

Guide to the galleries of mammalia (mammalian, osteological, cetacean) in the Department of Zoology of the British Museum (Natural History).

Contributors

British Museum (Natural History). Department of Zoology.
Günther, Albert C. L. G. 1830-1914.

Publication/Creation

[London] : Printed by order of the Trustees, 1887 (London : Taylor and Francis.)

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GUIDE
TO THE
GALLERIES
OF
MAMMALIA
(MAMMALIAN, OSTEOLOGICAL, CETACEAN)
IN THE
DEPARTMENT OF ZOOLOGY
OF THE
BRITISH MUSEUM (NATURAL HISTORY).

ILLUSTRATED BY 57 WOODCUTS AND 2 PLANS.

[THIRD EDITION.]

PRINTED BY ORDER OF THE TRUSTEES.

1887.

Price Fourpence.



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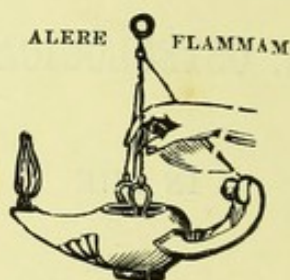
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P R E F A C E.

THE present 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, fewer in number, who desire, by closer study, to acquaint themselves with the general arrangement and the principal features of the members of this class of animals.

In the preparation of the parts relating to the Mammalian and Osteological Galleries much assistance has been given by Mr. OLDFIELD THOMAS, the Assistant in charge of these collections. The portion describing the contents of the Cetacean Gallery has been written by the Director, Professor FLOWER, F.R.S.

ALBERT GÜNTHER.

Zoological Department,
February 14, 1885.

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INTRODUCTORY.

MAMMALIA are vertebrate* air-breathing animals, more or less clothed externally with hair; the females are provided with mammary or milk-glands, and the young are brought forth alive, with the exception of the Australian *Ornithorhynchus* and *Echidna* which are oviparous. Their limbs are usually four in number, the hinder pair being, however, sometimes either modified into swimming-paddles or suppressed altogether, while the anterior are in some cases developed into wings, and in others into flippers. The tail may be quite rudimentary, as in Man and the higher Apes; long, simple, and forming a practically useless appendage, 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 development on it of broad "flukes," as in the Whales, or merely by being itself flattened vertically as in the Beaver, or from side to side as in the Muskrat, *Potamogale*, and others.

The heart of Mammalia consists of two completely separated divisions, each with a ventricle and auricle. Their blood maintains a uniformly high temperature, with the exception of some of the lowest forms, as *Echidna*.

The number of known kinds of Mammals at present existing

* *i. e.* with a backbone.

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

on the earth, and sufficiently distinct from each other to be regarded by zoologists as species, has been estimated at about 3000, and there are doubtless many, especially among those of smaller size, still to be discovered.

Mammals make their first appearance as far back as the Triassic or early Mesozoic period, a few minute teeth, representing three small species, having been found in the Rhætic beds of Germany and England. Later than these are the early Jurassic or Middle Mesozoic Mammals, found at Stonesfield in Oxfordshire, where several more or less complete lower jaws have been discovered, such as those named *Amphitherium* and *Phascolotherium*, figured in the Geological Guide, p. 33. In Upper Jurassic times also a very large number of small mammals must have lived in this country, as evidenced by remains found at Swanage, now exhibited in the Palæontological Gallery.

Of the exact affinities of these Mesozoic Mammals it is almost impossible to form an idea ; but there can be little doubt that their nearest living allies are the Marsupials, that is “Didelphian” Mammals, in which the young are brought forth in an embryonic condition, completing their development in a pouch formed of the external integuments of the mother. To this day Marsupials show the same division into two groups, according to their dentition, which is observed in the ancient Swanage genera—*Plagiaulax*, as figured in the Geological Guide, representing the modern diprotodont*, and the others the polyprotodont* Marsupials.

At the commencement of the Tertiary period “Monodelphian” Mammals were already abundant, many of them resembling living species—a fact which shows how imperfect is our knowledge of the intermediate time during which all these forms must have been gradually developed from their Mesozoic ancestors. Thus the Eocene, the earliest of the Tertiary periods, has yielded remains of Bats, Insectivores, Carnivores, Rodentia, many Ungulates, Sirenia, and Cetacea.

The Mammals of the Miocene, Pliocene, and Pleistocene periods, for which the Visitor is referred to the Geological Guide, have increased in number and variety to the present day ; but, at least for those that dwelt on the land, the maximum of size has long

* For the explanation of these terms see p. 99.

been past, the modern forms being as a whole but diminutive descendants of their gigantic predecessors. On the other hand, the evidence of fossil remains shows that at no time have Whales existed so large as those that now swim in our seas.

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

Systematic Arrangement of the Class Mammalia.

Subclass I. **MONODELPHIA.**

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	{ Oxen, Antelopes, Deer, and Giraffe 41, 92

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Order IX. CETACEA : Whales and Dolphins.

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Order X. EDENTATA.

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Order XI. MARSUPIALIA : Pouched Mammals (Kangaroos, Opossums, &c.).....	53, 9
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Order XII. MONOTREMATA : Ornithorhynchus and Echidna ..	59, 102
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[A series of Catalogues, in which the contents of the Zoological collections are described in detail, has been published by the Trustees. The entire series or single volumes may be purchased in the Director's Office at the Museum, or ordered through any bookseller.]

The MAMMALIA are exhibited in three Galleries:—

1. The *Mammalian Gallery* (on the first floor), in which is placed the series of stuffed specimens, with the exception of the *Sirenia* and *Cetacea*. Skeletons of the most important types are incorporated with this series. Also the collection of Antlers of the family of Deer are ranged along the tops of the cases.

2. The *Osteological Gallery* (on the second floor), which contains the complete series of skeletons and skulls. The stuffed *Sirenia* and the collection of Horns of the Oxen, Antelopes, and Sheep are also placed in this Gallery.

3. The *Cetacean Gallery* (in the basement), which contains stuffed specimens and skeletons of the Whales and Dolphins.

MAMMALIAN GALLERY.

In this Gallery, which is devoted to the exhibition of the stuffed specimens, the contents are arranged in a continuous series in the Pier-cases, the order commencing on the left hand as the visitor enters. Large specimens are placed in the Recesses between the Cases or in the Saloon at the western end of the Gallery. Some large Cases in the centre of the Gallery contain the Seals and Sea-Lions, the Zebras and Asses, and the collection of Horns of *Cervidæ* or Deer is distributed throughout the Gallery, on the top of the Cases or on the Piers. The great size of some of the Cetaceans (Whales and Dolphins) has prevented them from being placed with the other members of their Class; and a separate Gallery in the basement has been prepared for their reception.

[See
Plan.]

Order I. PRIMATES.

(Cases 1-10.)

The Primates consist of Man, Monkeys, and Lemurs. The Monkeys most nearly allied to Man are the so-called Anthropoid* Apes (the Gorilla, Chimpanzee, Orang Outang, and Gibbons), which in many points of their internal structure approach more nearly to Man than to the other Monkeys, though their resemblance to him, both in osteological and external characters,

Fig. 1.

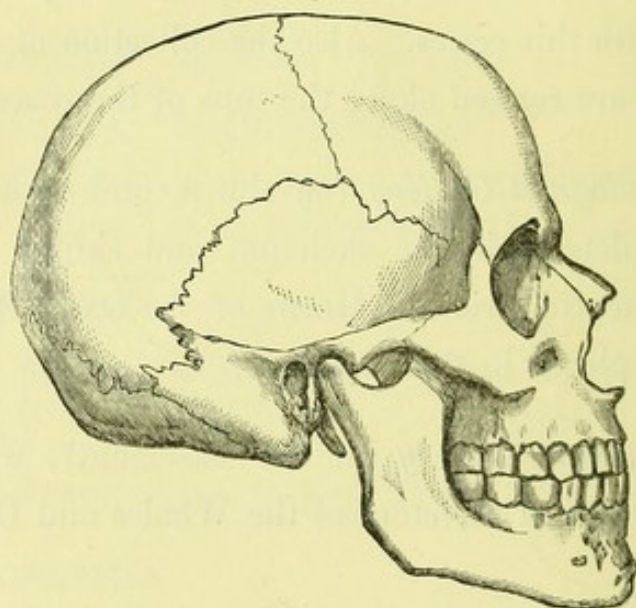


Fig. 2.

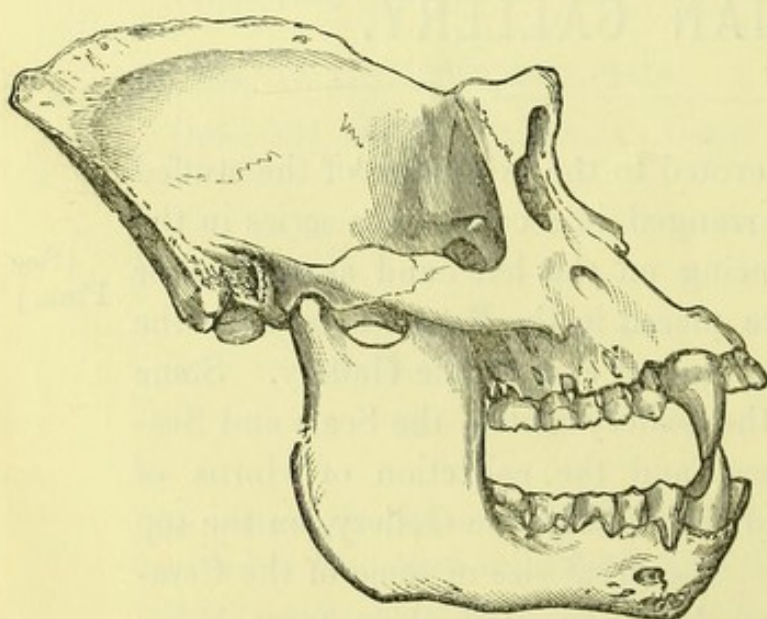


Fig. 3.

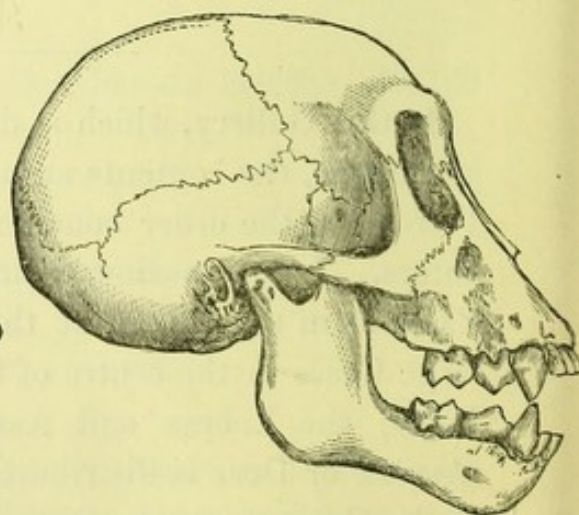


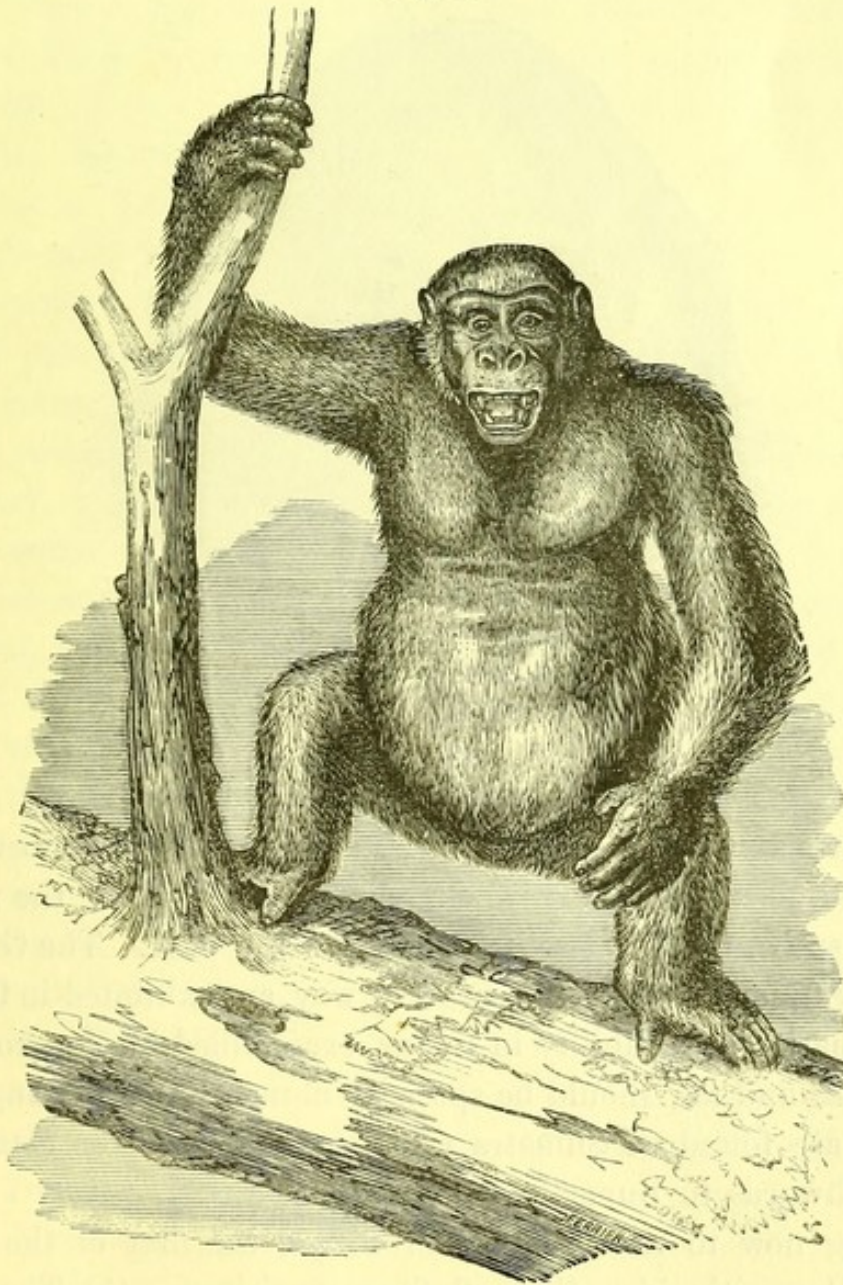
Fig. 1. Skull of Man. Fig. 2. Skull of old ; and fig. 3, of young Gorilla.

* From the Greek *anthropos*, Man; *anthropoid* = Man-like.

is far greater in their infancy than after they have attained to maturity. They are tailless, and habitually assume a semi-erect position, using their disproportionally long arms to balance themselves by resting their knuckles on the ground. Their great toes are opposable, like thumbs, to the other toes, so as to form a second pair of hands, on account of which the term *Quadrumana* (four-handed) has been applied to them and the other Monkeys.

Several specimens of the Gorilla (*Troglodytes gorilla*) of various ages are exhibited in the separate Case in the first recess on the right

Fig. 4.

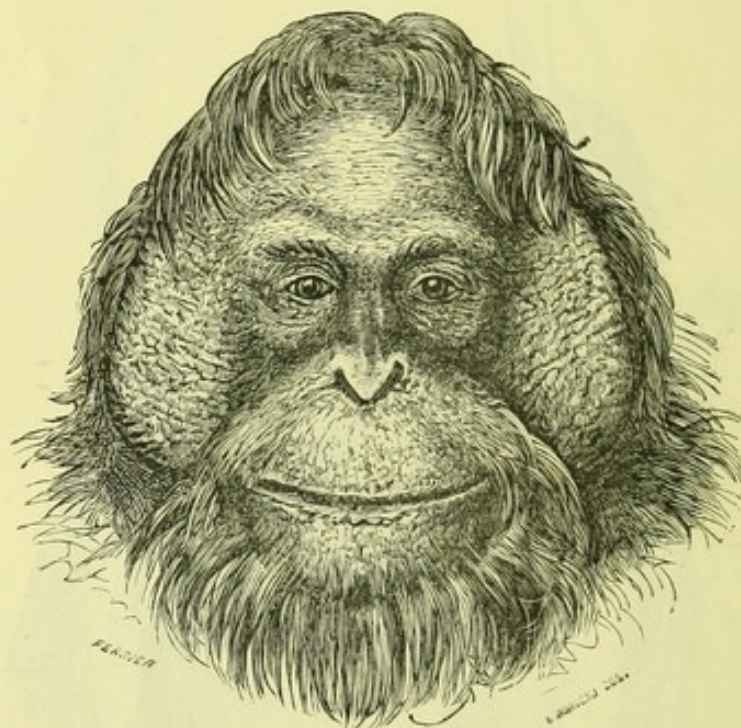


Gorilla.

of the Gallery (between Pier-cases 95 and 98), conspicuous among them being two remarkably fine 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 of men, or of their own young.

In the corresponding Case on the left are the Chimpanzees (*Troglodytes niger*) and Orang Outangs (*Simia satyrus* and *morio*), the former being closely allied and very similar to the Gorilla, and, like it, a native of the forests of Western and Central Africa. The large male Orang in this Case shows very well the peculiar shape

Fig. 5.



Head of adult Orang Outang.

[Case 1.] of the cheeks, which are provided with thick fleshy protuberances. These protuberances may also be seen in the male of the pair of heads in spirit, on the small table close to the Case. The Gibbons (*Hylobates*), far less man-like in every way, are exhibited in Case 1. Their remarkable variability in colour, exemplified by the groups of *H. pileatus* and *lar*, should be specially noticed. The Orangs and Gibbons are found in Sumatra and Borneo, the latter extending also northwards to Burmah and Assam.

[Cases 2
and 3.]

