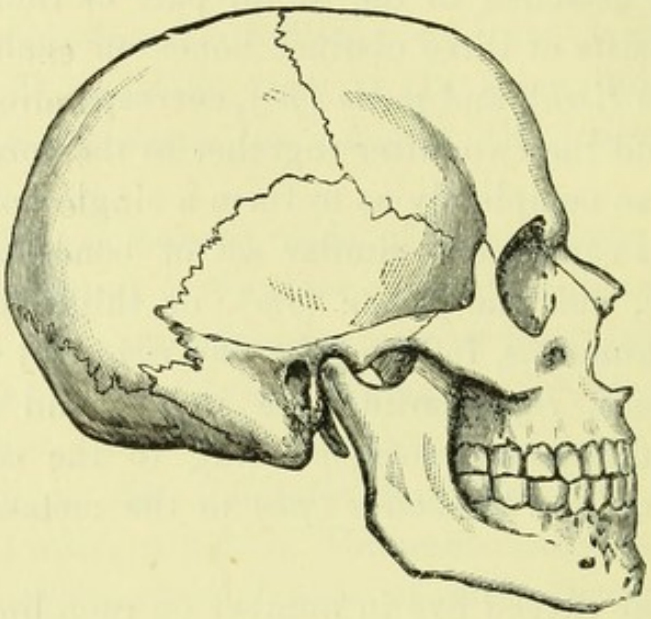


Fig. 4.

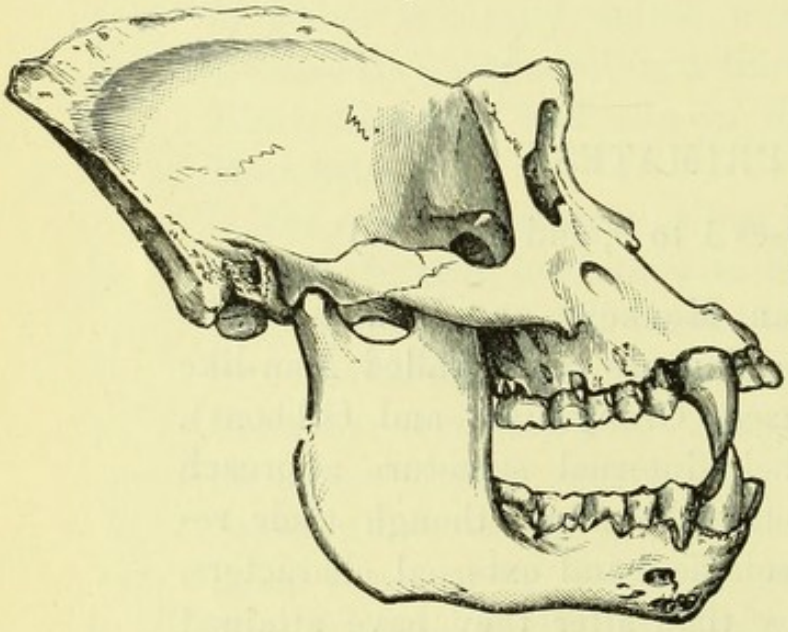


Fig. 5.

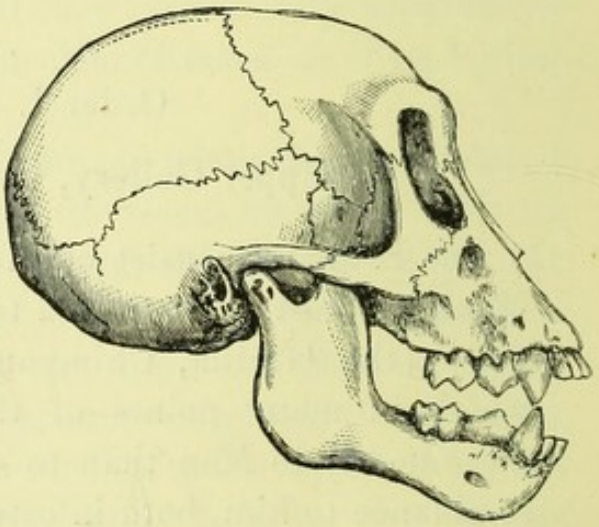


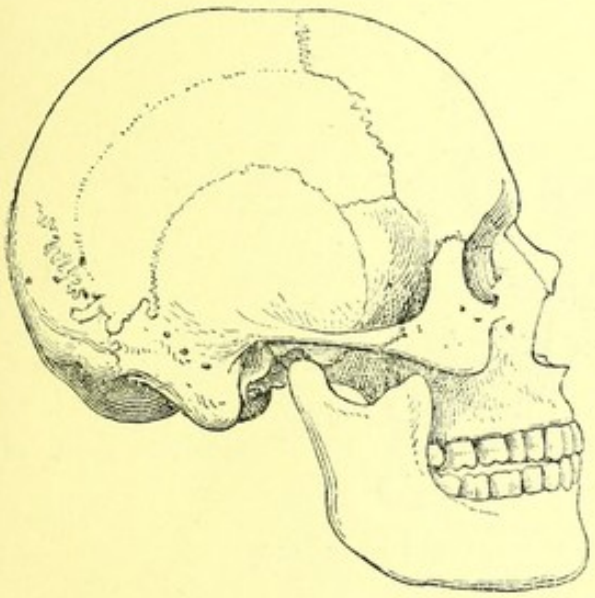
Fig. 3. Skull of a Man. Fig. 4. Skull of an old male and, fig. 5, of a young Gorilla.

[Cases 1 to 7.] The first family is the *Hominidæ*, containing Man himself *. His skeleton differs from the typical mammalian form mainly in relation to the upright position of the body, and the total

* See 'Guide to the Races of Mankind (Anthropology).' Price 4*d*.

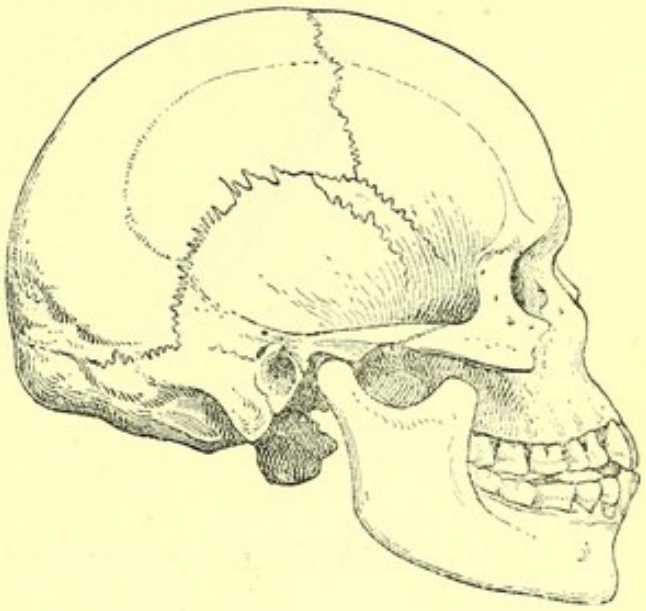
withdrawal of the front limbs from the function of progression, and their modification into grasping and feeling organs; at the same time the hind-limbs are developed sufficiently to be capable, by themselves, of supporting and moving the whole weight of the body. The direction of the hind-limbs is in a straight line with the axis of the vertebral column, instead of at right angles to it, as in other Mammals; the thumb is so attached to the wrist-bones as to be completely opposable to the other four digits, while the great toe is fixed parallel to the other toes, so that the foot is quite flat beneath, with little power of grasping, but forming a base on which the body may be balanced. The tail is only represented by the *coccyx*, an immovable bone composed of from three to five united vertebræ.

Fig. 6.



Skull of a Caucasian.

Fig. 7.



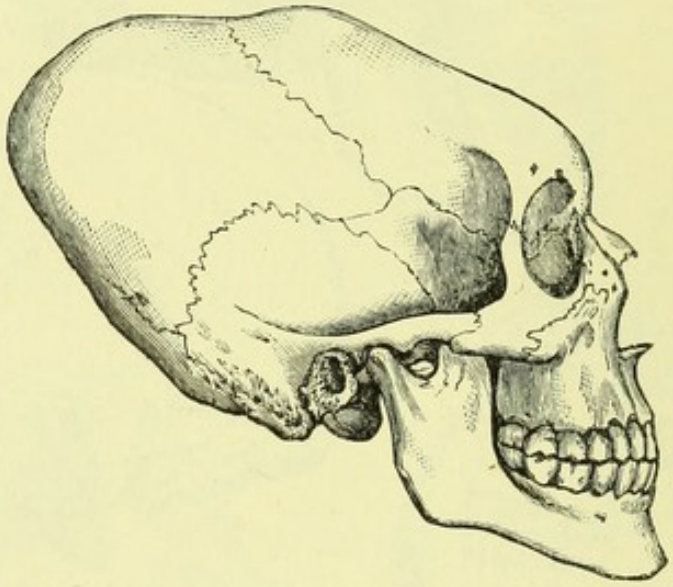
Skull of a Tasmanian.

Man's skull differs from that of the other Mammals by the great size of the brain-case, and the proportional reduction of the bones of the face, the result of the high development of the brain and the disuse of the jaws and teeth as weapons of offence and defence. It therefore follows that those races of mankind which have prominent jaws and small brain-cases are of a lower type than those in which the jaws are more reduced in size and the brain-case is larger. Australians and Tasmanians, for example, have a very small brain-cavity, thick skull-bones,

receding forehead, over-hanging brows, flat nasal bones, long and low orbits, very broad and low nasal opening, forwardly projecting jaws, but receding chin, and large teeth: strongly contrasting in each of these respects with the skull of a European.

[Cases 1 & 2.] Cases 1 and 2 illustrate the zoological characters of the Caucasian or White Races. In addition to a male and a female skeleton, case 1 contains some European and North-African skulls, among which may be specially noted those of two ancient Greeks from a tomb at Cyrene. In case 2 are exhibited some of the many skulls of Egyptian Mummies presented by Prof. Flinders Petrie. The Polynesians, Maoris, and Australians are also included in this section.

Fig. 8.



Skull of a Vancouver Islander, artificially deformed in infancy.

[Cases 3 & 4.] In cases 3 and 4 are specimens illustrating the Mongol, or Yellow and Red Races, which form the second great primary type into which the human race may be divided. In addition to the more typical Mongols (like the Chinese, Tatars, and Japanese), this division also includes the Eskimo and the native inhabitants of America, the latter of which are illustrated by a large series of photographs. There are exhibited numerous skulls of the Eskimo and American Indians, among which are some remarkable instances of artificially distorted skulls, formed by fastening boards and bands round the head during infancy. Fig. 8 represents one that has been lengthened in this way, that

of a Vancouver Islander; while there are others in the case that have been much shortened and broadened, notably two from Sacraficios Island, Gulf of Mexico. A series of busts illustrates some of the types of American Indians.

Attention may be directed to heads of two American Indians of the Javara tribe, from Ecuador, much reduced below the original size by the removal of the skull, and exhibited to display the character of the hair. Two skeletons of Arawak Indians from Guiana are of great interest to the anthropologist.

With the exception of the last, which contains American Monkeys, the remaining cases on the left side of the upper gallery are devoted to the Negro or Black Races, including not only the typical Negroes of the African Continent, but also the Negritos of the Andaman Islands, the Melanesian inhabitants of Eastern Polynesia and Papua, and the Tasmanians. Of the last, which are now extinct, busts of two of the latest survivors, as well as a skeleton, are exhibited, from which it will be seen that these people differ from the Australians by the frizzly nature of their hair, hereby resembling true Negroes. The South-African Bushmen—also a very low type—are represented by busts of a male and female; and the African Pigmies are exhibited in the form of the skeleton of a female of the Akka tribe obtained in Equatorial Africa by the late Dr. Emin Pasha, and by one of a male of the Bambuti tribe given by Sir H. H. Johnston, G.C.M.G. The Papuans are illustrated by photographs as well as by models and skulls; while, in addition to skulls, the fast-disappearing natives of the Andaman Islands are represented by three skeletons. [Cases 5–7.]

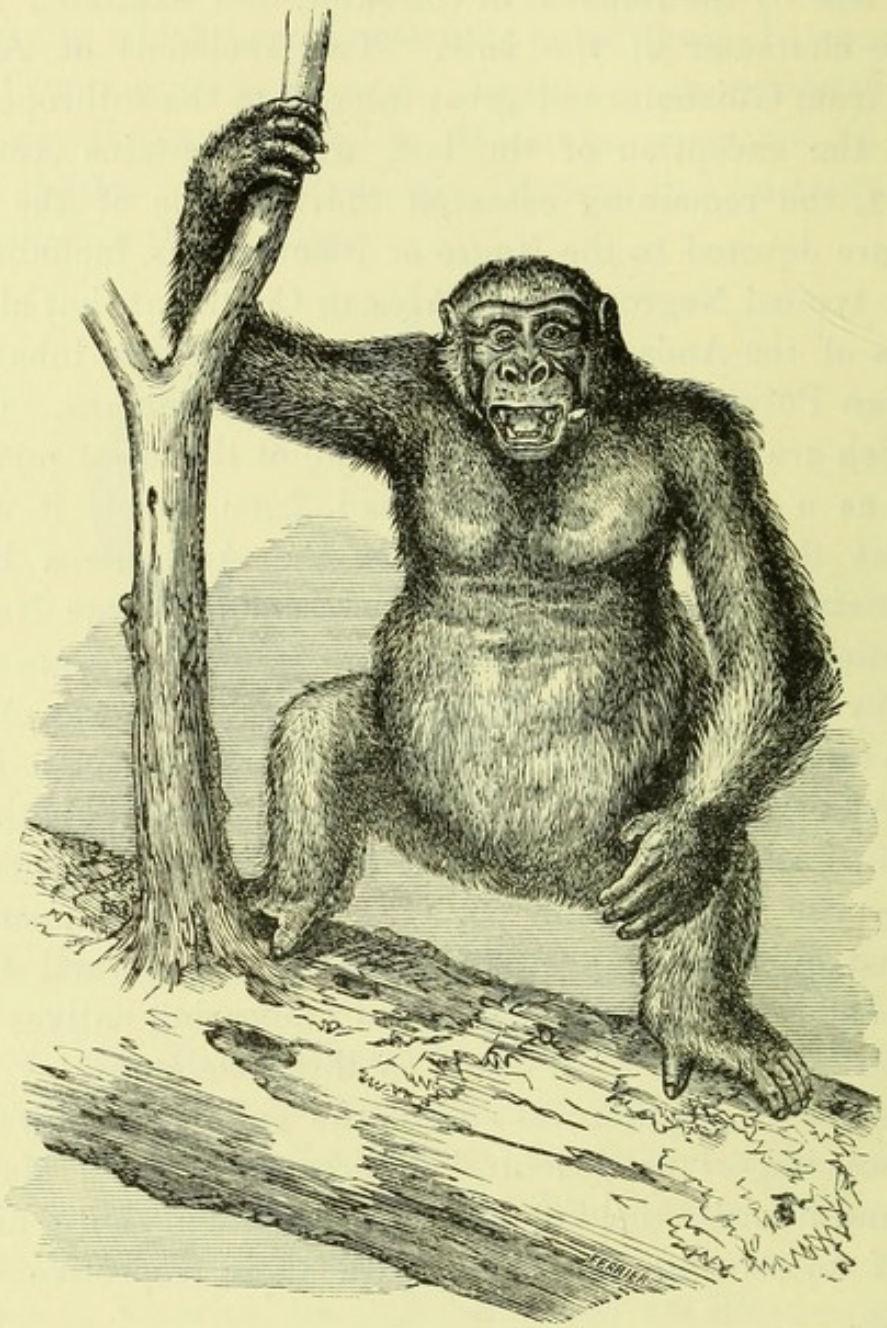
Table-case IV, at the west end of the gallery, displays some of the most important structural differences between Man and Apes; and likewise the different types of human skulls, and the mode of measuring the same, with their respective brain-capacities. [Case IV.]

In this case is placed a cast the only known fragment of the skull of *Pithecanthropus erectus*, a creature from the superficial deposits of Java supposed to connect Man with the Man-like Apes, and more especially the Gibbons. On the adjacent screen are exhibited the "papillary ridges" on the hands and feet of

Man and Apes, and also the method of identifying criminals by means of finger-prints.

[Cases I & II.] The *Simiidæ*, or Man-like Apes (cases I & II), are characterized by their inclined spinal column, broad breast-bone, the great length of their arms as compared with their legs, the enormous

Fig. 9.



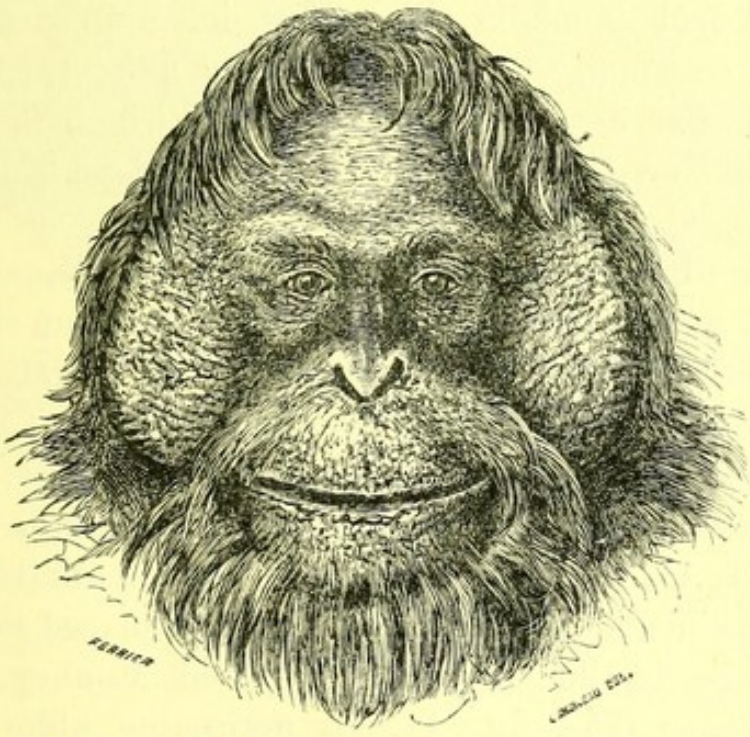
The Gorilla (*Anthropopithecus gorilla*).

ridges of bone above their eyes, especially in the male specimens, the large size of their teeth, and, in common with other Monkeys, the opposability of the great toe, a character which may be seen in the mounted skeletons. This family is taken to

include not only the Gorilla, Chimpanzee, and Orang-utan, but also the Gibbons; of all of which skeletons and skulls are exhibited. These Apes are tailless, and habitually assume a semi-erect position, using their disproportionally long arms to balance themselves by resting their knuckles on the ground. Several specimens of the Gorilla, *Anthropopithecus gorilla* (**1**), of various ages are exhibited in the front of the large centre case near the entrance to the gallery: conspicuous among them are two male specimens, whose projecting jaws, powerful teeth, and enormous brow-ridges give them a ferocious and savage appearance, wholly unlike that even of the lowest races of men or of their own young.

On the left of case II are the Chimpanzees, *Anthropopithecus troglodytes* (**2**), and in case I the Orang-utan, *Simia satyrus* (**3**), the former being closely allied and somewhat similar to the Gorilla, and also natives of the forests of Western and Central

Fig. 10.



Head of an adult Orang-utan (*Simia satyrus*).

Africa. The large male Orang-utan shows the peculiar shape of the cheeks characteristic of some individuals, in which they are provided with thick wart-like protuberances. The Gibbons, *Hylobates* (Nos. **4–10**), far less Man-like in every way, and

perhaps representing a distinct family, are also exhibited in case I. Their remarkable variability in colour, as exemplified by the groups of *H. pileatus* (**9**) and the Siaman, *H. syndactylus* (**10**), should be specially noticed. The Orang-utan and Gibbons are found in Sumatra and Borneo, the latter extending also northwards to Burma, Assam, and the Island of Hainan.

[Cases II & III.] The *Cercopithecidæ*, comprising the rest of the Old-World Monkeys, are of very various sizes and proportions, some having no tails at all, while others have enormously long ones, which, however, are never prehensile. They are distinguished from the *Simiidæ* by the quadrupedal position of the body, and the consequent modification of their skeleton, especially the shortening of their fore-limbs, which are always exceeded in length by the hind pair ; by their lower central incisors being larger than the outer ones, the converse holding in Man and the Man-like Apes ; by their more numerous back-vertebræ ; and by many other less definite characters, which remove them from Man in the direction of the lower Mammals.

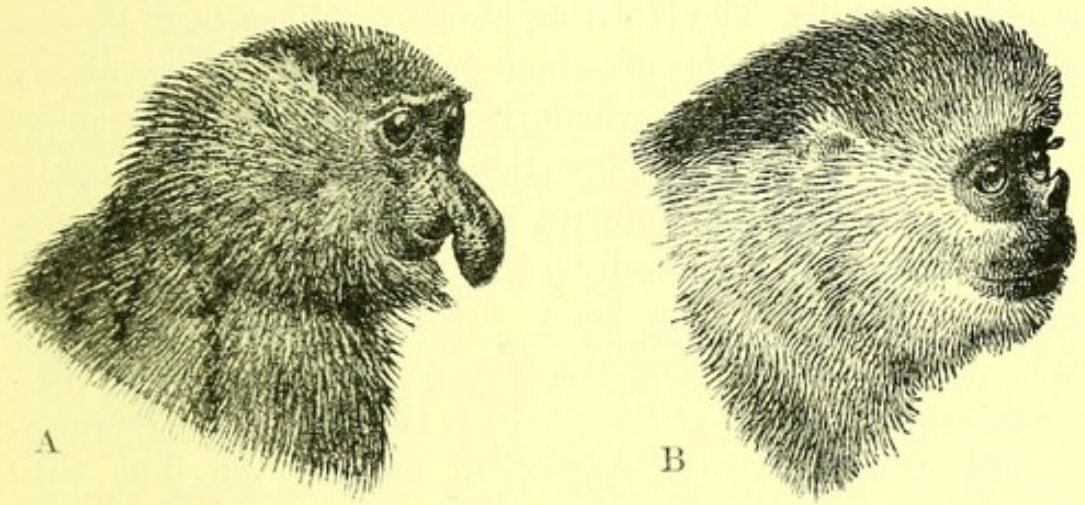
All Old-World Monkeys, like Man, have an osteological character in common, viz. the presence of a long bony tube leading from the outer to the inner ear, which is entirely absent in the New-World Monkeys. Their dental formula is invariably I. $\frac{2}{2}$, C. $\frac{1}{1}$, P. $\frac{2}{2}$, M. $\frac{3}{3} \times 2 = 32$.

In this family are included the Langurs, *Semnopithecus* (Nos. **11–22**), which are monkeys of large or medium size, with long tails, small posterior callosities, and generally rather short crisp fur, nearly uniform in colour, natives of India, China, and the East-Indian Archipelago. A more striking species, both in form and colour, is the Proboscis Monkey, *Nasalis larvatus*, of Borneo (fig. 11, A), so called on account of the remarkable length of nose of the male, of which examples are placed in case II (**23**). Near by is the Orange Snub-nosed Monkey, *Rhinopithecus roxellanæ* (**24**), fig. 11, B, noticeable alike for its brilliant coloration and small upturned nose; it inhabits Western China. The Guerezas, *Colobus* (Nos. **25** to **34**), are closely allied to the Langurs, but are natives of Africa ; some are dull rufous or grey, and others finely marked with sharply contrasting black and white, with long tufted tails, notably the true

[Cases II & III.]

Guereza (*Colobus guereza*), of Abyssinia, which has on each side a peculiar fringe of long white hairs reaching quite down to the ground. A number of specimens of these black and black-and-white Guerezas are placed in case III, to exhibit the transition [Case III.] from the black *C. satanas* (**28**) to species like *C. sharpei* (**27**), *C. caudatus* (**26**) and *C. vellerosus* (**29**), with much white. The long-tailed African Guenons, *Cercopithecus* (Nos. **35** to **57**), provided with cheek-pouches in which food can be temporarily stored, have large posterior callosities and extremely long tails; many of them are brilliantly coloured, as, for example, the Mona Guenon, *C. mona* (**52**). The Macaques, *Macacus* (Nos. **61** to **74**), are chiefly inhabitants of Southern Asia, but one species,

Fig. 11.



Heads of Male Proboscis Monkey, *Nasalis larvatus* (A), and Orange Snub-nosed Monkey, *Rhinopithecus roxellanæ* (B).

Macacus innuus (**72**), occurs in North Africa and also leads a precarious existence on the Rock of Gibraltar. The Baboons, *Papio* (Nos. **79** to **90**), hideous animals with powerful teeth, projecting jaws, nearly equal fore and hind limbs, and dull-coloured fur, are natives of Africa and Arabia (case II). [Case II.] One species, the Mandrill, *Papio maimon* (**87**), of West Africa, has a short stumpy tail and a perfectly naked face, the skin of which is brightly marked with blue and vermilion. The Drill, *P. leucophæus* (**88**), is an allied western species, without the bright colours. All the others are dull-coloured animals, with well-developed tails, the South African Chacma, *P. porcarius*

(**90**), and the eastern *P. anubis* (**80**) being well-known species. In the Arabian *P. hamadryas* (**86**) there is a large mantle of long hair on the shoulders, which is also developed in the closely-allied Abyssinian Gelada, *Theropithecus gelada* (**78**).

[Cases 7, 8, & 9.] The American Monkeys, forming the family *Cebidæ*, usually have a dental formula, I. $\frac{2}{2}$, C. $\frac{1}{1}$, P. $\frac{3}{3}$, M. $\frac{3}{3} \times 2 = 36$, differing from that of Old-World Monkeys by the presence of an additional premolar on both sides of each jaw. Externally they are characterised by their widely separated nostrils and imperfectly opposable thumbs, and usually by their prehensile tails.

The *Cebidæ* comprise, firstly, the Spider-Monkeys, *Ateles* (Nos. **96** to **110**), remarkable for their extremely long and slender limbs—of which, alone among the family, the anterior are longer than the posterior,—their rudimentary thumbs, and long prehensile tails. The Howling Monkeys, *Alouatta* or *Mycetes* (Nos. **128–131**), the males of which possess most extraordinary voices, the resonance of which is increased by a peculiar chamber formed by the middle portion of the bone of the tongue; they are stout, thick-set animals, with well-developed thumbs, prehensile tails, and generally of a uniform red, brown, or blackish colour, the males being furnished with short thick beards. The Woolly Monkeys, *Lagothrix* (Nos. **114** & **115**). The Sakis and Uakaris (*Pithecia*, Nos. **136–140**, and *Ouacaria*, Nos. **134** & **135**), two closely-allied genera, the first with peculiarly long thick hair all over the body and tail, the latter, though long, not being prehensile. The second genus is distinguished from all other American Monkeys by having scarcely any tail; one species (*O. calva*, **135**) exhibited is quite bald, and all are very thinly haired, in marked contrast to the Sakis. The Douroucoulis and Squirrel-Monkeys, *Nyctipithecus* (Nos. **152–154**), *Callithrix* or *Callicebus* (Nos. **146–151**), and *Chrysothrix* (Nos. **143–145**) are beautiful little creatures, with soft bright-coloured fur, long, hairy, non-prehensile tails, and well-developed thumbs; they live partly on insects. The Sapajous, or Capuchin Monkeys, *Cebus* (Nos. **117–124**), form a genus of numerous dull-coloured species, with thick prehensile tails and well-developed thumbs. Being comparatively hardy

and easily tamed, trained specimens are frequently exhibited alive in this country.

The last family of the more typical Primates is the *Hapalidæ* (Nos. **156–168**), or Marmosets, differing from the others by the non-opposable thumb, which is provided with a claw instead of a nail, the rudimentary great toe, long, hairy, and never prehensile tail, and the different number of their teeth. They are small animals, some not exceeding a rat in size, of bright and varied appearance, many being ornamented with long tufts of hair on their ears, and all more or less brightly coloured. Marmosets are almost entirely confined to the forests of tropical South America, a single species only extending as far north as Panama. Well-known representatives are the Common Marmoset, *Hapale jacchus* (**166**), and the Pinchi, *Midas œdipus* (**163**). [Case 9.]

The second suborder of the Primates—the LEMUROIDEA—includes a number of Mammals of a lower type than those hitherto mentioned, and for the most part natives of Madagascar, although a few are found in Africa and Southern Asia. They are almost invariably arboreal in their habits, and generally have long, bushy, and non-prehensile tails, opposable thumbs and great toes, large eyes, and long fox-like faces. From the Monkeys they differ osteologically by their longer snouts, smaller brain-cases, different dentition, and also by the sockets of the eyes, with one exception, being bounded on the outside only by a simple rod of bone instead of by a distinct bony wall. Among the skeletons of the genera exhibited, attention may be directed to that of *Tarsius spectrum* (**220**), remarkable for the extraordinary prolongation of the hind-foot. In this genus, as in Monkeys, the sockets of the eyes are bounded all round by a thin plate of bone, and the dentition is I. $\frac{2}{1}$, C. $\frac{1}{1}$, P. $\frac{3}{3}$, M. $\frac{3}{3} \times 2 = 34$. In the Aye-aye, *Chiromys madagascariensis* (**229**), the teeth are extremely reduced in number, the formula being I. $\frac{1}{1}$, C. $\frac{0}{0}$, P. $\frac{1}{0}$, M. $\frac{3}{3} \times 2 = 18$. The incisors are very thick, long, curved, and without roots, as in Rodents, while the crowns of the molars are flat and smooth. The suborder is divided into families, of which the *Lemuridæ* contains by far the great majority of the species [Cases 9 to 9 C.]

and all those inhabiting Madagascar, which agree in respect to certain structural details of the internal ear. It is subdivided into the following subfamily groups :—

[Case 9.] The *Indrisinæ* or Sifakas, *Indris* (**171**) and *Propithecus* (**174–184**), characterized by their disproportionately long hind-limbs, the toes of which are united by skin, and the possession of only 30 teeth. They are exhibited in case 9, and are singularly variable in colour, as may be seen by the mounted groups of the different species. When on the ground they move in an upright position, holding their arms over their heads in order to balance themselves, and progressing by short leaps in a most awkward and ludicrous manner.

Fig. 12.

The Aye-aye (*Chiromys madagascariensis*).

[Cases 9 & 9 A.] The true Lemurs, or *Lemurinæ*, have the fore and hind limbs of nearly equal length, toes free to the base, and 36 teeth. They are more quadrupedal in their action than the last group, moving about both on the ground and in trees with great activity. Like the Sifakas, they are very variable in their coloration, being marked with various shades of red, brown, and black. Numerous specimens of the Ruffed Lemur, *Lemur varius* (**200**), are exhibited in the case, which also contains the Ring-tailed Lemur, *L. catta* (**199**).

[Case 9 C.] The third subfamily is represented by the aforesaid Aye-aye (**229**, fig. 12), a creature with only 18 teeth, large ears, a long

bushy tail, and long compressed claws on all the fingers and toes, with the exception of the great toe, which is opposable and furnished with a flat nail. The middle finger of the fore-foot is unusually thin, and it is said that with this finger the Aye-aye pulls out of their holes the wood-boring caterpillars which form part of its diet. It also uses its powerful incisors or cutting-teeth, which are shaped like those of a Rodent, to gnaw through the stems of sugar-canes and other plants, in order to obtain their succulent juice.