Passing now to the ordinary Monkeys, the first of the series are the *Cercopithecidae* (Cases 2-6), comprising :—(1) The long-

tailed Indian Monkeys (*Semnopithecus*) (Cases 2 and 3), of 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. The most striking species both in form and colour is the Proboscis Monkey (so called on account of the remarkable length of its nose), *Nasalis larvatus*, of Borneo, of which a fine male example is placed in the centre of the case. (2) The *Colobi* (Case 4), closely allied to the last, but natives of Africa; some are dull rufous or grey, and others finely marked with sharply contrasting black and white, with long tufted tails, noticeably the Guereza (*Colobus guereza*), which has on its side a peculiar fringe of long white hairs reaching quite down to the ground, and probably serving as a protection from the fierce African sun. (3) The long-tailed African Monkeys (*Cerco-pithecus*) (Cases 3 & 4), provided with cheek-pouches in which food can be temporarily stowed away, large posterior callosities, and extremely long tails; many of them are brilliantly coloured, as for example the Mona Monkey (*C. mona*). (4) The Macaques, chiefly inhabitants of Southern Asia, one species (*Inuus ecaudatus*) occurring in North Africa and leading a precarious existence on the rocks of Gibraltar (Cases 5 & 6). (5) The Baboons (*Cynocephalus*), hideous animals with powerful teeth, projecting jaws, nearly equal fore and hind limbs, and dull-coloured fur, natives of Africa and Arabia (Case 6): one species, the Mandrill (*Papio maimon*), has a short stumpy tail, and a perfectly naked face, the skin of which is brightly marked with blue and vermilion; all the others are dull-coloured animals, with well-developed tails. [Case 4.] [Cases 5 and 6.]

All the species hitherto enumerated, from Man down to the Baboons, are classed together as one group, the *Catarrhini**, or "narrow-nosed," distinguished by the very narrow division between their nostrils and by having only 32 teeth; they are entirely restricted to the Old World. The Monkeys following form the group of *Platyrrhini*, or "broad-nosed" Monkeys, peculiar to America, and characterized by their widely separated nostrils, frequently prehensile tails, less perfectly opposable thumbs, &c.

The first family of this group is the *Cebidæ*, comprising:—(1) The Spider-Monkeys (*Ateles*) (Cases 7 & 8), remarkable for their ex- [Cases 7 and 8.]

* From the Greek *kata*, below, and *rhis*, nose; the nostrils directed downwards.

tremely long and slender limbs—of which, alone among the *Platyrrhini*, the anterior are longer than the posterior—their rudimentary thumbs, and long prehensile tails. (2) The Howling Monkeys (*Myctes*, Case 7), the males of which possess a most extraordinary voice, the resonance of which is increased by a peculiar chamber formed by the middle portion of the bone of the tongue (see p. 70): they are stout, thick-set animals, with well-developed thumbs, prehensile tails, and generally of a uniform red, brown, or blackish colour; the males are furnished with short thick beards. (3) The Negro-Monkeys (*Lagothrix*, Case 8). (4) The Yarkees and Uakaris (*Pithecia* and *Ouakaria*), two closely allied genera, the first with peculiarly long thick hair all over its body and tail, which latter, though long, is not prehensile; the second distinguished from all the other American Monkeys by having scarcely any tail; one species (*O. calvus*), exhibited in this Case, is quite bald; and all are very thinly haired, in marked contrast to the Yarkees. (5) The Squirrel-Monkeys (*Nyctipithecus*, *Callithrix*, and *Chrysomys*, Case 9) are all beautiful little creatures, with soft bright-coloured fur, long, hairy, non-prehensile tails, and well-developed thumbs; they live partly on insects. (6) The Sapajous, or Capuchin Monkeys (*Cebus*, Case 9), are 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 in this country.

[Case 9.]

The second family of the *Platyrrhini* are the *Hapalidæ* or Marmosets, differing from the others by their non-opposable pollex*, which is provided with a claw instead of a nail, their rudimentary hallux†, long, hairy, and never prehensile tail, and the different number of their teeth. They are small animals, some not exceeding a rat in size, and of bright and varied appearance, many being ornamented with long tufts of hair on their ears, and all being more or less brightly coloured. They are almost entirely confined to the forests of tropical South America, a single species only extending as far north as Panama.

The second Suborder of the Primates—the LEMUROIDEA—

* The first or innermost digit of the fore limb, corresponding to the human "thumb," a name inapplicable when it is not opposable to the other digits.

† The first digit of the hind limb, corresponding to our "great toe."

consists of a number of very remarkable animals, of a far lower type than those we have hitherto mentioned; they are for the most part natives of Madagascar, although a few aberrant members of the group are found in Africa and Southern Asia. They are invariably arboreal in their habits, with generally long, bushy, and non-prehensile tails, opposable thumbs and great toes, large eyes, and long dog-like faces. They are divided into three families, of which the typical one, the *Lemuridæ*, contains all but the whole of the species. It is subdivided into the following groups:—

1. The *Indrisinæ* (*Indris* and *Propithecus*), from Madagascar, characterized by their disproportionately long hind limbs, hind toes united by skin, and the possession of only 30 teeth. They are exhibited in separate Cases in the centre of the Gallery, and in the recess between Pier-cases 5 and 8. They are singularly variable in their 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.

2. The *Lemurinæ* or true Lemurs (Case 10), also confined to [Case 10.] Madagascar, have fore and hind limbs of nearly equal length, toes free to the base, and 36 teeth. They are more quadrupedal in their actions than the last group, moving about both on the ground and in trees with great activity. Like the *Propithecæ*, they are very variable in their coloration, being marked with various shades of red, brown, and black. Specimens of the Ruffed Lemur (*Varecia varia*) are exhibited in the same Recess as the *Propithecæ*.

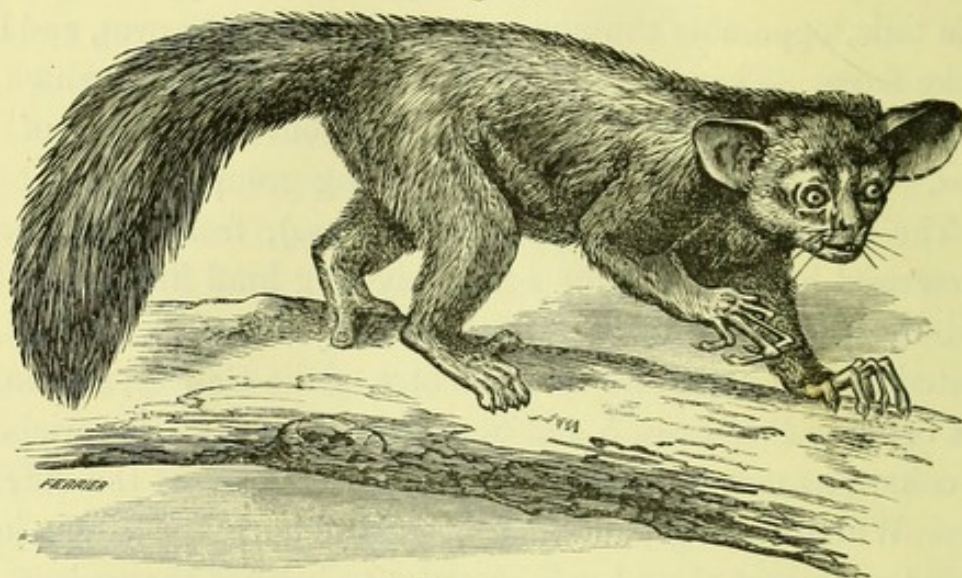
3. The *Galagininæ* are distinguished by the unusual elongation of their tarsal bones. There are two genera, of which the first, *Chirogale*, contains 3 or 4 small species, with long bushy tails and soft woolly fur. They are very like large dormice, both in their appearance and habits, building nests and hibernating during the winter. *Galago*, the second genus, is found in Africa, and distributed from Senegambia to Mozambique.

4. The group of *Lorisinæ* contains 5 or 6 rare and curious forms, such as the Potto (*Perodicticus potto*) of Western Africa, and the Loris of India and Ceylon. Specimens of both are exhibited in Case 10.

The second and third families of the Lemuroidea, the *Tarsiidæ*

[Case 10.] and *Chiromyidae*, contain each a single species only, viz. the Tarsier (*Tarsius spectrum*), an extraordinary little animal about the size of a rat, with 34 teeth, very long feet, long tufted tail, and extremely large eyes; it is a native of the islands of the East-India Archipelago.

Fig. 6.



The Aye-aye.

The type of the second family is *Chiromys madagascariensis*, the Aye-aye of Madagascar, a still more specialized form, 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 hallux, which is opposable and has 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 similar plants, in order to obtain their succulent juice.

Order II. CARNIVORA.

(Cases 11–26.)

The Carnivora comprise the whole assemblage of animals known by the name of Beasts of Prey—the Cats, Wolves and Dogs, Bears, Weasels, and many other allied animals. From this terrestrial type another has been developed, adapted for an aquatic life, with limbs modified into swimming-organs, viz. the *Carnivora Pinnipedia*, or Fin-footed Carnivores—Seals and Walruses.

The CARNIVORA FISSIPEDIA, or Land Carnivores, are divided into three great groups, of which the first, or *ÆLUROIDEA**, contains the Cats, Hyænas, and Civet-Cats; the second, or *CYNOIDEA* †, the Dogs, Wolves, and Foxes; and the third, or *ARCTOIDEA* ‡, the Bears, Weasels, and Raccoons.

The Cats, or *Felidæ* (Cases 11 to 16), 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 strongly built, with small heads, short 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 fingers and toes, not on their palms and soles; and are provided with five toes on their fore feet, of which the first, or pollex, does not touch the ground, and four on their 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 retraction is explained on p. 73, in connection with the osteology of the family. In disposition the Cats belong to the fiercest of animals, and man has succeeded in taming, to a certain extent, one member of the group only, our common House-Cat; but all the other species become savage and bloodthirsty when adult, even if, as kittens, they are apparently docile and attached to their masters. The geographical distribution of the Cats extends over the whole world, with the exception of Madagascar and the Australian region.

[Cases
11-16.]

Of the Lion there are exhibited an adult male Barbary Lion, [Case 11.] showing the thick black mane, which is especially well developed in North-African individuals; a maneless Lion from Gujerat, formerly thought to represent a distinct species; and a fine Lioness from South Africa. There is also a Lion-cub, bred in England, which shows traces of the dark spots so general in the family of Cats, a fact which appears to indicate that the ancestors of our tawny spotless Lion had spotted coats like the other Cats. The present range of the Lion extends over the whole of Africa, through Persia to the north-western corner of the continent of India.

Above the Lioness, in Case 12, are placed two specimens of the [Case 12.]

* *Ailouros*, a cat.

† *Kuon*, a dog.

‡ *Arktos*, a bear.

Ounce or Snow-Leopard (*Felis uncia*), a beautiful, soft-furred, long-tailed species, which inhabits the snowy regions of the Himalayas 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. It has never been brought alive to Europe.

The upper part of Cases 11 and 12 is filled with specimens of the Leopard (*Felis pardus*), one of the largest of the spotted Cats, whose range extends over all Africa and Southern Asia as far north as Persia. In India it is extremely destructive to cattle and other domestic animals, and aged individuals frequently become "man-eaters."

[Cases
13 and 14.]

The Tiger (*Felis tigris*), Cases 13 and 14, is the largest and most dangerous of the Felidæ, exceeding the Lion slightly in size, and far surpassing him in destructiveness. It is the only Cat ornamented with cross stripes on the body, a type of coloration which is very scarce among Mammals; these cross stripes help to render the animal inconspicuous among the reeds in which it commonly hides itself, and where it would be comparatively easily seen if marked with spots or longitudinal bands. It inhabits nearly the whole of Asia, from Persia, across Siberia, to Formosa, and southwards throughout India and Burma to Sumatra, Java, and Bali, while it is not found in either Ceylon or Borneo. Specimens are exhibited of the smaller, softer-furred variety of Persia, and of the very large, short-haired Bengal form.

[Cases
15 and 16.]

The remainder of the true Cats are placed above the Tigers in Cases 13 and 14, and in the lower parts of Cases 15 and 16. Of these the most noteworthy are the series of the Central and South-American Ocelots, the Clouded Tiger of Assam. The fine collection of Norwegian, Canadian, and other Lynxes is also placed here. The Lynxes differ from the ordinary Cats by their short tails, tufted ears, and by certain differences in their skulls and dentition, and are confined to the North Temperate and Arctic zones of both the Old and New Worlds.

The most aberrant member of the *Felidæ* is the Cheetah or Hunting Leopard (Case 16), characterized by its small round head, its light and slender form, semi-retractile claws, and various other peculiarities, osteological and external. It is a native of the whole

of the African and the western part of the Indian regions. 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 animal.

The second family of the *Æluroidæ* comprises the *Hyænas* only (Case 15), of which there are three species—*Hyæna striata* and *brunnea*, the Striped and Brown Hyænas, and *Crocota maculata*, the Spotted Hyæna of South Africa. They are all of about the size of a large wolf, of cowardly and nocturnal habits, feeding for the most part on carrion, and rarely attacking other animals which are able to defend themselves. They have four toes on each of their feet, non-retractile claws, and rather short, hairy tails. [Case 15.]

The family *Protelidæ* contains only a single species, the Aard-Wolf of the Cape Colony (*Proteles cristatus*), of which there is a fine specimen in Case 15. This animal looks like a diminutive hyæna, but is almost toothless, living nearly entirely on decomposing carcasses, and on termites, which its strong claws enable it to dig out of their nests.

The last family of the *Æluroidæ* is the *Viverridæ*, consisting of the Civet-Cats and their allies. These are all comparatively small animals, of low build, dull coloration, and 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. The most noteworthy groups of the *Viverridæ* are:—(1) *Cryptoprocta*, containing but one species, the Foussa (*C. ferox*), peculiar to Madagascar, and the largest Carnivore of that island; it is remarkable for its cat-like head, retractile claws, and other feline characters. It is quite untamable, and excessively savage when caught or wounded. (2) The true Civet-Cats (*Viverra*), with hairy soles and semi-retractile claws, of which there are four species, one African and three Indian; these animals secrete in a glandular pouch beneath the tail the scent known as civet, which is obtained by the natives from specimens kept in captivity for that purpose. (3) The Genets (*Genetta*), smaller than, but very [Cases 17 and 18.]

similar to, the last, of which there are four or five African species, one of them, the Common Genet (*G. vulgaris*), extending into Europe as far north as Central France. (4) The Palm-Civets (*Paradoxurus*), 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 birds and eggs, or on vegetable food, such as rice and fruit. (5) The Mongooses (*Herpestes*, &c.), of Africa and India, with 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 are entirely without foundation. There are about 30 species of Mongooses known, of which the most noticeable are the Egyptian Mongoose (*Herpestes ichneumon*), which is found also in Spain, and feeds largely on the eggs and young of the crocodile; and the Grey Mongoose (*Herpestes griseus*), the species tamed in India. Some years ago the latter was introduced into the island of Jamaica, where rats had multiplied on the sugar-plantations to such an extent as to inflict the greatest losses upon the planters, who were nearly ruined. In a short time the Mongooses cleared the plantations of the vermin, and are now under the protection of the law.

Allied to the Mongooses are several aberrant animals found in Madagascar, among which may be specially mentioned the curious *Eupleres goudoti*, exhibited in Case 18, which obtains the beetles and worms on which it lives by burrowing in the earth with its elongated snout.

[Cases
17-20.]

The second Suborder of the Carnivora, the CYNODEA, consists of a single family, the *Canidæ*, or Dogs, Wolves, and Foxes. They are on the whole lightly built animals, of great speed and endurance, obtaining their prey, as a rule, by running it fairly down, rather than by pouncing upon it in the manner of the Cats and their allies. They are digitigrade, and have, with a single exception, five toes on their fore and four on their hind feet; their palms and soles are always hairy, the only naked parts being

the foot-pads. Their osteological characters are referred to on p. 74.

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

The history of the development and domestication of the Common Dog is a highly interesting subject, which is as yet far from being fully understood. Many naturalists, to within a very recent period, entertained the view that there had existed one original wild species from which, by man's agency, all the various races of Dogs had been 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 indigenous to their 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 of Dog found in their country. Thus the Esquimaux Dog resembles the North-American Wolf (*Canis occidentalis*), 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 degraded 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.

Thus there can be no 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

[Cases 17-20.] selection has gone so very much further, that the Dogs have gradually lost nearly all traces of their wild ancestry, and have developed into the innumerable different races now existing, races so distinct that, were they natural instead of artificial, they would be referred to several different genera.

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.

Several varieties of the Domestic Dog are exhibited in Case 19; in Case 20 two diminutive Lap-Dogs, not six inches long, and representing the smallest development of the tribe as yet attained; behind them a head of the largest known Dog, a prize Great Dane, the skeleton of which is mounted in the Osteological Gallery; the weight of this Dog when alive was nearly 13 stone. A specimen of the Dingo (*Canis dingo*), the Wild Dog of Australia, undoubtedly introduced in that continent, though long before the advent of Europeans, and an example of the African Hunting-Dog (*Lycan venaticus*), remarkable for the possession of only four toes on each of its feet, and for its superficial resemblance to the Hyænas, are exhibited in the same Cases.

In the upper compartments of Cases 17 and 18 are the Wolves, among them a specimen of the European Wolf (*Canis lupus*) from Moscow, and one of the Black Wolf of Thibet (*C. laniger*). Wolves range all over Europe, continental Asia, and North America. The Jackals of Africa and India (Case 19) and the Wild Dogs of India (Case 20) are smaller in size.

Among the Foxes (*Vulpes*) may be noticed the Common Fox (*V. vulgaris*), the Cross-Fox of North America (*V. pennsylvanica*), and others. The white race of the Arctic Fox (*V. lagopus*), one of the most valuable fur-bearing animals, changes the colour of its coat according to the season, like many other Arctic animals; while the blue race retains its colour all the year round and yields a still more rich and valuable fur than the white.

The beautiful large-eared Fennecs of Africa are closely allied to the Foxes. The Bush-Dog of Guiana and Brazil (*Ichtyon venaticus*) and the Raccoon Dog of China and Japan (*Nyctereutes procyonoides*) are other remarkable types of Dogs, very aberrant

externally, but closely related to the ordinary Canidæ in their more important dental and cranial characters. With these is placed a specimen of the Long-eared Fox of South Africa (*Otocyon megalotis*), remarkable for its very numerous teeth and its sharp-pointed and long ears; special interest is attached to it, as it has been considered to represent the original type of canine animal, whence all the wild forms of Dogs and Foxes of the present day have been developed.

The last great division of the fissiped Carnivora is the ARCTOIDEA, consisting of the Bears, Weasels, Raccoons, &c. The most typical members are completely plantigrade, walking flat on their palms and soles; and all have five toes on each of their feet.

The first family, *Mustelidæ* (Cases 21 and 22), contains the Weasels, Otters, Badgers, &c., which all agree very closely in their skulls and dentition, but may be readily separated into three Tribes by their general form, and by the structure of their feet and claws. These tribes are:—(1) The *Mustelinæ*, the Weasel tribe, 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 Martens and Sables (*Mustela*) of Northern Europe, Asia, and America. Of these one species is British, namely the Pine-Marten (*M. martes*), now nearly exterminated in England, but still holding its own in the wilder parts of Scotland. The true Weasels (*Putorius*) consist of about 20 or 30 comparatively short-haired species, inhabiting nearly all parts of the world. Among them may be mentioned the common English Stoat or Ermine (*Putorius ermineus*), three specimens of which have been mounted to show the seasonal change of fur; the Weasel (*P. vulgaris*); the Polecat (*M. putorius*), the domesticated form of which is the Ferret. *Pæcilogale albinucha* is the brightest marked of the tribe; and its largest member, the Glutton (*Gulo luscus*), a heavily built, powerful animal, much resembling a small bear, and very destructive to the larger game. (2) The *Melinæ*, or Badger tribe, 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*), Ratels

[Cases
21 and 22

(*Mellivora*), and Skunks (*Mephitis*), the latter with an evil reputation on account of the intensely disagreeable and penetrating smell which they emit when provoked. (3) The *Lutrinæ*, or Otter tribe (Case 22), have short feet, webbed toes, small claws, and long powerful tails. There are about 15 species known, all very similar externally, in colour, size, and general proportions, our English Otter (*Lutra vulgaris*) being a very typical member of the group. The most aberrant is the Sea-Otter (*Enhydra lutris*), which has its hind feet very peculiarly 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 fur, the most costly of all, its numbers have been so much thinned, that it is sure to be exterminated unless effectual measures be taken for its protection.

The *Procyonidæ* (Case 22) form the second family of the *Arctoidea*. They are wholly American, and contain, among others, the Raccoons (*Procyon*), the peculiar long-nosed Coatis (*Nasua*), and the Kinkajou (*Cercoleptes*), the last a nocturnal animal with a long prehensile tail. All the members of this family habitually live largely on vegetable food, such as fruit, berries, &c., as well as on small mammals, birds, insects, worms, eggs, &c.

The brilliantly coloured Panda (*Ælurus fulgens*), exhibited in the same Case, is closely allied to the last family, although it occurs in a very different part of the globe, viz. in North India and Assam. It lives at a great altitude in the Himalayas, seldom descending lower than about 7000 feet above the sea, and feeds wholly on fruit and other vegetable food.

[Cases
21-26.]

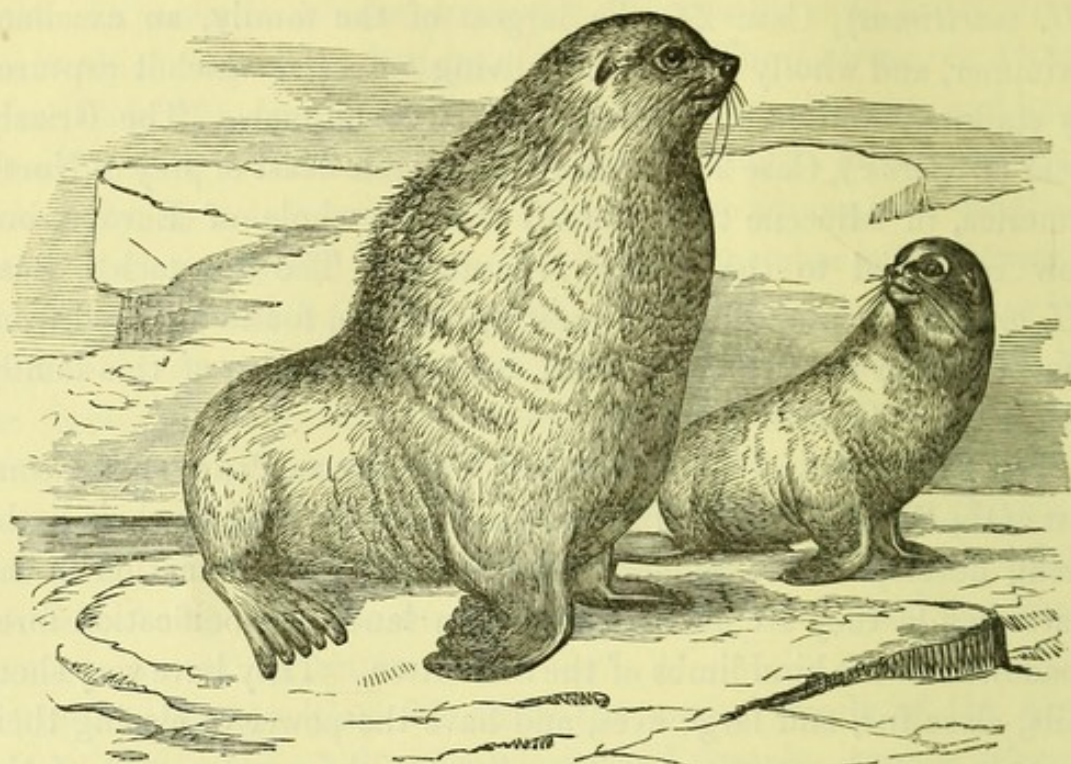
The true Bears (*Ursidæ*), Cases 21-26, form the last family of the land Carnivores. They are characterized by their large size, thick and clumsy build, rudimentary tails, plantigrade, five-toed feet, long, blunt, and nearly straight claws, small ears, and long shaggy fur. Their distribution includes Europe, Asia, and North America, while they are entirely absent from Australia, Africa, and the greater part of South America. The most noteworthy members of the group are:—The Brown Bear (*Ursus arctos*), Case 23, of Europe and North Asia, which was formerly found in England, having only been exterminated within

historic times. The Syrian Bear (Case 21). The Polar Bear (*U. maritimus*), Case 24, the largest of the family, an excellent swimmer, and wholly carnivorous, living on seals, which it captures by stalking, and on the carcasses of large animals. The Grizzly Bear (*U. ferox*), Case 25, the most formidable beast of prey of North America, in Miocene times spread over the whole of Europe, but now restricted to the Rocky Mountains. The Spectacled Bear (*U. ornatus*), Case 26, an interesting species, found isolated from the others in the Andes of Peru, no representative of this family occurring in Central America.

The FIN-FOOTED CARNIVORES, or CARNIVORA PINNIPEDIA, consist of the Seals and their allies, and are distinguished by their limbs being developed into flippers, and adapted for locomotion 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 have the power of closing their nostrils and ear-openings. They live for the greater part of the year in the sea, generally close to the shore, but at times wandering far from land, to which, however, they invariably resort during the breeding-season in order 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*); and an enormous number, both of the Eared and True Seals, are killed every year by the sealers for the sake of their valuable fur and oil.

The Eared or Fur-Seals (*Otariidæ*) are distinguished from the remainder of the Order 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 ear has been entirely lost, and the hind feet project straight backwards and are only used for swimming. The Eared Seals are exhibited in the first two Cases in the centre of the Gallery (A and B), and very fine male specimens of the Northern Sea-Lion (*Otaria stelleri*) and of the Southern (*Otaria jubata*) in a separate case beyond them. Especially striking among these animals is the great difference in size between the male and female;

Fig. 7.



Northern Fur-Seal (*Callorhinus ursinus*), ♂ and ♀ ; after Elliot.

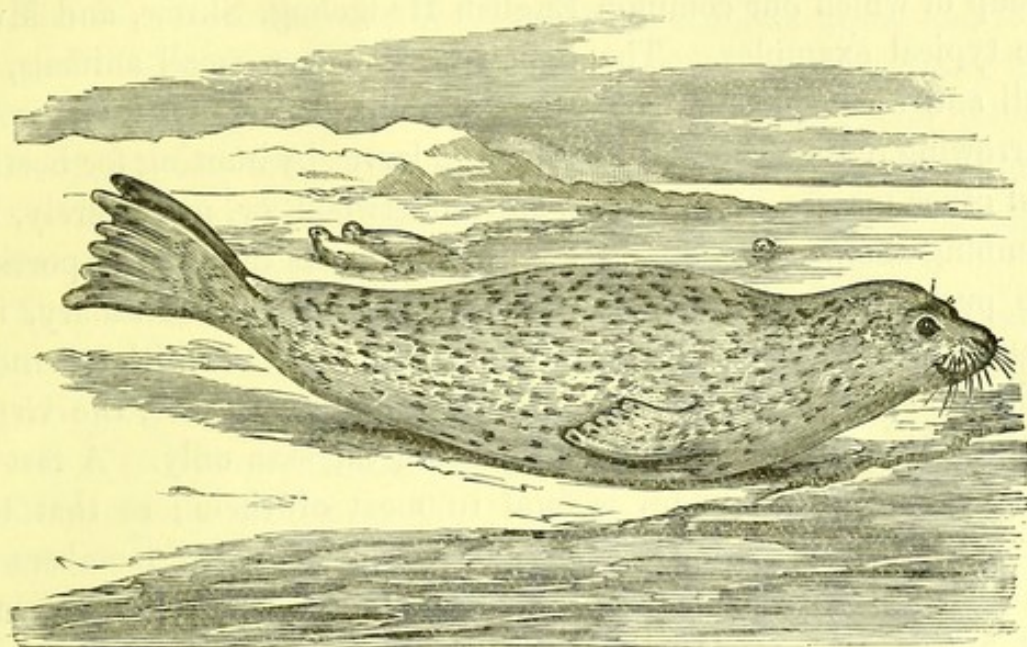
all Eared Seals seem to be polygamous. Of the numerous species, one of the most worthy of mention is the Fur-Seal (*Callorhinus ursinus*), of the North Pacific (Case A), from which most of the seal-skins sold are obtained. It may be observed that the coats of the stuffed specimens do not show any resemblance to the "seal-skin" of the trade; in the latter only the soft under-fur of immature and female specimens is preserved, all the long coarse hairs having been removed.

Intermediate in many respects between the Eared and True Seals are the *Trichechidæ*, containing but a single species, *Trichechus rosmarus*, the Walrus, which lacks external ears, but uses its hind limbs after the manner of the Eared Seals. In one respect, however, it is quite unique—namely, in its possession of enormously long and powerful 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 this species chiefly lives. Its range extends all round the North Pole, along the edges of the ice-fields.

In the *Phocidæ*, or True Seals (Cases C and D), the adaptation

for an aquatic life has reached its highest development. They are without external ears, the palms and soles of their feet are covered

Fig. 8.



The Common Seal (*Phoca vitulina*).

with hair, and their coat has no woolly under-fur, consisting only 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.

The most noteworthy of the Phocidæ exhibited are :—(Case C) the Sea-Leopard (*Stenorhynchus leptonyx*), of the Antarctic seas; the Hooded Seal (*Cystophora cristata*), from Greenland, the male of which has a peculiar bag of skin on its muzzle, which it has the power of inflating with air when excited; (Case D) the Sea-Elephant (*Macrorhinus leoninus*), the largest of the family, sometimes attaining nearly 20 feet in length; and various other smaller Seals, such as the Common Seal of the English coast (*Phoca vitulina*).

Order III. INSECTIVORA.

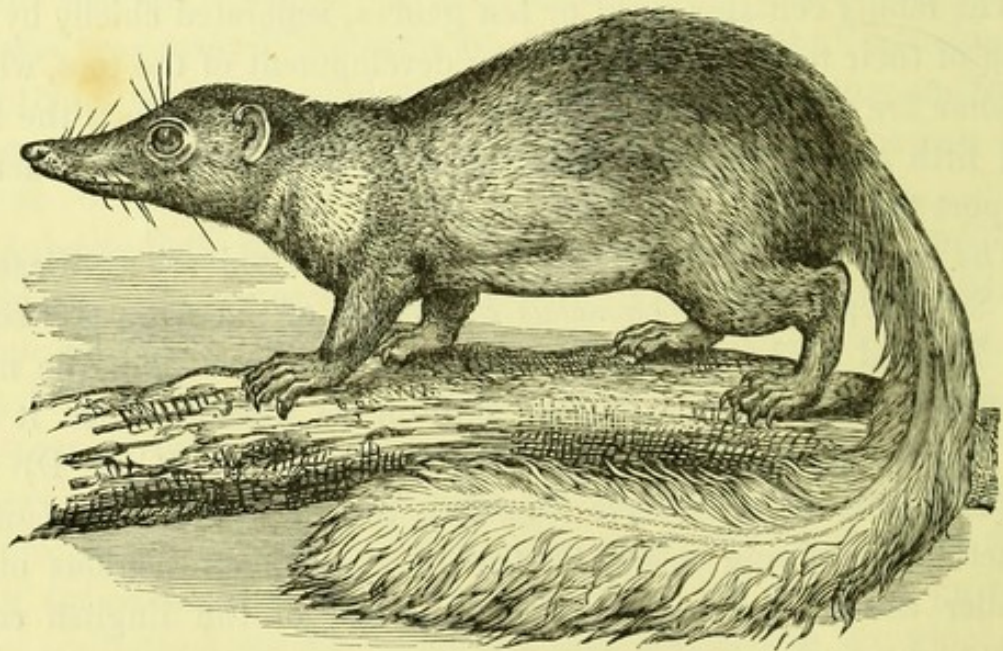
(Case 27.)

[Case 27. The small Order known as the Insectivora, or Insect-eaters, is a group of which our common English Hedgehog, Shrew, and Mole are typical examples. The members of it are small animals, of dull and inconspicuous coloration, gaining their living either by burrowing in the ground for worms and larvæ, by hunting for beetles and other insects in the 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 two individuals kept in the same cage have attacked each other, the victor eating the whole of its opponent, leaving the skin only. A fast of only 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 South America and Australia.

They are divided into the following families:—

The *Tupaia*dæ, or Tree-Shrews of India and Malaysia, so like

Fig. 9.

The Tupaia (*Tupaia tana*).

Squirrels both in appearance and habits as to be easily mistaken for them. They feed on various insects, and also to a small extent

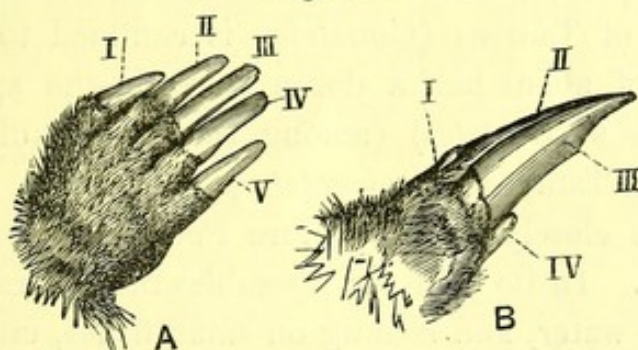
on fruit, and are the only Insectivores which habitually seek their food by day. There are about eight brightly-coloured, bushy-tailed species belonging to the family. [Case 27.]

The 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 *Erinaceidæ* contain two genera—*Erinaceus*, the Hedgehogs, of which there are nineteen species, all extremely similar to our English Hedgehog, both in appearance and habits, and distributed over Europe, Africa, and Asia; and *Gymnura*, a long-tailed animal, closely related to the Hedgehogs, but looking externally much more like a large rat. It is a native of Malacca, Sumatra, and Borneo.

Of the Mole family (*Talpidae*) there are two well-marked groups:—(1) The long-tailed *Myogale*, one species of which lives in the neighbourhood of the Caspian Sea, and the second in the Pyrenees. They are entirely aquatic in their habits, living on water-insects and crustaceans, which they obtain by the help of their long and peculiarly formed snouts. Their feet are edged with stiff

Fig. 10.



A, Fore foot of Mole (*Talpa*). B, Fore foot of the Golden Mole (*Chrysochloris*).

The digits are distinguished by numerals, the fifth being absent in *Chrysochloris*.

bristles to assist them in swimming, and, for the same purpose, their powerful tail is flattened from side to side. (2) The group of true Moles (*Talpidae*), which comprises a considerable number

[Case 27.] of species, all strikingly alike externally, but differing among themselves in the structure of their skulls and teeth. They are long-nosed, short-tailed animals, with rudimentary eyes, soft velvety fur, of such a structure as to lie equally well in either direction, thus enabling the Mole to move freely in its burrows either backwards or forwards, and with short, broadened, spade-like fore feet, the toes being strong and all of nearly the same length (see fig. 10, A). With these highly efficient instruments the Mole is able to force the earth aside and throw it backwards while it is burrowing in the ground.