The second family, or *Nycticebidæ*, includes the African Galagos, or *Galaginæ*, distinguished by the unusual elongation of their tarsal bones. The species of *Galago* (**205–208**) are found in Africa, from Senegambia to Cape Colony. It also comprises the subfamily *Lorisinæ*, which contains several rare and curious forms, such as the Pottos, *Perodicticus* (**224–226**), of Equatorial Africa and the Slow Lemurs, *Nycticebus* (**221–223**) and *Loris* (**227, 228**), of India and Ceylon. Specimens of all are exhibited in case 9 A. [Case 9 A.]

The third family of Lemuroidea, the *Tarsiidæ*, contains a single genus only. The Tarsiers, *Tarsius spectrum* (**220**) and *T. fuscomanus*, are extraordinary little animals about the size of a small rat, with 34 teeth, very long feet, long tufted tails, and extremely large eyes; they are natives of the islands of the East-Indian Archipelago. [Case 9 B.]

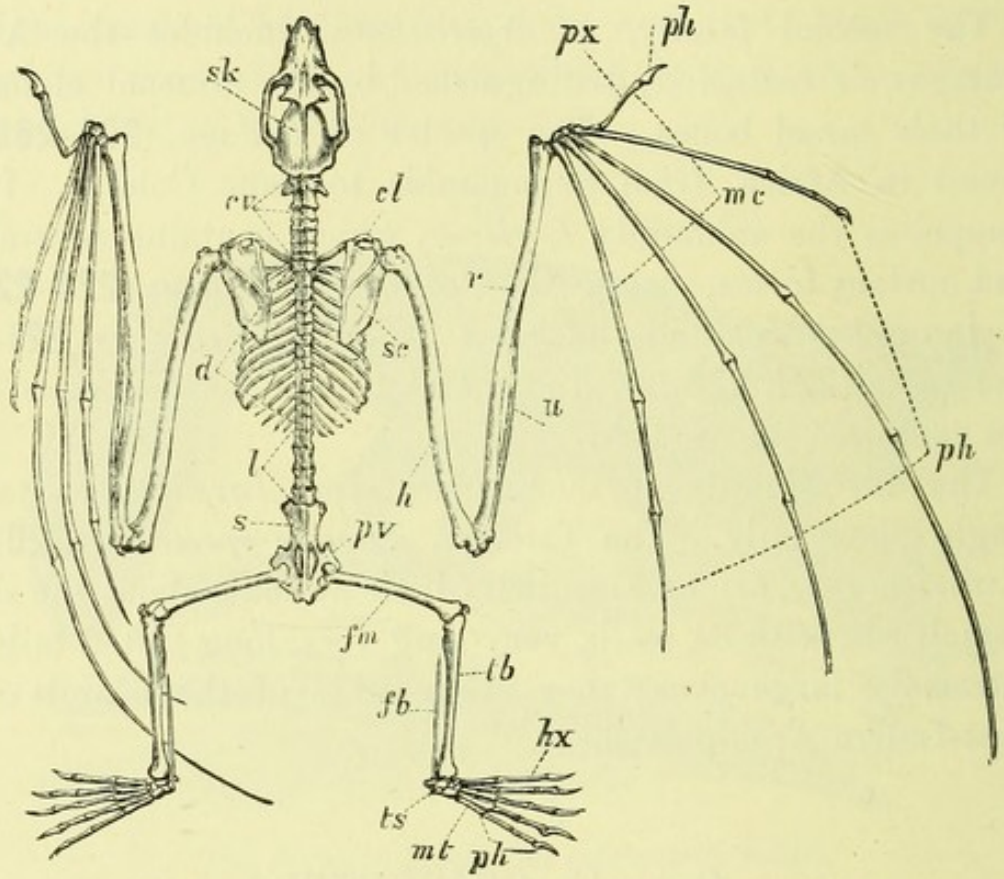
Order II. CHIROPTERA.

(Upper Gallery, Cases 13 A, B, and C, and 14.)

The Bats, or Chiroptera, form one of the most sharply defined of all the orders of Mammalia, having the fore-limbs modified into wings. The structure of a Bat's wing is very simple : it consists of a framework formed by the bones of the arm and the enormously elongated fingers, between which the flying membrane (a continuation of the skin of the body) is expanded, being attached behind to the front of the hind-leg. In most species there is also an additional membrane spread between the hind-legs, in which the tail is included. The thumb alone is free,

and assists in locomotion during the awkward attempts of most Bats to walk on all-fours. The hind-limbs, which in ordinary Mammals propel the body forwards, are almost entirely relieved of that office, being singularly weak and feeble, and of little use except while the animal is flying, asleep, or resting. In repose Bats hook the sharp claws, with which the hind toes are furnished, on to some support, and remain suspended with the head downwards until again ready to fly.

Fig. 13.



Skeleton of a Fox-Bat or Flying-Fox (*Pteropus*).

cl, clavicle; *cv*, cervical vertebræ; *d*, dorsal vertebræ; *fb*, fibula; *fm*, femur; *h*, humerus; *hx*, great toe, or hallux; *l*, lumbar vertebræ; *mc*, metacarpals; *mt*, metatarsals; *ph*, phalanges; *pv*, pelvis; *px*, thumb, or pollex; *r*, radius; *s*, sacral vertebræ; *sc*, scapula; *sk*, skull; *tb*, tibia; *ts*, tarsus; *u*, ulna.

In the skeleton (fig. 13) the fore-arm is formed almost entirely by the *radius* (*r*), the *ulna* (*u*) being rudimentary. The thumb (*px*) is short, free from the flying-membrane, and provided with a claw (*ph*); while the other fingers are long, slender, and clawless, with the exception of the index, corresponding to our

fore-finger, which in some genera also possesses a claw. Collar-bones or clavicles (*cl*) are well developed in all the species.

The hind-limbs, which, as already stated, are thin and feeble, differ from those of other Mammals in that they are twisted backwards, so that the knee, like the elbow, is directed backwards. In those species which are provided with a flying-membrane between the hind-legs, this is supported by a long process, or spur, attached to the heel.

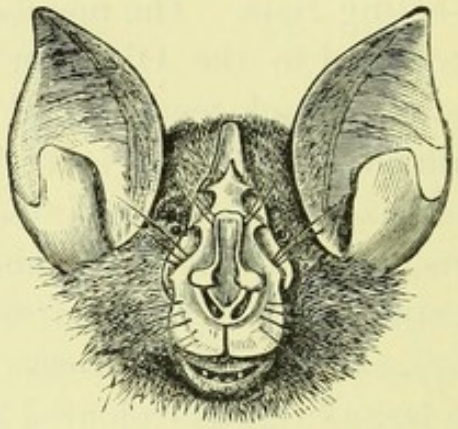
The Chiroptera are divided into two suborders—the Fruit-eating and Insect-eating Bats. The members of the first group, all of which are confined to the Old World, are, as a rule, of large size, with flattened back-teeth, suited for munching fruit, and with claws both on the first and second fingers; while the latter are of smaller size, with sharp-pointed back-teeth, suitable for crushing insects, and with claws on the thumbs only.

Of the Fruit-eating Bats (Megachiroptera, with the one family *Pteropodidæ*), exhibited in wall-case 14, the most worthy of mention are the large brightly-coloured Fox-Bats, commonly called Flying-Foxes, of which certain species, for example the Philippine Fruit-Bat, *Pteropus jubatus* (**301**), reach to between 4 and 5 feet in spread of wing. One member of this group, *Pteropus medius* (**297**), is extremely common all over India, where it inflicts enormous damage on fruit-gardens, to pillage which these Bats will often make nightly raids of from ten to twenty miles, returning each morning to their accustomed sleeping-places. In striking contrast to these is the small *Rousettus amplexicaudatus* (**308**). Another noticeable group contains the Tube-nosed Bats, *Cephalotes* (**312, 313**), in which the nostrils are elongated into peculiar tubes, the special use of this still remaining a mystery; they range from Celebes to Australasia. Fruit-Bats are spread over all the tropical parts of the Old World, *Pteropus* being unrepresented in Africa, where its place is taken by the Epauletted Fruit-Bats, *Epomophorus* (**314–316**), and the Hammer-headed Bat, *Hypsignathus monstrosus* (**317**), of West Africa. [Case 14.]

The Insect-eating Bats, or Microchiroptera, exhibited in cases 13 A, B, C, are much more numerous, being distributed over the whole world, and extending even to remote islands in [Cases 13 A, B, C.]

the Pacific, where they are the only indigenous Mammals. With few exceptions, they are of dull coloration. Though in other respects much alike, they present striking modifications in their facial characters, many of them developing on their muzzles structures known as nose-leaves, which seem to be organs of touch of extreme delicacy, and are of wonderful variability both in shape and size (see fig. 14). Another

Fig. 14.



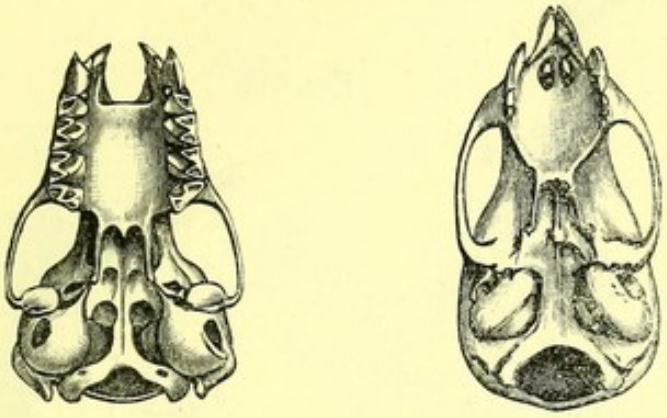
Head of the Indian Horseshoe-Bat (*Rhinolophus mitratus*).

feature of Bats, especially those in which the nose-leaf is small or absent, is the presence of a kind of an additional ear, or "tragus," within the main ear.

Of the Insectivorous Bats exhibited, the following may be noticed :—The False Vampires, *Megaderma* (**343**) of Africa, Asia, and Australia, which correspond among Bats to the Carnivora among Mammals generally, preying habitually on the smaller species of Chiroptera ; the Horseshoe-Bats of Europe, *Rhinolophus ferrum-equinum* (**320**) and *H. hipposiderus* (**324**) ; the Long-eared Bat, *Plecotus auritus* (**341**), in which the ear is nearly as long as the body ; the Noctule, *Pipistrellus* (*Pterygistes*) *noctula* (**361**), the largest of the English Bats ; the peculiar Naked Bat, *Chiromeles torquata* (**380**), of the Malay countries ; the White Bat, *Diclidurus albus* (**381**), of South America ; and the Painted Bat, *Kerivoula picta* (**369**), of India, in which the orange-and-black wings resemble the fruit and decaying leaves of the bananas among which it lives. Among the Vampires may be mentioned the Lesser Vampire,

Vampyrus auritus (**397**), and the Javelin Vampire (**398**), both well-known South American species. Many of these American Bats were formerly supposed to be guilty of blood-sucking; but one of the three real Blood-sucking Bats is *Desmodus rufus* (**400**), of which a specimen was caught by

Fig. 15.



A B

Skulls of (A) the Noctule and (B) a Blood-sucking Bat.

Mr. Darwin in the act of sucking blood from a horse. These Bats attack men as well as animals in their sleep, fanning the victims with their wings. The wounds they inflict are small, but often continue to bleed after the Bats are satisfied, and do not readily heal.

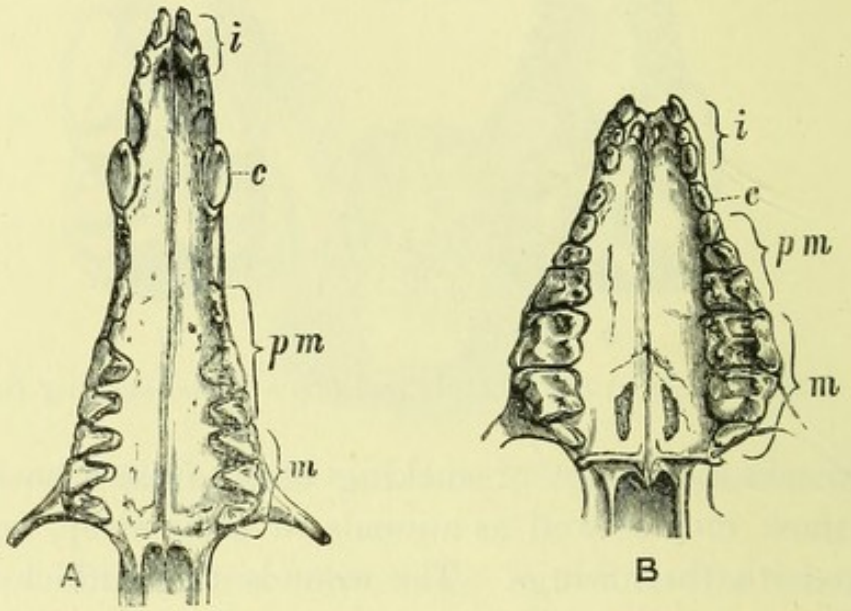
Order III. INSECTIVORA.

(Upper Gallery, Case 13.)

The small order of Insectivora, or Insect-eating Mammals, is a group of which the English Hedgehog, Shrew, and Mole are familiar examples. The members of this group are small Mammals, of dull and inconspicuous coloration, gaining their living either by burrowing in the ground for worms and grubs, by hunting for beetles and other insects in grass and underwood, or, more rarely, by climbing among trees after their prey. By far the greater portion are purely animal-feeders. Their voracity is extraordinary, instances being recorded, both of Moles and Shrews, in which, when two individuals kept

in the same cage have attacked each other, the victor has eaten the whole of its opponent, leaving only the skin. A fast of three or four hours is fatal to most of them, so that the total number of worms and insects destroyed by the members of this order must be enormous. The range of the Insectivora extends over the whole world, with the exception of Australasia and South America.

Fig. 16.



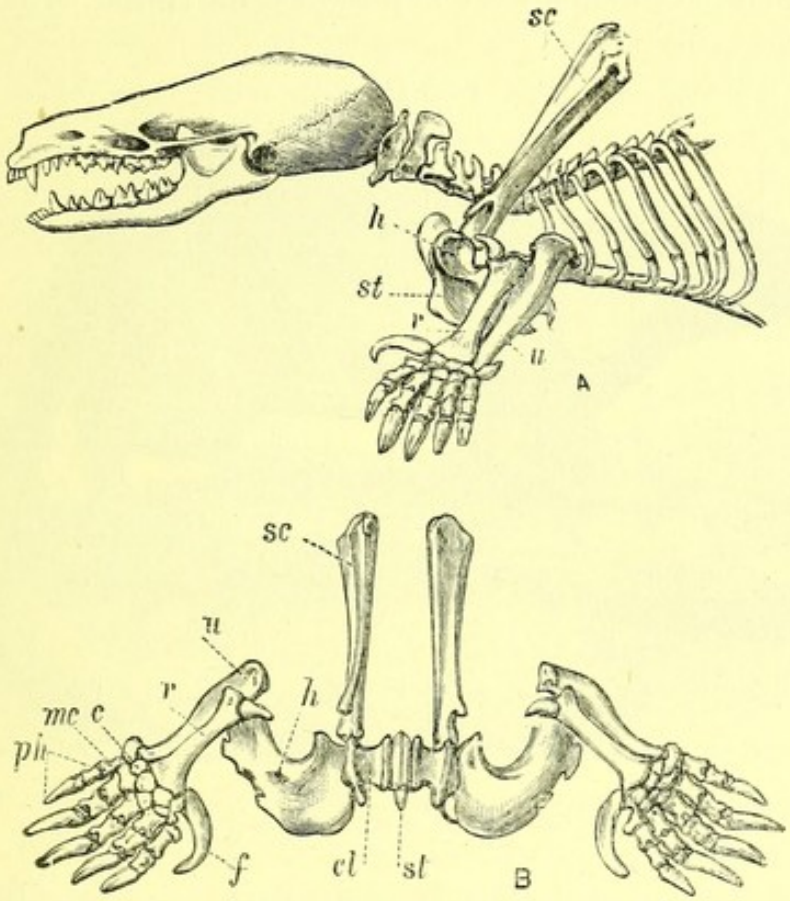
Upper teeth of (A) the Tenrec and (B) the Hedgehog.

c, canines; *i*, incisors; *m*, molars; *pm*, premolars.

Insectivora are not an easily defined group, since they contain many species in which certain parts of the skeleton are remarkably modified. Their teeth are strong and well developed, and, in the majority, clearly separable into the usual divisions; but in some, such as the Shrews and Moles, the incisors, canines, and premolars are by no means readily distinguished from one another. Throughout the order the premolars and the molars are surmounted with minute pointed cusps, suitable for crushing the insects on which, as may be gathered from their name, nearly all Insectivora feed. The zygomatic, or cheek, arches are generally either weak or entirely absent. The dentition offers many important differences, the Desmans (*Myogale*) having enormous incisors and

small canines, while the opposite is the case in the Moles (*Talpa*) and the Tenrecs (*Centetidæ*). The members of the typical section, Insectivora Vera, are divided into two groups, distinguished by the shape of the molars, which are either triangular and 3-cusped, as in the Tenrecs (fig. 16, A) and Golden Moles, or square and many-cusped, as in the Hedgehogs (fig. 16, B), Moles, and Shrews.

Fig. 17.



Fore part of the Skeleton of the Mole. A, Side view. B, Front view of Shoulder-girdle and Fore-legs.

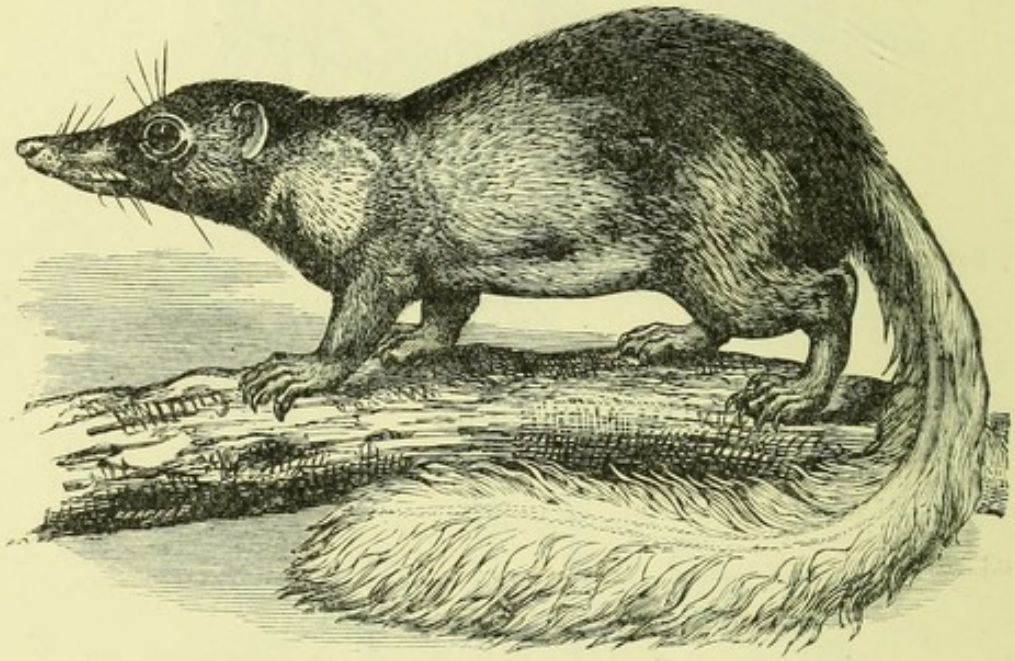
c, carpus; *cl*, collar-bone, or clavicle; *f*, sickle-like bone; *h*, humerus; *mc*, metacarpus; *ph*, phalanges; *r*, radius; *sc*, scapula; *st*, sternum; *u*, ulna.

Skeletons of the chief types are exhibited; the most noteworthy are those of the Moles (*Talpa*), fig. 17, in which the *humerus* (*h*) is enormously large, strong, and ridged, to afford insertion for the powerful digging-muscles; the *scapula* (*sc*) is long and straight; and the fore-foot, in addition to its proper

complement of five toes with strong nails, possesses a much enlarged sickle-like bone (*f*), which adds to the breadth and strength of the palmar surface. The pelvis or hip-bone is much compressed, in order that the hind-legs, which are comparatively weak and small, should not project too much laterally.

The order is divided into the typical Insectivora, or Insectivora Vera, and the Dermoptera, represented only by the aberrant Flying Lemurs. In the former group we have, firstly, the Tupais, or Tree-Shrews (*Tupaiidæ*), of India, Malaya, and

Fig. 18.



A Tupai, or Tree-Shrew (*Tupaia tana*).

S. China, which are so like Squirrels both in appearance and habits as easily to be mistaken for them. They feed on various insects, and also to a small extent on fruit, and are the only Insectivores which habitually seek their food by day. There are numerous brightly-coloured, bushy-tailed species belonging to the family, mostly referable to the genus *Tupaia* (fig. 18, **286–289**) ; but there is also the curious little pen-tailed Tree-Shrew, *Ptilocercus lowi* (**290**).

The Jumping Shrews, or Elephant-Shrews (*Macroscelididæ*), are long-nosed and long-legged little animals, natives of Africa, which use their long hind-legs for leaping about over the sand,

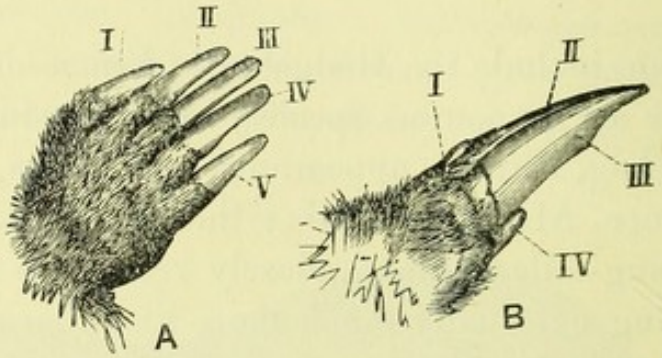
like kangaroos or jerboas, seldom putting their fore-feet to the ground. This modification for leaping is very common in animals living in tracts of desert country, as it facilitates progress over deep loose sand. The largest members of the family belong to the genus *Rhynchocyon* (**264**), of which mounted specimens and a skeleton are exhibited; several species of the typical genus *Macroscelides* (**268–270**) are also shown.

The *Erinaceidæ* include the Hedgehogs (*Erinaceus*, **247–249**), of which there are numerous species, all very similar to the English Hedgehog, both in appearance and habits, and distributed over Europe, Africa, and Asia; the Rat-Shrew, *Gymnura* (**245, 246**), a long-tailed animal, closely related to the Hedgehogs, but looking externally much more like a large Rat; and *Hylomys* (**244**), also Rat-like, but much smaller and with a very short tail; the two latter are natives of the Malay Peninsula, Sumatra, and Borneo.

In the Mole family (*Talpidæ*) the long-tailed Desmans, *Myogale*, one species of which, *M. moschata* (**278**), lives in the neighbourhood of the Caspian Sea, and the second, *M. pyrenaica* (**279**), in the Pyrenees, are entirely aquatic in their habits, living on water-insects and crustaceans, which they obtain by the help of the long and peculiarly formed snout. The feet are edged with stiff bristles to assist them in swimming, and, for the same purpose, the powerful tail is flattened from side to side. The Moles, *Talpa* (**274, 275**), comprise a considerable number of species, alike externally, but differing among themselves in the structure of their skulls and teeth. They are long-nosed, short-tailed animals, with rudimentary eyes, and soft velvety fur, of such a structure as to lie equally well in either direction, thus enabling them to move freely in their burrows either backwards or forwards. They are also remarkable for their short, broadened, spade-like fore-feet, the toes being strong and all of nearly the same length (see fig. 19, A). With these highly efficient instruments Moles are able to force the earth aside and throw it backwards while burrowing in the ground. Their breeding-habits are illustrated in a special case in the pavilion at the end of the Bird Gallery on the ground

floor. In North America Moles are represented by several distinct genera, such as *Scapanus* (**271**) and *Condylura* (**277**), the latter being the curious Star-nosed Mole. In Japan there is the Mole-Shrew, *Urotrichus* (**273**), represented by an allied species in North America.

Fig. 19.



A, Fore-foot of Mole. B, Fore-foot of Golden Mole.

The digits are distinguished by numerals, the fifth being absent in the Golden Mole.

The Shrew-Mice (*Soricidæ*) form a family containing a large number of Mouse-like animals differing from one another mainly by slight variations in their teeth, but all presenting much the same external appearance. The great majority are terrestrial in their habits, as, for example, the English Common and Pigmy Shrews, *Sorex araneus* (**252**) and *S. minutus* (**253**), which burrow on or close to the surface of the ground, and live on small beetles, worms, or such other animal food as they can obtain. The larger Indian Shrews, *Crocidura* (**257–260**), are provided with unusually large scent-glands, by means of which a substance of a most penetrating odour is secreted. Others live in ponds and streams, feeding on water-beetles and crustaceans, after which they swim and dive with great facility. To this group belongs the British Water-Shrew, *Neomys fodiens* (**250**), a beautiful velvet-coated animal with a long tail, and feet provided, like those of the Desmans, with lateral swimming-bristles.

The family of Tenrecs (*Centetidæ*), which is confined to Madagascar and the Comoro Islands, consists of several genera and species. Among these may be mentioned the Spiny

Tenrecs, *Centetes* (**233**), as some of the largest of the order and the Striped Tenrecs, *Hemicentetes* (**238**, **239**). The Long-tailed Tenrecs, *Microgale* (**235**, **236**), are remarkable for the length of their tails; and there are also the Rice-Tenrecs, *Oryzoryctes* (**237**), and the aquatic *Limnogale*.

To these is allied *Potamogale velox* (**232**), a native of Equatorial Africa, which in habits resembles the Otters, living in the

Fig. 20.

The Flying-Lemur or Taguan (*Galeopithecus volans*).

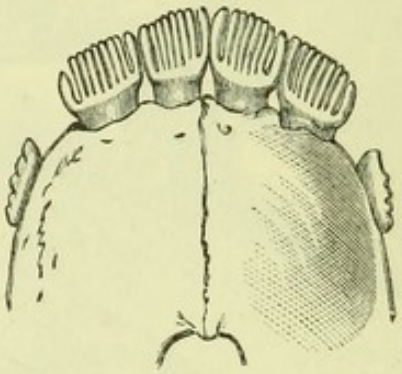
water, and feeding on small fishes, crustaceans, and water-beetles. Still more curious, on account of their isolated distribution, are *Solenodon cubanus* (**231**), of Cuba, and an allied species from Haiti, forming the family *Solenodontidæ*, there being practically no representatives of the order in Central or South America.

The last family is formed by the Golden Moles (*Chrysochloridæ*), of East and South Africa, which are very like European Moles in general shape, but are distinguished,

among other points, by the entirely different form of their anterior digging limbs, which are narrow, and each provided with an enormous central claw, the outer toes being quite small (see fig. 19, B). Several species of *Chrysochloris* (**240**, **241**) are shown, some remarkable for the iridescence of their fur, which fades when dried and stuffed.

The Taguans or Flying-Lemurs, *Galeopithecus* (**284**, fig. 20), of the Indo-Malay countries represent the group Dermoptera, which is classed by some with the Insectivora and by others as a distinct order. These animals are about the size of cats, with a lateral extension of the skin of the body, supported by the four limbs and tail, and forming a sort of parachute, by means of which they can glide through the air for considerable distances

Fig. 21.



Lower Incisor Teeth of the Flying-Lemur.

from tree to tree ; their flying leaps are, however, always in a descending direction, as in Flying-Squirrels and Flying-Lizards, and unlike the flight of Bats. Flying-Lemurs live exclusively on vegetable food. In the skeleton the radius and ulna are partly joined together, in order to render the fore-arm more rigid ; the hip-bones are united below by a long bony union ; and in the skull the muzzle is broad and flattened, the socket of the eye nearly surrounded by bone, and there are well-developed cheek-arches. The dentition of these animals is altogether unique, especially the lower incisor teeth (fig. 21), which are of a very remarkable pattern, being so deeply notched as to appear like minute combs.

Order IV. CARNIVORA.

(Lower Gallery, Cases 17 to 32 and F & F*.)

The Carnivora comprise the animals known as Beasts of Prey, such as Cats, Wolves, Dogs, Bears, Weasels, and allied Mammals. From this terrestrial type (Carnivora Fissipedia) has been developed another, adapted for an aquatic life, with limbs modified into swimming-organs, viz. the Carnivora Pinnipedia, or Fin-footed Carnivora, as represented by Seals and Walruses.

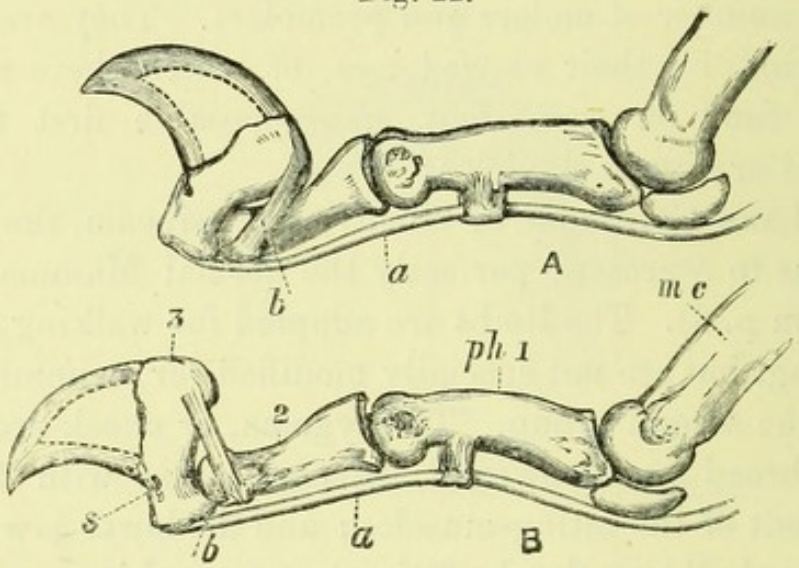
The Carnivora form a large and natural division of Mammals, distinguished by their specialized double sets of teeth; the second or permanent set being almost invariably made up of three incisors on each side, above and below (of which the outer is the largest), one long, sharp, and powerful canine or eye-tooth, and a variable number of molars and premolars. They are also well characterized by their clawed toes, of which there are never less than four on each foot, non-opposable first toes, and incomplete or absent clavicles.

In the Land-Carnivora, or Carnivora Fissipedia, the skeletons are such as to represent perfectly the normal Mammalian type (figured on p. 6). The limbs are adapted for walking, running, or climbing, but are not specially modified for swimming, as are those of the second group. The zygoma, or cheek-arch, of the skull is broad and powerful, in correlation with the great development of the biting-muscles; and the lower jaw is articulated to the skull by a closely-fitting transverse hinge, which gives great strength and firmness to the joint, but deprives the animal of the power of moving the jaw backwards and forwards, or from side to side, its only motion being in a vertical direction. The varied and highly-developed dentition differs from that of other Mammals by the development of the last premolar of the upper jaw and the first molar in the lower into the so-called "sectorial" or "carnassial" teeth, which are specially adapted for cutting animal food. The shape of these teeth is highly characteristic of the different genera.