The Shrews (*Soricidæ*) form a family containing a very large number of mouse-like animals, differing from each other mainly by slight variations in their teeth, but all presenting very much the same external appearance. The great majority are terrestrial in their habits (as, for example, the English Common and Pygmy Shrews), burrowing on or close to the surface of the ground, and living on small beetles, worms, or any other animal food they can obtain. The large Indian Shrews, provided with scent-glands, by which a substance of a most penetrating odour is secreted. Others live in ponds and streams, feeding on water-beetles and crustaceans, for which they swim and dive with great facility. To this group belongs our common Water-Shrew (*Crossopus fodiens*), a beautiful velvet-coated animal with a long tail, and with its feet, like those of the Myogales, provided with lateral swimming-bristles.

The family of Tanrecs (*Centetidæ*) is confined to Madagascar, and consists of about half a dozen species—the spiny Tanrecs, or Ground-Hogs (*Centetes*) (among the largest of the Order), and the striped Tanrecs (*Hemicentetes*).

To these is closely allied the rare *Potamogale velox*, a native of West Africa. In its habits it resembles the Otters, living almost entirely in the water, and feeding on small fishes, crustaceans, and water-beetles.

The last family is that of the Golden Moles (*Chrysochloridæ*), natives of South Africa, which are very like our European Moles in their 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. 10, B). There are five species

of *Chrysochloris*, some of them remarkable for the iridescence of their fur, which can be preserved by placing the animal in spirit, but entirely fades when it is dried and stuffed.

Order IV. CHIROPTERA.

(Case 27.)

The Chiroptera*, or Bats, form one of the most sharply defined [Case 27.] of all the Orders of Mammalia, being characterized by the modification of the fore limbs into true wings, having the power of flapping and propelling the animal through the air. The structure of a Bat's wing is of a very simple character. 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 many 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 the animal to walk on all fours. The hind limbs, which in other mammals have the function of propelling the body forwards, are almost entirely relieved of that office, being singularly weak and feeble, and of but little use to the animal except while asleep or resting, when it hooks the sharp claws, with which the hind toes are furnished, on to some support, and remains suspended with the head downwards until again ready to fly.

The Chiroptera are divided into two distinct Suborders—the Frugivorous and Insectivorous Bats, of which the first, as a rule, are of large size, with flattened teeth, suited for munching fruit, and with claws both on their first and second fingers; the latter are of smaller size, with sharp-pointed teeth, suitable for crushing insects, and with claws on their thumbs only.

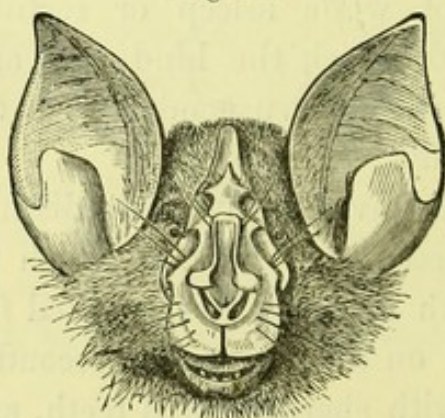
Of the fruit-eating Bats, the most worthy of mention are the large brightly-coloured Flying Foxes, of which certain species, for example the Philippine Fruit-Bat (*Pteropus jubatus*), reach to

* Greek, *cheir*, a hand, and *pteron*, a wing.

between 4 and 5 feet in spread of wing. One of this group, *Pteropus medius*, is extremely common all over India, doing an enormous amount of damage to the fruit-gardens, to pillage which it is said they will make nightly expeditions of from twenty to thirty miles, returning each morning to their accustomed sleeping-places. In striking contrast to these great animals is the tiny *Macroglossus minimus*, a true Fruit-Bat, but no bigger than a Mouse, which inhabits South Asia and Australia. Another noticeable species is the Long-nosed Bat (*Harpyia cephalotes*), whose nostrils are elongated into peculiar tubes, the special use of which still remains to be discovered. There are about 70 species of Fruit-Bats, spread over all the tropical parts of the Old World.

The Insectivorous Bats are much more numerous than the Frugivorous, numbering about 350 species, distributed over the whole world, and extending even to remote islands in the Pacific, where they are the only indigenous Mammals. With but 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 very remarkable structures, known as nose-leaves, which seem to be tactile organs of extreme delicacy, and which are of wonderful variability both in shape and size (see fig. 11).

Fig. 11.



Mountain Horseshoe-Bat of India (*Rhinolophus luctus*).

Of the Insectivorous Bats exhibited, the following may be noticed:—The Great Nose-leaf Bats (*Megaderma*) of Africa, Asia, and Australia, which are the analogues among Bats of the Carnivora among Mammals generally, preying habitually on the smaller

species of Chiroptera; the Horseshoe-Bats of Europe (*Rhinolophus ferrum-equinum* and *hipposideros*); the Long-eared Bat (*Plecotus auritus*), whose ear is nearly as long as its body; the Noctule (*Vesperugo noctula*), the largest of our English Bats; the peculiar-looking *Cheiromeles torquatus* of the East Indies; the White Bat (*Dictidurus albus*) of South America, one of the very few Mammals, and the only Bat, normally white in colour; the Vampire (*Vampyrus spectrum*), the largest of the American Bats, formerly erroneously supposed to be guilty of blood-sucking; and, finally, the real blood-sucking Bat (*Desmodus rufus*), of which the specimen exhibited was caught by 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 V. DERMOPTERA.

The single genus of this Order (*Galeopithecus*) has been placed

Fig. 12.



Galeopithecus.

by some with the Lemurs, by others with the Insectivores, but differs sufficiently from both to be considered apart. It contains the so-called Flying Lemurs of Malaysia and the Philippines, animals of about the size of a cat, with a lateral extension of the skin of the body, supported by the four limbs and tail, and forming a sort of parachute. By the help of this parachute, the *Galeopithecus* can float through the air for considerable distances from tree to tree, but their flying leaps are always in a descending direction, as in Flying Squirrels and Flying Lizards, and not as in Bats, which have the power of flapping their wings and rising and falling in the air at their pleasure. *Galeopithecus* lives exclusively on vegetable food. Two specimens, one of which has the parachute opened, are exhibited.

Order VI. RODENTIA, OR GNAWING MAMMALS.

(Cases 27-32.)

The Rodentia, or Gnawing Animals, comprise the Squirrels, Rats, Hares, &c., and form by far the largest order of Mammals, containing over 900 distinct species, a number more than double that of the next largest, the Chiroptera. As a whole, the 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 of the species will occasionally eat eggs, birds, fish, or other animal food. Their peculiar dentition, by which they are distinguished from other Mammals, is described on p. 83.

With regard to their geographical distribution, they are, next to the Chiroptera, the most widely spread of all Orders, extending over the whole world, with the exception of the more remote Pacific islands, to which they have hitherto not had means of access. Many of the species are arboreal, like the Squirrels, or aquatic, like the Water-Voles and Musquashes; but the great majority are burrowing and terrestrial animals, which only come forth by night to seek their food, on which account, although so numerous, they are but little seen by ordinary observers.

The Order is divided into those with only one pair of incisor teeth in the upper jaw, and those with two. 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.

Of the *Sciuromorpha*, or Squirrel section, may be mentioned the following:—

The Scaly-tailed Flying Squirrels (*Anomalurus*) of Equatorial Africa (Case 27), with membranous parachutes like the Flying [Case 27.] Lemurs described above (p. 30), and with a series of pointed scales so placed under the base of their tails 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.

The true Flying Squirrels of Southern Asia (*Pteromys*), perhaps the most brightly coloured of all Mammals; with the exception of their flying membrane, there is no structural difference between them and the ordinary Squirrels.

The Chipmunks, Souseliks, and Marmots (*Tamias*, *Spermophilus*, and *Arctomys*) (Case 27) live in burrows of their own construction. The Common Marmot (*Arctomys marmotta*) inhabits the Alpine regions of Europe. The North-American Prairie-Marmots (*Cynomys*), 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, which quarter themselves on the unfortunate Marmots, and feed on their young.

The Squirrels (*Sciurus*) (Case 28) form the largest genus of the [Case 28.] present group, about 70 species being known, 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 Squirrel (*Sciurus indicus*) of India, down to others scarcely larger than Mice, as, for example, the Black-eared Squirrel of Borneo (*S. melanotis*). Squirrels are generally bright-coloured, and vary in an extraordinary degree, as may be gathered from an examination of the instructive series of *S. hypopyrrhus*, the Grizzled Squirrel, placed in the lower part of Case 28. 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 our common Squirrel also (*S. vulgaris*), killed respectively in England, Switzerland, and Siberia, would appear so different from each other as to be readily taken for three separate species, were it not that all the intermediate stages are known. The colours, moreover, change somewhat according to season, winter specimens of the English species being decidedly greyer and less ruddy in tint than those killed in summer.

[Case 29.] The Beaver (*Castor fiber*) (Case 29) is distinguished by its flat and scaly tail, webbed hind feet, and soft, thick fur. Its incisor teeth are of remarkable strength and sharpness, and it is able with them to gnaw through the trunks of large trees, which it requires for the construction of dams, in a short space of time. This interesting animal is rapidly becoming exterminated, owing to the great demand for its fur*, so that whereas it formerly inhabited the whole of Northern Europe, Asia, and America, it is now only to be found in a few isolated localities in the most inaccessible parts of its proper range.

[Cases 29 and 30.] The *Myomorpha*, or Rat section (Cases 29 and 30), contains about 60 genera and 500 species, which are spread over the whole world, and externally present but few striking differences between the various forms. They possess generally large ears, long and more or less scaly tails, and bright prominent eyes. The families included in this section are:—(1) The *Myoxidæ*, or Dormice, beautiful soft-furred, bushy-tailed little animals, natives of Europe, North Asia, and Africa, of which one small species, *Muscardinus avellanarius*, the common Dormouse, is a native of England. (2) The *Muridæ*, or Rats and Mice, of which may be mentioned the Gerbilles of India and Africa (*Gerbillus*), with elongated hind feet, on which they jump like kangaroos; the Rats and Mice of the Old World (*Mus*), and the Vesper-Mice (*Hesperomys*) of America; the Voles (*Arvicola*), whose best-known members are the common English Field-Vole (*Arvicola agrestis*), the Water-Vole or Water-Rat (*Arvicola amphibius*), and its ally the North-American Musquash (*Fiber zibethicus*), a beautiful albino example of which is exhibited in Case 30. (3) The Bamboo-Rats of Asia

* In the years 1864–1875 the Hudson's Bay Company sold on an average 150,000 Beaver-skins per annum.

and Africa (*Spalacidae*), with short tails, thick heavy bodies, and powerful digging claws. (4) The Gophers and Pouched Mice (*Geomyidae*), somewhat similar to the last, but provided with pouches in their cheeks, outside their mouths, often large enough to hold a walnut. (5) The *Dipodidae* (Case 30), consisting of the long-legged and long-tailed Jerboas of North Africa and Asia, specially modified for leaping lightly over a yielding sandy soil. The Jumping Hare of the Cape Colony (*Pedetes capensis*) is also a member of this family.

The *Hystricomorpha*, or Porcupine section, contains the following:—(1) The *Octodontidae* (Case 31), with 17 or 18 genera, [Case 31.] nearly all confined to South America, of which the best known is the aquatic Coypu (*Myopotamus coypu*), whose habits are similar to those of the Water-Vole, and whose fur is thick and soft, and of considerable value. (2) The Porcupines (*Hystriidae*) (Cases 29 and 30), found both in the Old and New Worlds, are all covered [Cases 29 and 30.] with stout variegated spines, although in some of the species these are hidden in the long thick hair. The Porcupine of Southern Europe (*Hystrix cristata*) is now becoming extinct, but several species closely allied to it are still very common in India and the Malay Archipelago. They feed on fruit, bark, and roots, and live in burrows of their own construction, with the exception of the South-American Tree-Porcupines, which are wholly arboreal, and have long prehensile tails. (3) The Chinchillas (*Chinchillidae*), celebrated for their beautiful soft fur. (4) The Agoutis and their allies (*Dasyproctidae*); and (5) the Cavies (*Caviidae*) (Case 32), [Case 32.] to which belong the little animals known to us as Guinea-pigs, and the great Capybara (*Hydrochærus capybara*), by far the largest of the Order. Its habits are somewhat similar to those of the Hippopotamus, it being thoroughly aquatic, and feeding on water-weeds, grass, and other vegetable substances. The last three families are all entirely restricted to South America.

The second suborder of Rodents, distinguished by possessing two pairs of incisors in the upper jaw, consists only of the Hares and Rabbits (*Lepus*) and the Pikas (*Lagomys*), animals far less specialized for gnawing than the other Rodents, and showing, in some respects, the links by which the Rodents are related to other Mammals. *Lepus* (Cases 31 and 32, above) contains about 45 [Cases 31 and 32.]

species, all on the whole very much alike, of which the three British species, the Common Hare (*Lepus europæus*), the Alpine or Varying Hare (*L. variabilis*), found both in Scotland and Ireland, and the Rabbit (*L. cuniculus*) are typical examples. *Lagomys* (Case 32, below) consists only of about 8 species; they are short-eared, little animals, known as Pikas or Calling-Hares, from the peculiar calling sound they make. They resemble Guinea-pigs in their external appearance, and are natives of Northern Asia and North America.

Order VII. UNGULATA, OR HOOVED ANIMALS.

Suborder PROBOSCIDEA.

This Suborder, so named from the long trunk or proboscis into which the nose is produced, consists, at the present day, of two species only, the African and Indian Elephants. They are the survivors of a very large number of species which are now extinct, but ranged in former times over the whole of the northern half of both the Old and New Worlds.

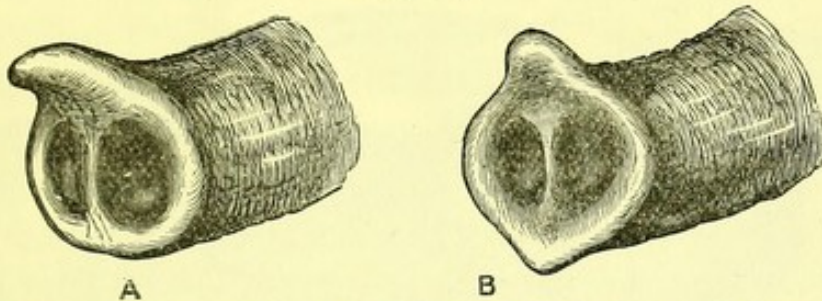
Elephants are heavily-built animals, with large ears, nostrils produced into a long flexible trunk, thick limbs, each provided with 5 toes, enclosed in a common skin, so that only the nails show externally, and of these there are, as a rule, only three or four on the hind foot; tail well developed, reaching nearly to the ground; skin almost naked, although in the extinct Mammoths it was clothed with long shaggy hair. Incisor teeth growing into long curved tusks, directed downwards and forward.

The two existing species are:—(1) The Indian Elephant (*Elephas indicus*), of rather smaller size than the African, with much smaller ears, a back arched upwards, with always 4 and sometimes, though very rarely, 5 nails on the hind feet, a finger-like process at the tip of the trunk, and with only small tusks in the female. It is an inhabitant of the Indian region from India and Ceylon, through Burmah and Malacca, to Sumatra. Of this species a rather small stuffed specimen is placed in the Saloon at the end of the Gallery, and there are several skeletons and skulls in the Osteological Gallery, which will be referred to later on (see p. 87).

(2) The African Elephant (*Elephas africanus*) is of a somewhat

larger size than the Indian, and has enormous ears, a more or less hollow back, only 3 nails on each of its hind feet, and its trunk ends in two equal-sized lips. The female has well-developed tusks,

Fig. 13.



Tips of Trunks of (A) Indian and (B) African Elephants.

though not so large as those of the male. This species inhabited the whole of Africa south of the Sahara, but is now driven back towards the centre of the continent; its fossil remains have also been found in North Africa and Southern Europe. It is more courageous and ill-tempered than its Indian ally, and therefore more difficult to tame. The ancient Carthaginians and Romans understood how to train it, but none of the present African natives have attempted its domestication. Owing to the value of its ivory it is continually hunted, and it is therefore much to be feared that the species will ere long become extinct.

Owing to the great difficulty of preserving the thick skin of so large an animal under the tropical sun of Africa, only a very young animal can be shown, at present, in the Saloon. But skeletons and skulls of full-grown individuals are exhibited in the Osteological Saloon.

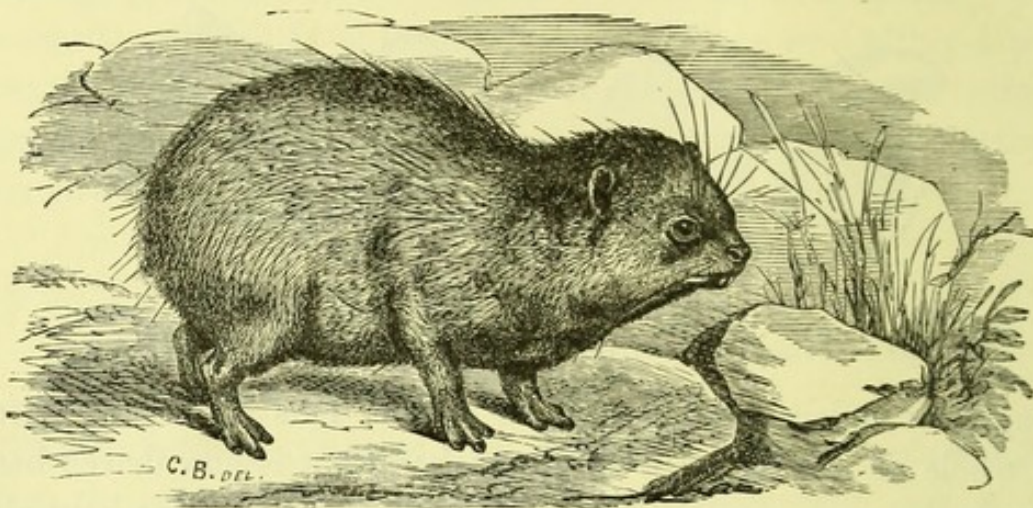
Suborder HYRACOIDEA.