The Cats, or *Felidæ* (cases 17 to 19), are the most highly organized of all the Beasts of Prey, representing the predaceous type of animal in its fullest perfection. They are all lightly but [Cases 17-19.]

strongly built, with short heads and ears, and, except in the Lynxes, long hairy tails, which are never prehensile. They are invariably digitigrade (that is to say, they walk on their toes, not on their palms and soles), and are provided with five toes on the fore-feet, of which the first, or thumb, does not touch the ground, and four on the hind-feet, the first being entirely suppressed. Their sharp, powerful, and strongly-curved claws are retractile (*i. e.* they can be drawn back when not in use, to prevent them from being blunted by contact with the ground), the mechanism of this retraction being explained below. In disposition Cats belong to the fiercest of animals, and Man has succeeded in taming, to a certain extent, only one member of the group, the common Domesticated Cat. All the other species

Fig. 22.



Bones and Tendons of Toe of the Cat. A, with retracted, and B, with extended claw.

a, tendon of extensor muscle; *b*, retractor ligament; *mc*, metacarpal; *ph* (1, 2, and 3), 1st, 2nd, and 3rd phalanges; *s*, bony sheath, into which the claw is fixed.

become savage and blood-thirsty when adult, even if, as kittens, they are apparently docile and attached to their masters. The geographical distribution of Cats extends over the whole world, with the exception of Madagascar and the Australian region. Cats have unusually long and powerful canine teeth, admirably suited for seizing and killing their prey, and sharp-edged scissor-like sectorial teeth, equally well adapted for cutting up

flesh or breaking and crushing bones, which form an essential part of their food. The actual number of teeth, however, is much reduced, the dental formula being I. $\frac{3}{3}$, C. $\frac{1}{1}$, P. $\frac{3}{2}$, M. $\frac{1}{1} \times 2 = 30$ and the whole jaw is shorter in comparison with the length of the head, and therefore proportionally stronger. In the limbs the most noticeable characteristic is the peculiar shape and articulation of the toe-bones, which have direct reference to the power Cats possess of retracting their claws. Fig. 22 A shows the bones of a toe with the claw in its ordinary retracted state ; when the animal wishes to strike, the tendon (*a*) is drawn back, and the whole terminal phalanx (3) with the claw attached is drawn downwards and forwards, as in B. At other times the claw is drawn back and kept from contact with the ground by an elastic ligament (*b*). The sheath (*s*) into which the claw is fixed is present in all Carnivora, but in no other is it so much developed as in the present family.

Of the Lion, *Felis leo* (**410**), several examples from different parts of Africa are exhibited. Lion-cubs show traces of the dark spots so general in the family of Cats. The present range of the Lion extends over the whole of Africa, through Persia, to the north-western corner of India. [Case 17*.]

In case 18 is placed a specimen of the Ounce or Snow-Leopard, *Felis uncia* (**417**), a soft-furred, long-tailed species, which inhabits the snowy regions of the Himalaya and Central Asia, at elevations varying, according to the season, from 9000 to 18,000 feet above the sea, never ranging very far below the snow-line. The same case contains specimens of different races of Leopard, *Felis pardus* (**412**), one of the largest of the spotted Cats, whose range extends over all Africa and Southern Asia as far north as Persia and Tibet. In India it is extremely destructive to cattle and other domestic animals, and aged individuals frequently become "man-eaters." The Jaguar, *Felis onca* (**418**), may be regarded as the American representative of the Leopard. [Case 18.]

The Tiger, *Felis tigris* (**411**), case 19, is the largest and most dangerous of the *Felidæ*, exceeding the Lion slightly in size, and far surpassing it in destructiveness. It is one of the few Cats ornamented with cross-stripes on the body, a type of colouring [Case 19.

scarce among Mammals, these cross-stripes helping to render the animal inconspicuous among the vegetation in which it commonly hides itself, where it would be comparatively easily seen if marked with spots or longitudinal bands. The Tiger inhabits nearly the whole of Asia, from Persia, across Siberia, to Formosa, and southwards throughout India and Burma to Sumatra, Java, and Bali, but it is not found in either Ceylon or Borneo. Specimens are exhibited of the smaller, longer-furred variety of Persia, of the very large, short-haired Bengal form, and also of the large, stoutly built, and long-haired Siberian race. A Nepalese Tiger shot by H.M. the King is exhibited near the entrance to the Upper Mammal Gallery.

[Cases 17 to 19.] Of the other species of Cats exhibited to the public, the most noteworthy are the tropical American Ocelot, *F. pardalis* (**435**), and Fontanier's Cat, *F. tristis* (**437**), of Tibet, and the Clouded Leopard, *F. nebulosa* (**416**), of Assam and the Malay countries, which are its Asiatic representatives. The African Serval, *F. serval* (**427**) ; the long-haired Tibetan Pallas's Cat, *F. manul* (**421**) ; and the African Wild Cat, *F. ocreata* (**425**), from the Egyptian representative of which Domesticated Cats originated, are also shown. Lynxes (case 19), which differ from ordinary Cats by their short tails, tufted ears, and certain peculiarities in their skulls and dentition, are very characteristic of the North Temperate and Arctic zones of both the Old and New Worlds, but are represented in India and Africa by the Caracal. The species represented include the Common Lynx, *F.* (*Lynx*) *lynx* (**444**), the Southern Lynx, *F.* (*L.*) *pardina* (**452**), and the Caracal, *F.* (*L.*) *caracal* (**446**).

[Case 19*.] The most aberrant member of the *Felidæ* is the Hunting Leopard, usually called in this country the Chita, characterized by its small round head, light and slender form, semi-retractile claws, and various other peculiarities, both osteological and external. It is a native of a large part of Africa and India. In India it is trained for hunting antelopes and similar game. Its speed at times, and for short distances, is marvellous, surpassing that of a race-horse ; and, when well trained, it always runs down its quarry, although in the wild state it uses the same tactics as other Cats when stalking its prey, availing itself of

every inequality of the ground to steal close up to a spot whence it can suddenly spring upon the unsuspecting victim. It is referred to a genus by itself, under the name of *Cynælurus jubatus* (**447**).

In case 18 is placed a cast of the skull of the great extinct South American Sabre-toothed Tiger (*Machærodus neogæus*), as representing a group formerly widely spread over the globe, and remarkable for the great development of their huge upper canine teeth.

The second family of the Carnivora is the *Viverridæ*, consisting of the Civet-Cats and allies. These are all comparatively small animals, of low build and dull coloration, with long hairy tails; they are entirely confined to Africa and Southern Asia, with the exception of two species which are found in South-western Europe. They are in all respects less highly specialized for carnivorous habits than the Cats, their teeth being more numerous and far weaker than those of the latter. The following are the most noteworthy groups:—*Cryptoprocta*, containing but one species, the Foussa, *C. ferox* (**454**), peculiar to Madagascar, and the largest Carnivore of that island. This animal is remarkable for its Cat-like head, retractile claws, and other feline characters; it is quite untamable, and excessively savage when caught or wounded. The Civet-Cats, *Viverra* (**463** to **465**), of which there are four species, one African and three Indian, have hairy soles and partially retractile claws; these animals produce in a pouch beneath the tail the scent known as civet, which is obtained by the natives from individuals kept in captivity for the purpose. The Genets, *Genetta* (**458** & **459**), of which there are several African species, are smaller than, but very similar to, the last; one of them, the Common Genet, *G. vulgaris*, or *G. genetta*, extends into Europe as far as Central France. The beautiful Oriental animals known as Linsangs, *Linsanga* or *Prionodon* (**478**), with their West African relative *Poiana* (**477**), find a place here. The Palm-Civets, *Paradoxurus* (**471** to **476**), are long-bodied, short-limbed animals, with short ears, long, powerful, hairy tails, naked soles, and semi-retractile claws, common in India and the Malay Archipelago. They are arboreal in their habits, and feed either on rats, lizards, small [Case 20.]

birds and eggs, or on vegetable food, such as rice and fruit. In Africa they are replaced by the allied genus *Nandinia* (**468**, [Case 21.] **469**). The Mongooses, *Herpestes* (**483** to **503**) &c., of Africa and India, have naked soles, and long, straight, non-retractile claws. They feed on reptiles and birds, rats and mice, eggs, &c., and are often domesticated for the purpose of clearing houses of vermin. They are most useful in destroying poisonous snakes, whose bites they avoid by their wonderful watchfulness and agility, the stories of their having recourse to some plant as an antidote to the snake's poison being entirely without foundation. There are about 30 species of Mongoose known. Of these the most noticeable are the Egyptian Mongoose, *Herpestes ichneumon* (**499**), which is found also in Spain, and feeds largely on the eggs and young of the crocodile; and the Indian Mongoose, *H. mungos* (**498**), the species tamed in India. Many of the African Mongooses are referred to separate genera, among the best-known being the Kusimanses, *Crossarchus* (**491**, **492**), of which one species is banded, and the Meerkat, *Suricata* (**488**), the latter being easily tamed.

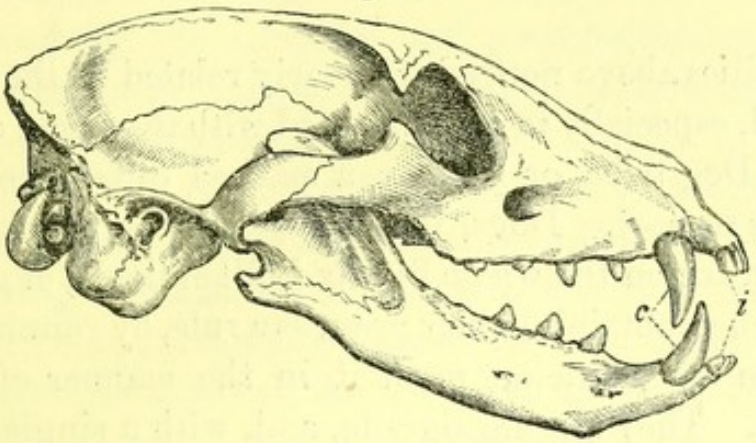
More or less nearly allied to the Mongooses are several peculiar species from Madagascar, among which may be specially mentioned *Eupleres goudoti* (**483**), exhibited in case 21, which obtains the beetles and worms on which it lives by burrowing in the earth with its elongated snout. Its teeth are so reduced in size as to resemble those of the Insectivora.

The Maned Jackal, or Aard-Wolf of the Dutch Boers of South Africa, *Proteles cristatus* (**505**), of which there are specimens in case 21, looks like a diminutive Hyæna, but has very feeble teeth, as it lives nearly entirely on decomposing carcases, and on termites or white ants, which its strong claws enable it to dig out of their nests. It is found throughout Africa, from Abyssinia and Somaliland to the Cape. The molar teeth are almost rudimentary, and the skull (fig. 23) has no strong ridges or crests. By some naturalists this animal is taken to indicate a separate family; but by others it is included in the *Hyænidæ*.

[Case 21.] The family *Hyænidæ* comprises the Hyænas (case 21), of which there are three well-marked living species, *Hyæna striata* (**506**) and *H. brunnea*, the Striped and Brown Hyænas, and

Hyæna crocuta (**508**), the Spotted Hyæna of South Africa. They are of about the size of a large Wolf, of cowardly and nocturnal

Fig. 23.

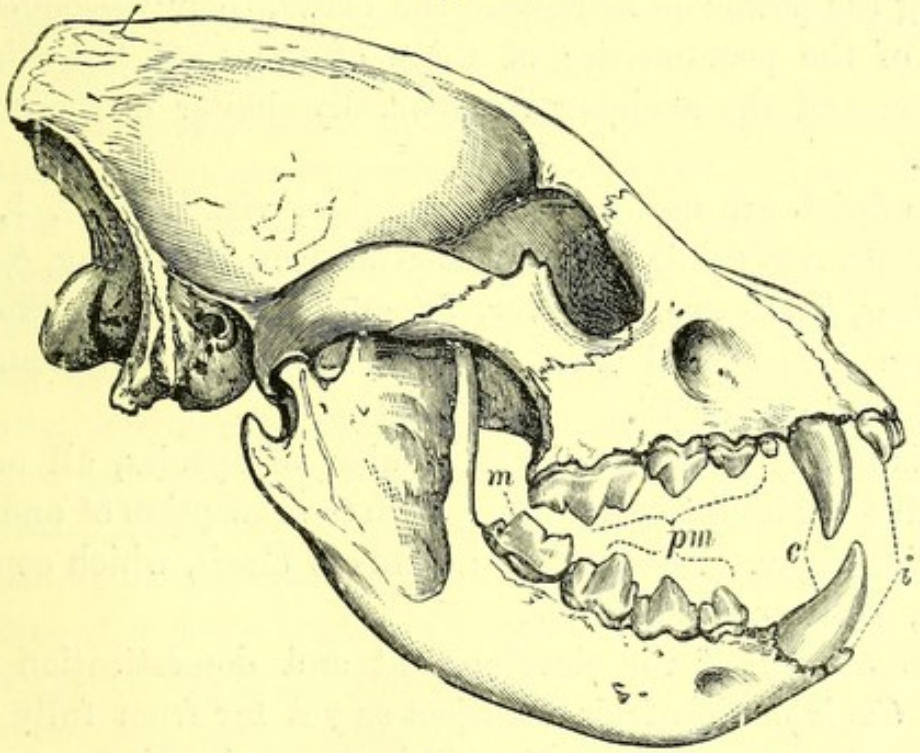


Skull of the Aard-Wolf (*Proteles cristatus*).

c, canine; *i*, incisors.

habits, feeding for the most part on carrion, and rarely attacking animals which are able to defend themselves. They have four toes on each foot, non-retractile claws, and a rather short, hairy

Fig. 24.



Skull of the Striped Hyæna (*Hyæna striata*).

c, canine; *i*, incisors; *pm*, premolars; *m*, molars.

tail. Hyænas are specially characterized by the enormous power of their teeth and jaws and the great height of the crests on the skull for the attachment of the biting-muscles. The dental

formula of the existing species is I. $\frac{3}{3}$, C. $\frac{1}{1}$, P. $\frac{4}{3}$, M. $\frac{1}{1} \times 2 = 34$. Certain extinct species have, however, rather more teeth; some forming a connecting-link between the modern Hyænas and the Civets.

[Cases 21* & 22.] The families above noticed are nearly related in the characters of the skull, especially those connected with the organ of hearing, but in the Dog tribe, or *Canidæ*, a marked difference is observable in this respect. Dogs, Wolves, and Foxes, which constitute this family, are on the whole lightly-built animals, of great speed and endurance, obtaining their prey, as a rule, by running it down, rather than by pouncing upon it in the manner of Cats and their allies. They are digitigrade, and, with a single exception, have five toes on their fore and four on their hind feet; their palms and soles are always hairy, the only naked parts being the pads of the feet. The various members of the family are all much alike in their osteological and dental characters; their skulls are more elongated than those of the Cats, and their teeth (fig. 2, p. 7) more numerous and less highly specialized. Not having the power of retracting the claws, their toe-bones have none of the peculiarities of those of the Cats, but otherwise the bones of the skeleton are generally similar to those of the latter.

The teeth are usually 42 in number, viz. I. $\frac{3}{3}$, C. $\frac{1}{1}$, P. $\frac{4}{4}$, M. $\frac{2}{3}$. In one species, the South-American Bush-Dog, *Speothus venaticus*, there are, however, 38 only; while in another, the African Long-eared Fox, *Otocyon megalotis*, the number is increased to 46 or 48.

This family contains a large number of species, all more or less closely allied to each other, with the exception of one or two peculiar kinds. The principal genus is *Canis*, which comprises Dogs, Wolves, and Jackals.

The history of the development and domestication of the Dog, *Canis familiaris*, is a subject as yet far from fully understood. Many naturalists, till within a recent period, entertained the view that there had existed one original wild species, from which, by Man's agency, all the various breeds were developed. This view has now been abandoned; in its place it is believed that in many parts of the world the natives have tamed the wild

species of their own country, and that in course of time, as certain nations became more civilized, their Dogs were more and more adapted to their various requirements by careful breeding, and by the selection and perpetuation of the most useful varieties, until many of them ceased to show resemblance to their far-distant wild ancestors.

In support of this view, the fact may be adduced that at the present day, among savage and primitive tribes, the tame Dogs bear a striking resemblance to the wild species found in their country. Thus the Eskimo Dog resembles the North-American Wolf (*Canis lupus nubilus*), the Hare-Indian Dog the Coyote or Prairie-Wolf (*C. latrans*), while in British Guiana the natives are known to train and domesticate the indigenous Wild Dogs. In the Old World the Hungarian Sheep-Dog might be readily mistaken for the European Wolf (*Canis lupus*), the Street-Dogs of Constantinople and Cairo for Jackals, and certain of the Indian Pariah Dogs for individuals of the Indian Wolf (*Canis pallipes*). The Bushmen of South Africa have a tame Dog which agrees in many of its characters with the Black-backed Jackal (*Canis mesomelas*) of that region.

There accordingly seems little doubt that these tame or semi-domesticated Dogs are individuals of the same stock as the wild species of the country, with which indeed they readily mix whenever they cease to be under the control of their masters.

In more civilized countries the process of domestication and selection has gone so very much further that the Dogs have gradually lost nearly all traces of their wild ancestry, and developed into the innumerable different breeds now existing, breeds so distinct that, were they natural instead of artificial, they would be referred to several different genera. Representatives of a large number of these breeds, inclusive of the Pariah Dogs of India and Egypt, and of the Dingo, or Australian Dog, are exhibited in the North Hall with the other domesticated animals.

Dogs were domesticated by Man long before the earliest records of history, their remains being found in association with the rude implements of the ancient cave and lake dwellers of Central Europe.

[Cases 21*-22.] In case 21* are the Wolves. The species and races represented include the European Wolf, *C. lupus* (**517**), the American Wolf, *C. lupus nubilus* (**510**), and the great Alaskan Black Wolf, *C. l. pambasileus* (**512**), the latter represented by a specimen presented by Mr. F. C. Selous. The Prairie-Wolf or Coyote, *C. latrans* (**513**), of North America, and the very different Red or Maned Wolf, *C. jubatus* (**514**), of South America, are also shown. The Jackals of Africa and India (in the same case) are smaller in size, well-known species being *C. aureus* (**523**), *C. adustus* (**525**), and *C. mesomelas* (**524**).

Among the Foxes (*Vulpes*) may be noticed the Common Fox, *V. alopex* or *V. vulpes* (**543**), the Cross-Fox of North America, *V. v. fulva* (**541**), and others. The white phase of the Arctic Fox, *V. lagopus* (**540**), one of the most important fur-bearing animals, changes the colour of its coat according to the season, like many other Arctic animals; but the blue phase retains its dark colour all the year round.

The beautiful large-eared Fennecs (case 22) of Africa are closely allied to the Foxes. With these is placed a specimen of the Long-eared Fox of South and East Africa, *Otocyon megalotis* (**535**), noticeable for its very numerous teeth and sharp-pointed and long ears.

[Cases 21*-22.] The African Hunting-Dog, *Lycaon pictus* (**518**), so remarkable for its external similarity to a small Spotted Hyæna, forms a genus by itself, readily characterized by having but four toes to each foot (case 21*). Another peculiar genus is represented only by the Bush-Dog, *Speothus venaticus* (**548**), of Guiana and Brazil, and an allied South American species; an example of the first is exhibited in case 22. Its molar teeth are quite unlike those of other members of the family. The Wild Dogs or Dholes of Asia (case 21*) resemble, in some respects, the Hunting-Dog, but since they have five front toes, fewer teeth, and other characteristic points of difference, they are regarded as representing a separate genus, under the name of *Cyon*, the species represented being the Central Asian *C. alpinus* (**519**) and the Indian *C. deccanensis* (**521**).

[Case 25.] With the Raccoon tribe, or *Procyonidæ* (case 25), we come to the first of three families of Land-Carnivora, which differ from

all the foregoing members of the order in regard to the conformation of that part of the skull connected with the internal organ of hearing. The more typical members of this assemblage are completely plantigrade, walking on the soles of their feet, the great majority having five toes to each foot.

The *Procyonidæ* are typically American, and contain, among others, the Raccoons, *Procyon* (**582**), the peculiar long-nosed Coatis, *Nasua* (**583**, **584**), and the Kinkajou (*Cercoleptes*, or *Potos*), the last a nocturnal animal with a long prehensile tail. All the members of this family habitually live largely on vegetable food, such as fruits, berries, &c., as well as on small mammals, birds, insects, worms, eggs, &c.

Fig. 25.

The Great Panda (*Æluropus melanoleucus*).

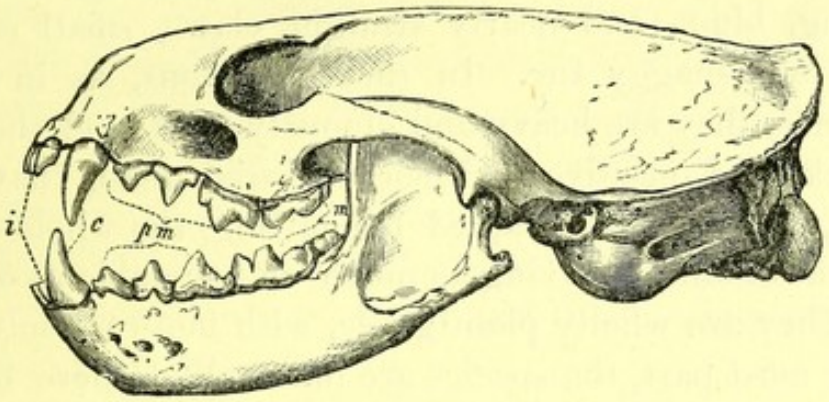
The brilliantly-coloured Panda, *Ælurus fulgens* (**586**), exhibited in the same case, is one of two Asiatic representatives of the family, and occurs in the north-eastern Himalaya and the mountains of Assam, whence it ranges into Western China. It lives at a considerable altitude in the Himalaya, seldom descending lower than about 7000 feet above the sea, and feeds

wholly on fruits and other vegetable food. Remains of a larger extinct species have been found in the Upper Tertiary formations of England. The other Asiatic species is the Great Panda, *Æluropus melanoleucus* (**587**, fig. 25), a short-tailed black-and-white animal, inhabiting Eastern Tibet and Western China, long regarded as a Bear, to which group it has probably some relationship.

[Cases 23 & 24.] The family *Mustelidæ* (cases 23 and 24) contains the Weasels, Otters, Badgers, &c., which agree closely in the characters of their skulls and teeth, but may be separated into three groups by their general form and the structure of their feet and claws. These tribes are:—(1) The *Mustelinæ*, or Weasel group, the members of which have long low bodies, with short legs, short and partly webbed toes, and small, sharp, and often semi-retractile claws. The fur of some of the species forms an important article of trade, as of the Marten and Sable, *Mustela* (**563** to **568**), of Northern Europe, Asia, and America. Of these one species is British, namely the Pine-Marten, *M. martes* (**565**), now nearly exterminated in England, but still holding its own in the wilder parts of Scotland. The true Weasels, *Putorius* (**550** to **561**), comprise a number of comparatively short-haired species, inhabiting nearly all parts of the world. Among them may be mentioned the Stoat or Ermine, *Putorius ermineus* (**552**), three specimens of which have been mounted to show the séasonal change of fur; the Weasel, *P. nivalis* (**553**); and the Polecat, *P. fœtidus*, or *P. putorius* (**558**), of which the Ferret is a domesticated form. The African *Pœcilogale albinucha* (**569**) is the most brightly marked of the group; and its largest member is the circumpolar Glutton, *Gulo luscus* (**577**), a heavily built, powerful animal, much resembling a small Bear, and very destructive to game. (2) The *Melinæ*, or Badger group, have comparatively stout thick-set bodies, covered with fur generally marked with more or less sharply contrasted black and white bands or patches, and long toes provided with large straight claws, more powerful on the fore than on the hind feet. They include the Badgers, *Meles* [Case 24.] (**606** & **607**), Ratels or Honey-Badgers, *Mellivora* (**573**), and Skunks, *Mephitis* (**599, 600**), *Conepatus* (**596** to **598**), and *Spilo-*

gale (**601**), the latter conspicuous for their black-and-white coats, but having a bad reputation on account of the intensely disagreeable and evil-smelling fluid they emit when provoked. (3) The *Lutrinæ*, or Otter group (case 24), have short feet, webbed toes, small claws, and long powerful tails. There are about 15 species known, all very similar externally in colour,

Fig. 26.



Skull of the Otter (*Lutra vulgaris*).

i, incisors; *c*, canine; *pm*, premolars; *m*, molars.

size, and general proportions — the English Otter, *Lutra vulgaris*, or *L. lutra* (**591**), being the typical member of the group. The most peculiar is the Sea-Otter, *Lataæ lutris* (**594**), which has its hind-feet partially modified into flippers, somewhat as in the Seals. This animal frequents the salt water, and was once abundant on all the coasts of the North Pacific; but owing to the merciless persecution to which it has been subjected for the sake of its valuable fur, its numbers have been so much thinned that it is sure to be exterminated unless effectual measures be taken for its protection. A fine skin has been sold for over £200 sterling.

All the members of the Weasel tribe have thoroughly carnivorous habits, and therefore strong and well-developed teeth. Skulls of the Otter and Badger are mounted so as to show the teeth from below. The latter animal has its lower jaw so articulated to the cranium that it cannot be separated from it without breaking the bone. All *Mustelidæ* have broad flattened skulls, long and low bodies, short legs, and feet fitted either for running, digging, or swimming. In the Sea-Otter

the teeth are enormously broad and powerful, with rounded tubercular cusps well adapted for breaking the hard shells of crabs and molluscs, on which it is supposed to feed. Alone among the Carnivora Fissipedia, the Sea-Otter has only two lower incisors.

[Cases 25, 26, & 27.] The Bears (*Ursidæ*), cases 25 and 26, which form the last family of Land-Carnivora, are characterized by their large size, thick and clumsy build, rudimentary tails, plantigrade, five-toed feet, long, blunt, and nearly straight claws, small ears, and, usually, long shaggy fur. In their skeletons, as in external appearance, they are heavy and clumsily built, and their bones are thick and massive. Their sectorial teeth have broad surfaces, and are little adapted for cutting, the whole dentition being that of animals living as much on vegetable as on animal food. They are wholly plantigrade, with non-rectractile claws. For the most part, the species are much alike, there being few differences between them other than those of size and the proportions of the skulls and teeth. Their distribution includes Europe, Asia, and North America, but they are entirely absent from Australia, most of Africa, and the greater part of South America. The most noteworthy members of the group are :— The Brown Bear, *Ursus arctus* (**614**), case 27, of Europe and North Asia, which was formerly found in England, having been exterminated only within historic times. The nearly allied Kashmir Snow-Bear, *U. a. isabellinus* (**617**). A dwarfed, long-haired Bear from the highlands of Tibet known as *U. pruinosus* (**615**). The Polar Bear, *U. maritimus* (**626**), the largest of the family, an excellent swimmer, and wholly carnivorous, living on seals (which it captures by stalking) and the carcases of large animals. The Grizzly Bear, *U. horribilis*, and the closely related Alaskan Grizzly, *U. h. dalli* (**616**), of which a remarkably fine example is mounted in case 25, are the most formidable beasts of prey of North America. The Spectacled Bear, *U. ornatus* (**622**), an interesting species, found isolated from the others in the Andes of Peru and Ecuador ; no representative of this family occurring in Central America. The Himalayan Black Bear, *U. torquatus* (**625**), and the small Malay Bear, *U. malayanus* (**623**), are also exhibited. More

distinct is the Indian Sloth-Bear, *Melursus ursinus* (**633**), differing from the rest in the form of its snout and the number of its teeth, which are remarkably weak. It is the only member of the family found in Peninsular India.

In the same case (No. 27) are shown casts of the teeth and jaws of the extinct animals known as *Hyænarctus* (**528, 529**), which, with other forms, constitute a connecting-link between the Dogs and the Bears.

This case likewise contains a few casts of the remains of the still older *Hyænodon* (**632**), an animal representing a large group of extinct Carnivora which belong neither to the modern Fissipedia nor to the Pinnipedia, but constitute by themselves a separate subordinal group, the Creodontia. Their teeth are of a type quite different from those of existing Carnivora. Remains of numerous representatives of the group are exhibited in the Geological Department.

[Cases 27* to 31, F & F*.]

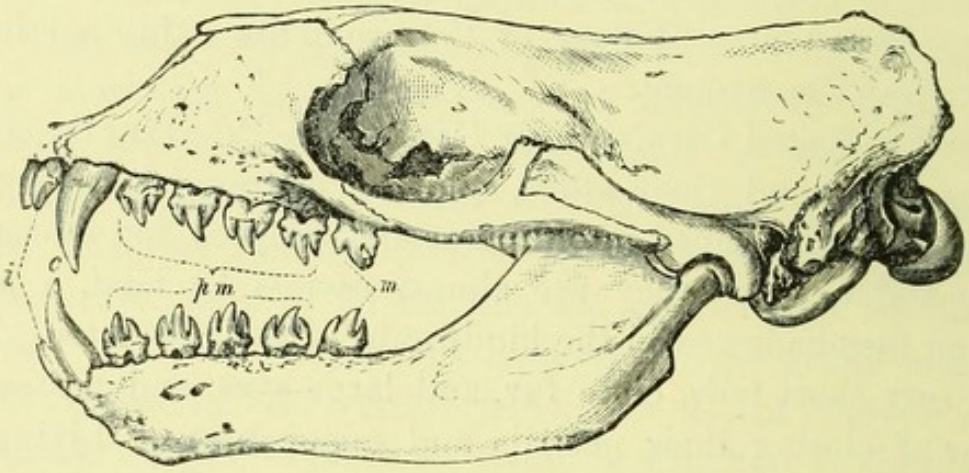
The Fin-footed Carnivora, or CARNIVORA PINNIPEDIA, consist of the Seals and their allies, and are distinguished by their limbs being developed into flippers and adapted for movement in the water, while they are almost useless on land, a modification foreshadowed in the hind-limbs of the Sea-Otter. They have very short tails, close fur, and large eyes, and possess the power of closing their nostrils and ear-openings. Living for the greater part of the year in the sea, generally close to the shore, Seals sometimes wander far from land, to which, however, or to floating ice-floes, they resort in the breeding-season to bring forth their young. Their food consists almost entirely of fish, varied with crabs and cuttlefish, while the smaller species in their turn are preyed upon to a great extent by certain of the toothed Whales, such as the "Killer" (*Orca gladiator*). An enormous number, both of the Eared and True Seals, are killed by sealers for the sake either of their valuable fur or for their hides and oil. The skeleton of a typical Seal (fig. 28) is elongate, with a small skull, no clavicles, rudimentary tail, and limbs of which the upper bones are very short, while the fore and hind feet are long, with five well-developed toes. The hind-legs are turned backwards, so that the two soles are opposed to each other when the animal swims, the two together

forming a single posterior swimming-paddle. Their action is similar to that of a person propelling a boat with a single oar worked from the stern.