[Case 35.]

Allied both to the Elephants and Rhinoceros are certain small animals looking like short-eared Rabbits, and known as Coneys (*Hyrax*) (Case 35), of which about 6 or 7 species are distributed over Africa, and extend northwards into Arabia and Palestine. They are distinguished from their ponderous allies by their small size, peculiar dentition, and active habits. Their feet are provided with four anterior and three posterior rounded hoofs, quite unlike the claws of Rodents, and their soles are covered with fleshy pads, which enable them to adhere to, and

climb with safety up, smooth surfaces of rocks or trees. These animals are entirely vegetable feeders, some dwelling among rocks, others climbing up trees. Among the Rock-Coneys may be

Fig. 14.

The Coney (*Hyrax sinaiticus*).

specially mentioned the *Hyrax sinaiticus*, which is the "Coney" of our English translation of the Bible.

Suborder PERISSODACTYLA.

The Perissodactyla, or Odd-toed Ungulates, are represented at the present day by three well-known animals, the Rhinoceros, Tapir, and Horse, which have in common many important characters, chiefly in their teeth and limb-bones, which will be better explained in connection with the skeletons exhibited in the Osteological Gallery. Whilst in Miocene and Pliocene times this Suborder was represented by a very large number of different forms, it is now so deficient in species and individuals that it must be supposed to be in a more or less decadent condition.

Of the Rhinoceroses there are five or six known species, all large animals, with such thick and unyielding skins as to necessitate in some the formation of deep folds to enable them to move their limbs with any facility, and with three toes on each foot. The horns, which are placed on their muzzles, differ essentially in structure from those of other Mammals, being composed of modified and agglutinated hairs.

This group is now restricted to the African and Indian regions,

but in former times they were spread over all Europe, Asia, and America. One of them (*R. tichorhinus*), a native of Europe and N. Asia, was invested with a coat of thick woolly hairs, just like its contemporary, the Mammoth. Specimens of the following species are exhibited on the left of the Saloon:—

The Indian Two-horned Rhinoceros (*R. niger*), a native of the Malayan peninsula, one of the rarest of the genus. The Common African Black Rhinoceros (*R. bicornis*), found all over Africa. It is distinguished from the next species by its elongated and prehensile upper lip, smaller size, and different habits. Its two horns are very variable in length, the front one being generally much the longer of the two, but in some specimens the posterior horn is as long as or longer than the anterior; these latter specimens are often considered to be a distinct species, to which the name of “Keitloa” is given.

The White Rhinoceros (*R. simus*) of S. Africa, with a square upper lip, is a large species, of which no full-grown specimens have ever been sent to Europe. Its anterior horn is very slender, and has been found to attain to a length of four feet; the animal being of a mild and timid disposition, and feeding chiefly on grass, uses its horn rarely, either for digging or for attack. This species is becoming very scarce and in danger of being exterminated, which is the more to be regretted, as from all accounts it was capable of being domesticated. A young mounted specimen is placed near the *R. bicornis*.

The large Indian Rhinoceros (*R. unicornis*), a one-horned species from North-eastern India, of which a full-grown male is exhibited.

There are also several smaller specimens of different species placed in Wall-cases 45 and 46, and on the top of both these Cases, and of 53 and 54, is a series of horns representing variations of growth.

The Tapirs (*Tapirus*) (Cases 35 and 36) are swamp-loving animals, excellent swimmers and divers, of which one species occurs in Malaysia and the others in Central and South America—a distribution which shows that at some former period of the world's history they ranged all over the intervening countries, through China, Kamtschatka, and North-west America. In fact a fossil Chinese Tapir has been discovered in which the teeth are so perfectly preserved as to show that the species can only

[Cases
35 and 36.]

have become recently extinct. Of the five species of Tapir known the Malayan has a white back, while the rest are nearly uniformly black when adult, although all when young are marked with longitudinal stripes of yellow or white. They are thick-set animals, with short ears, and with their nose elongated into a short prehensile proboscis; they have four toes on their fore, and three on their hind feet.

In the Horses, Asses, and Zebras (*Equidæ*) the toes are reduced in number to an extent entirely unique among the Mammalia, there being only a single digit on each of the four feet, enormously strengthened to bear the weight of the body, but yet retaining the same composition as our own middle finger. The wild species of this family are indigenous in the open plains of Asia and Africa. The herds of Wild Horses now found in America are the descendants of domesticated and introduced animals. Curiously enough, however, that continent was in former ages the headquarters of the family, many different forms having been there developed, and become again entirely extinct.

The two Cases in the centre of the Gallery show several members of the family, as, for instance, the nearly extinct true Zebra (*Equus zebra*); the comparatively common Burchell's Zebra (*Equus burchelli*) of Central South Africa, distinguished by the different arrangement of the stripes on the body; the Wild Ass of Central Asia; and several interesting cross-breeds between the Quagga and the domestic Donkey.

Suborder ARTIODACTYLA.

The Artiodactyla, or Even-toed Ungulates, are distinguished by having the two central hoofs of each foot equal in size. They consist of two very distinct groups. The members of the first are the Pigs and Hippopotami, which are non-ruminant, the second comprising all the Ruminants, or Mammals that chew the cud.

[Cases 37-40.] The Pigs, or *Suidæ* (Cases 37-40), are distinguished by their long snout, flattened in front, small eyes, four-toed feet, short tails, strongly-built bodies, and in disposition by their remarkable courage and ferocity. They are represented in the Old World by the genus *Sus*, of which the Wild Boar of the continent of Europe may be looked upon as the most typical species. This animal, unlike its domesticated descendant, our Common Pig, is

covered all over with thick grizzled hair, has a longer and narrower head, and great projecting tusks, with which it can rip up and kill a man at a stroke. The species is spread all over Europe (now exterminated in England), North Africa, and Western Asia, being replaced in China and India by another very closely-allied animal, almost identical in external appearance (*Sus indicus*).

Other noteworthy Old-World species are:—The Papuan Pig (*Sus papuensis*) of New Guinea (Case 38); the Wart-Hog (*Phacochærus*) and the peculiarly-coloured River-Hog (*Potamochoærus*) of Tropical Africa (Cases 37 and 38); the Babirusa (*Babirusa alfurus*) of Celebes (Case 40, above), an extraordinary hairless species, with long, upwardly-curved tusks, which in old age may grow so long as to describe an almost complete circle and to penetrate into the skin of the animal's forehead. The Pygmy Hog (*Porcula salvania*), of Nepal and Assam, is noticeable for its diminutive size, being seldom more than one foot in height and two in length; but is in other respects quite similar to the ordinary Pigs.

In the New World, Pigs are represented by the Peccaries (*Dicotyles*) (Case 39), animals much smaller than an ordinary Wild Boar, and differing in their skulls and dentition from the Old-World Suidæ. Especially noteworthy is the fact that the upper canine teeth do not project outwards and upwards, and are therefore less formidable weapons than the Boar's tusks; but, notwithstanding this, the Peccaries are more dangerous to man than any other of the Pig-tribe, as they herd together in bands of from 15 to 40, and make most determined attacks on any person the moment they are aware of his presence; unless he is able to take refuge in a tree, or to kill nearly the whole of the band, he is very likely to fall a victim to their ferocity. They are themselves preyed upon by the Jaguar and Anaconda.

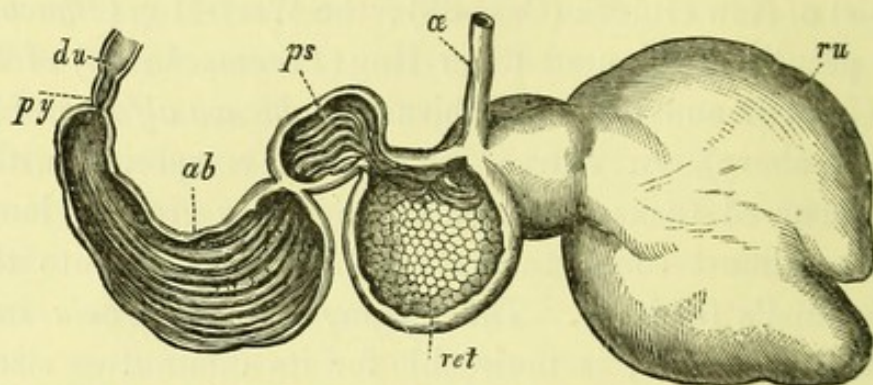
Of the *Hippopotamidæ*, which were once extremely numerous in this country, in Southern Europe, and India, only two species have survived, viz. the Common Hippopotamus (*H. amphibius*), too well known to require further notice, and of which several stuffed specimens are exhibited in the Saloon; and the much smaller Liberian Hippopotamus, which does not exceed a Wild Boar in size, and occurs only in a few localities in West Africa.

The second great group of the Artiodactyles consists of the Ruminants, and contains (1) the *Tylopoda* or Camel tribe, (2) the

Tragulina or Chevrotains, and (3) the *Pecora*, or the Oxen, Antelopes and Deer, and the Giraffe.

The molars of all these Mammals consist of two pairs of crescent-shaped lobes, and their stomach is composed of four, or, rarely, three divisions, from one of which their food is returned to their

Fig. 15.



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

æ, 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.

mouths after it has been swallowed, in order to be chewed a second time, a process known as ruminating or chewing the cud.

(1) The *Tylopoda*, the Camels and Llamas, are distinguished from the other Ungulates by their elongate and prehensile upper lips, their thick woolly fur, long neck and legs, two-toed feet, the pads of skin beneath their hoofs (whence the name Tylopoda, or "pad-footed"), their complicated stomachs, whose walls contain a peculiar set of large cavities, the so-called "water-cells" (supposed, though with much doubt, to be for the purpose of storing water), their oval blood-corpuscles (all other Mammals having round ones), and by numerous other special characters. The first genus, *Camelus*, contains the Dromedary and the Camel, both domesticated, and ranging from North Africa, through Arabia, Persia, and Central Asia, to India. The Dromedary, with one hump on the back, is not known in a wild state; while the two-humped Camel (*C. bactrianus*) has recently been discovered wild by Russian travelers in the mountain-ranges of Central Asia. The humps are large masses of fatty substance serving as a store of nutriment, which during periods of scarcity of food is gradually absorbed, and replenished when the animals meet again with abundant pasturage.

As they also have the power of retaining water in their capacious stomachs for more than a week, Camels are quite invaluable as carriers in desert countries, where food and water cannot regularly be obtained, although in disposition they are both obstinate and ill-tempered, and are said never to attach themselves to their masters.

The second genus of the Tylopoda is *Auchenia*, containing two species—the Huanaco, which is the wild form of the domesticated Llama, and the Vicuña, which stands in the same relation to the Alpaca. They are natives of the Andes and adjoining plateaus of South America; the domesticated forms being used as beasts of burden in the same way as the Camels; their wool, especially that of the Alpaca, is long and fine, and of considerable value. They are without humps on their backs, and much smaller and more lightly built than the Camels. The wide distance which separates the Llamas from the Camels at the present time has been partially bridged over by the recent discoveries of a large number of fossils referable to this group in North America, near the Rocky Mountains. A Dromedary is placed in the centre of the Recess facing the Llamas, which are in Cases 39 to 42. [Cases 39-42.]

(2) The *Tragulina*, or Chevrotains (Case 42), 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 only three, instead of four divisions. There are two genera in the group, namely, *Tragulus*, with five or six beautiful little species, ranging from India to Borneo; and *Hyomoschus*, with but one, the Water-Chevrotain (*H. aquaticus*), of Western Africa. [Case 42.]

(3) The *Pecora* consist of a very large number of closely related animals, characterized by their generally lightly-built and graceful forms, their long narrow ears, large eyes, rudimentary or absent outer toes, absence of teeth in front of the upper jaw, and their complicated stomachs, which consist of four compartments. Among themselves they differ but little, at least in the more important characters, the horns and antlers, with which the males of most of the species are furnished, affording almost the only points by which they can be subdivided.

The families of Pecora are the following:—The *Bovidae*, or Bull tribe, containing the Oxen, Sheep, Antelopes, and Gazelles, is distinguished by the possession of true horns, present for the most part in both sexes. Each horn consists of a bony core (an extension

of the frontal bone of the skull), surrounded by the fibrous horn-substance, which grows from the base, while it is worn away at the tip, and which is never dropped off entire. This horn is never branched, but consists of a single hollow stem, which in the different species varies considerably both in shape and size, as may be seen by an examination of the fine series placed along the tops of the Cases in the Osteological Gallery.

The most remarkable specimens of Wild and Domesticated Cattle are exhibited in the Saloon and the adjoining part of the Gallery, viz.:—A Hungarian Bull, as a representative of the Common Domesticated Ox (*Bos taurus*), the numerous races of which have been produced partly by crossing originally wild species (*Bos primigenius*, *Bos longifrons*, *Bos frontosus*), which now survive in their domesticated descendants only, and partly by artificial selection. A Brahmin Bull or Zebu (*Bos indicus*), the sacred Cattle of the Hindoos; this specimen was bred from a pair presented by Her Majesty to the Zoological Society, and was thirteen years old at the time of its death in 1884. A pair of the Gaur (*Bos gaurus*), a native of North and Central India, untamable, and strong enough to hold its own against the Tiger. A Gayal (*Bos frontalis*), domesticated in various parts of the Indian continent and archipelago, and no longer occurring in a wild state, supposed by some to be the descendant of the Gaur. A Banteng (*Bos banteng*), the indigenous Cattle of Java, Sumatra, and Borneo. No specimen of the Common Domesticated Buffalo is exhibited at present; but numerous horns, showing the varieties of size and shape, are fixed on the wall of the Osteological Saloon. The Buffalo attains its greatest development in its original home, India, where one race (*Bos arni*) is armed with horns upwards of 6 feet in length; it ranges into North Africa and South Europe. Both the wild Buffaloes of Tropical Africa (*B. caffer* and *B. centralis*) are exhibited, the former with enormously thick solid horns, their bases touching each other in the middle of the forehead; the latter of a less ferocious disposition, and with less powerful horns. The European Bison or Aurochs (*B. bonasus*), originally a native of the large forests of Europe, now restricted to the Caucasus and to the forest of Bialowicza in Lithuania, where it is protected by the Emperor of Russia, the donor of the fine Bull exhibited here. The American Bison,

erroneously called Buffalo (*B. americanus*), which still wanders in annually diminishing herds over the prairies of North America, forming the chief means of subsistence to tribes of Indians, equally doomed to speedy extinction. Finally, the Wild Ox of Central Asia, the Yak (*Poëphagus grunniens*), partly reclaimed and domesticated in Thibet and Mongolia.

The Musk-Ox (*Ovibos moschatus*) is represented by a remarkably fine series in Cases 57-60, for which we are indebted to the various British Arctic Expeditions. It is covered all over with very

[Cases 57-60.]

Fig. 16.



The Musk-Ox. (Discovery Bay ; Voyage of H.M.S. 'Alert'.)

long hair, often nearly a yard in length, and with a thick woolly under-fur. It inhabits the Polar regions of the Western Hemisphere, between the 60th and 83rd parallels of latitude, and is found in herds of from 10 to 30. It is surprising that so large an animal should be able to subsist during the long Arctic winter on the scanty vegetation of those regions. When fat its flesh is well-flavoured, but lean animals smell strongly of musk. Notwithstanding the shortness of its legs, the Musk-Ox runs fast, and climbs rocks and precipices with as great ease as a Wild Sheep, to which it is more allied than to the Ox tribe.

The Sheep form a small group, well characterized by their thick, heavy, and transversely-ridged horns, curved spirally outwards, and by their peculiar physiognomy, quite distinct from that of all

[Cases 47-52.]

their allies. Some of the wild species are as large as a donkey, and their horns are of enormous weight and strength. All the specimens are placed in the large Case against the north wall of the Saloon, on the top of which are also some of the finest pairs of horns, the remainder being arranged in the Osteological Gallery. The most worthy of note are:—The Wild Sheep of Cyprus (*Ovis ophion*); the races inhabiting the Alpine ranges and plateaus of Central Asia (*Ovis karelini*, *Ovis ammon*, *Ovis cycloceros*); the Wild Sheep of Kamtschatka and North-western America (*O. nivicola*); the Bighorn of North America (*O. canadensis*); the Mufflon of Corsica and Sardinia (*O. musimon*); the Burrhel (*O. nahura*); and, finally, the very peculiar, long-haired, long-bearded Barbary Sheep (*Ammotragus tragelaphus*), with horns quite different both in character and direction from those of all its allies. Of the horns exhibited, by far the finest are those of Marco Polo's Sheep (*O. poli*), of the Pamir Plateau, Central Asia, of which the tips of

Fig. 17.



Marco Polo's Sheep.

the two horns are 56 inches apart, while each horn measures along the curves 64 inches, and describes more than a circle and a quarter when viewed from the side. The habits of the different Sheep are all very similar: they live in highlands, some of the Himalayan species being seldom found lower than from 12,000 to 16,000 feet above the sea, climb with great facility, and are of all game the most wary and difficult of approach. It is almost impossible to ascertain now which of the Wild Sheep represent the ancestral stock from which the domestic races have descended. Probably, as in the case of oxen and dogs, they have a mixed origin from several distinct wild species. Some very extraordinary varieties of tame Sheep are exhibited in the same Case.