This description applies fully only to the true Seals or *Phocidæ*; the *Otariidæ*, or Eared Seals, resembling ordinary Carnivores far more, especially in the position of their hind-limbs, as explained below.

The skull (see fig. 27) has no processes behind the sockets of the eyes, and the posterior teeth are different from those of the Land-Carnivora, there being no specialized sectorial tooth nor any flat tubercular teeth at the back of the mouth. All the teeth are long and sharp, with the points directed towards the

Fig 27.



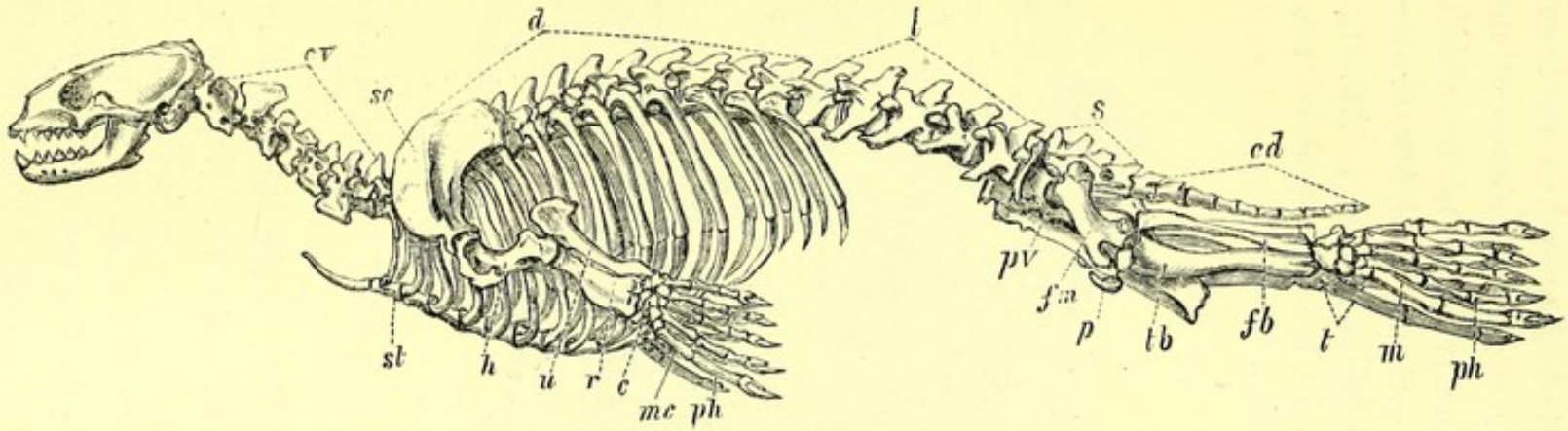
Skull of the Leopard-Seal (*Ogmorhinus leptonyx*).

i, incisors; *c*, canine; *pm*, premolars; *m*, molar.

throat, thus forming admirable instruments for catching and holding such slippery prey as the fishes on which Seals feed; but they are useless for biting the prey into small pieces, each fish being invariably swallowed whole. Some of the Seals have their teeth provided with additional sharp-pointed cusps along their edges, as in the Leopard-Seal, *Ogmorhinus leptonyx* (**646**), fig. 27.

In the Walruses, which are in many ways intermediate between these two families, the dentition is very remarkable, the canine teeth being enormously developed, while all the other teeth are small and rudimentary, with flattened crowns.

Fig. 28.



Skeleton of the Common Seal (*Phoca vitulina*).

c, carpus; *cd*, caudal vertebræ; *cv*, cervical vertebræ; *d*, dorsal vertebræ; *fb*, fibula; *fm*, femur; *h*, humerus; *l*, lumbar vertebræ; *m*, metatarsus; *mc*, metacarpus; *p*, patella; *ph*, phalanges; *pv*, pelvis; *r*, radius; *s*, sacral vertebræ; *sc*, scapula; *st*, sternum; *t*, tarsus; *tb*, tibia; *u*, ulna.

[Cases 27*, 28, & 29.]

The Eared Seals, or Sea-Lions and Sea-Bears (*Otariidæ*), are distinguished from the other members of the suborder by possessing small external ears, and by being able to bend their hind-feet forwards under their bodies and to use them for walking on land, showing in both respects a closer relationship to ordinary land-animals than do the true Seals, in which the outer ears have been entirely lost and the hind-feet project straight backwards and are used only for swimming. Among the Eared Seals are exhibited very fine male specimens of the Northern Sea-

Fig. 29.

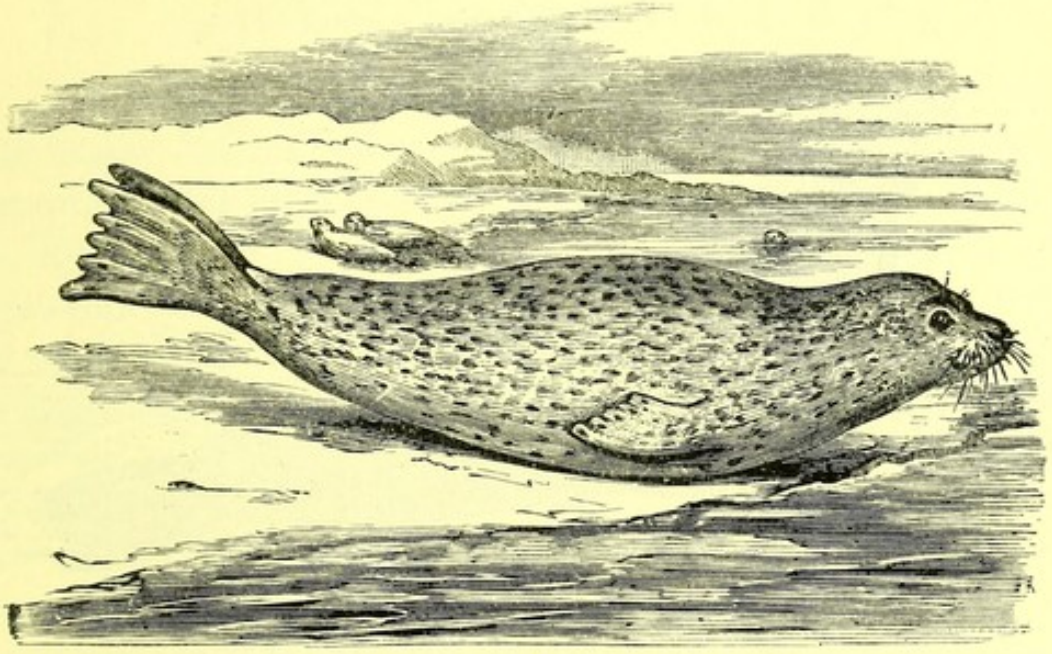
Male and Female of the Northern Fur-Seal (*Otaria ursina*).

Lion, *Otaria stelleri* (**534**), and of the Southern Sea-Lion, *Otaria jubata* (**535**), in case 28. Especially striking among these animals is the great difference in size between the male and female; all Eared Seals seem to be polygamous. Of the numerous species, one of the most worthy of mention is the Fur-Seal of the North Pacific, *Otaria ursina* (**537**), from which most of the furriers' seal-skins sold are obtained. A fine series of this Seal, comprising specimens of both sexes and of various ages, is exhibited in case 27* and a skeleton in case 29; the

specimens were presented by Sir G. Baden-Powell, K.C.M.G., by whom they were obtained on a visit to the Commander Islands, Bering Sea. It may be observed that the coats of the stuffed specimens do not show any resemblance to the "seal-skin" of trade; in the latter only the soft under-fur is preserved, all the long coarse hairs having been removed. The difference is shown in the Index Museum.

Intermediate in many respects between the Eared and the True Seals are the *Odobænidæ*, containing the two species or races of the Walrus, respectively inhabiting the North Atlantic [Cases 28 & F*.]

Fig. 30.



The Common Seal (*Phoca vitulina*).

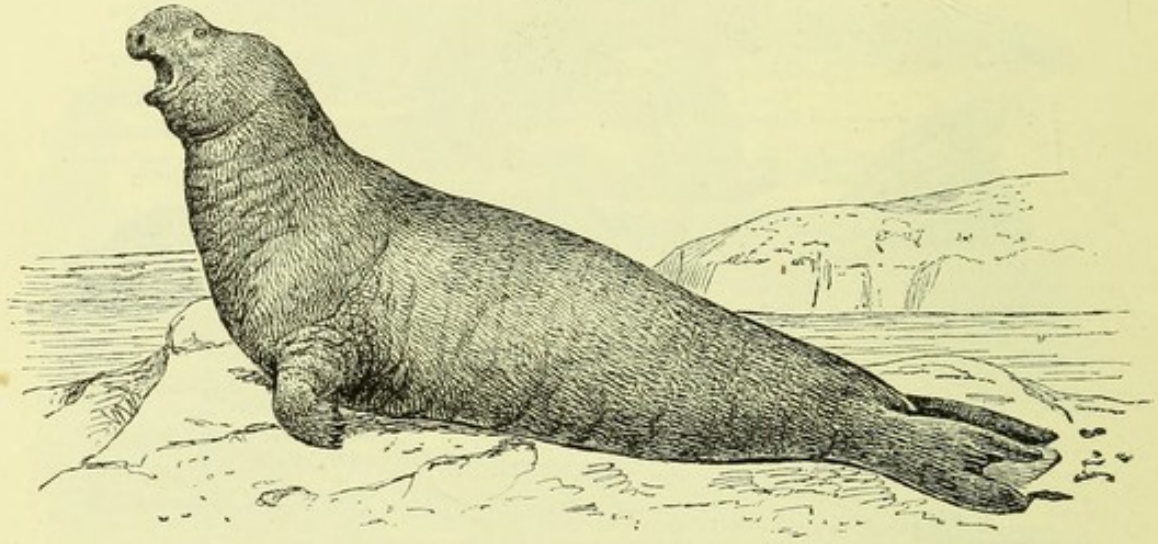
and North Pacific Oceans. These animals lack external ears, but use their hind-limbs after the manner of the Eared Seals. In one respect, however, they are quite unique—namely, in the possession of long and powerful upper canine teeth, or "tusks," which project downwards far below the lower jaw, and are used for fighting, for climbing from the water on to the ice, and for digging on the sea-bottom for the shell-fish and crustaceans on which these animals chiefly live. Their range extends all round the North Pole, along the edges of the ice-fields. A complete specimen of the Atlantic Walrus, [Case F*.] *Odobænus rosmarus* (**642**), is shown, but the Pacific *O. obesus* (**644**) is represented only by skulls and tusks.

[Cases 30, 31, & F.]

In the *Phocidæ*, or True Seals, the adaptation for an aquatic life has reached its highest development. They are without external ears, the soles of their feet are covered with hair, and the coat has no woolly under-fur, consisting merely of long stiff hairs lying closely against the skin ; so that their fur is of value only for the manufacture of coarse wearing apparel.

The family contains eight or ten genera, separated chiefly by the form of their teeth and the varying development of the toes, which in some are all of about the same length, while in others the first and fifth toes are much elongated beyond the rest, in order to support the web.

Fig. 31.



Male Elephant-Seal (*Morunga leonina*).

The most noteworthy of the Northern *Phocidæ* exhibited are :—the Hooded Seal, *Cystophora cristata* (**651**), from Greenland, the male of which has a peculiar bag of skin on its muzzle, capable of being inflated with air when the animal is excited ; the Common Seal of the English coast, *Phoca vitulina* (**662**, fig. 30), exhibited in the British Saloon, at the end of the Bird Gallery; the Greenland or Harp-Seal, *P. grœnlandica* (**661**); the rare Banded Seal, *P. equestris* (**663**), of the North Pacific; and the Grey Seal, *Halichœrus grypus* (**654**).

In one of the cases are shown the Seals of the Southern Seas, most of which were collected by the 'Discovery,' although others are the gift of Sir George Newnes. They include the

Leopard-Seal, *Ogmorhinus leptonyx* (**646**), Ross's Seal, *Ommatophoca rossi* (**647**), and the Crab-eating Seal, *Lobodon carcinophagus* (**649**). Very different is the gigantic Sea-Elephant or Elephant-Seal, *Morunga*, or *Macrorhinus, leonina* (**650**, fig. 31), the largest member of the family, and likewise a southern type. The large case in the middle line of the Gallery contains a unique series of the local races of this species. Several of the specimens were presented by the Hon. Walter Rothschild.

Order V. RODENTIA, or Gnawing Mammals.

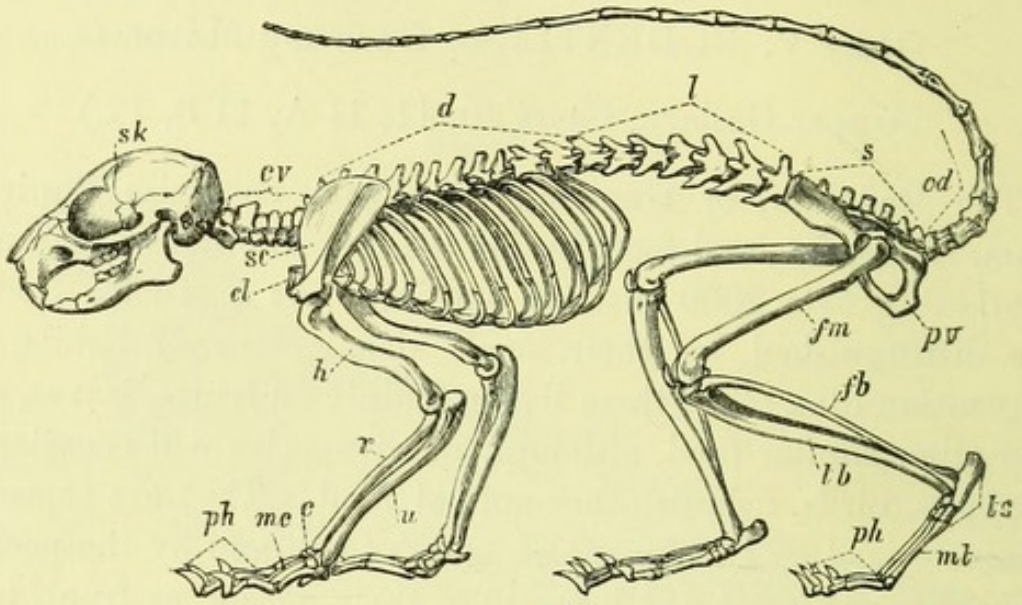
(Upper Gallery, Cases 10, 11, 11 A, 11 B, 12.)

The Rodentia, or Gnawing Mammals, comprise Squirrels, Rats, Hares, &c., and form by far the largest order of Mammals, containing over 2000 distinct species. As a whole, Rodents are distinguished by their small size, nocturnal habits, and vegetarian diet, all of them living mainly on fruits, leaves, nuts, and other similar food, although many species will occasionally eat eggs, birds, fish, or other animal food. They are especially characterized by their want of canine teeth and by the peculiar structure and great development of their incisor, or front, teeth. The majority have only a single pair of incisors above and below, which are large, curved, and adapted for gnawing by possessing sharp, chisel-like edges, formed by the hard outer coat of enamel, restricted to the front surface, and wearing away more slowly than the softer dentine or tooth-core. These teeth, moreover, continue to grow during the whole life of the animal from their roots as fast as they wear down at their tips. Should, however, one of them get destroyed or diseased, the corresponding tooth in the opposite jaw, which ought to have been worn down by it, continues to grow until it may even bring about the death of the animal by preventing the mouth from closing, and thus causing starvation, or by curving right over and entering the back of the head. Examples of such abnormal developments are exhibited in the North Hall. The collar-bones, or clavicles, vary in their development, being, as is usual throughout the Mammalia, complete from end to end in those

species, such as the Squirrels, in which the fore-limbs are used for grasping or climbing ; while they are incomplete or absent in those which live a simple terrestrial life, and use their fore-limbs for walking or digging only.

The lower jaw is attached to the skull by a longitudinal condyle, which gives a large amount of mobility and freedom at a corresponding sacrifice of strength and rigidity. This

Fig. 32.



Skeleton of a Squirrel.

c, carpus; *cd*, caudal vertebræ ; *cl*, clavicle ; *cv*, cervical vertebræ ; *d*, dorsal vertebræ ; *fb*, fibula ; *fm*, femur ; *h*, humerus; *l*, lumbar vertebræ ; *mc*, metacarpus ; *mt*, metatarsus ; *ph*, phalanges ; *pv*, pelvis ; *r*, radius ; *s*, sacral vertebræ ; *sc*, scapula ; *sk*, skull ; *tb*, tibia ; *ts*, tarsus ; *u*, ulna.

permits of the backward-and-forward movements so noticeable in a Rabbit when feeding.

Rodents, next to Bats, are the most widely spread of all Mammals, extending over the whole world, with the exception of the more remote Pacific islands, to which they have never had access. Many of the species are arboreal, like the Squirrels, or aquatic, like the Water-Rat and Musquash ; but the great majority are burrowing and terrestrial animals, which only come forth by night to seek their food, so that, although so numerous, they are little seen by ordinary observers.

The order is divided into those with only one pair of incisor teeth in the upper jaw (Simplicidentata) and those with two pairs (Duplicidentata). The first of these suborders contains by far the greatest number of species, and is itself divisible into three sections, of which the Squirrel, Rat, and Porcupine are severally typical.

The members of the Sciuromorpha, or Squirrel section, are distinguished by having at least one pair of premolars, by a flattened, not twisted, lower jaw, small perforations on the palate, and by the two shin-bones, the tibia and fibula, always remaining separate. They generally have well-marked processes behind the sockets of the eyes in the skull. To this group belong the Squirrels (*Sciuridæ*), Beavers (*Castoridæ*), &c.

Although it is doubtful whether they belong to the Sciuromorpha, here may be mentioned the Scaly-tailed Squirrels (*Anomaluridæ*) of Equatorial Africa (case 12), typically with membranous parachutes like the Flying-Lemurs described above (p. 34), and with a series of pointed scales under the base of the tail, so placed as to be of use when the animal is resting on a vertical tree-trunk, the points of the scales sticking into the surface of the bark. *Anomalurus* (**753**) and *Idiurus* are flying forms, but in *Zenkerella* the parachute is absent. Near by are the American Sewellels (*Aplodontiidæ*), formerly regarded as near relatives of the Squirrels, and represented only by the single genus *Aplodontia*, or *Haplodon* (**754**). [Case 12.]

The Flying-Squirrels of Southern Asia, *Petaurista* (**725** & **726**), some of the most brightly coloured of all Mammals, belong to the family *Sciuridæ*. With the exception of the flying membrane, there is little structural difference between them and ordinary Squirrels. [Case 12.]

The Chipmunks, or Striped Gophers, *Tamias* (**719** to **723**), the Susliks, *Spermophilus* or *Citillus* (**732** to **739**), and the Marmots, *Arctomys* or *Marmotta* (**742** to **748**), live in burrows of their own construction. The Common Marmot, *Arctomys marmotta* (**746**), inhabits the Alpine regions of Europe. The North American Prairie-Marmots, *Cynomys* (**740**), better known as Prairie-Dogs, excavate a large number of deep burrows close together, forming

what is called a town. Frequently they have to share their home with weasels, burrowing-owls, and rattlesnakes.

[Case 12.] The Squirrels (*Sciurus*, &c.) form the largest group of the present family, distributed over the whole world, with the exception of the Australian region. They range in size from species more than a foot in length, such as the Purple Giant Squirrel, *Ratufa indica* (**682**), of India, down to others scarcely larger than Mice, as, for example, the Black-eared Squirrel, *Nannosciurus melanotis*, and the Pigmy Squirrel, *N. exilis* (**671**), of Borneo. Squirrels are generally bright-coloured, and vary in an extraordinary degree, as may be gathered from an examination of the instructive series of *Sciurus hypopyrrhus* (**691** to **715**), the Grizzled Squirrel. This species is ornamented with patches or bands of white, yellow, grey, brown, and black, in every combination, each variety passing, by insensible gradations, into the next. Specimens of the Common Squirrel, *S. vulgaris* (**678**), exhibit some of the local and seasonal variations observable in this species; and attention may be directed to the fine series of foreign Squirrels in the case. The beautiful Groove-toothed Squirrel of Borneo is made the type of the distinct genus *Rhithrosciurus* (**669**) on account of its grooved upper incisors.

[Case VI.] The Beavers, *Castoridæ* (case VI), are distinguished by the flat and scaly tail, webbed hind-feet, and soft thick fur. The incisor teeth are of remarkable strength and sharpness, and with them their owners are able to gnaw through the trunks of large trees, which they require for the construction of dams, in a short space of time. These interesting animals are rapidly becoming exterminated, owing to the great demand for their fur, so that whereas they formerly inhabited the whole of Northern Europe, Asia, and America, they are now to be found only in a few isolated localities in the most inaccessible parts of their proper range. Many naturalists regard the American Beaver as specifically distinct from the European, *Castor fiber* (**756**), and name it *Castor canadensis* (**757**); a group of the latter is shown in one of the bays.

[Cases 11, 11 A, 11 B.] The Myomorpha, or Rat section (cases 11, 11 A, and 11 B), contains numerous genera and a vast number of species, spread

over the whole world, and externally presenting few striking differences between the various species. Rats generally have large ears, long and more or less scaly tails, and bright prominent eyes. They have a variable number of premolars (0–3), a flattened lower jaw, no slits in the bony palate, processes behind the sockets of the eyes, long perfect clavicles, and the tibia and fibula of the leg joined to each other about halfway down (fig. 33).

Fig. 33.

Bones of the lower part of the Hind-leg of the Rat.

f, fibula ; *t*, tibia.

The following families are included in this section:—The *Gliridæ* or Dormice, beautiful soft-furred, bushy-tailed little rodents, inhabiting Europe, North Asia, and Africa, of which one small species, the Common Dormouse, *Muscardinus avellanarius* (**775**), is a native of England.

The *Muridæ*, or Rats and Mice, of which may be mentioned the Gerbilles of India and Africa, *Gerbillus* or *Tatera* (**794** to **796**), and allied genera with elongated hind-feet, on which they jump like kangaroos; the Rats and Mice of the Old World (*Murinæ*), and the Hamsters and American Vesper-Mice (*Cricetinæ*) ; the Voles (*Microtus*), of which the best-known members are the common English Field-Mouse, *M. agrestis*, and the Water-Rat, *M. amphibius*, both shown in the British Saloon ; and their near relative the North American Musquash, *Fiber zibethicus* (**873**), a beautiful example of which is exhibited in cases 11, 11 A, and 11 B. Among the most remarkable members of the *Muridæ*

[Cases 11, 11 A, & 11 B.]

in these cases may be mentioned the gigantic Tree-Rats of Luzon in the Philippines, *Crateromys* (**826**) and *Phlœomys* (**792**); and likewise the orange-bellied Australian Water-Rat, *Hydromys chrysogaster* (**791**), which typifies a separate subfamily. There are numerous other genera of the family which must be passed over here, but attention may be directed to specimens of the interesting Lemmings, *Lemmus* (**877** to **879**), and *Dicrostonyx* (**880**), as well as to the burrowing Mole-Voles, *Ellobius* (**876**), and Zokors, *Myotalpa* (**881**), examples of both of which are shown.

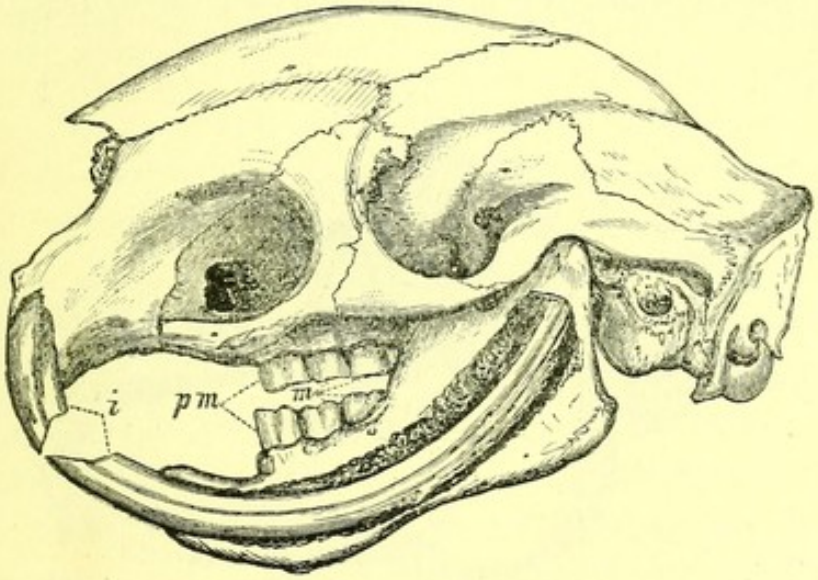
[Case 12.] The Bamboo-Rats, *Rhizomys* (**767**), and Mole-Rats, *Spalax* (**770**) and *Bathyergus* (**788**), of Asia and Africa, represent the families *Spalacidæ* and *Bathyergidæ*, and have short tails, thick heavy bodies, and powerful digging claws. Next come the North American Pocket-Gophers (*Geomyidæ*), somewhat similar to the last, but provided with pouches in their cheeks, outside their mouths, often large enough to hold a walnut. Specimens of the typical genus *Geomys* (**777** to **779**) are exhibited. The Kangaroo-Rats and Pocket-Mice (*Heteromyidæ*), which are also North American, include the genera *Heteromys* (**782**) and *Dipodops* (**784**). Following these are the *Dipodidæ* (or *Jaculidæ*, case 12), comprising the long-legged and long-tailed Jerboas of North Africa and Asia, specially modified for leaping lightly over a yielding sandy soil, of which there are several generic types, such as *Dipus* or *Jaculus* (**761**), *Alactaga* (**758**), and *Euchoreutes* (**763**) of Yarkand.

The Hystricomorpha, or Porcupine tribe, have almost invariably one pair of premolars above and below, a peculiarly twisted lower jaw, variably shaped slits in the palate, generally no process behind the socket of the eye, and separate shin-bones. The Rodents forming this section are very variable both in size and the characters of the skeleton.

[Case 11.] This section contains the following families :—The *Pedetidæ*, represented by the Springhaas, or so-called Jumping Hare, *Pedetes caffer* (**910**), of Africa. The *Octodontidæ* (case 11), with 17 or 18 genera, nearly all confined to South America, of which the best known is the aquatic Coypu, *Myocastor coypus* (**913**), the habits of which are similar to those of the Water-Rat, while the fur is thick and soft, and of considerable value. The Porcupines,

found both in the Old and New Worlds, are all covered with stout variegated spines, although in some of the species these are hidden in the long thick hair. Of the Old-World Porcupines, *Hystricidæ*, the Porcupine of Southern Europe, *Hystrix cristata* (**921**), is now becoming very rare, but several closely allied species are common in India and the Malay Archipelago. They feed on fruit, bark, and roots, and live in burrows of their own construction. The American Porcupines, *Erethizontidæ*, are [Case 11.] typified by the Canadian Porcupine, *Erethizon dorsatus* (**929**), but also include the South-American Tree-Porcupines, *Synetheres* or *Coendou* (**928**), &c., which are wholly arboreal and have long

Fig. 34.



Skull of the Porcupine. The outer part of the bone of the left side of the lower jaw has been removed to show the whole length of the incisor tooth.

i, incisors; *pm*, premolar; *m*, molars.

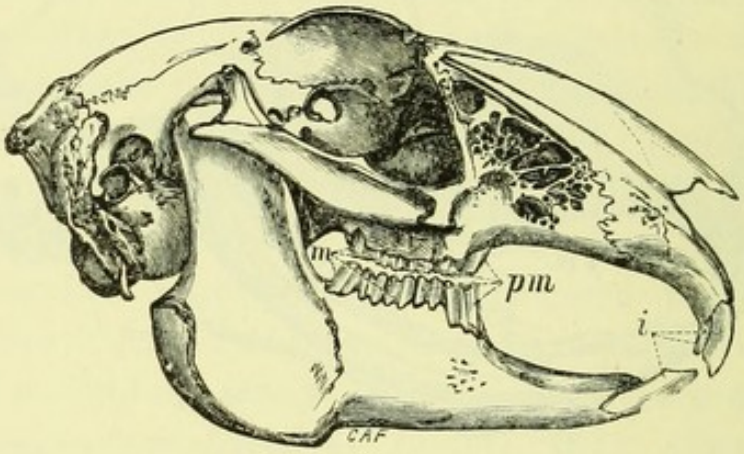
prehensile tails. The Chinchillas and Viscachas (*Chinchillidæ*), celebrated for their beautiful soft fur, include *Chinchilla* (**905**), *Lagidium* (**906**), and *Lagostomus* (**904**). The Agutis, *Dasyprocta* (**940** to **945**), and Pacas, *Cœlogenys* (**946**), represent [Case 10.] the *Dasyproctidæ*; the Cavies, *Cavia* (**934** to **939**), to which belong the little animals known as Guinea-pigs, together with the Maras, *Dolichotis* (**931** to **933**), and the Capybara, *Hydrochœrus capybara* (**947**), by far the largest of the living representatives of the order, constitute the *Caviidæ*. The Capybara in habits is somewhat similar to the Hippopotamus, being thoroughly

aquatic, and feeding on water-weeds, grass, and other vegetable substances. The last three families are restricted to South America.

[Cases 10 & 11.] It may be added that in the true Porcupines (*Hystrix*) the facial portion of the skull (fig. 34) is enormously expanded; while in the Pacas the cheek-arches of the skull are greatly inflated and swollen for the purpose of protecting a pouch which opens into the mouth. The Capybara or Carpincho, in addition to its size, is noticeable for the extreme complexity of the last molar tooth in each jaw.

The second suborder of Rodents, Duplicidentata, distinguished by possessing two pairs of incisors in the upper jaw, consists only of the Hares and Rabbits (*Lepus*) and the Pikas (*Ochotona*),

Fig. 35.



Skull of the Hare (*Lepus europæus*).

i, incisors; *pm*, premolars; *m*, molars.

animals far less specialized for gnawing than other Rodents, and showing, in some respects, the links by which the order is related to other Mammals. Their chief peculiarity is that some of the bones of their skulls are singularly imperfect, consisting in parts merely of a sort of bony network, especially in the neighbourhood of the nose-chamber (fig. 35). They possess processes behind the sockets of the eye, very large slits in the palate, and united shin-bones.

Lepus contains many species, all on the whole very much alike, of which the three British representatives, the Brown Hare, *Lepus europæus* (**960**), the Alpine or Blue Hare, *L. timidus* (**954**),

found both in the Highlands of Scotland and in Ireland, and the Rabbit, *L.* [*Oryctolagus*] *cuniculus* (**961**), are well-known examples. *Ochotona* (**968** to **970**) comprises about twenty species of short-eared little Rodents, known as Pikas or Calling-Hares, from the peculiar piping sound they make. They resemble Guinea-pigs in external appearance, and are natives of Northern and Central Asia and North America.

Order VI. UNGULATA.

(Lower Gallery, Corridors, etc.)

As the Hoofed Mammals constituting this group are referred to in a separate Guide *, they are treated more briefly than the other orders in this place. They are specially adapted for a terrestrial life, and in the main for a vegetable diet. Their molar teeth have broad crowns, with tuberculated or ridged surfaces. Their feet are provided with blunt, broad nails, or in the great majority of species with hoofs, more or less enclosing the ends of the toes, on which they walk. They are mostly of large or moderate size ; and the greater number belonging to the Artiodactyle section. The large size of the majority of the members of this order renders it difficult to arrange them all in their proper sequence, and it has been necessary not only to make them occupy the whole of the central line of the Lower Gallery, but to overflow into the Corridors.

[Cases 34 & 36–66, also centre of Gallery and Corridors.]

Suborder Hyracoidea.

The small animals looking like short-eared Rabbits and known as Hyraxes, *Hyrax* or *Procavia*, of which many species are distributed over Africa, and extend northwards into Arabia and Palestine, are exhibited in a case by themselves in the lower gallery. They are distinguished by their small size, peculiar dentition, and active habits. Their feet are provided with four anterior and three posterior rounded hoofs, unlike the claws of Rodents, and their soles are covered with fleshy pads, which enable them to adhere to and climb smooth surfaces of rocks or trees.

[Case 34.]

* 'Guide to Great Game Animals (Ungulata).' Price 1*s*.

The molars resemble those of Rhinoceroses, but the incisors are unique in structure and shape, the upper ones being typically rootless and triangular in section, with one of the angles

Fig. 36.

Syrian Hyrax (*Hyrax syriacus*).

directed forwards, so that, by a mode of wearing somewhat similar to that described in Rodents, a sharp point is formed and preserved at this angle. The lower incisors are short, flattened, and rooted. The dental formula is :—I. $\frac{1}{2}$, C. $\frac{0}{0}$, Pm. $\frac{4}{4}$, M. $\frac{3}{3} \times 2 = 34$.

Suborder Proboscidea.

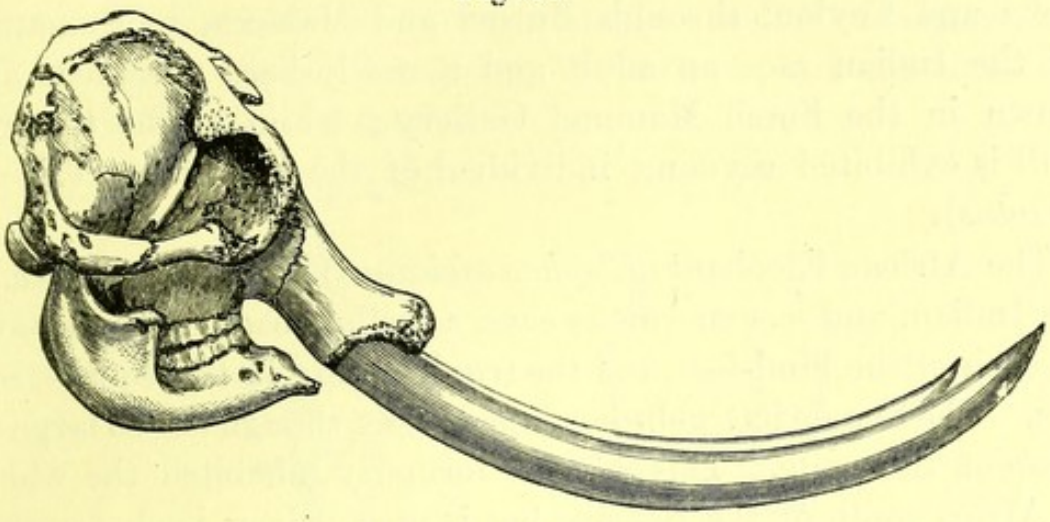
[Central Hall & Geol. Dept.]

This suborder, so named from the long trunk or proboscis into which the nose and upper lip are produced, consists, at the present day, of two species only, the African and Indian Elephants ; but these are survivors of a number of extinct species which ranged in former times over the greater part of the Old and New Worlds.

Elephants are heavily-built animals, with large ears, nostrils produced into a long flexible trunk, thick limbs, each provided with five toes enclosed in a common skin, so that only the nails show externally, a well-developed tail reaching nearly to the ground ; and the skin almost naked, although in the extinct Mammoth clothed with long shaggy hair. The upper incisor teeth grow into long curved tusks, directed downward and forward (fig. 37).

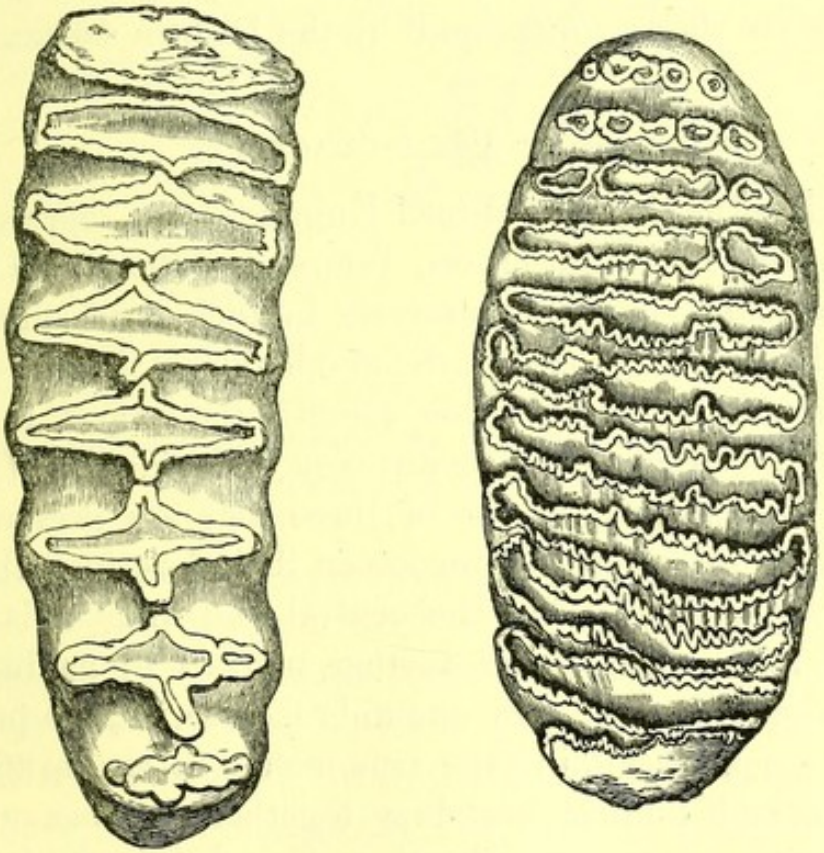
The crowns of the grinding-teeth are made up of a variable number of *laminæ* or thin plates, each composed of an outer layer of enamel and a core of dentine, and bound together side

Fig. 37.



Skull of male African Elephant.

Fig. 38. Fig. 39.



Molars of African (38) and Indian (39) Elephants.

to side by a substance known as cement. In the African Elephant each lamina, when seen in section, is lozenge-shaped, so that the grinding-surface of the tooth when worn has the

appearance shown in fig. 38 ; in the Indian species, however, the laminæ have flattened parallel sides, so that the crown-surface presents numerous transverse parallel bands of enamel, as in fig. 39. The Indian Elephant (*Elephas maximus*) ranges from India and Ceylon, through Burma and Malacca, to Sumatra. Of the Indian race an adult and a newly-born specimen are shown in the Fossil Mammal Gallery ; while in the Central Hall is exhibited a young individual of the Malay race (*E. m. hirsutus*).

The African Elephant (*Elephas africanus*) is of larger size than the Indian, and has enormous ears, a hollow back, only 3 nails on each of the hind-feet, and the trunk ending in two equal-sized lips. The female has well-developed tusks, though not so large as those of the male. This species formerly inhabited the whole of Africa south of the Sahara, but is now driven back towards the centre of the continent. A mounted specimen from Rhodesia is exhibited in the Central Hall, and two heads of other races are shown on the wall by the Darwin statue.

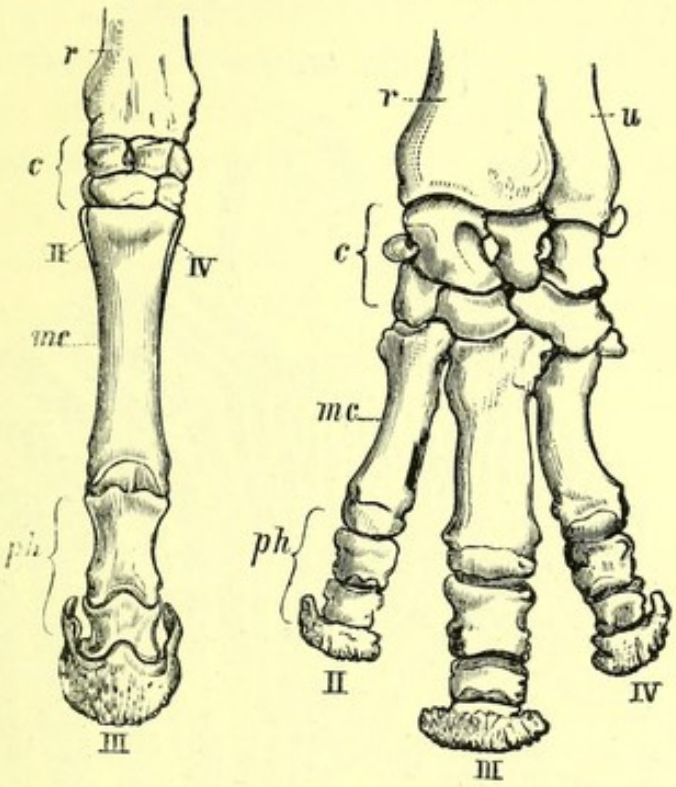
Suborder Perissodactyla.

[Cases 35 to 38 & H, G, & G*.] The Perissodactyla, or Odd-toed Ungulates, are represented at the present day by Rhinoceroses, Tapirs, and the Horse family, which have many common characters in their teeth and limb-bones. All are characterized by the middle line of the foot passing down the middle of the third toe, which is the largest, the other toes being ranged in a receding series on each side of it (figs. 40 and 41). Generally only one or three toes are present ; but the Tapirs possess a fourth outer toe on their fore-feet, the third toe, however, still forming the central and main axis of the foot. The Perissodactyla are further marked by having their premolar and molar teeth in one unbroken series, the posterior premolars much resembling the true molars in shape and size. The dorsal and lumbar vertebræ together number at least twenty-two ; and, as in all other Ungulates, clavicles are absent.

[Cases 35 & 36.] The Tapirs, *Tapiridæ* (**991–993**), present almost the same osteological characters as their ancestors which are found fossil:

the cheek-teeth have two simple transverse crests on their crowns, very different from the complex enamel foldings of the teeth of Rhinoceroses and Horses, the nasal bones are small, and the toes four in number on the fore, and three on the hind feet. They are swamp-loving animals, excellent swimmers and divers ; one species occurring in Malaya and the others in Central and South America.

Fig. 40. Fig. 41.



Bones of left Fore-foot of Horse (Fig. 40) and Rhinoceros (Fig. 41).

c, carpus; *mc*, metacarpus; *ph*, phalanges; *r*, radius; *u*, ulna; II–IV, second to fourth toes.

Rhinoceroses are characterized by the thickness and solidity of their bones, by the structure of their molar teeth, and the enlargement of their nasal bones to serve as supports for the single or double horns. Incisor teeth are wanting in the adults of the African species; but in the Indian there is a pair of large ones above, and two large and two small ones below. [Cases 36, 37, & G & G*.]

The Asiatic Two-horned Rhinoceros (*Rhinoceros sumatrensis*), a native of the Malay countries, is represented by a mounted specimen (**1001**) and skulls. The African Black Rhinoceros (*R. bicornis*), with a wide range in Africa, is distinguished from

the next species by its elongated and prehensile upper lip, smaller size, and different habits. Its horns are variable in length, the front one being generally the longer. It is represented by a mounted skin (**1003**) and many skulls and horns. The White Rhinoceros, *R. simus* (**1002**), of South, South-east, and Central Africa, with a square upper lip, is a large species represented in the Gallery by an adult and a young mounted specimen, as well as by a head and many skulls and horns.

Fig. 42.

Head of Grévy's Zebra (*Equus grevyi*).

The great Indian Rhinoceros, *R. unicornis* (**999**), is a one-horned species from North-eastern India, which is represented by a full-grown male in the Lower Gallery, and by the head of an animal obtained by H.M. the King, shown near the entrance to the Upper Gallery.

[Cases 38, 39, & H.] In the Horses, Asses, and Zebras (*Equidæ*) each foot has only a single complete toe (fig. 40) ; the cheek-teeth are large,

quadrangular, and complex, the enamel-foldings being numerous as compared with the simpler ones of Rhinoceroses and Tapirs. The wild species inhabit the plains of Asia and Africa.

The cases numbered 38 and 37, with the central case H, contain specimens of several members of the family, as, for instance, the true Zebra, *Equus zebra* (**1024**); Grévy's Zebra, *E. grevyi* (**1025**); some of the local races of the Bonte Quagga or Burchell's Zebra, *E. burchelli* (**1018**), distinguished by the different arrangement of the stripes on the body; and a specimen of the true Quagga, *E. quagga* (**1017**), now extinct. Two varieties of the African Wild Ass, *Equus asinus* (**1014**, **1015**), the ancestral form of the domesticated breeds, are also exhibited. In the same case are shown specimens of the Kiang of Tibet, *Equus kiang* (**1013**), and of the wild Mongolian Horse, *E. caballus przewalskii* (**1016**).

Suborder ARTIODACTYLA.

[Cases 40 to 46 and West Corridor.]

The Artiodactyla, or Even-toed Ungulates, are so called because their feet always possess an even number of toes, two or four, the centre line of the foot passing down between the toes which correspond to the third and fourth of the complete or typical five-toed mammal's foot. These two toes are always equal, and larger than the second and fifth, if those are present, the first being absent. The metacarpal and metatarsal bones of the third and fourth digits are generally united, and form a "cannon-bone." The premolars and molars are distinct in shape, the former being single- and the latter two-lobed. The dorsal and lumbar vertebræ together invariably number nineteen.

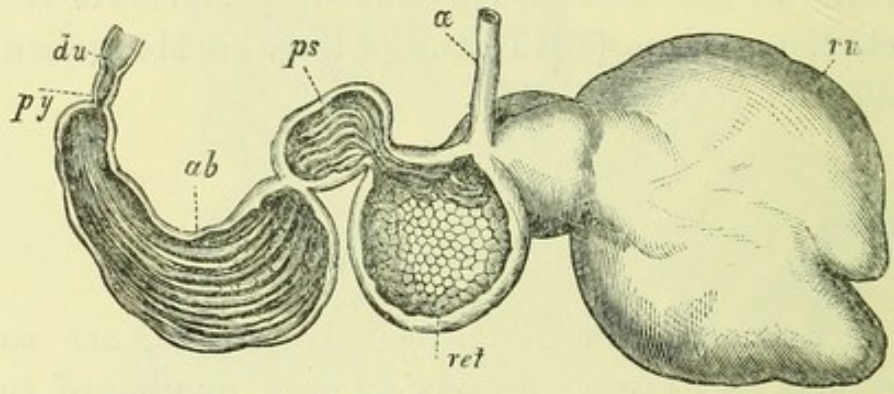
Artiodactyla, which are extraordinarily numerous both in genera, species, and individuals, are divided into four chief groups or sections, namely: (1) Pecora, or Oxen, Sheep, Antelopes, Giraffes and Deer; (2) Tylopoda, or Camels and Llamas; (3) Tragulina, or Chevrotains; and (4) Suina, or Hippopotamuses, Peccaries, and Pigs.

In the first three of these the molars consist of two pairs of

crescent-shaped lobes, and the stomach is composed of four or, rarely, three divisions, from one of which the food is returned to the mouth after it has been swallowed, in order to be chewed a second time—a process known as ruminating or chewing the cud.

The Pecora comprise a very large number of closely related animals, characterized by their generally lightly-built and graceful form, their long ears, large eyes, rudimentary or absent outer toes, absence of teeth in the front of the upper jaw, and their complicated stomachs, which consist of four compartments (fig. 43).

Fig. 43.



Stomach of a Sheep, cut open to show the internal structure.

œ, œsophagus, or gullet; *ru*, rumen, or paunch; *ret*, reticulum, or honeycomb; *ps*, psalterium, or manyplies; *ab*, abomasum; *py*, pylorus; *du*, duodenum, the commencement of the small intestine.

A splendid series of skulls and horns of India Pecora, bequeathed by Mr. A. O. Hume, C.B., in 1912, is exhibited on the wall at the head of the main staircase.

The families of Pecora are the following :—The *Bovidæ*, or Hollow-horned Ruminants, containing Oxen, Sheep, Goats, Antelopes, and Gazelles, are distinguished by the possession of true horns, often present in both sexes.

[Cases 40 to 44.] The specimens of Cattle exhibited at the end of the Lower Gallery and in the Saloon include a pair of the Indian Gaur, *Bos* [*Bibos*] *gaurus* (**1029**), its half-domesticated relative the Gayal of Assam and the neighbouring countries, the Bantin, *B.* [*Bibos*] *sondaicus* (**1027** to **1028**), the indigenous Ox of the Malay countries, the Asiatic Buffalo, *B.* [*Bubalus*] *bubalis* (**1043**), and various races of the Buffalo of Africa *B.* [*Bubalus*] *caffer* (**1037** to **1039**).

Other cattle shown in the Saloon are the small Philippine Buffalo or Tamarau, *B.* [*Bubalus*] *mindorensis* (**1044**), and likewise the still smaller Anoa, *B.* [*Anoa*] *depressicornis* (**1045**), of Celebes—the latter, which occupies a case to itself, being the most diminutive member of the Oxen ; the Bison *B.* [*Bison*] *bonasus* (**1034**), originally a native of the large forests of Europe, but now restricted to the Caucasus and the forest of Bialowicza in Lithuania ; the American Bison

Fig. 44.

Musk-Ox.

B. [*Bison*] *bison* (**1035**); and the Tibetan Yak *B.* [*Poëphagus*] *grunniens* (**1033**).

The Musk-Ox, *Ovibos moschatus* (**1047**, fig. 44), is represented by a skeleton in case 45* and stuffed specimens in case 45. [Case 45.]

Sheep form a small group, typically characterized by their thick, heavy, and transversely-ridged horns, curved spirally outwards, and their peculiar physiognomy. The specimens are in the large case (No. 47) placed against the north wall of the Saloon, and also in the separate case No. 46, on the top of which are horns, the remainder being arranged on the walls. The most worthy of note are the numerous races of the Great [Cases 46 & 47.]

Argali Sheep, *Ovis ammon*, inhabiting the plateaus of Central Asia, such as Marco Polo's Sheep, *O. a. poli* (**1061**), the typical Siberian Argali, *O. ammon* (**1057**, fig. 45), and the Tibetan Argali, *O. a. hodgsoni* (**1058**). Of smaller size are the Wild Sheep of Cyprus and Asia Minor, *O. orientalis* (**1065**, **1066**); the Urial, *Ovis vignei* (**1062**, **1063**), of the Himalaya and Punjab; and the Muflon of Corsica and Sardinia, *O. musimon* (**1067**). Other species are the Bighorn, *O. canadensis* (**1051**), with its numerous local races, of which two inhabit N.E. Asia.

Fig. 45.

The Siberian Argali (*Ovis ammon*).

[Case 48.] More distinct are the Tibetan Bharal, *Pseudoïs nahura* (**1068**), and the long-haired, long-bearded Barbary Sheep, *Ammotragus lervia* (**1069**), of the Atlas, Biskra, and the Sudan.

[Cases 48 to 51.] Wild Goats, *Capra hircus ægagrus* (**1082**), are represented by specimens from the Taurus Mountains of Asia Minor and Mount Ararat. Other Goats include the Ture of the Caucasus, *Capra caucasica* and *severtzowi* (**1081** & **1081** A), the Pyrenean Ibex (*C. pyrenaica*), and the Ibexes of the Himalaya, Alps, Pyrenees, and North Africa, which are exhibited in cases 48 and 49. Ture serve to connect the more typical Goats with Sheep

through the Bharal. Domesticated breeds of Cattle, Sheep, and Goats are shown in the North Hall.

Allied to the Goats, but with shorter horns, are the three species of Tahr, *Hemitragus* (**1099** to **1101**), examples of which are shown in case 51. In case 52 is exhibited the so-called Rocky Mountain Goat, *Oreamnus montanus* (**1114**), one of the few mammals white at all times of the year; the Serows, *Capricornis* (**1104** to **1106**), and Gorals, *Nemorhædus* (**1110**), of the Himalaya and other Oriental mountain-ranges; lastly, the Takins, *Budorcas* (**1118** to **1120**), of the Mishmi Hills, North of Assam, and China. The European Chamois, *Rupicapra tragus* (**1113**), likewise claims a place in this group. [Cases 51, 52, & 53.]

The next group is that of the Antelopes and Gazelles, distinguished by their light build, bright colours, and variously curved horns. They are found in their fullest development in Tropical Africa, more than three-fourths of the species being restricted to that continent. [Cases 54 to 57 and West Corridor.]

Of the groups exhibited, the following may be noted :—

Bushbucks or Harnessed Antelopes, *Tragelaphus* (West Corridor, case IV), remarkable for the circumstance that the two sexes frequently differ strikingly in colour; the Kudu (*Strepsiceros kudu*, **1206**), one of the handsomest and largest Antelopes; the Lesser Kudu (*S. imberbis*); the Elands (*Taurotragus*, **1208**, **1209**) of Central, West, East, and South Africa; and the Bongo (*Boöcercus*, **1204**).

Related to the foregoing is the Indian Nilgai (*Boselaphus tragocamelus*, **1186**), of which an adult is exhibited in Case IX.

The Sable and Roan Antelopes (*Hippotragus niger* and *H. equinus*, **1188**, **1189**) are placed in the West Corridor, as are also the Gemsbuck (*Oryx gazella*, **1197**) and the Beisa Oryx of Abyssinia (*O. beisa*). Gazelles (*Gazella*) are shown in the Gallery (cases 54 to 56), as are the long-necked Gerenuk (*Lithocranius walleri*), the Dibatag (*Ammodorcas clarkei*) of Somaliland, and the spiral-horned Indian Antelope or Blackbuck, *Antilope cervicapra* (case 56). [Cases 54 to 56.]

Case 54 contains examples of the African Pala (*Æpyceros melampus*, **1123**), and also the Angolan Pala (**1124**). In case 56 is the Saiga (*Saiga tatarica*, **1146**), an aberrant Russian and Siberian species, with an elongated and tapir-like snout. Near

by is the Chiru (*Pantholops hodgsoni,* **1144**), an apparently allied Antelope, from Tibet.

[Gallery Cases 56 & 57.] The Duikers (*Cephalophus*), some scarcely larger than Rabbits, found in most of Africa, occupy case 57, while the Pigmy Antelopes *Neotragus*, etc., and Dik-diks, *Madoqua*, are arranged in case 56, and the Klipspringer, *Oreotragus saltator* (**1166**), of the mountains of Africa, is represented in the same case by a male and female.

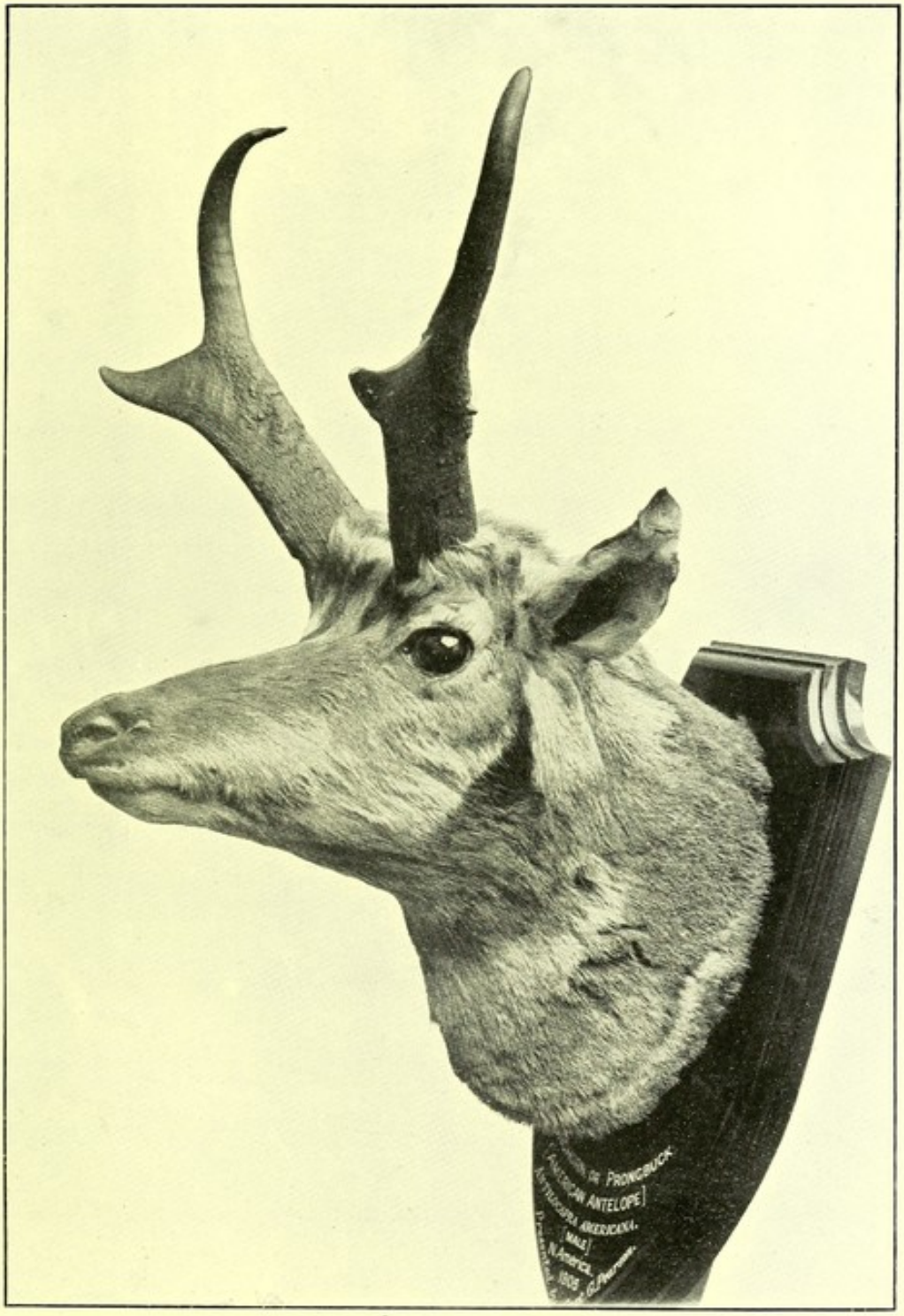
[Corridors.] The S. African Lechwe, *Cobus leche* (**1226**), together with the Puku (*C. vardoni,* **1225**), and two handsome black-and-white species from the Upper Nile, and other members of the Kob group, are exhibited in the West Corridor, where the Waterbuck (*Cobus ellipsiprymnus*, **1218**) and the Defassa (*Cobus defassa*, **1219**) are also shown.

The Gnus (*Connochætes*), grotesquely built animals, which appear to have the head and fore-quarters of a buffalo, with the hind-quarters and tail of a pony, are placed in the East Corridor. Several species of Hartebeest, such as *Bubalis caama* (**1246**), *B. tora* (**1244**), and *B. lichtensteini* (**1240**), are shown in the South Corridor. A specimen of the Sassaby (*Damaliscus lunatus,* **1231**) is exhibited inthe same case with Hunter's Antelope (*D. hunteri,* **1231**) in the West Corridor on the right side of the entrance into the Gallery, where heads of other species are shown. At the entrance is exhibited a group of Blesbok and Bontebok (*D. albifrons* and *D. pygargus*, **1234** & **1235**), shot by Mr. F. C. Selous. The fifth member of the group in this case is the Jimela (*D. corrigum jimela*), closely allied to which is the Tiang (*D. c. tiang,* **1232**) in the case on the right side of the entrance into the Gallery.

[Gallery Case 57.] The *Antilocapridæ*, the second family of the Pecora, contains only the Pronghorn of North America, *Antilocapra americana* (**1254**), the sole hollow-horned Ruminant in which the horns are bifurcated, and shed and renewed annually. In its habits it resembles many Antelopes, and is found in the open prairies of North America.

[E. Corridor.] The next family is the *Giraffidæ*, containing only the Giraffes (*Giraffa*) and Okapi (*Okapia*) of Africa, of which a magnificent series of specimens are shown in the East Corridor.

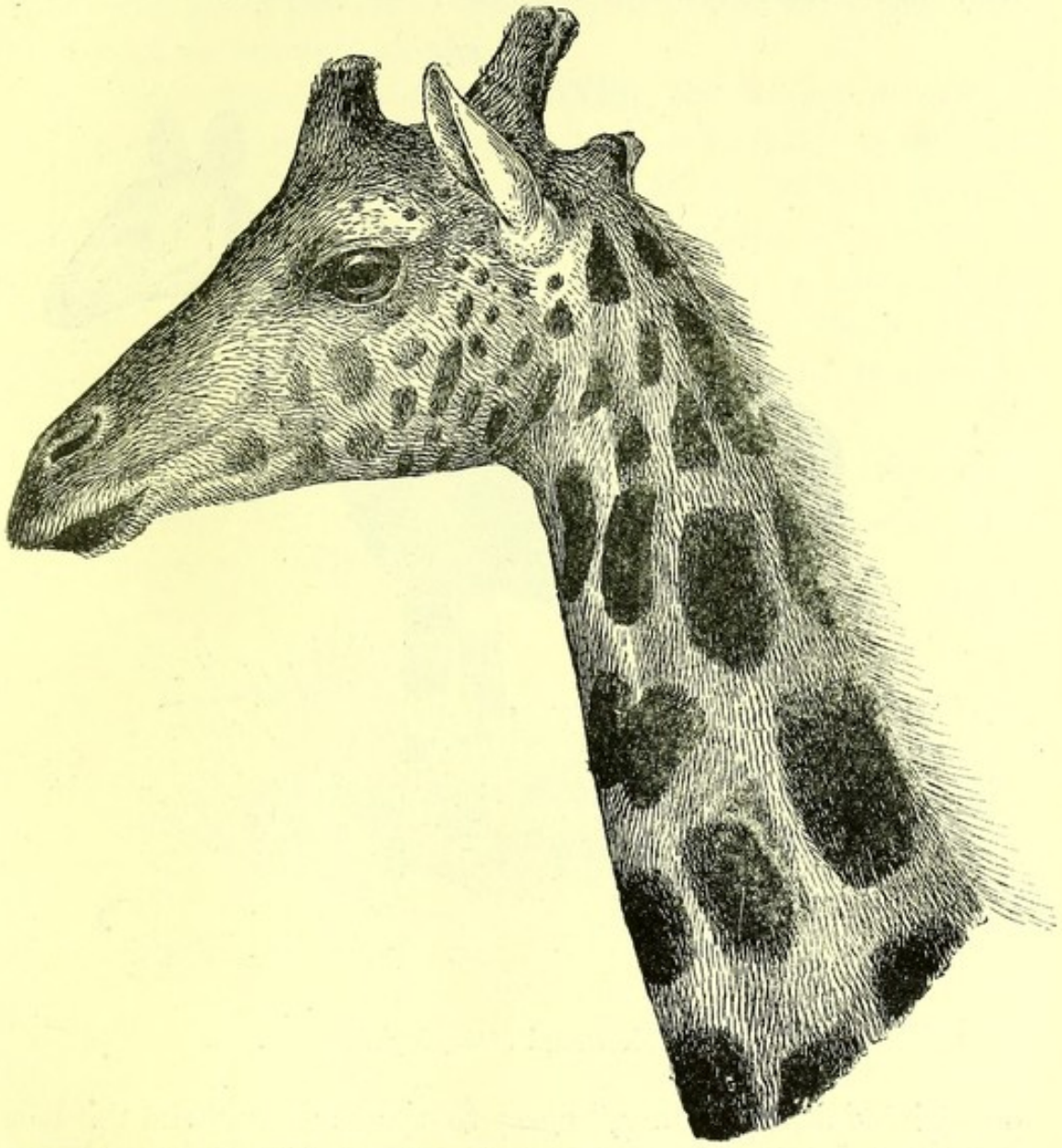
[*To face* p. 74.