The Goats are distinguished from the Sheep by their laterally flattened horns, which are placed more upright on the head and curve nearly directly backwards, often almost touching each other at their tips, by their long beards, shorter and less thickly-haired tails, and their strong, disagreeable odour. The Wild Goat (*Capra hircus*), of the mountains of South-western Asia (Cases 53 and 54), is certainly the ancestor of our common domestic animal, which is in some respects degenerated, being much smaller, and possessing horns not half the size of those of the wild stock. The specimens in the Case were obtained in the Taurus Mountains of Asia Minor, and on Mount Ararat. [Cases 53 and 54.]

The other Wild Goats, such as the Wild Goats of the Caucasus (*Capra caucasica* and *pallasii*), the Pyrenean Thar (*C. pyrenaica*), and the Ibexes of the Himalayas, Alps, and Pyrenees, are exhibited in Cases 45, 61 to 66. [Cases 45, 61-66.]

The next group is that of the Antelopes and Gazelles (Cases 67 to 83), distinguished by their light build, bright colours, and slender 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. As might be expected from this fact, they are all peculiarly suited to life in open plains and deserts, being very swift of foot, and, as a rule, of such a colour as to harmonize well with their general surroundings. [Cases 67-83.]

Of the Antelopes exhibited, too numerous and too closely allied for a detailed description here, the following may be noted :—

The Elands of Central and South Africa (*Oreas*), the largest of the group, and acclimatized in this country, are placed in a separate case in the Saloon.

The beautiful Lechee Antelope (*Onotragus lechee*). (Cases 67 and 68.)

The Water-Buck (*Kobus ellipsiprymnus*) (between Cases 63 and 66), and the Sing-Sing from Abyssinia (*Kobus sing-sing*) (between Cases 67-70).

The Sable Antelopes (*Hippotragus niger* and *leucophæus*). Between 25 and 28 on the left, and 71 and 74 on the right side of the Gallery.

The Bush-bucks (*Cephalophus*), some scarcely larger than rabbits; found all over Africa. (Case 71.)

The Dwarf Antelopes (*Neotragus* and *Nanotragus*), the former with elongated tubular nostrils. (Between Cases 71 and 72.)

The Saiga (*Saiga tartarica*), a very aberrant and peculiar species, a native of Russia and South Siberia, which has a still more elongated and tapir-like snout. (Case 73.)

The Gemsbock (*Oryx gazella*) (between Cases 91 and 94), and the Beisa Antelope of Abyssinia (*Oryx beisa*). (Case 74.)

The Gazelles (*Gazella*). (Cases 75 to 77.)

The spiral-horned Indian Antelope (*Antilope cervicapra*). (Case 78.)

A fine male specimen and a younger female of the so-called Mountain-Goat of North America, a Mountain-Antelope, inhabiting the wildest parts of the northern Rocky Mountains (*Haplocerus montanus*), are temporarily placed in the Saloon. (Case 46.)

Specimens of the Chamois from the Alps, Transylvania, and the Caucasus (*Rupicapra tragus*). (Case 79.)

The Harnessed Antelopes (*Tragelaphus*). (Cases 81 and 82.)

The Kudu (*Strepsiceros kudu*), one of the handsomest and largest Antelopes. (Between Cases 9 and 12 on the left, and 87 and 90 on the right.)

The Gnus (*Connochetes*), grotesquely built animals, which appear to have the head and fore-quarters of a buffalo, with the hind-quarters and tail of a pony. (Case 83 and between Cases 33 and 36.)

Several species of Hartebeest (*Alcelaphus caama*, between Cases 29 and 32; *Alcelaphus tora*, between Cases 33 and 36; *Alcelaphus lichtensteinii*, between Cases 37 and 40). Specimens of the Sassayby (*Damalis lunatus*) are exhibited in the same Case with the Cape Hartebeest.

[Case 84.] The *Antilocapridæ*, the second family of the Pecora, contains only a single species, the Pronghorn of North America (*Antilocapra americana*) (Case 84), the only one of the hollow-horned Ruminants in which the horns are bifurcated, and are shed and renewed annually, the horny sheath slipping off its bony core, and being replaced by a fresh horny growth, a process wholly unlike anything found either in the Antelopes or Deer. In its habits it resembles the Antelopes, and is found in the open prairies of North America.

The *Giraffidæ*, containing only the Giraffe (*Giraffa camelopardalis*), of which a stuffed specimen and a skeleton are placed in

the centre of the Saloon. Its true horns are two in number, small, solid, persistent, and covered with hair, but it has besides a bony protuberance on the middle of the face, which increases with age, and in old animals appears as a third horn; it has only two toes on each foot, the outer ones being entirely absent. At the present time Giraffes are being driven further and further back into the centre of Africa, over the whole of which they used to range, like the other large animals of that continent, and it is feared that before very long the species will be entirely exterminated. Giraffes browse partly on ground vegetation, partly on the leaves of trees, their great height and long extensile tongues enabling them to strip branches which are far out of the reach of other animals.

The *Cervidæ*, or Deer family, consists of a very large number of genera and species inhabiting Europe, Asia, and America, but is, except for one species found in Barbary, entirely unrepresented in Africa. They are distinguished from the other Ruminants by their antlers, which in the majority of the species are present in the males only. Antlers are bony outgrowths of the frontal part of the skull, annually shed and renewed, 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 aborted 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." A more or less elongated portion or "pedicle" always remains on the skull, from the summit of which the new antler grows next year. The antlers increase in strength and complexity with the age of the animal, from the simple upright snag of the one-year-old "Brocket" to the large many-tined antlers of the "Royal Hart," as the fully adult Red Deer is generally called. These differences in the development of the antlers are also those of species as well as of age, some of the Deer never having more complex horns than a young Red Deer, while others have no antlers at any age.

The series of separate antlers is placed on the tops of the Cases all round the Gallery.

The following Deer may be specially mentioned:—

The Reindeer (*Rangifer tarandus*), formerly ranging over the greater part of Europe, is now found only in the northern regions of both the Old and New Worlds. It is the only member of the family in which both the male and female have antlers; and these also are peculiar in not being quite alike on the two sides, the great palmated brow-antler being, as a rule, developed on one side only. A set of European Reindeer are placed between Cases 17 and 20 on the left, and specimens from America between 79 and 82 on the right side of the Gallery. Only the European race has been domesticated.

The Elk (*Alces machlis*) is the largest of the family, and also circumpolar in its distribution. European specimens are placed between 13 and 16 on the left, and American between 83 and 86 on the right.

The Wapiti (*Cervus canadensis*) from North America, represented by a stuffed male and skeleton standing in the centre of the Gallery. For comparison with these largest of living Deer there is placed in close proximity the skeleton of a gigantic extinct Deer (*Megaceros hibernicus*) which once lived in many parts of Europe, and the remains of which are found in greatest abundance and in the most perfect state of preservation in the peat-bogs of Ireland.

[Cases
85-94.]

The common Red Deer of Europe (*Cervus elaphus*). (Case 85.)

The Muntjacs (*Cervulus*), a small Asiatic group, in which the antlers are supported on long hair-covered pedicles of bone, longer than the portion which is annually shed and renewed. (Above Case 88.)

The Fallow Deer (*Dama vulgaris*), a native of Southern Europe and Asia Minor; introduced into England at an early but uncertain period, perhaps by the Romans. (Case 88.)

The Roebuck (*Capreolus caprea*), formerly found in all forests of Great Britain, but gradually driven to the north; it has been reintroduced in certain places in the south of England. There is, for instance, a flourishing colony at Blandford, in Dorsetshire, a fine male from which is exhibited, with others, in Case 91.

The Virginian, White-tailed, and Mule Deer (*Cariacus virgi-*

nianus, *leucurus*, and *macrotis*) of North America. (Cases 92 and 93.)

The Pudu (*Pudu humilis*), of the Andes. (Case 93.)

The Peruvian Roebuck (*Furcifer antisiensis*), from the Peruvian Andes. (Case 94.)

The Musk-Deer (*Moschus moschiferus*) differs in many important structural characters from the other Deer, especially by its entire want of horns, and the great development of its 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 open 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 Thibet to China and Siberia. The "musk," which is now used as a perfume rather than a medicinal drug, continues to be a most 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.

Order VIII. SIRENIA.

See Osteological Gallery, p. 94.

Order IX. CETACEA.

See Cetacean Gallery, p. 104.

Order X. EDENTATA.

(Cases 33 and 34.)

The Edentata, so named on account of the incompleteness of their dentition, or entire want of teeth, contain several widely different groups.

The first, that of the *Pilosa* or Hairy Edentates, comprises the Sloths and Anteaters, which, though apparently very distinct, are yet linked together by numerous fossils filling up the gap between them.

The Sloths (*Bradypodidæ*) are characterized by their short round [Case 33.] heads, long fore legs, toes fastened together by skin and terminating in long curved claws, and by their coat of coarse brittle

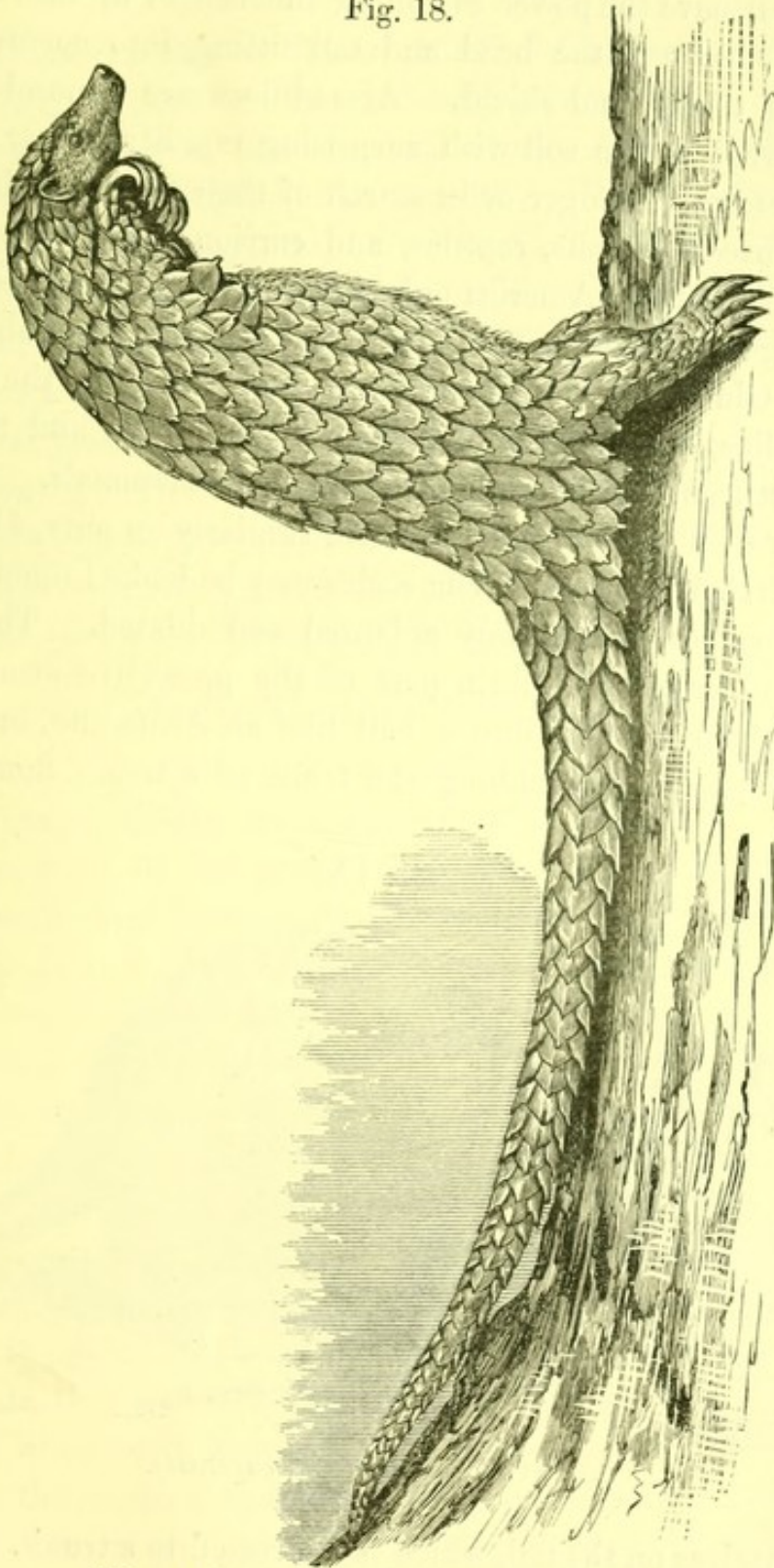
hairs. They are entirely tailless. They pass their whole existence on trees, hanging by their long and powerful claws to the underside of the branches, never descending to the ground unless compelled, and feeding on leaves and young twigs, for the mastication of which their few and simple teeth are sufficiently well suited. 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 exertion than by the difficulty with which they are distinguished from the branch to which they cling. They inhabit the forests of Tropical America. The living species of Sloths are not much larger than a cat; but remains of an extinct Sloth (*Megatherium*) occur in abundance in the Pampas of South America, which exceeded in bulk an elephant. So ponderous an animal could only live on the ground.

[Case 33.] The Anteaters (*Myrmecophagidæ*) have narrow heads with long snouts, to accommodate their enormously long worm-like tongues; their tails are well developed, and in some species prehensile, their toes separate from each other, as in ordinary mammals, and the third on the fore foot is provided with a huge digging claw. Like the Sloths, they are all natives of Tropical America. The Great Anteater (*Myrmecophaga jubata*) is about four feet in length and has a long black mane along its back, and a thick bushy tail. It 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 Tamanduas and the Two-toed Anteater, the latter being scarcely larger than a rat. Both lead an entirely arboreal life.

The *Loricata*, or Shielded Edentates, consist of the single family *Dasypodidæ*, or Armadilloes, remarkable for the thick plates of ossified skin with which their bodies are covered, and which form immovable shields across the shoulders and hips, while the centre of the back is protected by a greater or less number of transverse bands of plates, jointed to each other by flexible skin. The head and tail are also covered by a mosaic of bony plates; but the belly and the inner sides of the limbs are clothed with soft skin only. They possess teeth, which, however, are of very simple character. Their fore feet have a variable number of long and powerful claws, and their hind feet have always five rather small claws. About twenty

species are known. *Priodon maximus*, the Giant Armadillo, is the largest, measuring more than two feet in length; while the smallest,

Fig. 18.



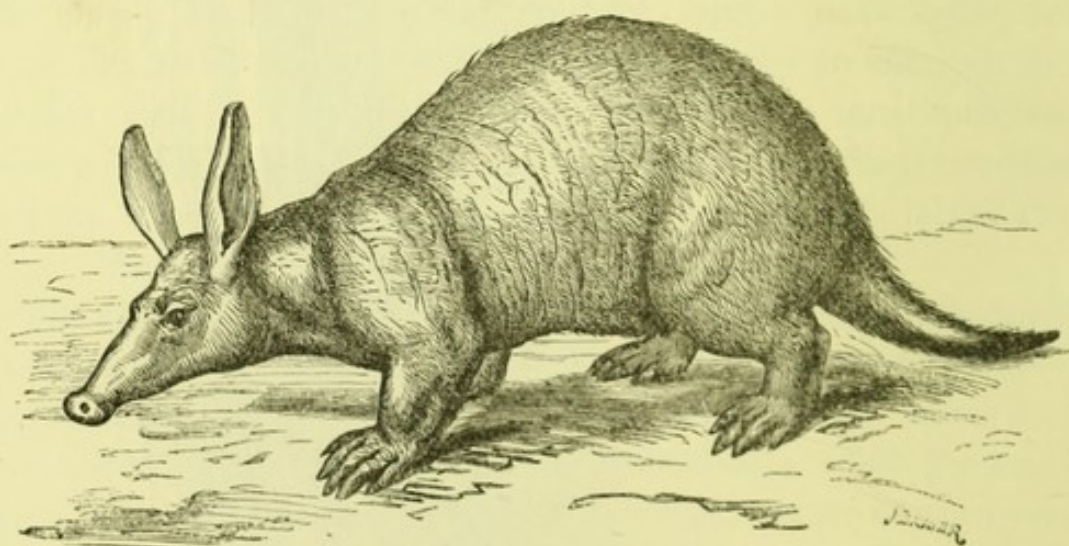
West-African Pangolin (*Manis tricuspis*).

rarest, and in many respects the most interesting, is the Mole-Armadillo (*Chlamyphorus truncatus*), which has the outer shield

attached to the hip-bones by peculiar bony processes. Like a mole, it leads a subterranean life. The Three-banded Armadilloes (*Tolypeutes*) have the power of rolling themselves up into a perfect ball like hedgehogs, the head and tail fitting into corresponding notches in the dermal shield. Armadilloes 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 in the warmer parts of America only, where also the remains of their extinct gigantic predecessors (*Glyptodon*) occur in great abundance.

[Case 34.] In the Old World the Edentata are represented by the *Manidæ*, or Pangolins, which, with their long scaly bodies and tails, and their short legs, look more like reptiles than mammals. Like the Anteaters they are toothless, and live similarly 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 a ball like an Armadillo, or they use them as supports in climbing the trunk of a tree. Some species

Fig. 19.



Aard-vark (*Orycteropus capensis*).

rest themselves on the tail, which is adpressed to a trunk, whilst the body is thrown backwards and assumes the appearance of a projecting broken branch (fig. 18). 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. In all there are seven species of Pangolins, of which four are African and three Asiatic.

The *Tubulidentata*, or Tube-toothed Edentates, consist of two [Case 34.] species only, the Aard-varks (*Orycteropus capensis* and *æthiopicus*), natives respectively of the Cape and North Africa, strikingly different from all other Edentates (fig. 19). They 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 their fore, and five on their hind feet, all modified for digging, their manner of life being very similar to that of the Great Anteater, as they feed chiefly on ants and other small animals. Two adult specimens placed in Case 34 will 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.* Ground-pigs.