HEAD OF MALE PRONGHORN ANTELOPE
(*Antilocapra americana*).

The Okapi (fig. 47) of the Great Congo Forest is characterized by its comparatively short neck and limbs, the presence of small bony antlers in the male, and the peculiar type of coloration, which is quite unlike that of the Giraffe. The head

Fig. 46.



Head and neck of Baringo Giraffe (*Giraffa camelopardalis rothschildi*).

is pale fawn-colour, while the neck and body are dark purplish brown, and the thighs and legs white with black bars.

The *Cervidæ*, or Deer family, comprises a large number of genera and species inhabiting Europe, Asia, and America, but, except for two species in the north, unrepresented in Africa. Most of them are distinguished from other Ruminants by their

[Cases 58–63 & middle line of Gallery.]

antlers, which, except in Reindeer, are wanting in the females. Antlers are bony outgrowths of the frontal part of the skull, usually shed and renewed yearly, without any horny sheath over them, but during growth covered with a sensitive hairy skin provided with blood-vessels, the so-called "velvet." When they have reached their full size, the blood-vessels become

Fig. 47.

A female Okapi (*Okapia johnstoni*).

constricted at the "burr," close to the skull, and the "velvet" dries up and is rubbed off; the antlers, then bare and non-sensitive, are ready for their sole function—fighting. The time of the growth of the antlers precedes the pairing-season; after this is over, by a process of absorption near the base, they become detached from the skull, and are shed.

The series of separate antlers is placed on the tops of the cases, partly over those containing the groups to which they belong, and partly elsewhere, while a few are fixed to the walls.

The following Deer may be specially mentioned :—

The Reindeer, *Rangifer tarandus* (**1262**), now found only in the northern regions of both the Old and New Worlds, is the only member of the family in which both males and females have antlers ; and these are peculiar in not being alike on the two sides, the great palmated brow-antler being, as a rule, fully developed on one side only. [Cases B, C, & 58.]

The Elk, *Alces machlis* (**1259**, **1260**), the largest member of the family, is also circumpolar in its distribution. A male and female are exhibited near the entrance of the Gallery (case A). The Wapiti, *Cervus canadensis* (**1269**), which is typically a North American species, is represented by a male in the middle line of the Gallery (case D) ; the Tien Shan Wapiti, *C. c. songaricus* (**1271**), is also shown, as is the Manchurian Wapiti, *C. c. xanthopygus* (**1275**). [Cases A & 60.]

Thorold's Deer, *Cervus albirostris* (**1265**), is a distinct species from Central Tibet, while the Hangul or Kashmir Stag, *C. cashmirianus* (**1266**), represents another type. [Cases 62, C*, & E.]

The Japanese Deer, *C. sika*, and its ally *C. hortulorum* (**1278**), of China are smaller species.

The Fallow Deer, *Cervus*, or *Dama*, *dama* (**1280**), is a native of Southern Europe and Asia Minor. The typical member of the whole group is the European Red Deer, *C. elaphus* (**1263**), of which the Maral, *C. e. maral* (**1264**), is an eastern race.

The various members of the Rusine and Rucervine groups are natives of the Oriental countries, such as the Sambar, *C.* [*Rusa*] *unicolor* (**1282**), the Moluccan Deer, *C.* [*R.*] *moluccensis*, and the Hog-deer, *C.* [*Hyelaphus*] *porcinus* (**1296**). Of the last, a set of seven pairs of antlers, developed in as many successive years by the same individual, is exhibited. [Case 60.]

The Muntjacs, *Cervulus* (**1295** to **1297**), form a small Asiatic group, in which the antlers are supported on hair-covered pedicles, longer than the portion annually shed and renewed. Nearly related to these are the Tufted Deer, *Elaphodus* (**1298** to **1299**), exhibited in the same case. On the west side of case 58 are specimens of the Chinese Water-Deer, *Hydropotes inermis* (**1300**). [Case 60.] [Case 58.]

The Roebuck, *Capreolus caprea* (**1302**), formerly found in all forests of Great Britain, but gradually driven to the north, has [Case 60.]

been reintroduced in certain places in the south of England, as Blandford, Dorsetshire, a fine specimen from which place is exhibited in case 60. The Siberian Roe, *C. pygargus* (**1303**), is also exhibited.

[Cases 58 & 59.] Père David's Deer, *Elaphurus davidianus* (**1304**), originally from the Imperial Park, Pekin, but now known only by a herd kept at Woburn, is represented by the mounted skin of a male and the head of a female, presented by the Duke of Bedford, K.G.

[Case 59.] The Virginian and Mule Deer, *Dorcelaphus*, or *Odocoileus*, *americanus* and *D. hemionus* (**1305** & **1306**), of North America, represent the typical group of the New World Deer. The Marsh-Deer, *D. dichotomus* (**1309**), and the Pampas Deer, *D. bezoarticus* (**1308**), of South America are also shown.

[Case 58.] Other specimens represent the Central American Brocket, *Mazama sartorii* (**1312**), the Pudu, *Pudua pudu* (**1314**), of the Andes, the Peruvian Guemal, *Xenelaphus antisiensis* (**1311**), from the Peruvian Andes, and the Chilian Guemal, *X. bisulcus* (**1310**), from Patagonia.

The Musk-Deer, *Moschus moschiferus* (**1314**), differs in many important structural characters from most other Deer, especially by the absence of antlers, and by the great development of the upper canine teeth, which project outside the mouth some way below the chin. It is covered with a coat of long and thick hair, well adapted for keeping out cold ; its toes are so articulated as to spread out very widely, an arrangement by which it is enabled to pass with ease over deep snow. It is an alpine animal, inhabiting the mountains of Central Asia from Tibet to China and Siberia. The "musk," now used as a perfume rather than a drug, is a valuable article of trade. It is contained in a pouch of the size of a small hen's egg, on the lower part of the abdomen of the male.

[Cases 64 & 65.] The Tylopoda, Camels and Llamas, are distinguished from all other Ungulates by the elongated and prehensile upper lip, the thick woolly fur, long neck and legs, two-toed feet, the pads of skin beneath the hoofs (whence the name Tylopoda, or "pad-footed"), and the complicated stomach, the walls of which contain a set of large cavities, the so-called "water-cells." The genus *Camelus* contains the two species of Camel, both

domesticated, and ranging from North Africa, through Arabia, Persia, and Central Asia, to India. The two-humped *C. bactrianus* (**1326**) exists in a wild state in the deserts of Central Asia.

The second genus of the Tylopoda is *Lama*, containing two species—the Guanaco, *L. huanacus* (**1328**), which is the wild form of the domesticated Llama and Alpaca, and the much smaller Vicuña, *L. vicugna* (**1327**). They are natives of the Andes and some of the adjoining plains of South America, the domesticated breeds being used as beasts of burden in the same way as the Camels. [Case 65.]

The Tragulina, or Chevrotains (case 64*), are a group of small deer-like animals of about the size of rabbits. Their feet are more like those of pigs, and their stomachs have three, instead of four divisions. There are two genera in the group, namely, *Tragulus* (**1331**), with five or six beautiful little species, ranging from India to Borneo ; and *Dorcatherium*, with but one living representative, the Water-Chevrotain, *D. aquaticum* (**1334**), of Equatorial Africa. [Case 64*.]

In case 68 are placed a few remains of the extinct families *Anthracotheriidæ* and *Oreodontidæ*, groups which serve in some degree to connect the preceding sections of Artiodactyla with the Suina, especially as regards their teeth. In the modern Suina the teeth of the cheek-series never show the semicylindrical columns on their grinding-surfaces characteristic of those of the Pecora, Tylopoda, and Tragulina. Their feet also are of a less specialized type, four toes are present, and there are never cannon-bones in both limbs. The group now includes three families *Hippopotamidæ*, *Suidæ*, and *Dicotylidæ*. [Cases 66 & 68.]

Of the *Hippopotamidæ*, which were once extremely numerous in this country, in Southern Europe, and India, only two species survive, viz. the common *Hippopotamus amphibius* (**1340**), too well known to require further notice, of which a stuffed specimen is exhibited in case 66* ; and the much smaller Liberian *Hippopotamus* (*Chœropsis*) *liberiensis* (**1341**), which does not exceed a Wild Boar in size, and occurs only in a few localities in West Africa. [Cases 67 & 68.]

The Pigs, or *Suidæ* (cases 67 and 68), are distinguished by their long snouts, flattened in front, small eyes, four-toed feet, [Cases 66 & 68.]

short tails, strongly-built bodies, and in disposition by their remarkable courage and ferocity. They are represented in Europe, Asia, and North Africa by the genus *Sus*, of which the Wild Boar, *S. scrofa* (**1345**), is the typical species. A specimen of the nearly allied Indian Wild Boar, *S. cristatus* (**1346**), is shown in the same case. The Pigmy Hog, *S. salvanius* (**1351**), of Nepal and Assam, is noticeable for its diminutive size. Other Old-World species are the Bornean *S. barbatus* (**1348**), the African Bush-Pigs, *Potamochœrus* (**1349**, **1350**), Forest-Hog, *Hylochœrus* (**1352**), Wart-Hogs, *Phacochœrus* (**1353**, **1354**), and the Babirusa, *Babirusa alfurus* (**1355**), of Celebes, a hairless species with upwardly-curved tusks.

In the New World the Pigs are represented by the Peccaries, *Dicotyles* (**1342–1344**), which are smaller than a Wild Boar, and differ in their skulls and dentition from all Old-World *Suidæ*.

Order VII. SIRENIA, or Sea-Cows.

(Fossil Mammal Gallery, Geological Department.)

The members of this order differ strikingly in structure from all the foregoing, on account of their aquatic habits and want of hind-limbs. They have rounded heads, very small eyes, no external ears, a pair of fore-flippers, capable of being moved in all directions, no hind-limbs, and broad flattened tails, placed horizontally ; while the skin is thick and nearly hairless, the lips alone being covered with stiff bristles.

Most of their bones are extremely dense and heavy, especially the ribs ; of the hind-limbs two rudimentary pelvic bones, but no trace of true limb-bones, remain in the existing species. The earlier tail-vertebræ have well-marked chevron-bones attached to their lower surfaces ; and in one genus (*Manatus*) there are only six cervical vertebræ, one of the few exceptions to the general Mammalian number of seven. The fore-limbs are developed into flat flippers, not showing externally any trace of toes.

The skull is of peculiar shape and structure, the front part of both jaws being bent downwards nearly vertically. The molars

are either absent, or simple square teeth with transverse ridges, suitable for chewing water-weeds and other vegetable substances. The opening of the nose, as in the Elephants, is placed far back on the upper surface of the skull.

Of the living representatives of the group, the Manatees (*Manatus*) have about twenty molars on each side, of which six or eight are present at any one time. The muzzle is but little bent downwards; the tail is depressed and rounded, with its hind edge forming a semicircle; and there are rudimentary nails on the flippers. The Manatees, so called from their using their flippers to a slight extent as hands (*manus*), are natives of the rivers and shores of Eastern America and Western Africa within the tropics, never straying far out to sea, but yet unable to go on land, their whole lives being passed in the water. There are three species, namely the African *M. senegalensis*, the American *M. americanus*, and the Amazonian *M. inunguis*.

Mounted specimens and skeletons of *Manatus inunguis* and *M. americanus* are placed in the cases.

The Dugongs, *Halicore*, represent a second genus, characterized by the possession of two tusk-like incisors, and five or six molars on each side; the snout is bent nearly vertically downwards, while there are no nails on the flippers; and the tail is broad, with the hind edge nearly straight, somewhat as in Whales. Dugongs inhabit the coasts of the Indian Ocean, from the Red Sea to Australia, living in shallow waters, and feeding, like Manatees, on marine and river weeds, but being on the whole more marine in their habits, and taking more readily to deep water. Three species have been distinguished, namely, *H. tabernaculi*, the Red-Sea Dugong, *H. dugong*, the Indian, and *H. australis*, the Australian species. A specimen of the Red-Sea Dugong and a skeleton of the Indian species, as well as skulls, are exhibited.

The Northern Sea-Cow (*Rhytina gigas*), which formerly inhabited the shores of the islands in the neighbourhood of Bering Strait and Alaska in numbers, represents a genus without teeth, their place being taken by rough horny plates; snout moderately bent downwards; flippers short; tail with two

lateral flukes. The capture of this huge animal was so easy that the process of extermination was accomplished towards the end of the eighteenth century, within a short period after its discovery. Before its extermination, a German naturalist in the Russian service, Steller, published an account of its anatomy and habits. Many of its remains were discovered during the voyage of the 'Vega' in the region where it lived. A nearly perfect skeleton from Bering Island is placed in the case. The Northern Sea-Cow was more than twice as large as either the Dugongs or Manatees, attaining a length of about 25 feet; but its habits were similar.

Fossil Sirenians are known as far back as the Middle Eocene period, *Eotherium ægyptiacum* having been found in Egyptian deposits of that age. In later times the members of this order, such as *Halitherium*, were abundant in European seas, and their remains occur fossil in Germany, France, and Italy, as well as in the bone-bed of the English Red Crag. Remains of many representatives of these fossil Sea-Cows are exhibited.

Order VIII. CETACEA, or Whales and Dolphins *.

(Gound-Floor.)

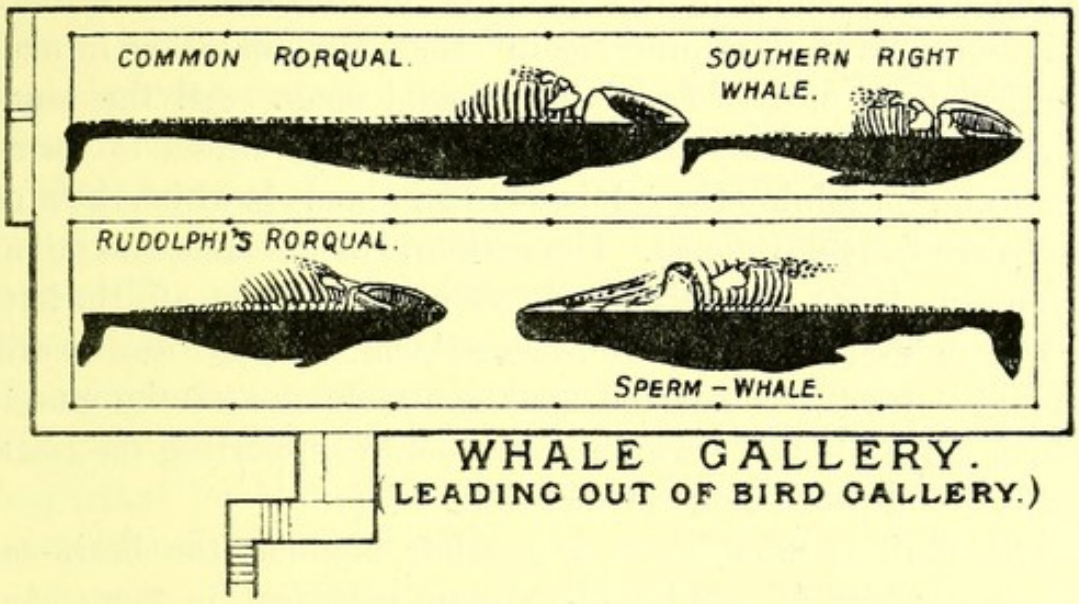
The large size of so many members of this group renders it impossible that they can be exhibited in their proper serial position, and they are consequently placed in a special annexe, leading out from the Bird Gallery on the ground-floor (fig. 48). Moreover, since it is almost impracticable to preserve the skins of the larger Whales, owing to the oil with which they are saturated, the exhibition of these animals is affected by means of models, casts, skeletons, and sketches.

The order Cetacea is one of the best marked and most natural of all the larger groups into which the class Mammalia is divided. In all essential characters, by which Mammals are distinguished from the other vertebrated animals, such as possessing warm blood, breathing air by means of lungs, bringing

* See 'Guide to the Whales, Porpoises, and Dolphins.' Price 4*d*.

forth their young alive, and nourishing them for a time with milk, they agree with the other members of their class; the striking external differences being all in relation to their adaptation to an entirely aquatic mode of life. Their external form is fish-like, the body being spindle-shaped, passing into the head usually without a distinct neck, and tapering behind gradually towards the extremity of the tail, which is provided with a pair of lateral pointed expansions called "flukes"; thus forming a horizontally-placed triangular propelling organ, notched in the middle line behind, with which these animals drive themselves through the water.

Fig. 48.



The head is generally large, in some species attaining more than one-third the entire length of the animal, and the mouth is wide, and bounded by nearly immobile lips. The fore-limbs are reduced to flattened paddles, encased in skin showing no external sign of division into arm, fore-arm, and hand, or of separate toes, and without trace of nails. No traces of hind-limbs are visible externally. The general surface of the skin is smooth, glistening, and devoid of hair, although in most species there are a few fine bristles in the neighbourhood of the mouth, which either remain throughout life or are found only in the young state. Immediately beneath the skin is a thick layer of

fat, held together by a mesh of fibrous tissue, constituting the "blubber," which serves the purpose of the hairy covering of other Mammals in retaining the heat of the body. In most species there is a fin, more or less triangular in shape, composed only of skin and fibrous tissue, near the middle of the back, which assists in keeping the animal upright when swimming. The eye is small; and the aperture of the ear minute, and without vestige of a pinna or conch. The nostrils, generally called "blow-holes," open separately, or by a single valve-like aperture, placed (except in the Sperm-Whale) not at the extremity of the snout, but near the top of the head.

The bones generally are spongy in texture, their cavities being filled with oil. In the backbone the region of the neck is remarkably short and incapable of motion, and the vertebræ, originally seven in number, as in other Mammals, are in many species more or less fused into a solid mass. All the hinder vertebræ of the body are free; none being united to form a "sacrum," or joining the pelvis, as in Mammals in which the hind-limbs are fully developed. The vertebræ of the loins and tail are numerous, large, and capable of free motion. Beneath the latter are large V-shaped "chevron-bones" which project downwards, and give increased surface for the attachment of the muscles which move the tail. There are no bones supporting the lateral "flukes" of the tail or the back-fin.

The skull is modified in a peculiar manner, the brain-case being short, high, and broad—almost spherical, in fact. As a rule, the nostrils open upwards, in front of the brain-case, and before them is a more or less horizontally prolonged beak, extending forwards to form the upper jaw or roof of the mouth. There are no collar-bones (clavicles). The upper arm-bone or humerus is freely movable on the scapula, or blade-bone, at the shoulder-joint; but beyond this the articulations of the limb are imperfect, flattened ends of the bones coming in contact with each other, with fibrous tissue interposed, allowing of scarcely any motion. The two bones of the fore-arm (radius and ulna) are distinct and much flattened, as are the bones of the hand. There are usually five digits, though sometimes the number may be reduced to four. The pelvis, or hip-bone, is

represented by a pair of elongated slender bones, suspended below, and at some distance from, the vertebral column, in the region of the loins. Since these bones are concealed in the flesh and not connected with the spinal column, they are often lost in preparing skeletons. To the outer side of these, in some Whales, are attached small bones which represent the bones of the limb. In the skeleton of the Common Rorqual (*Balænoptera musculus*) a little nodule of bone, scarcely larger than a walnut, has been preserved ; it is the rudiment of the thigh-bone or femur, and the only trace of a hind-limb which this gigantic animal possesses. The existence of these rudimentary structures has an important bearing upon the origin and past history of Whales and their relationship to other Mammals.

Cetaceans abound in all seas, and some species are inhabitants of the larger rivers of South America and Asia. Their organization necessitates passing their life entirely in the water, as on land they are absolutely helpless. They have, however, to rise frequently to the surface in order to breathe ; and, in relation to the constant upward and downward movement in the water thus necessitated, their principal instrument of motion, the tail, is expanded horizontally, unlike that of a Fish, in which the movements are mainly in straightforward or lateral directions. The position of the nostrils on the highest part of the head is important for this mode of life, as it is the only part of the body the exposure of which above the surface is absolutely necessary. The "spouting," or properly "blowing," of Whales is nothing more than the ordinary act of breathing, performed at longer intervals than is the case with land-animals. The moment a Whale rises to the surface it forcibly expels from its lungs the air taken in at the last inspiration, which of course is heated and charged with water-vapour. This, rapidly condensing in the cold atmosphere in which the phenomenon is often observed, forms a column of steam or spray, which has been mistaken for water. Frequently, however, it happens, especially when the surface of the ocean is agitated into waves, that the animal commences to "blow" before the nostril has cleared the top of the water, some of which may thus be driven upwards with the blast. In hunting Whales the

harpoon often pierces the lungs or air-passages, and then fountains of blood may be forced high in the air through the blowholes, as commonly depicted in scenes of Arctic adventure; but this is nothing more (allowance being made for the Whale's peculiar mode of breathing) than what follows severe wounds of the lungs in other Mammals.

Whales and Dolphins prey upon living animal food; but the Killer-Whales, *Orca*, alone eat other warm-blooded animals, as Seals, and even members of their own order, large and small. Many feed on fish, others on small floating crustaceans, minute molluscs, and jelly-fish; while the principal food of many is constituted by various species of cuttlefishes, especially squid, which abound in some seas, where they form almost the entire support of some of the largest members of the order.

In size the members of the group vary much, some of the smaller Dolphins scarcely exceeding four feet in length, while Whales are the most colossal of all animals. It is true that statements of their bulk are exaggerated, but even when reduced to their actual dimensions some of the existing Whales exceed in bulk all animals of the present and nearly all those of past times.

With some exceptions, Whales and Dolphins are timid inoffensive animals, active in their movements, and affectionate in disposition towards one another. This is especially the case with regard to the conduct of the mother towards her young, of which there is usually but one, and at most two, at a time. They are generally gregarious, swimming in herds or "schools" sometimes amounting to hundreds in number, though some species are met with singly or in pairs.

The great commercial value of the oil which all the Cetacea yield, and the special products of certain species, such as whalebone, spermaceti, &c., cause them to be subject to unremitting persecution, which has greatly diminished their numbers, and threatens some with extermination.

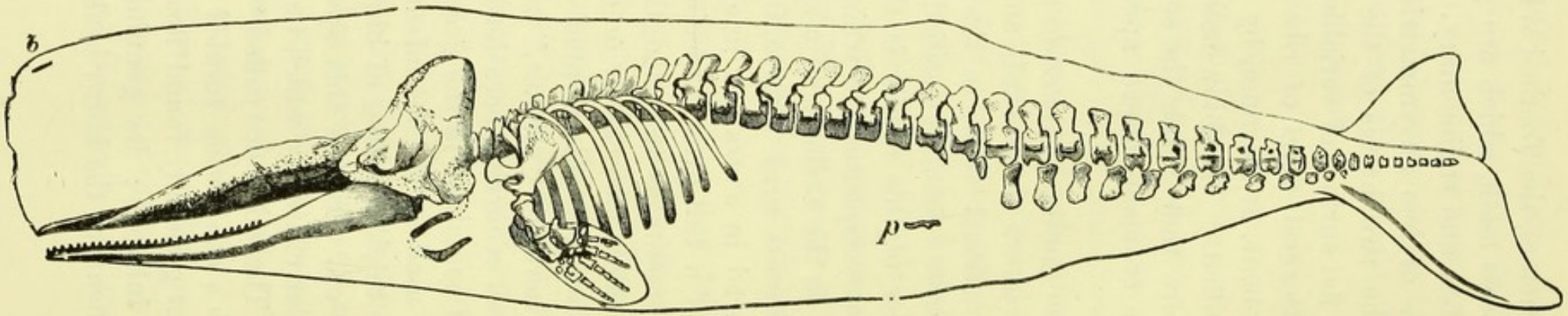
The existing members of the order are separated into two suborders, showing important structural differences. These are the Toothed Whales or Odontoceti, and the Whalebone-Whales or Mystacoceti.

Among other characters, the Toothed Whales have no whalebone, but always possess teeth, which are generally numerous, although sometimes few and rudimentary. The upper portion of the skull is more or less unsymmetrical, and there is no organ of smell. The two halves of the lower jaw come in contact in front by a flat surface of variable length, constituting a true symphysis. Several pairs of ribs are connected with the elongated breast-bone, or sternum, by means of cartilages, which are often ossified. The blow-hole is single, the two nostrils uniting before they reach the surface, usually in the form of a transverse crescent-shaped aperture on the top of the head.

The members of the family *Physeteridæ* are distinguished by several common characters of the skull and vertebral column, by never having functional teeth in the upper jaw, and by their rib-cartilages never becoming ossified.

The largest member of this family is the Sperm-Whale or Cachalot (*Physeter macrocephalus*), of which a model (fig. 49) has been constructed on the skeleton of a specimen cast ashore on the coast of Caithness, near Thurso, in June 1863. It is 54 feet long (measured in a straight line)—this being about the average length of a full-grown specimen of this animal, notwithstanding statements as to a length of 80 or 100 feet being attained. Cachalots feed chiefly on cuttlefishes, and are some of the most extensively distributed of Cetaceans, being met with, usually in herds or "schools," in almost all tropical or subtropical seas, and occurring occasionally even so far north as Shetland. The oil contained in the great cavity of the skull yields "spermaceti," used in the manufacture of candles and of ointments, and the thick covering of blubber enveloping the body produces sperm-oil. Hence this species has long been the subject of a regular chase, by which its numbers have been greatly diminished. The substance called "ambergris," largely used in perfumery, is a concretion formed in the intestines of the Sperm-Whale, but generally found floating on the surface of the seas which it inhabits; its genuineness is attested by the presence of fragments of the horny beaks of the cephalopods

Fig. 49.



The Sperm-Whale or Cachalot (*Physeter macrocephalus*).

Skeleton and outline. *b*, nostri or blow-hole ; *p*, rudimentary pelvic bone.

on which the Whales feed. A specimen is exhibited in a small glass case at the north-west corner of the room.

Nearly allied to the Sperm-Whale, but of much smaller size, is the Lesser Sperm-Whale, *Cogia breviceps*: the skeleton exhibited is from the neighbourhood of Sydney.

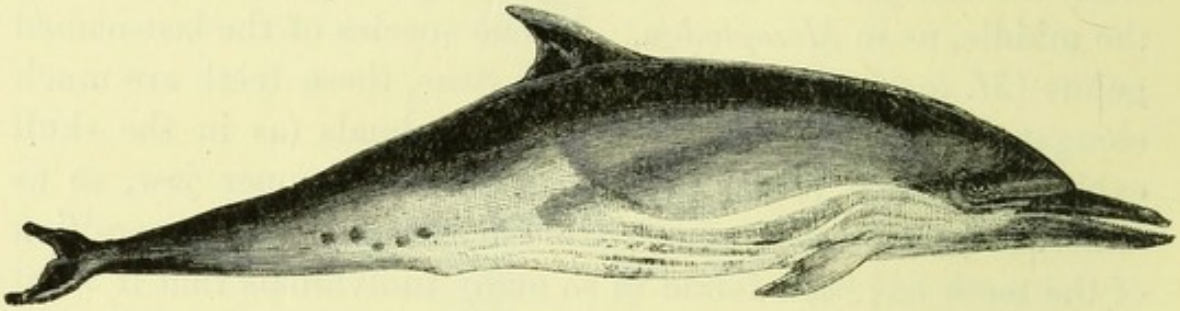
The Beaked Whales, or *Ziphiidæ*, nearly allied to the *Physeteridæ*, resemble Sperm-Whales in having no upper teeth (or if present rudimentary and attached only to the gum), but differ in that the lower teeth, instead of being numerous, are reduced to one or, rarely, two pairs. They are situated either at the front extremity of the jaw, as in *Ziphius* and *Hyperoödon*, or near the middle, as in *Mesoplodon*. In one species of the last-named genus (*M. layardi*), from the South Seas, these teeth are much elongated and flattened, and in old animals (as in the skull exhibited) curve round and meet over the upper jaw, so as almost to prevent the mouth from opening. This disposition of the teeth has been found in so many individuals that it must be normal, and not, as at first thought, an accidental peculiarity, though it is difficult to understand how it is consistent with the animal obtaining its food.

The best-known member of this group found in the British seas is the Bottle-nose (*Hyperoödon rostratus*). In the young of both sexes the bony crests on the upper surface of the skull are small, and in females they remain of medium size, but in males they gradually increase as age advances. This Whale is an inhabitant of the northern Atlantic, and, as it yields both spermaceti and oil equal in value to that of the Sperm-Whale, it is now the object of a regular "fishery."

On the left side of the vestibule leading into the building is a case containing the Freshwater Dolphins, or *Platanistidæ*. Among these are a model, a skeleton, and several skulls of the Dolphin of the rivers of India (*Platanista gangetica*), which has never been found in the open sea, but is extensively distributed throughout nearly the whole of the river-systems, not only of the Ganges, but of the Bramaputra and Indus, ascending as high as the depth of water permits. The eyes are exceedingly small and imperfect in structure; and the creature appears to be quite blind. It feeds on small fish and

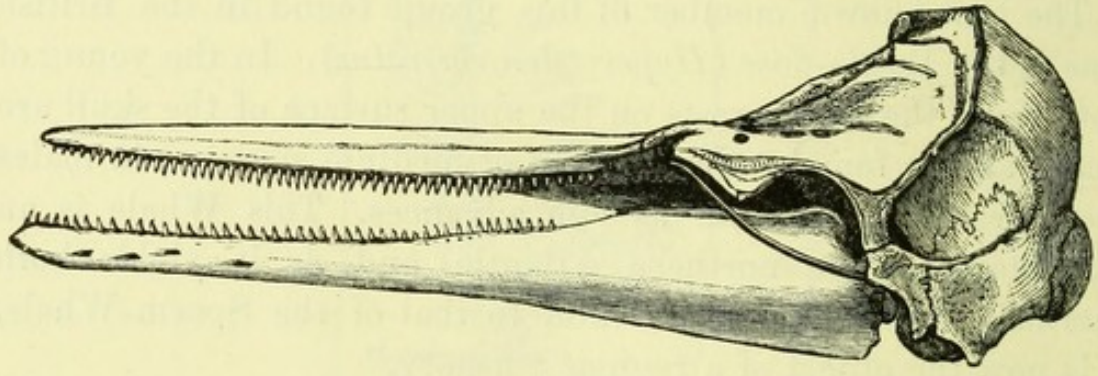
crustaceans, which it gropes for with its long snout in the muddy water at the bottom of the rivers. The blowhole, as may be seen in the model, is a single slit, placed lengthwise, and not transversely to the head as in most Dolphins, and the back-fin is merely a low ridge. The skull has on the upper surface a pair of large, compressed, bony crests, overarching the aperture of the nostrils and base of the beak, and nearly meeting in the middle line above. The jaws are exceedingly long and narrow, and armed with numerous,

Fig. 50.



The Dolphin (*Delphinus delphis*).

Fig. 51.



Skull of the Dolphin.

slender, pointed teeth, which undergo curious changes of form as life advances, the cast of the beak of a very old individual exhibiting the form assumed by the teeth at this stage.

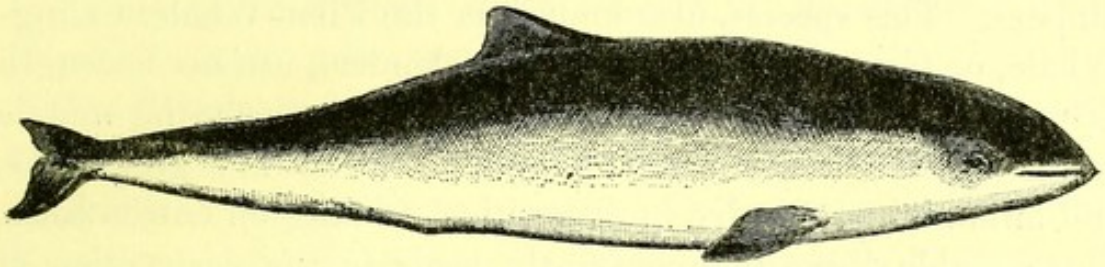
In the same case are the skeleton and some skulls of another freshwater Dolphin, *Inia geoffroyensis*, from the Upper Amazon and its tributary streams, and also of a species, *Pontoporia blainvillei*, from the estuary of the Rio de la Plata, of very small size, with long and slender jaws and the most numerous

teeth of any Mammal, sometimes as many as 60 on each side of each jaw, or 240 in all. Of the latter species a coloured model is also exhibited.

The *Delphinidæ* form a numerous group, including the species commonly called Dolphins and Porpoises, although some of the larger members are also dignified by the name of Whales. Skeletons of some of the species are exhibited, and models of others; and a series of casts of heads is affixed to the walls.

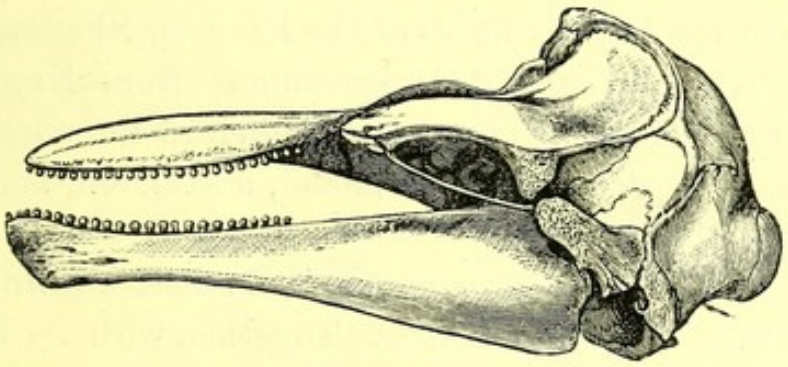
Among the more interesting forms, reference may be made

Fig. 52.



The Porpoise (*Phocæna communis*).

Fig. 53.



Skull of the Porpoise.

to the true Dolphins (*Delphinus*), which are found in considerable abundance in all seas, and are some of the smaller members of the order, none exceeding 10 feet in length. Their food is chiefly fish, for the capture of which their long pointed beaks, armed with numerous sharp teeth, are well adapted; but some also devour crustaceans and shell-fish. They are mostly sociable, and the agility and grace of their movements are constant themes of admiration. The name *Delphinus* is restricted to the Dolphin of the Mediterranean, *D. delphis*, and

its immediate allies. There are casts of the entire animal and of the heads of this species and also of the allied Bottlenose Dolphin, *Tursiops tursio*, from the Atlantic coast of North America. Risso's Dolphin, *Grampus griseus*, which is about 13 feet long, with no teeth in the upper, and but few in the lower jaw, and of very variable colour, is occasionally met with off our coasts. On the wall are coloured casts of the heads of an adult and young from North America.

The Black-fish, *Globiocephalus melas* or *Globicephala melæna*, has few and small teeth present in both jaws. It is characterized by the rounded form of the head and the long and narrow flippers. This species, also known as the Pilot-Whale, Ca'ing-Whale, or Grindhval by the Färoe islanders, attains a length of 20 feet, and is of nearly uniform black, except the middle of the under surface, which is lighter. It is very gregarious, and mild and inoffensive in disposition, feeding on cuttle-fishes. This sociable disposition constantly leads to the destruction of these Whales, as, when attacked, they rush together and blindly follow the leaders of the herd. In this way many hundreds at a time are frequently driven ashore and killed, when a herd enters one of the bays or fiords of the Färoe or Shetland Islands. They are widely distributed, specimens from New Zealand being indistinguishable from those taken in the northern seas. The species is represented by a model, a skeleton, and casts of the paddles.

The Porpoise, *Phocæna communis*, is the best-known and most frequent Cetacean on our coasts. Together with its immediate allies, it differs from other *Delphinidæ* in the form of the teeth, which, instead of being conical and pointed, have compressed spade-shaped crowns. Its external form is well seen in the model of an English specimen. A closely-allied species, *Neomeris*, or *Neophocæna, phocænoides*, differing mainly in the absence of a back-fin, is common off the coast of Bombay, and has been met with in other parts of the Indian Ocean and near Japan. One of the specimens exhibited was captured in the Yang-tse-kiang River, nearly a thousand miles from the sea.

Very different in structure and habits from the last is the "Grampus" or "Killer," *Orca gladiator*, a powerful species

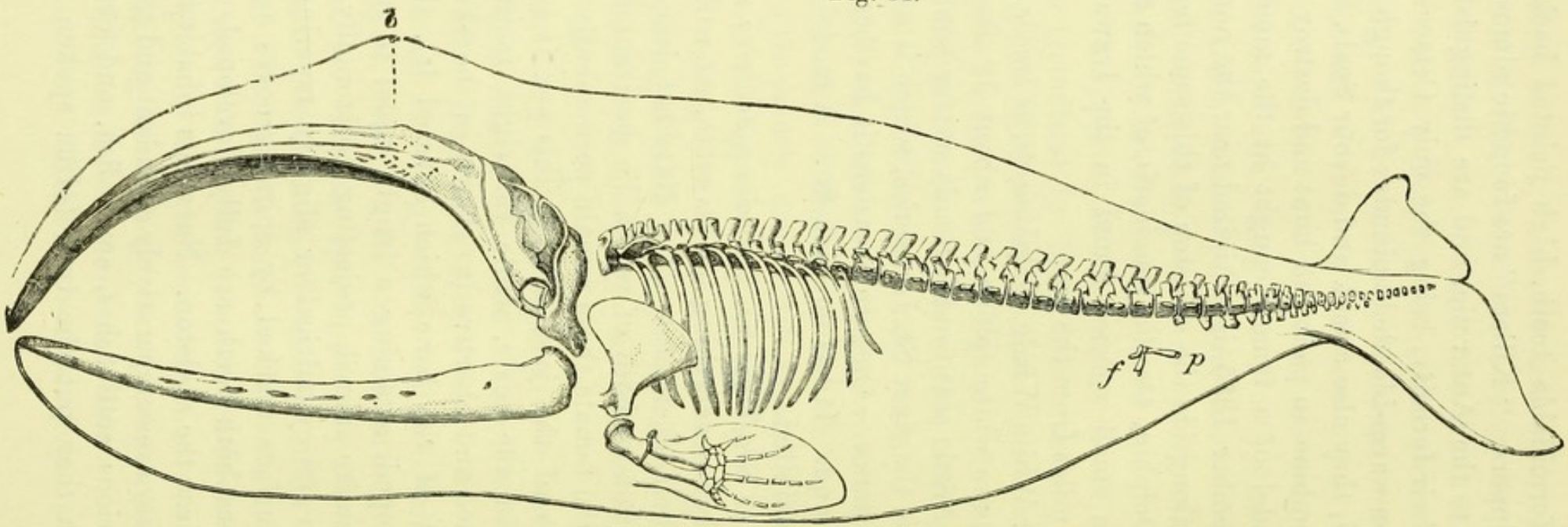
with numerous formidable teeth, high pointed back-fin, and broad rounded flippers. "Killers" are found in almost all seas, from Greenland to the Antarctic, and are distinguished from their allies by their ferocity, being the only Cetaceans which habitually prey on warm-blooded animals; for though fish form part of their food, they also attack and devour Seals, Porpoises, Dolphins, and combine in packs to hunt and destroy full-sized Whales. A model of a female caught at the mouth of the Humber, in November 1885, is exhibited near the north end of the gallery, and alongside the skeleton of this same female.

The Irawadi Dolphin, *Orcella fluminalis*, of which a skeleton is exhibited, is a small species found in the Irawadi River, from 300 to 900 miles from the sea.

The Beluga, or White Whale, *Delphinapterus leucas*, so called from its almost pure white colour, and about 12 feet long, is abundant in the Arctic seas, and extends as far south on the American coast as the river St. Lawrence, which it ascends for a considerable distance. On rare occasions it has been seen on the coast of Scotland. It has no back-fin. A model made on the skeleton is exhibited.

The Narwhal, or Sea-Unicorn, *Monodon monoceros*, resembles the Beluga closely in everything but its teeth, as will be seen by comparing their skeletons. The Narwhal has only two teeth in the adult state, both of which lie horizontally in the upper jaw. In the female these remain permanently concealed within the bones of the jaw, so that this sex is practically toothless; but in the male, while the right tooth remains similarly concealed and abortive (as shown in the skeleton by removal of part of the bone which covered it), the left is immensely developed, attaining a length equal to more than half that of the entire animal, projecting horizontally from the head in the form of a cylindrical or slightly tapering pointed tusk, with the surface marked by spiral grooves and ridges. In very rare cases both teeth are fully developed, as in the skull exhibited near the skeleton. Narwhals inhabit the Arctic regions, where they are comparatively abundant and gregarious, and feed on various cuttlefishes, small fish, and crustaceans. The use to which they put the tusk (often spoken of as the

Fig. 54.



The Greenland Right-Whale (*Balæna mysticetus*).

Skeleton and outline. *b*, position of nostrils or blow-holes; *p*, pelvic or hip bone; *f*, rudimentary femur or thigh-bone.

"horn") is not known. Three tusks are exhibited on the wall to the right of the entrance.

Although the Whalebone Whales (Mystacoceti) have rudimentary teeth developed at an early period of life, these soon disappear, and their place is occupied in the upper jaw by the "whalebone," which consists of a series of flattened horny plates, between three and four hundred in number on each side of the mouth, placed transversely to the long axis of the latter, with very small interspaces. Each plate or blade is somewhat triangular in form with the base attached to the palate, and the point hanging downwards. The outer edge of the blade is hard and smooth, but the inner edge and tip fray out into long bristly fibres, so that the roof of the Whale's mouth looks as if covered with hair. The blades are longest near the middle of the series, and gradually diminish towards the front and back of the mouth. Whalebone (as seen in various specimens in the skulls and on the walls) varies much in colour in different species of Whales. In some it is almost jet-black, in others slate-colour, horn-colour, yellow, or even creamy white. In some the blades are variegated with longitudinal stripes of different hues. It differs also greatly in other respects, being short, thick, coarse, and stiff in some, and greatly elongated and highly elastic in those species (as the Greenland Right-Whale, *Balæna mysticetus*) in which it attains its fullest development. Its use is to strain the water from the small marine molluscs, crustaceans, or fishes upon which these Whales subsist. In feeding, they fill the immense mouth with water containing shoals of these small creatures, and then, on closing the jaws and raising the tongue so as to diminish the cavity of the mouth, the water streams out through the narrow intervals between the hairy fringe of the whalebone-blades, and escapes through the lips, leaving the living prey to be swallowed.

Among other characters distinguishing Whalebone Whales from Toothed Whales is the distinctness of the external openings of the nostrils, which consist of a pair of longitudinal slits on the top of the head. The two sides of the upper part of the skull are also symmetrically developed, and

the organ of smell, though small, is formed as in other Mammals. The two halves of the lower jaw are curved outwards in the middle, and loosely connected both to the skull behind and to each other in front by fibrous bands. When the mouth is open in feeding, they fall outwards, widening the capacious bag formed by the dilateable skin of the throat (the power of distention of which is aided in many species by a series of longitudinal folds), which may be compared to the pouch under the beak of the Pelican. By their rotation upwards and inwards when the mouth is closed, they are brought close to the upper jaw. The sternum, or breast-bone, is composed of a single piece, often taking the form of a cross, and articulating only with a single pair of ribs. There are never any bony sternal ribs joining the breast-bone.

In the Right-Whales, *Balæna*, the skin of the throat is smooth, and not furrowed; there is no back-fin; the neck-vertebræ are united into a single mass; and the fore-limb is broad and short, with five fingers. The head is very large, and the whalebone very long and narrow, highly elastic and black, as seen in the specimens on the wall at the north-west corner of the gallery.

This genus contains the well-known Greenland Right-Whale (*Balæna mysticetus*) of the Arctic seas, which yields whalebone of the greatest value and train-oil. As it never leaves the ice, it is not an inhabitant of the seas round our islands. It used to be hunted every summer in Baffin Bay and the seas round Spitsbergen by ships fitted out at Dundee and Peterhead. The Museum at present only possesses a skull of this interesting species; but a carefully executed coloured model, on the scale of one inch to the foot, presented by Captain D. Gray, gives a good idea of its external appearance.

Besides the Greenland Right-Whale there are other members of the same genus, distinguished by having heads somewhat smaller in proportion to the body, with shorter whalebone and a larger number of vertebræ. These inhabit the temperate seas of both northern and southern hemispheres; and, although divided into species, in accordance with their geographical distribution (such as *B. biscayensis* of the North Atlantic,

B. japonica of the North Pacific, *B. australis* of the South Atlantic, and *B. antipodarum* of the South Pacific), their distinctive differences are comparatively slight. The first-named was the Whale formerly hunted regularly by whalers from the Basque sea-ports of France and Spain, and the main source of supply of whalebone and oil until the discovery of the Greenland Whale in the seventeenth century. It became extremely rare, but, owing to the diversion of the whalers' attention to the larger and more profitable Arctic species, it again became rather more numerous. The skeleton of a male specimen obtained from the coast of Iceland forms the basis for a half-model of this species. A mass of united neck-vertebræ, dredged from the bottom of the sea near Bridport, in 1853, probably also belongs to this species. None of the Right-Whales exceeds 50 feet in length.

A cast of the head of the Pigmy Whale, *Neobalæna australis*, of New Zealand, Australia, and South America, is placed on the north wall of the building, and a skeleton near by. Besides peculiarities in the form of its bones, this species, which does not exceed 25 feet in length, is distinguished by its very long, slender, elastic whalebone, which is nearly white in colour, with a dark external border.

The Grey Whale of the North Pacific, *Rhachianectes glaucus*, of which a small model is exhibited, combines the small head, elongated form, and narrow flippers of the Rorquals with a smooth throat and absence of a back-fin, as in the Right-Whales. The whalebone is short and yellow in colour, the two front ribs are at least frequently fused together, and the sternum is unusually long and narrow.

Another group is represented by the Humpback Whale (*Megaptera boöps*), a species likewise at present represented only by a small model in the exhibited series. In this Whale the head is of moderate size, and the whalebone-plates are short and broad, the neck-vertebræ being free. The most conspicuous distinguishing character is the immense length of the flipper, about one-fourth of that of the entire animal. It is on account of the low rounded form of the back-fin that

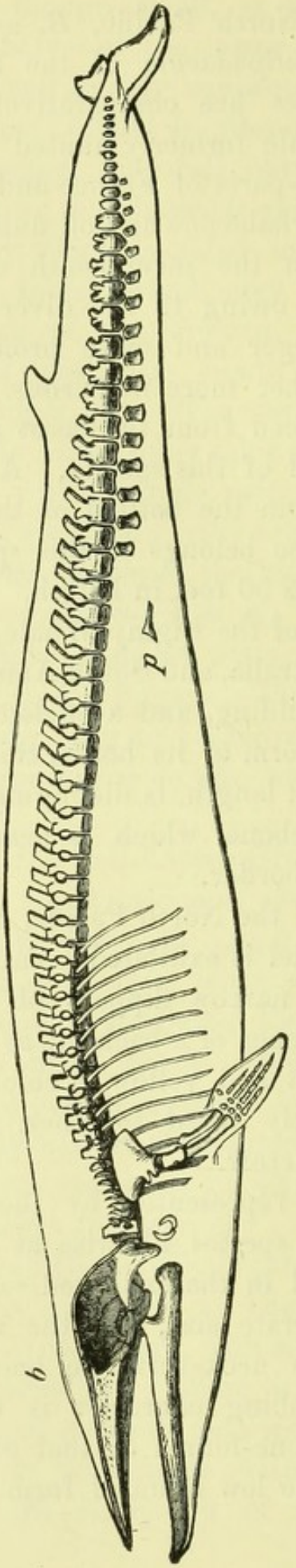


Fig. 55.

The Common Rorqual or Fin-Whale (*Balænoptera musculus*).

Skeleton and outline. *b*, position of blow-holes; *p*, pelvic bone.

these Whales are called "Humpbacks" by the whalers. They have a wide geographical range.

The various species of Rorquals, Fin-Whales, Fin-backs, Finners or Razor-backs, as they are variously called, some of which are found in almost every sea, constitute the genus *Balænoptera*, characterized by the comparatively small, flat, and pointed head, with the throat marked by longitudinal pleats capable of distention to form a pouch, low back-fin, short, narrow, and pointed flippers, with but four digits, coarse and short whalebone, and separate neck-vertebræ.

Rorquals are "clipper-built" Whales, adapted for a high rate of speed. The largest is Sibbald's Rorqual (*B. sibbaldi*), which grows to about 100 feet, and is common in the seas between Scotland and Norway. Almost of equally colossal proportions is the Common Rorqual (*B. musculus*), found throughout the North Atlantic and Mediterranean, and often stranded on the English coasts. The skeleton of a full-grown animal, 68 feet long measured in a straight line, from the Moray Firth, Scotland, where it was captured in 1882, shows the osteological characters of this group of Whales, even to the small pelvic bone and rudimentary nodule representing the femur or thigh-bone. Upon this skeleton has been modelled one half of the body to exhibit the external form. The whalebone is in place in the mouth, and the flukes of the tail and the dorsal fin are also preserved, and suspended on the wall behind the specimen. *Balænoptera borealis*, Rudolphi's Rorqual, and *B. acutorostrata*, the Lesser Rorqual, are smaller species than the last, also stranded in Great Britain, the second more commonly than the first. Casts of paddles of Rorquals, exhibiting both the external form and the internal structure, are displayed on the north wall of the building.

In a table-case near the large Rorqual are exhibited the curious ear-bones of various Whalebone Whales, together with a few of those of the Toothed Group. Each genus, if not species, can readily be distinguished by the form of its ear bones.

Order IX. EDENTATA, or Sloths, Anteaters, and Armadillos.

(Lower Gallery, Cases 32 & 33.)

The Edentates, as represented by the Sloths, Anteaters, and Armadillos of South and Central America and the Pangolins and Ant-Bears of the Old World, are characterized by the incomplete state of their dentition, teeth in many cases being absent, while when present they are always composed of dentine and cement only (without enamel), and rarely form roots. As a rule, the teeth are of a simple type, more or less completely alike, absent from the front of the jaws, and without milk-predecessors.

[Case 32.] Of the American members of the group, the Sloths (*Bradypodidæ*) are characterized by their short round heads, long fore-legs, toes fastened together by skin and terminating in long curved claws, and the coat of coarse brittle hairs. They are entirely tailless. Sloths pass their whole existence on trees, hanging by their long and powerful claws to the underside of the branches, never descending to the ground unless compelled, and feeding on leaves and young twigs, for the mastication of which their few and simple teeth are sufficiently well suited. Inhabiting the forests of Tropical America, they are slow in their movements, but by no means so helpless as is often supposed, although they escape their enemies less by their own exertions than by the difficulty with which they are distinguished from the branches to which they cling. This resemblance is increased by the growth of an alga in the grooves of the coarse hair (as illustrated in the case), which communicates a green tinge to the entire coat.

Sloths have five teeth above and four below. The neck-vertebræ, which in all other Mammals except Manatees are 7 in number, amount to no less than 9 in the Three-toed Sloths, *Bradypus* (**1383**), while in certain of the Two-toed Sloths, *Cholœpus* (**1384**), there are only 6. The pelvis is remarkable for being united to an unusually long portion of the back-bone.

In old animals most of the bones of the wrist and ankle joints become united. In addition to the difference in the number of their claws, the Three-toed Sloths, or Unaus, and the Ais, or Two-toed Sloths, are distinguished by the different shape and proportions of their teeth,—those of the former being small, of equal size, and the upper ones placed opposite the lower, so that they wear down nearly flat ; while in the latter the first tooth in each jaw forms a sort of canine, twice as long as any of the others, and as the teeth are placed alternately in the two jaws, they are worn down into wedge-shaped crowns. Skeletons and skulls of both genera are placed in the case.

Intermediate to a certain extent between Sloths and Ant-eaters are certain huge fossil animals, found in the Tertiary deposits of South America, of which the best known is the Great Ground-Sloth (*Megatherium americanum*, **1385**) ; a cast of the skeleton is exhibited in the Palæontological Gallery, and one tooth in case 32 of the Lower Mammal Gallery. *Mylodon* is an allied genus. In the earlier Tertiaries of Patagonia the species are much smaller : one of the larger kinds certainly existed within the human period.

The Anteaters (*Myrmecophagidæ*) have narrow heads with [Case 32.] long snouts, to accommodate their enormously elongated, worm-like tongues ; their tails are well developed, and in some species prehensile, their toes are separate from each other, as in ordinary Mammals, and the third on the fore-foot is provided with a huge digging claw. Like Sloths, they are natives of Tropical America. The Great Anteater, *Myrmecophaga jubata* (**1388**), is about four feet in length and has a long black mane along its back, a thick bushy tail, and a long narrow head, about a foot in length, the greater part of which is made up by the maxillary bones. There are no zygomatic, or cheek, arches to the skull, little biting-power being needed ; and the collar-bones, or clavicles, are exceedingly rudimentary. This Anteater is terrestrial in its habits, and feeds entirely on ants, which it catches with its long sticky tongue, after having torn open their nests with its powerful claws. Much smaller are the Tamandua, *Tamandua tridactyla* (**1387**) and the Two-toed Anteater, *Cycloturus*, or *Cyclopes*, *didactylus* (**1386**), the

latter being scarcely larger than a Rat. Both lead an entirely arboreal life and have the tail prehensile.

The Armadillos, *Dasypodidæ*, are remarkable for the thick plates of bone with which their bodies are covered, forming immovable shields across the shoulders and hips, the centre of the back being protected by a larger or smaller number of transverse bands of plates, joined to each other by flexible skin. The head and tail are also covered by a mosaic of bony plates; but the belly and inner sides of the limbs are clothed only with soft skin. The fore-feet have a variable number of long and powerful claws, but the hind-feet always carry five rather small claws. In all the group teeth are present, generally $\frac{7 \text{ to } 9}{7 \text{ to } 10} = 28$ to 38 in number, but in the Giant Armadillo amounting to $\frac{20 \text{ to } 25}{20 \text{ to } 25} = 80$ to 100. These teeth are small and simple, with single roots. In the genus *Tatusia* alone a set of double-rooted milk-teeth precedes the simple single-rooted permanent ones, and traces of a milk-dentition have also been found in *Dasypus*. The second and third, and often several of the other neck-vertebræ are welded together. The collar-bones, or clavicles, are well developed, and the whole fore-limb is enormously strengthened to support the huge digging-claws.

The largest living species is the Giant Armadillo, *Priodontes gigas* (**1381**), measuring more than two feet in length ; while the smallest, rarest, and in many respects the most interesting, is the Pichiciego, or Fairy Armadillo, *Chlamydophorus truncatus* (**1377**), which has the outer shield attached to the hip-bones by peculiar bony processes. It leads an underground life. The Three-banded Armadillos, *Tolypeutes* (**1373** to **1374**), have the power of rolling themselves up into perfect balls, like Hedgehogs, the head and tail fitting into corresponding notches in the shield. Armadillos are ground-animals, able to burrow in the soil with surprising rapidity, either with the object of escaping danger or in search of their food, which consists of roots, insects, worms, reptiles, and carrion. They are found chiefly in the warmer parts of Central and South America, although a few range southwards into Patagonia.

Fossil Armadillos are numerous in the Tertiary deposits of

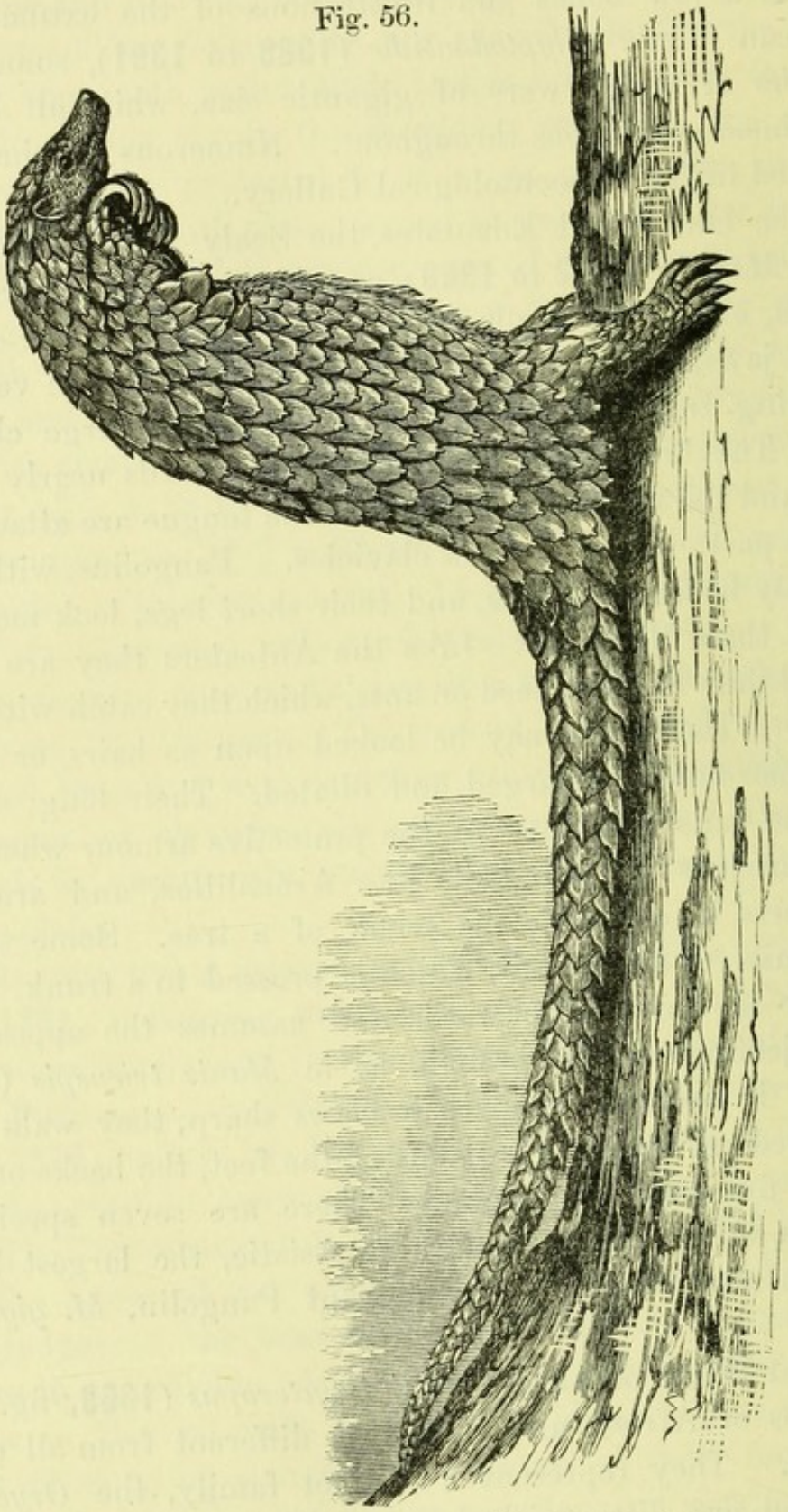
South America, many belonging to existing genera. The case contains a few bones and illustrations of the extinct South American family *Glyptodontidæ* (**1389** to **1391**), some of the members of which were of gigantic size, while all had the bony shield continuous throughout. Numerous specimens are exhibited in the Palæontological Gallery.

Of the Old-World Edentates, the Scaly Anteaters, or Pangolins, *Manidæ* (**1362** to **1368**), are characterized by their want of teeth, elongated skulls (which are without cheek-arches), slender jaws, and long powerful tails, of which the vertebræ, numbering from 28 to 46, are provided with large chevron-bones. The breast-bone is produced backwards nearly to the pelvis, and the retracting muscles of the tongue are attached to its hind part. There are no clavicles. Pangolins, with their long scaly bodies and tails, and their short legs, look more like Reptiles than Mammals. Like the Anteaters they are toothless, and they likewise feed on ants, which they catch with their tongues. The scales may be looked upon as hairs, or rather spines, enormously enlarged and dilated. Their long, strong, and broad tails form part of the protective armour when they coil themselves up into balls like Armadillos, and are used as supports in climbing the trunk of a tree. Some species rest themselves on the tail, which is pressed to a trunk, whilst the body is thrown backwards and assumes the appearance of a projecting broken branch, as in *Manis tricuspis* (**1363**, fig. 56). In order to keep their claws sharp, they walk with them closed up against the palms of the feet, the backs only of the toes touching the ground. There are seven species of Pangolins, four African and three Asiatic, the largest being the West and Central African Giant Pangolin, *M. gigantea* (**1365**). [Case 33.]

The Ant-Bears, or Aard-Varks, *Orycteropus* (**1369**, fig. 57), are natives of Africa, and strikingly different from all other Edentates. They represent a distinct family, the *Orycteropodidæ*, and are distinguished externally by their long, low, hair-covered bodies, long snouts and tongues, large ears, stout powerful tails, and short thick limbs. They have four toes on the front and five on the hind-feet, all modified for digging, [Case 33.]

their manner of life being very similar to that of the Great

Fig. 56.