Order XI. MARSUPIALIA.

(Cases 95-98.)

This Order differs by numerous and important anatomical characters from all the previous Orders. There is, moreover, a curious parallelism between its members and the preceding Orders, inasmuch as the Marsupials include forms representative of the herbivorous, carnivorous, and insectivorous types of the other Mammalia, a fact which must appear to be all the more significant as the oldest Mammalia known, from the Secondary period, are Marsupials, which then were spread probably over the greater portion of the globe, and lived in numerous genera and species in Great Britain and other parts of Europe.

The females of most Marsupials* possess a peculiar pouch of skin on their bellies, a character which gives the name to the Order. In this pouch the young, which are in a very embryonic condition when born, continue their development, adhering at first firmly to the nipples, and using the pouch afterwards for a long time as a place of refuge until able to take care of themselves. In fact, functionally, the pouch of a Marsupial corresponds to the nest constructed by a mammal or a bird for its progeny.

* *Marsupium* = a pouch.

The geographical distribution of this Order is highly remarkable, one family out of six being found in South America, while all the rest are entirely confined to the Australian region.

[Cases 95 and 96.] The families generally recognized are :—1. The Kangaroos (*Macropodidæ*) (Cases 95 and 96), 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 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

Fig. 20.



Kangaroo from New South Wales (*Halmaturus parryi*).

the first, 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 are 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 as large as a man to others smaller than a rabbit, such as the Rat-Kangaroos (*Hypsiprymnus*). Of those exhibited may be specially mentioned the Great Woolly Kangaroo (*Macropus rufus*), the largest of the family, and the beautiful Yellow-footed Wallaby (*Halmaturus xanthopus*), the most brightly coloured species of the family.

2. The Bandicoots (*Peramelidæ*) are distinguished by the structure of their fore feet—in which two or three of the middle toes are long and subequal, while the others are quite rudimentary—by the Kangaroo-like structure of their hind feet, and by the large number of their lower incisor teeth, of which there are six, the Kangaroos having two only in this position. The most striking members of the family are :—The Striped Bandicoot (*Perameles fasciata*) of Tasmania ; the Long-nosed Bandicoot (*P. raffrayana*) of New Guinea ; the long-eared rabbit-like *Peragalea lagotis* of Western Australia ; and the extraordinary little Pig-footed Bandicoot (*Chæropus castanotis*), an animal somewhat resembling a rat, but with feet which remind us of those of a pig. [Case 97.]

3. Allied to the *Peramelidæ* are the carnivorous *Dasyuridæ*, in which the feet are of the ordinary mammalian type, with five toes on the fore and four on the hind pair. To this family belong :—

The Tasmanian Wolf (*Thylacinus cynocephalus*) (fig. 21), an animal remarkably like a striped dog, both in its external form and the general shape of its skull. 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 it will be quite extinct. No Thylacines now live on the continent of Australia, but their fossil remains have been found in bone-caves in New South Wales.

The Dasyures (Case 97) are small animals of about the size and proportions of a cat. They are wholly carnivorous in their habits, living on eggs, small birds and mammals, and on insects. One of them is the well-known Tasmanian Devil (*Dasyurus ursinus*), which has earned its English name by its untameable disposition and the damage it does to poultry and game.

The *Phascologales* and *Antechini* are still smaller than the last, many of them with a striking resemblance to ordinary mice, both in size and colour.

Fig. 21.

Tasmanian Wolf (*Thylacinus cynocephalus*).

The Marsupial Anteater (*Myrmecobius fasciatus*) is one of the few mammals marked with cross bars. It is of about the size and shape of a squirrel, but has a long pointed snout and extensile tongue, with which it catches ants and other small insects. It is a native of Western Australia.

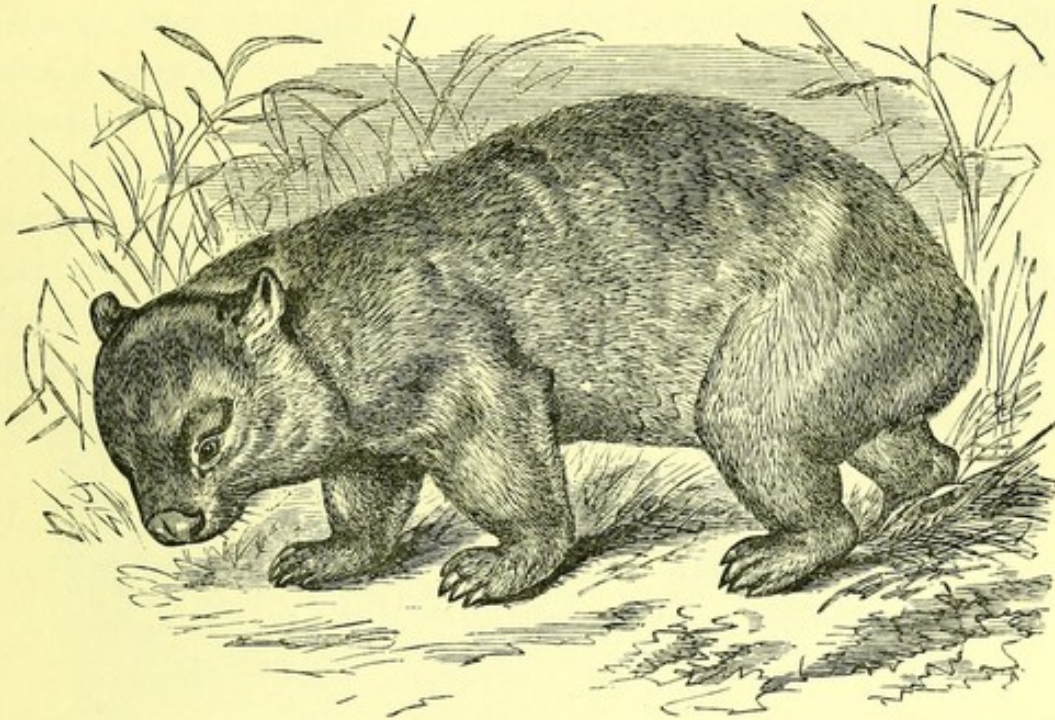
4. The Wombats (*Phascolomyidæ*) (fig. 22) are large clumsily-built animals, somewhat resembling marmots in their general form; they have short, rounded heads, short ears, scarcely any tail, and long powerful claws with which they dig their burrows. There are three species, all very similar externally, 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.

5. The Phalangiers (*Phalangistidæ*) form a large and varied group, to which belong:—

The shrew-like *Tarsipes*, a little long-nosed animal with an extensile tongue, and with three distinct stripes down its back; it feeds on insects and honey, and is confined to Western Australia.

The true Phalangens (*Phalangista*), cat-like animals, with thick fur and long bushy tails; the finely-marked Striped Phalanger (*Dactylopsila trivirgata*) of New Guinea; the Dormouse Phalangens (*Dromicia*); the Bare-tailed Phalangens (*Cuscus*); and, finally, the

Fig. 22.

Common Wombat (*Phascolomys wombatus*).

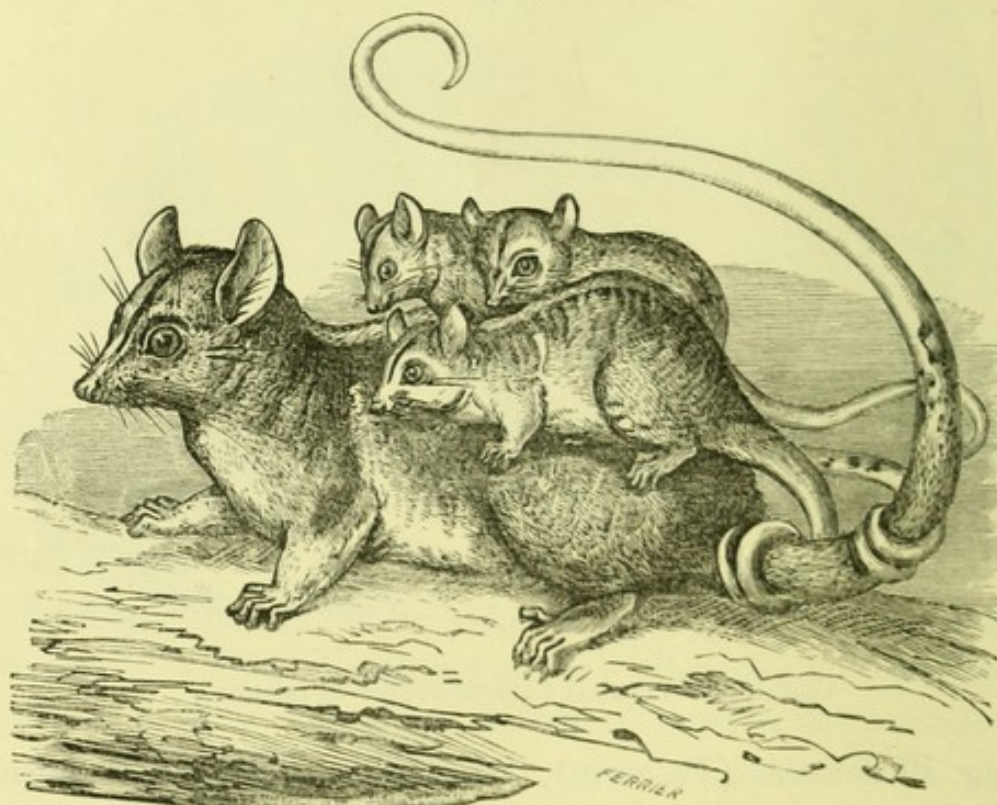
Flying Phalangens (*Petaurus*), which, like the flying squirrels, have a lateral extension of the skin of the body, forming a parachute: are all closely related to each other, and form the great mass of the present family.

The Koala (*Phascolarctos cinereus*) is a curious species, somewhat similar, in its general appearance, to a little bear, but is entirely a vegetable feeder, living chiefly on the leaves of the Eucalyptus. It is of a harmless and peaceable disposition, of about the same size as the Wombats, with long ashy-grey hair, tufted ears, no tail, and five toes on each of its feet.

6. The Opossums (*Didelphyidæ*) are the only living extra-Australian members of the Order, being limited to the American continent, where they range from the United States to Patagonia, the number of species being greatest in the more tropical parts. Opossums are characterized by their slender build, long noses, well-developed prehensile tails, and above all by their hind feet

[Case 98.] being provided with a hallux or great toe, which, like that of the monkeys, is opposed to the other toes, and enables the animal to grasp boughs or other objects; the thumb is without nail or claw, and has only a broad, flat, fleshy pad at its tip. Of the *Didelphidae* the most worthy of mention are:—The Virginian Opossum (*Didelphys virginiana*), a native of the United States, where it is

Fig. 23.

Opossum (*Didelphys derbiana*).

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. The Crab-eating Opossum (*D. cancrivora*) is its South-American representative. Other South-American species are smaller, some little larger than a mouse. The females carry their young on the back, the latter using their prehensile tails by twisting them round that of their mother.

The Yapock (*Chironectes variegatus*) differs from the Opossums by 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.

Order XII. MONOTREMATA.

(Case 98.)

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

The Monotremes lay eggs and have pouches, but their mode of incubation is not yet satisfactorily known; they are without true mammary nipples, the mother's milk exuding from groups of pores in the skin. The males are provided with remarkable horny spurs on their heels, connected with a small gland on the back of the thigh, the function of which is entirely unknown. The temperature of

Fig. 24.

*Echidna aculeata.*

the blood is lower than that of other mammals, recent observations having shown that that of *Echidna* stands only at about 78° , some 20° lower than that of man, and about 30° below that of the average of birds.

The few living species of Monotremata are referred to two families, the first being the *Echidnidae*, characterized by the long narrow snout, small mouth, long worm-like tongue, entire want of teeth of any sort, rudimentary tail, free toes with stout digging

claws, and spiny porcupine-like coats. The family contains three species, two with five toes to each foot, viz. the common Australian and New-Guinea Echidnas; and the Three-toed Echidna (*Proechidna bruijnii*), an animal only recently discovered in the mountainous region of Northern New Guinea.

All Echidnas 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. Echidnas are able, by the help of their strong curved claws, to bury themselves in loose soil in a very few minutes.

The second family of the Order is the *Ornithorhynchidæ*, distinguished by the extraordinary structure of the muzzle, which resembles the bill of a duck, and is provided with horny lamellæ instead of teeth; the tail is long and broad, and the toes are webbed; its coat consists of thick, close hair without any spines.

The only species is the Duck-billed Platypus (*Ornithorhynchus anatinus*), or Water-Mole of the colonists, which, as might be ex-

Fig. 25.



Australian Water-Mole (*Ornithorhynchus anatinus*).

pected from its structure, is entirely an aquatic animal, feeding on water-animals, for which it searches in the mud in the same manner as a duck. Like the Echidna it is a native both of Australia and Tasmania, but has not been found in New Guinea.

OSTEOLOGICAL GALLERY.

IN this Gallery are exhibited the skeletons and skulls of the Mammalia, their order commencing on the left and running round the Wall-Cases, as in the Mammalian Gallery. In the centre of the room are arranged skeletons which are too large to be placed in the Cases, and on the tops of the latter are the horns of the "hollow-horned Ruminants," viz. Oxen, Sheep, and Antelopes. The largest skeletons (of Elephants, Giraffe, &c.) are exhibited in the Saloon at the end of the Gallery, together with the collection of Sirenia or Sea-Cows.

[See
Plan.]

Visitors who desire to understand the modifications of the bony framework of the various types of Mammalia would do well to gain some idea of the bones of which a normal Mammalian skeleton is made up, and for this purpose the following woodcuts have been prepared. Fig. 26 is the skeleton of a Lioness, and fig. 27 the skull of a Dog divided down the centre to show its interior.

The skeleton of a Mammal consists of an *axial* portion, containing the bones belonging to the central axis of the body, viz. the skull, vertebral column, ribs, and breast-bone; and an *appendicular* portion, comprising those which form the limbs, and the girdles of bone by which the limbs are attached to the vertebral column.

The skull is the portion of the axial skeleton which is by far the most important to the systematic zoologist, who bases in great part his classification of the Mammalia on the variations presented by the skull and teeth, which latter, although really no part of the internal skeleton, have, from their intimate relation with the skull, to be treated as though they belonged to it.

The skull consists of three parts—(1) the *cranium*, a complicated framework of bones united together to form a case for the