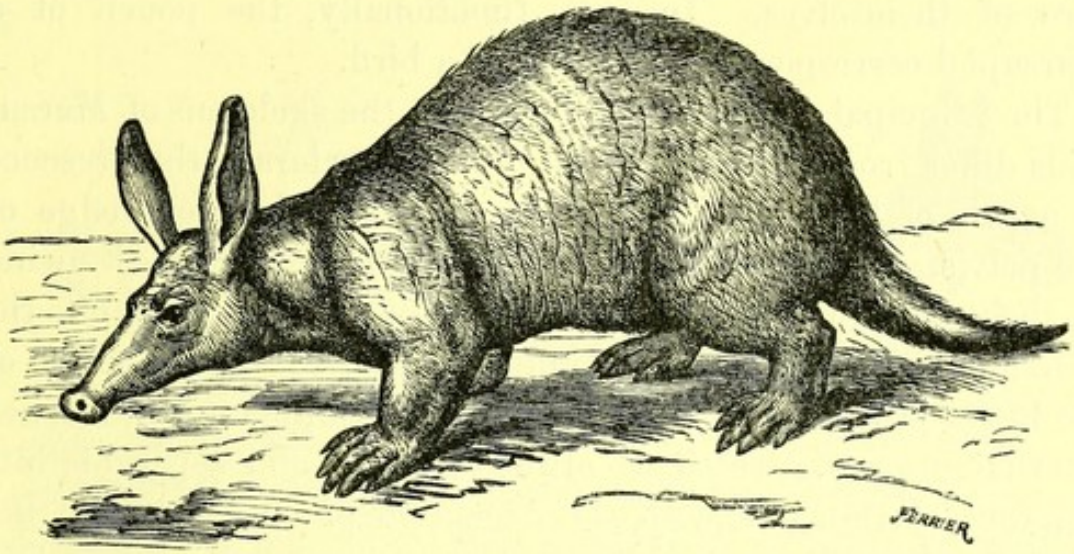
West-African Pangolin (*Manis tricuspis*).

Anteater, as they feed chiefly on ants and other small animals. The specimens exhibited show the curious appearance of these

animals, which induced the early Dutch settlers in the Cape to compare them to Pigs, and to name them Aard-Varks, *i. e.* Earth-Pigs.

Ant-Bears have $\frac{8 \text{ to } 10}{8}$ teeth, of a peculiar and complex structure, each consisting of a large number of separate parallel tubes, closely packed together. In transverse section these teeth present an appearance not unlike that of a piece of

Fig. 57.



Ant-Bear, or Aard-Vark (*Orycteropus afer*).

cane; and they are preceded by a set of minute milk-teeth, remnants of a former functional set, which show indications of a division into different groups, such as premolars and molars. The cheek-arches, or zygomata, are complete, and there are well-developed collar-bones, or clavicles. The Ant-Bear, *Orycteropus afer* (fig. 57), is about the size of a Pig.

Order X. MARSUPIALIA, or Marsupials.

(Lower Gallery, Cases 69–70.)

This order differs by numerous and important anatomical characters from all the preceding groups; and there is, moreover, a curious parallelism between its members and the

former, in that Marsupials include species representative of the herbivorous, carnivorous, and insectivorous types of other Mammals.

The females of most Marsupials possess a pouch of skin on the under part of their bodies, which gives the name to the order. In this pouch the young, which are in a very imperfect condition when born, continue their development, clinging at first firmly to the nipples, and using the pouch for a long time afterwards as a place of refuge until able to take care of themselves. In fact, functionally, the pouch of a Marsupial corresponds to the nest of a bird.

The principal characteristic by which the skeletons of Marsupials differ from those of all the previous orders is the presence of a pair of long slender bones, attached to the front edge of the pelvis. These are known as the "marsupial bones," owing to their proximity to the external pouch *. In their skulls the Marsupials differ from other Mammals by having the angle of the lower jaw much bent inwards, and forming a well-marked internal process. Teeth are always present, and separable into different classes, but, with the exception of one premolar, not preceded by milk-teeth. The incisors are generally unequal in number in the two jaws, and range from $\frac{2}{2}$ to $\frac{5}{4}$. The dorso-lumbar vertebræ are invariably 19.

[Cases 69 & 69*.] Marsupials are divided primarily into two great groups: in the first, as in the Rodents and Ungulates, the incisors are few in number, but large and powerful, and the canines, at least in the lower jaw, are either entirely absent or small and rudimentary; while the second possess, like the Placental Carnivora, small and numerous incisors and large and sharp canines. The former are called "Diprotodont" † and the latter "Polyprotodont" ‡.

To the former group belong Kangaroos, Phalangers or Australian Opossums, and Wombats, which, with but few exceptions, live chiefly upon vegetable food; to the latter,

* They are absent in one genus only, *Thylacynus*, and in some American Opossums.

† "With two front teeth."

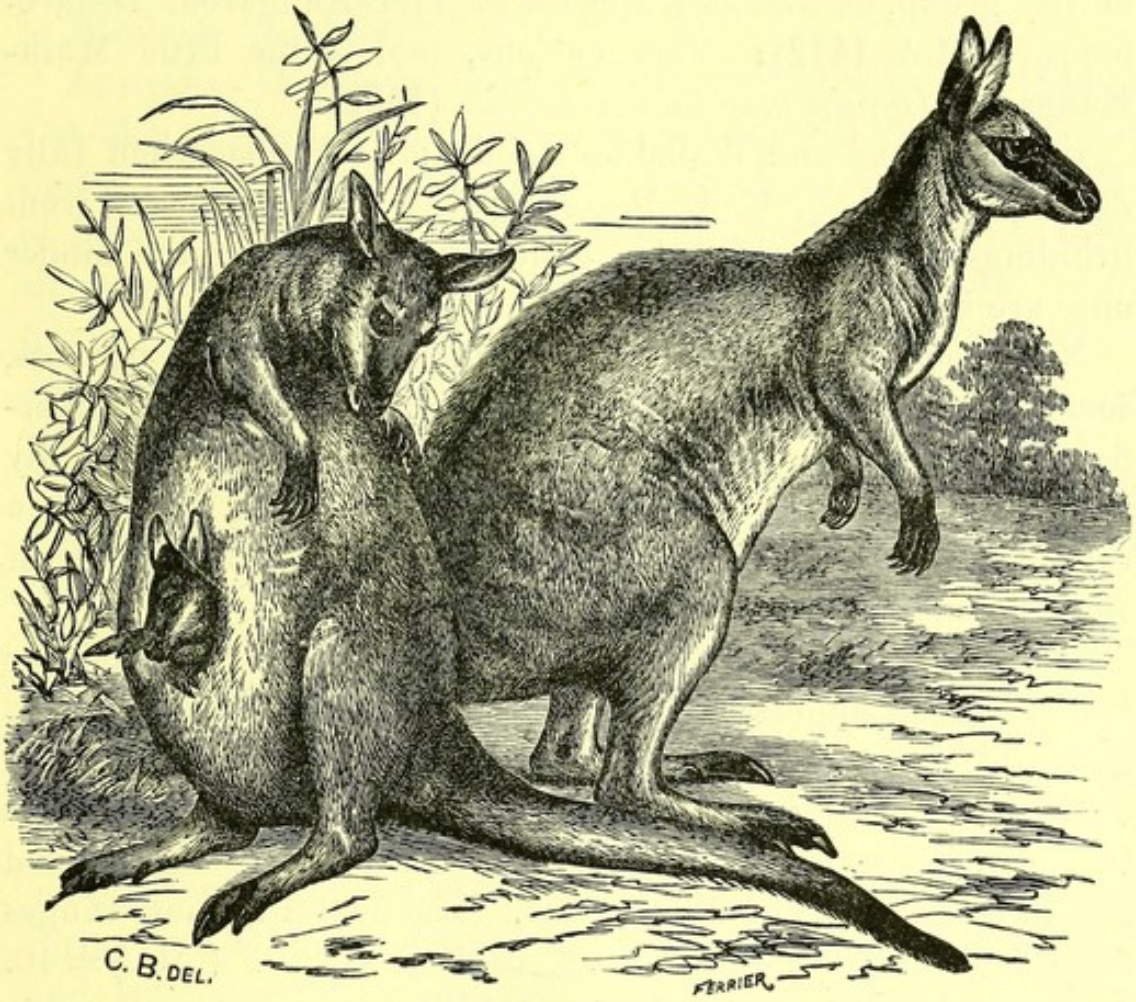
‡ "With many front teeth."

carnivorous both in structure and habits, the American Opossums, Dasyures or Native Cats, and Bandicoots.

The geographical distribution of this order is remarkable, two families out of eight being found in South America, while all the rest are now confined to the Australian region.

The Kangaroo group, or *Macropodidæ* (cases 69 and 69*), includes herbivorous animals with disproportionately large hind-limbs and long powerful tails, both of which they use in leaping or in assuming an erect position, putting their short fore-feet

Fig. 58.



Parry's Wallaby (*Macropus parryi*).

to the ground only when feeding or walking. Their hind-feet are of very peculiar structure, the great mass of the foot being made up of the much-developed fourth toe, while the first toe, corresponding to our great toe, is entirely absent; and the second and third, although long, are so slender and weak as to be quite useless, and bound up in a common skin to the nails,

This structure of the foot is not confined to the Kangaroos, but is also found in certain of the other families.

Kangaroos vary in size from species belonging to the typical genus *Macropus* (**1396** to **1406**) as large as a man, through the smaller kinds known as Wallabies (fig. 58), to others smaller than a Rabbit, such as the Kangaroo-Rats, or Rat-Kangaroos, *Potorous* (**1415**, **1416**). Of those exhibited may be specially mentioned the Great Red Kangaroo, *Macropus rufus* (**1405**), the largest of the family, and the beautiful Yellow-footed Wallaby, *Petrogale xanthopus* (**1410**), the most brightly-coloured species of the group, as well as a species of Tree-Kangaroo, *Dendrolagus* (**1411** & **1412**). Very curious, too, is the little Musk-Kangaroo, *Hypsiprymnodon moschatus* (**1422**).

In Kangaroos and Wallabies the dental formula, when fully developed, is I. $\frac{3}{1}$, C. $\frac{1}{0}$, P.+M. $\frac{6}{6}=34$; some of the front grinding-teeth, however, are generally lost before the hinder ones are in position.

Numerous fossil remains of animals allied to Kangaroos, some as large as a Rhinoceros, have been found in the superficial deposits of Australia, among which may be specially mentioned the huge *Diprotodon australis* (**1425**), of which a cast of the lower jaw is exhibited in case 69. A fine series of remains is shown in the Palæontological Gallery.

[Case 70.] The Australian Opossums and their relatives, collectively known as Phalangers (*Phalangeridæ*), differ from the Kangaroo group by the possession of a large opposable great toe and the comparative shortness of their hind-feet. The teeth are variable in form and number, the genera of the family being founded almost entirely on these variations. The dental formula ranges from I. $\frac{3}{1}$, C. $\frac{1}{0}$, P.+M. $\frac{5}{4}=28$, to I. $\frac{3}{1}$, C. $\frac{1}{1}$, P+M. $\frac{7}{7}=40$. In the curious *Tarsipes rostratus* (**1446**) the molar teeth are so reduced and variable that no definite number can be assigned to it. The hind-feet are of the same type as in the Kangaroos, but the disproportion between the bones of the united second and third toes on the one hand, and the fourth on the other, is not so great as in those animals.

The members of this group vary in size from that of a Mouse,

as for example the Pigmy Flying Phalanger, the Flying Squirrel of the Colonists, *Acrobates pygmæus* (**1441**), to others larger than a Cat, such as the Native Bear, or Koala, *Phascolarctus cinereus* (**1414**). Skeletons are exhibited of the latter animal, of a Cuscus, *Phalanger maculatus*, and of a Flying Phalanger, *Petaurus sciureus* (**1437**).

Of the more noticeable types, the following may be mentioned :—

The Shrew-like *Tarsipes rostratus* (**1446**), a little long-nosed animal with an extensile tongue, and three distinct stripes down its back, which feeds on insects and honey, and is confined to Western Australia.

Australian Opossums, or true Phalangers, *Trichosurus* (**1442**), [Case 69.] Cat-like animals, with thick fur and long bushy tails ; the finely-marked Striped Phalanger, *Dactylopsila trivirgata* (**1435**), of New Guinea ; the Dormouse-Phalangers, *Dromicia* (**1439**) ; the larger Moluccan Cuscuses, *Phalanger* (**1429**, **1430**) ; and, finally, the Flying-Phalangers, or Australian Flying-Squirrels, *Petaurus* (**1436**), which, like true Flying-Squirrels, have a lateral extension of the skin of the body, forming a parachute.

The Native Bear, or Koala, *Phascolarctus cinereus* (**1414**), is a curious species, somewhat similar in its general appearance to a little Bear, but a vegetable-feeder, living chiefly on the leaves of gum-trees. It is of a harmless and peaceable disposition, of about the same size as a Wombat, with long ashy-grey hair, tufted ears, no tail, and five toes on each of its feet. It is related both to Phalangers and Wombats.

Wombats, *Phascolomyidæ* (**1393** to **1395**, fig. 59), are rather [Case 69.] clumsily-built animals, somewhat resembling Marmots in general form, with a short, rounded head, short ears, scarcely any tail, and long powerful claws with which they dig their burrows. There are four species, very similar externally, distributed over the whole of Australia and Tasmania, and living on roots and other vegetable food. They often exceed 100 lb. in weight, and are valued as food.

Wombats are the only Marsupials with rootless teeth and an equal number of incisors in each jaw, their dentition being

I. $\frac{1}{1}$, C. $\frac{0}{0}$, P. + M. $\frac{5}{5} = 24$. The incisors are large and cutting, with the enamel confined to the front surface, as in Rodents. The cheek-teeth are strongly curved, and composed of two parallel lobes each. The general form is stout and squat, and the tail rudimentary, consisting of only from 8 to 12 vertebræ, while the Phalangers have from 25 to 31. The hind-feet show a slight tendency towards the Kangaroo type of structure.

Fig. 59.

Common Wombat (*Phascolomys ursinus*).

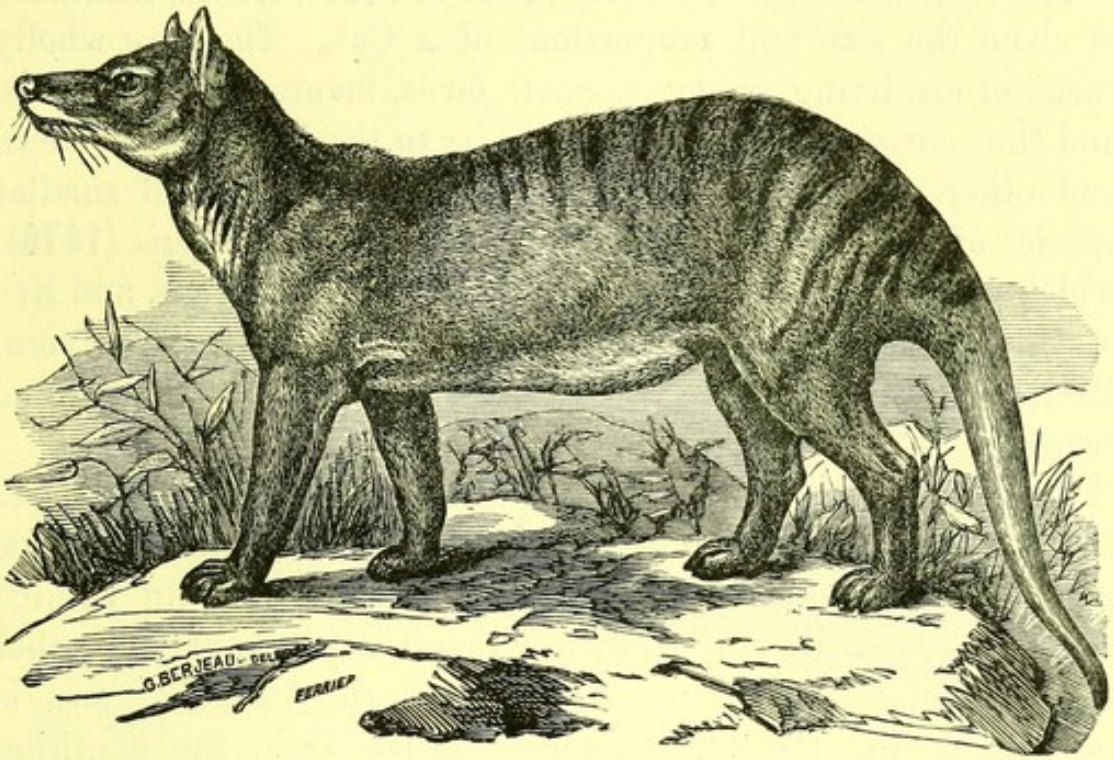
[Case 70.] Bandicoots, *Peramelidæ*, are the first examples of the "polyprotodont" carnivorous dentition, that is one with many incisors in the lower jaw, and with the lower and upper canines well developed, and suited for seizing and holding small Mammals, birds, worms, beetles, &c. The dental formula is I. $\frac{5}{3}$, C, $\frac{1}{1}$, P + M. $\frac{7}{7} = 48$. On the other hand, the hind-feet show a close resemblance to those of the Kangaroos, so that these animals are in some measure intermediate between the two great groups of Marsupials.

Some of the more important members of the family are the Striped Bandicoot, *Perameles fasciata* (**1464**), of Tasmania;

the Long-nosed Bandicoot, *P. nasuta* (**1465**), of New Guinea; the Long-eared Rabbit-Bandicoot, *Peragale lagotis* (**1468**), of Western Australia; and the little Pig-footed Bandicoot, *Chœropus castanotis* (**1467**), an animal somewhat resembling a Rat, but with fore-feet recalling those of a Pig.

Allied to the Bandicoots are the carnivorous *Dasyuridæ*, in which the feet are of the ordinary type, with five toes on the fore and four on the hind pair. [Case 70.]

Fig. 60.



The Pouched Wolf, or Thylacyne (*Thylacynus cynocephalus*).

The *Dasyuridæ* are the most highly developed carnivorous Marsupials, representing in this order the Carnivora of the placental series. The largest is the Thylacyne or Pouched Wolf, *Thylacynus cynocephalus* (**1484**, fig. 60), the skull of which strikingly resembles that of one of the Dog tribe. Its dentition is I. $\frac{4}{3}$, C. $\frac{1}{1}$, P. + M. $\frac{7}{7} = 46$, the teeth being sharp and cutting, and well suited to its predatory habits. The feet are like those of a Wolf, and the marsupial bones are represented by cartilages. Externally the Thylacyne is remarkably like a striped Wolf. For a long time it was the bane of the

Tasmanian settlers, owing to the havoc it created among their sheep; but it has now been nearly exterminated, and at no distant period will be quite extinct. No Thylacynes now live on the continent of Australia, but their fossil remains have been found in bone-caves in New South Wales.

The second largest member of the family is the well-known Tasmanian Devil, *Sarcophilus ursinus* (**1482**), which has earned its English name by its untamable disposition and the damage it does to poultry and game.

The Native Cats, or Dasyures (**1477** to **1481**), are small animals of about the size and proportions of a Cat. They are wholly carnivorous, living on eggs, small birds, mammals, and insects, and thus corresponding in their habits to the Weasels, Martens, and other small placental Carnivora; while the still smaller species of *Phascologale* (**1470** to **1474**) and *Sminthopsis* (**1476**), which range from the size of a Rat to that of a Mouse, and live on insects, worms, &c., represent the placental Insectivora. Their teeth are numerous, small, and covered with sharp-pointed cusps.

The Banded, or Marsupial, Anteater, *Myrmecobius fasciatus* (**1469**), is one of the few Mammals marked with cross-bars. About the size and shape of a Squirrel, it has a long pointed snout and extensile tongue, with which it catches ants and other small insects. It is a native of Western Australia, and is remarkable for the large number of its teeth, the dentition being I. $\frac{4}{3}$, C. $\frac{1}{1}$, P. + M. $\frac{9}{9} = 54$. The teeth are small and sharply cusped.

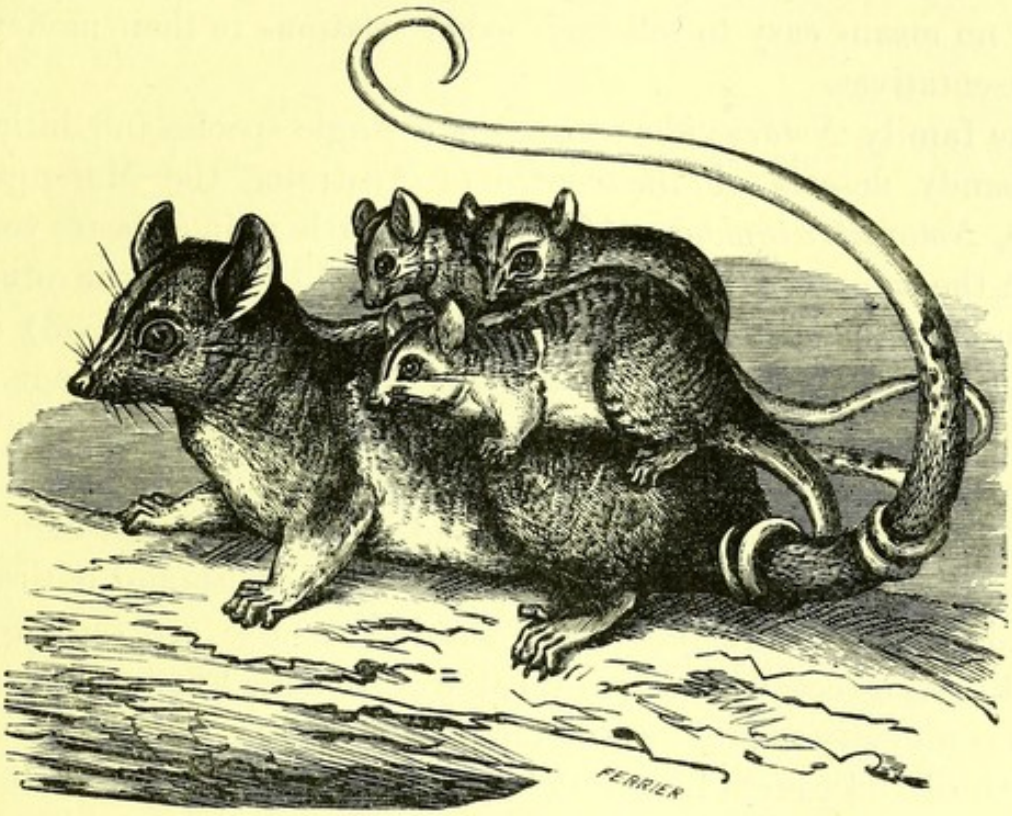
The American Opossums (fig. 61), or *Didelphyidæ*, resemble in their dentition the *Dasyuridæ*, and in the structure of their feet the Phalangers, the first hind-toe being opposable to the other toes, and so forming a posterior pair of hands. The dental formula is I. $\frac{5}{4}$, C. $\frac{1}{1}$, P. + M. $\frac{7}{7} = 50$.

The species of American Opossums are numerous, but in no family of equal extent are there so few differences in the characters of the skeleton—the skulls, teeth, and proportions of the limbs being in all nearly identical.

These Opossums are almost the only living extra-Australian members of the order, being limited to America, where they

range from the United States to Patagonia, the number of species being greatest in the more tropical parts. They are characterized externally by their slender build, long noses, well-developed prehensile tails, and above all by their hind-feet being provided with a great toe, which, as already stated, is opposed to the other toes, and enables the animal to grasp boughs or other objects; it is without nail or claw, and has only a broad, flat, fleshy pad at its tip. Of the *Didelphyidæ*

Fig. 61.



An American Opossum (*Didelphys dorsigera*) with its young.

the most worthy of mention is the Common Opossum, *Didelphys marsupialis* (**1458**), a native of all the countries from the United States to Brazil, and everywhere found in great abundance. It is of the size of a Cat, and feeds on all sorts of animal and vegetable substances, living even in towns, where it acts as a natural scavenger. Other South-American species are smaller, some little larger than a Mouse. The females carry their young on the back (fig. 61, No. **1450**), the latter using their prehensile tails by twisting them round that of their mother.

The Yapock or Water-Opossum, *Chironectes minimus* (**1447**), differs from other Opossums in having its toes webbed like those of an Otter ; it is wholly aquatic in its habits, and lives on water-beetles and crustaceans. Its colour is of a general ashy grey, with five or six broad slaty-brown bands across the back, standing out in high relief against the ground-colour of the body.

Fossil remains of Opossums are of special interest, on account of being found in the Eocene deposits of England and France. These fossils consist, however, chiefly of lower jaws, so that it is by no means easy to tell their exact relations to their modern representatives.

The family *Notoryctidæ* consists of a single species inhabiting the sandy deserts of the centre of Australia, the Marsupial Mole, *Notoryctes typhlops* (**1443**). This little animal bears very much the same relation in its structure and habits to the other Marsupials that the Moles and Golden Moles (pp. 31 & 33) do to the other Insectivora, and the Mole-Rats (p. 60) present to other Rodents. It lives chiefly underground, burrowing in the sandy soil, and feeding on worms, grubs, &c. Its snout is provided with a peculiar naked pad or shield with which it forces its way through the earth ; the tail is short and entirely naked ; the eyes are practically aborted, as also are the ears ; and the fore-feet, with which it burrows, are modified somewhat in the same way as are those of the Golden Moles (*Chrysochloris*). The third and fourth toes bear large digging claws, while those of the other three are small and slender.

The skeleton of this little animal, exhibited in case 70, is remarkable for its generally Mole-like structure, powerful fore-limb, with its stout and highly ridged humerus, the united neck-vertebræ, the first and the seventh being alone free, and for the peculiar roofing-in of the sacrum by the expansion of the processes of the sacral vertebræ. The teeth vary slightly in number, but the ordinary formula appears to be :—I. $\frac{3}{2}$, C. $\frac{1}{1}$, P. + M. $\frac{6}{7} = 40$.

A second South American group is now represented by the living genus *Cænolestes*, referred to the family *Epanorthidæ*, of which numerous fossil remains have been discovered in the

Tertiary formations of Patagonia. On account of its rarity, no example of this animal is at present shown.

Order XI. MONOTREMATA, or Egg-laying Mammals.

(Lower Gallery, Case 71.)

The order Monotremata, like the Marsupialia, represents by itself one of the primary sections or subclasses into which Mammals are divided. In all their anatomical characters its members show a remarkably low type of organization, doubtless transmitted more or less directly from some of the earliest Mammalian forms.

Fig. 62.

The Echidna, or Spiny Anteater (*Echidna aculeata*).

Monotremes present many important skeletal characters, among which may be specially noticed the peculiar structure of the shoulder-girdle, in which the clavicle is large, and connected with the sternum by an "inter-clavicle"; the coracoid, instead of being rudimentary as in other Mammals, is large and articulates with the sternum; and the whole structure is of a very low and Reptile-like type. The skull is long and

depressed, with a large rounded brain-case, the walls of which are thin, as in Birds. There are no true teeth in adult life, but in the Platypus the young are provided with three pairs of peculiar flattened saucer-like teeth in each jaw, which are afterwards shed and replaced by horny plates. There are 19 vertebræ in the trunk, well-marked sternal ribs, and a pair of large marsupial bones placed on the pelvis.

The two families of the order differ in many important respects, especially in the shape of the skull. The Duck-billed Platypus, or Platypus, *Ornithorhynchus*, has a broad, flat expansion, forked in front, which supports the beak, and in which first the teeth and then the horny plates are implanted ; while in the Spiny Anteaters, *Echidna* (fig. 62), the snout is long, narrow, and toothless, and forms merely a long tube for the

Fig. 63.

The Egg of a Spiny Anteater, or Echidna. Nat. size.

lodgment of the tongue, as in the true Anteaters. In *Proëchidna bruijnii* from New Guinea, of which a skeleton is mounted, the snout is nearly twice as long as the brain-case, and very much curved downwards, but in the Common Echidna it is shorter and curved upwards.

In both families the fore-limbs are more powerfully developed than the hind pair, the humerus especially being exceedingly thick, and provided with large ridges for the attachment of muscles.

Monotremes lay eggs and the Echidnas have a breeding-pouch, but the mode of incubation is not yet satisfactorily known. They are without true nipples, the milk exuding from groups of pores in the skin. The males are provided with horny spurs on the heels, connected with a small gland on the back of the thigh. The temperature of the blood is lower than

that of other Mammals, observations having shown that in *Echidna* it stands only at about 78°, some 20° lower than that of Man, and about 30° below that of the average of Birds.

Spiny Anteaters, *Echidnidæ*, are characterized by the long narrow snout, small mouth, long worm-like tongue, want of teeth of any sort, rudimentary tail, free toes with stout digging claws, and spiny porcupine-like coats. This family contains the common *Echidna aculeata* (**1485**, fig. 62), with five toes to each foot, from Australia as well as New Guinea, and the Three-toed Echidna, *Proëchidna bruijnii* (**1486**), confined to the mountainous region of northern New Guinea.

Fig. 64.

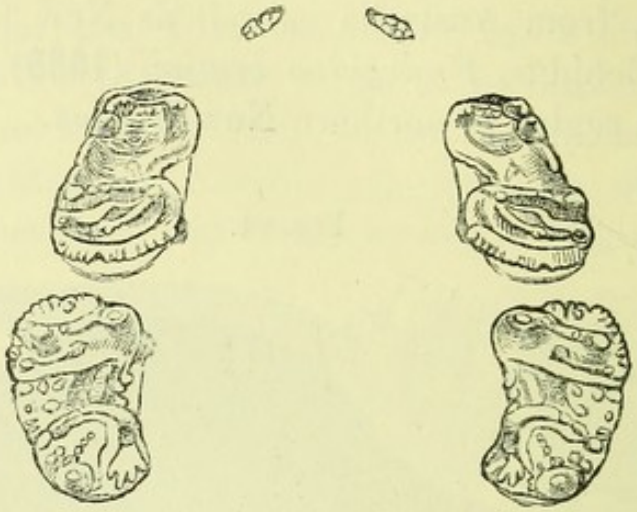
The Duck-billed Platypus (*Ornithorhynchus anatinus*).

Spiny Anteaters live exclusively on ants, which they catch with their long extensile tongues, like the true Anteaters. Their palates are covered with rows of horny spines, which serve to scrape the ants off the tongue when it is withdrawn into the mouth. By the help of their strong curved claws they are able to bury themselves in loose soil in a very few minutes. The two eggs are carried about by the female in the temporary pouch till they are hatched. A specimen (fig. 63) is exhibited in the case.

The Platypus (fig. 64), representing the family *Ornithorhynchidæ*, is, as already stated, distinguished by the structure

of the muzzle, which resembles the beak of a Duck, and is provided with the above-mentioned horny plates, which in the adult serve the purpose fulfilled during youth by teeth (fig. 65), the tail is long and broad, and the toes are webbed. The coat consists of thick, close hair without any spines. The eggs, two in number, are deposited in the burrow.

Fig. 65.



The Temporary Upper Teeth of the Duck-billed Platypus.

The only species is the Duck-billed Platypus, or Water-Mole, *Ornithorhynchus anatinus* (**1487**, fig. 64), which, as might be expected from its structure, is entirely aquatic, feeding on other water-animals, for which it searches in the mud in the same manner as a duck. Like the Spiny Anteater, it is a native both of Australia and Tasmania, but it does not occur in New Guinea.

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