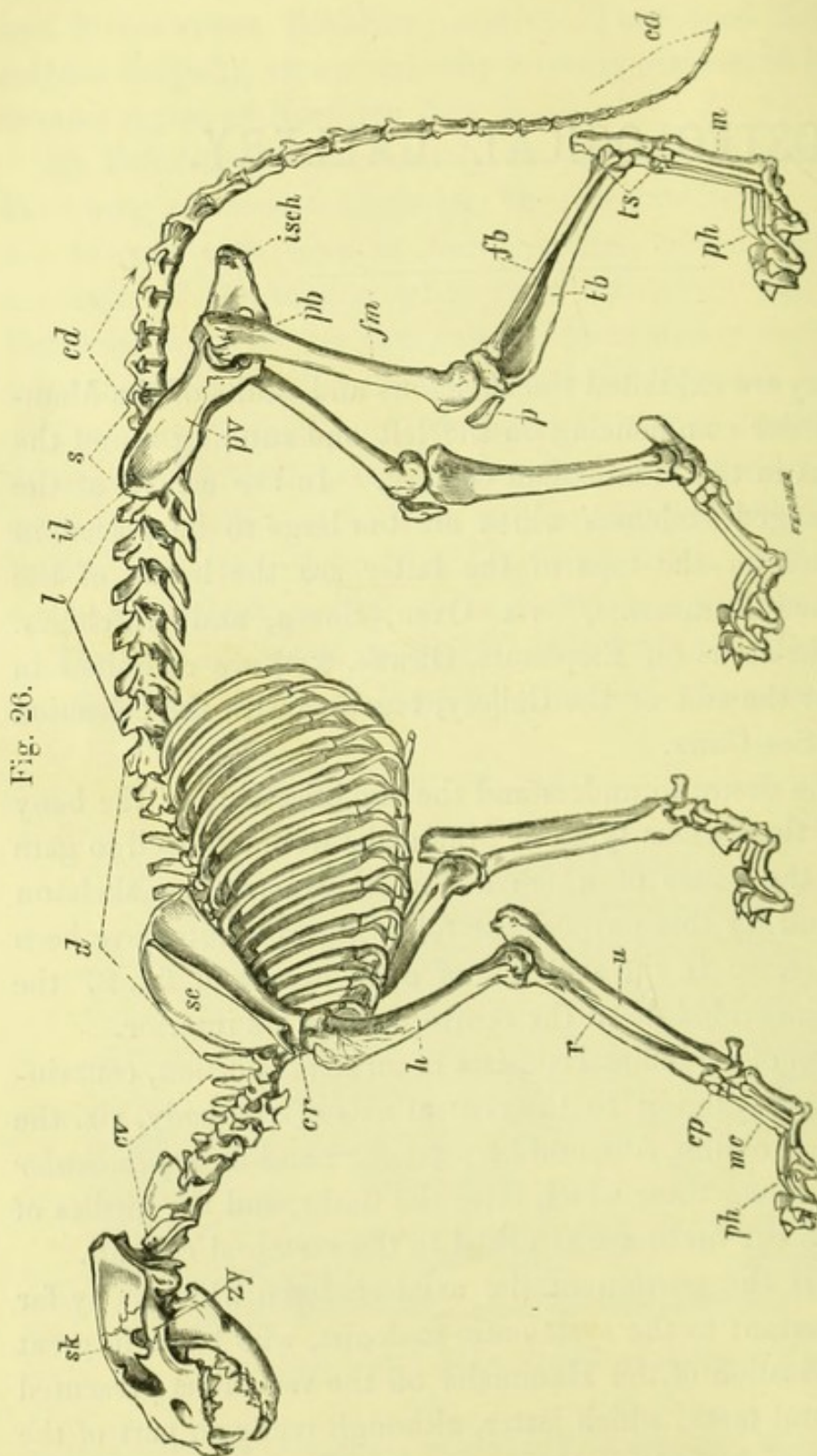
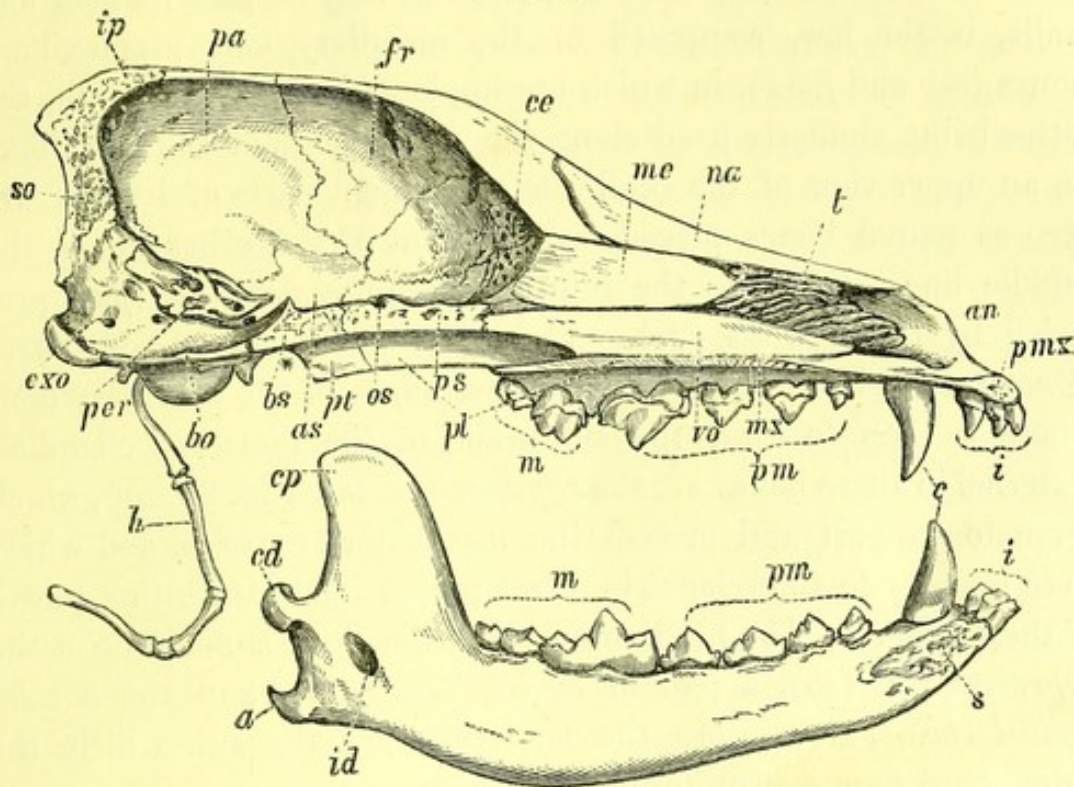


Fig. 26.

Skeleton of a Lioness.

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

Fig. 27.



Skull of a Dog, divided down the centre to show the internal structure.

an, anterior nasal opening; *as*, alisphenoid; *bo*, basisoccipital; *bs*, basisphenoid; *c*, canine teeth; *cd*, condyle; *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*, symphysis of mandible; *so*, supra-orbital; *t*, turbinal; *vo*, vomer; the asterisk indicates the part of the cranium to which the lower jaw is articulated.

brain, and a support and protection to the organs of smell, sight, hearing, and taste; (2) the *mandible*, or lower jaw; and (3) the *hyoid arch*, or tongue-bones.

The cranium forms in its posterior half a large hollow case for the reception of the brain, and has along its base numerous perforations, or *foramina*, for the passage of the nerves and blood-vessels; in front of this case, and separated from it by a sieve-like bone, the *cribriform plate* (fig. 27, *ce*), there is a bony tube, open in front at the *anterior nares* (*an*), filled with light spongy

bones, the *turbinal bones* (*t*), and forming the narial or olfactory chamber. Below this chamber, and forming in part its floor and walls, is the jaw, composed of the maxillary and premaxillary bones (*mx* and *pmx*), in which are implanted the upper teeth, the latter being similarly fixed along the upper edge of the mandible. 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 bone where it rises to form the side-walls of the olfactory chamber. External to these bones are the *zygomatic arches* (fig. 26, *zy*), which serve to support and protect the masticatory muscles, and which were 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* (*so*), a pair of *exoccipitals* (*exo*), and the *basioccipital* (*bo*), surrounding the large opening through which the spinal cord passes—the *foramen magnum*.

The mandible consists simply of a pair of solid bones, joined together in front where they form the chin, but widely separate behind, each with 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 mandible works. This hinge is generally transverse to the general axis of the skull; but in some Orders, such as the Rodents, the condyle is lengthened antero-posteriorly, and works in a corresponding longitudinal depression in the base of the skull.

The hyoid apparatus (*h*) consists 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 forms, known as "homalodont," all the teeth are of one type or pattern as in the Sloths, Armadilloes, Dolphins, &c.; the remainder, or "heterodont" Mammals, which form the great majority, are provided with teeth of several different types. Thus in the Dog's skull (fig. 27) 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 or false grinders (*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 Mammalia, 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. $\frac{1}{1}$, Pm. $\frac{4}{4}$, M. $\frac{2}{2} \times 2 = 42$, the letters indicating the sort, and the numerals the number of the teeth present on each side of the upper and lower jaws.

A second dental division of the Mammalia is founded on the fact that in some few forms, which are also chiefly "homalodont," 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. The Dolphins, Sloths, and some Armadilloes are examples of animals with only a single set of teeth during their lives; while the great majority of Mammals, like Man, have two fully-developed sets, viz. the milk-dentition and the permanent, the latter succeeding the former in a vertical direction.

The 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. 26), viz.:—the *cervical* (*cv*), or those of the neck, nearly 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 *Microgale longicaudata*, which is the longest-tailed Mammal known).

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

Passing to the *appendicular* skeleton, we have to notice first the anterior or shoulder-girdle, which in Mammals consists generally of only two separate bones—the *clavicle* or collar-bone, very often absent or imperfectly developed ; and the *scapula* (*sc*) or shoulder-blade, to which latter there is firmly united a small projection of bone, the *coracoid* (*cr*), representing a third girdle-bone, which is separate in Birds, Reptiles, and Fishes, and also in the Monotremes, the lowest of all the Mammalia.

The *scapula* is a more or less flattened triangular bone placed outside the ribs, but not attached to them by bone, and 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. Down the centre of the scapula on its outer surface runs a long prominent ridge, which terminates below in a prolonged process (*acromion*), to the tip of which the collar-bone, when present, is attached ; its other end being united to the upper part of the breast-bone.

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

The two bones of the forearm are joined below to the wrist-bones, collectively called the *carpus* (*cp*), and succeeded first by the *metacarpals* (*mp*), or palm-bones, and then by the *phalanges* (*ph*), or finger-bones, usually three to each properly-developed digit.

The posterior girdle or *pelvis* (*pv*) is comparatively strong and rigid, firmly attached to the sacral part of the vertebral column. 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 soon they are so completely united as to appear to be but a single bone.

The hind limbs themselves 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 even in some cases (*e.g.* the Horses) reduced to one.

Order I. PRIMATES.

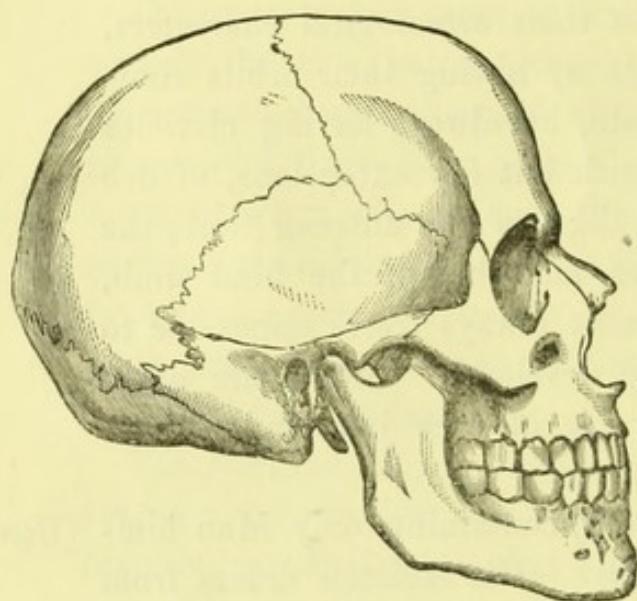
The Primates (see p. 6) are, in their osteological characters, distinguished from other Mammals by having their orbits completely surrounded by a bony plate, by always having clavicles or collar-bones, by the presence, with but few exceptions, of five digits on each extremity, the first digit of the anterior limb, the thumb or pollex, being sometimes, and that of the hind limb, the great toe or hallux, being 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.

The first Family is the *Hominidæ*, containing only Man himself (Cases 1 and 2, Div. A and B). [Case 1.] His skeleton differs from the typical Mammalian type described above mainly in relation to the upright position of the body, and the total withdrawal of the anterior limbs from the function of progression, and their modification into grasping and tactile 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 pollex is so attached to the carpal bones as to be completely opposable to the other four digits, while the hallux, or great toe, is fixed parallel to the other toes, so that the foot is quite flat beneath, with but little power of grasping, but forming an admirable 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 coalesced vertebræ.

The skull differs from that of the other Mammals in the great size of the brain-case, and the proportional reduction of the bones of the face, the natural result of the high development of the

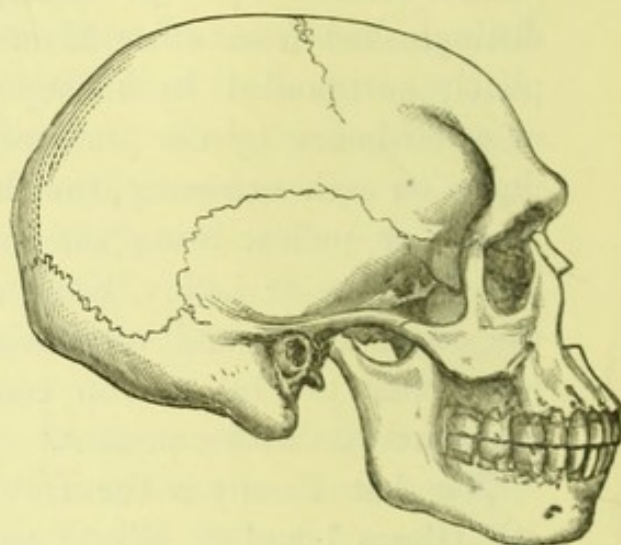
brain and the disuse of the jaws and teeth as weapons of offence and defence. It therefore follows that those races of mankind which have prominent jaws and small brain-cases are of a lower type than those in which the jaws are more reduced in size and the brain-case is larger. Thus the Australians and Tasmanians

Fig. 28.



Skull of Caucasian.

Fig. 29.



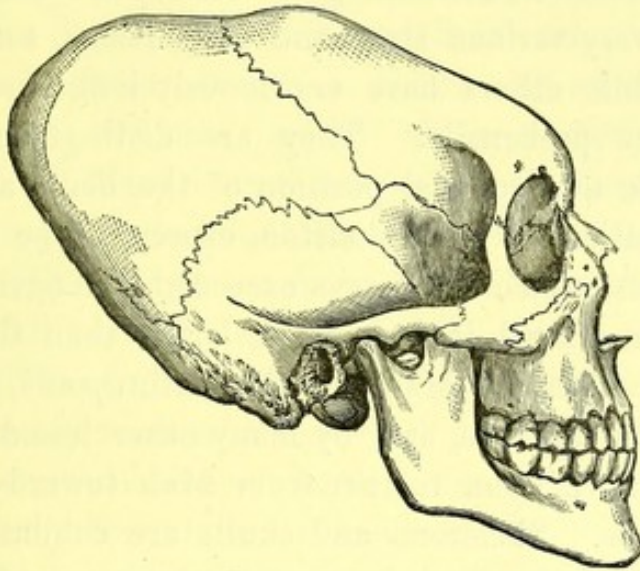
Skull of Torres-Strait Islander.

have a very small brain-cavity, thick skull-bones, receding forehead, overhanging brows, flat nasal bones, long and low orbits, very broad and low nasal-opening, forward projecting jaws, and large teeth: strongly contrasting in each of these respects with the skull of a European.

Above the skeletons in Case 1 are some European and North-African skulls, among which may be specially noted those of two ancient Greeks, from a tomb at Cyrene. In Division B is exhibited part of the magnificent collection of skulls of Nepalese natives of various tribes made by Mr. B. H. Hodgson, and presented by him to the Museum. Malaccan, Sumatran, and other Malay skulls are in the same Division. Then follow (Div. C) skulls of Maoris and other Polynesians, Esquimaux, 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. 30 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

Fig. 30.



Skull of Vancouver Islander, artificially deformed in infancy.

broadened, notably two from Sacrificios Island, Gulf of Mexico. Below these are six casts of the heads of South - Australian natives, and several Australian skulls.

In Case 2, Div. A, are the skulls of the Melanesians, among [Case 2.] which should be noticed that of a native of Nagheer Island, in Torres Straits, as representing this type most perfectly; and a prepared monumental head, with a distorted skull, clay face, and real hair, obtained in the island of New Britain.

Finally, in Div. B, is a selection from the fine series of Negro skulls obtained by Mr. P. Duchaillu on the West Coast of Africa.

The *Simiidæ*, or Man-like Apes (Case 2, C-F), are characterized by their inclined spinal column, broad breast-bones, the great length of their arms as compared with their legs, the enormous 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 their *halluces* or great toes, a character which may be seen very clearly in the mounted skeleton. The family

contains the Gorilla, Chimpanzee, Orang-Outang, and the Gibbons, of all of which skeletons and series of skulls are exhibited. The fine series of Chimpanzees' skeletons in the upper part of Divs. C and D, and the Orang-Outang skulls collected by the late Rajah Brooke and others in Borneo, are especially worthy of notice.

[Case 3.]

The *Cercopithecidae*, containing 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 are, however, never prehensile. They are distinguished from the *Simiidae* 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, by their lower central incisors being larger than the outer ones, the converse holding in Man and the Anthropoids, by their more numerous back vertebræ, and by many other less definite characters which remove them further from Man towards the ordinary lower Mammals. Skeletons and skulls are exhibited, in Case 3, Divs. A-D, of specimens belonging to the genera *Semnopithecus*, *Cercopithecus*, *Colobus*, *Macacus*, *Cynocephalus*, the distinguishing characters of which have already been referred to (p. 9).

All the *Catarrhini*, as the Old-World Monkeys and Man are called, have an osteological character in common (besides the external points noted on p. 9), viz. the presence of a long bony tube or meatus, leading from the outer to the inner ear, which is entirely absent in the New-World or Platyrrhine Monkeys. Their dental formula is invariably I. $\frac{2}{2}$, C. $\frac{1}{1}$, Pm. $\frac{2}{2}$, M. $\frac{3}{3} \times 2 = 32$.

The American or *Platyrrhine* Monkeys consist of two families, the first of which, the *Cebidae*, has for its dental formula, I. $\frac{2}{2}$, C. $\frac{1}{1}$, Pm. $\frac{3}{3}$, M. $\frac{3}{3} \times 2 = 36$, thus differing from the *Catarrhini* by having an additional premolar on each side of each jaw. Their external characters have already been referred to (p. 9). One of the genera of this family, *Mycetes*, the Howling Monkeys, is remarkable for possessing a bony enlargement of the hyoid or tongue-bone, in which the extraordinary howling or roaring sounds emitted by these Monkeys are produced; this structure may be seen *in situ* in the skeletons of *Mycetes laniger* exhibited.

The *Hapalidae*, or Marmosets, have the same total number of teeth as Man and the Old-World Monkeys, but they are not dis-

tributed in the same way, their formula being I. $\frac{2}{2}$, C. $\frac{1}{1}$, Pm. $\frac{3}{3}$, M. $\frac{2}{2} \times 2 = 32$. Skeletons and skulls of both the New-World families are exhibited in Case 2, Div. E.

The Lemurs (Suborder LEMUROIDEA) are placed in Div. F. They are, as already noted, far lower animals than the true Monkeys, from which they differ, osteologically, by their longer snouts, smaller brain-cases, different dentition, and by the fact that the orbit, with one exception, is bounded on the outside only by a simple rod of bone instead of by a distinct bony wall. Skeletons of all the principal genera are exhibited, and attention may be drawn particularly to that of *Tarsius spectrum*; remarkable for the extraordinary prolongation of the hind foot. Its orbits are bounded all round by a thin plate of bone; and its dentition is I. $\frac{2}{1}$, C. $\frac{1}{1}$, Pm. $\frac{3}{3}$, M. $\frac{3}{3} \times 2 = 34$. And, finally, in the Aye-aye (*Chiromys madagascariensis*) the teeth are extremely reduced in number, the formula being I. $\frac{1}{1}$, C. $\frac{0}{0}$, Pm. $\frac{1}{0}$, M. $\frac{3}{3} \times 2 = 18$. The incisors are very thick, long, and curved, and without roots, as in the Rodents, with which this animal was formerly associated. The crowns of its molars are flat and smooth.

Order II. CARNIVORA.

(Cases 4 to 7.)

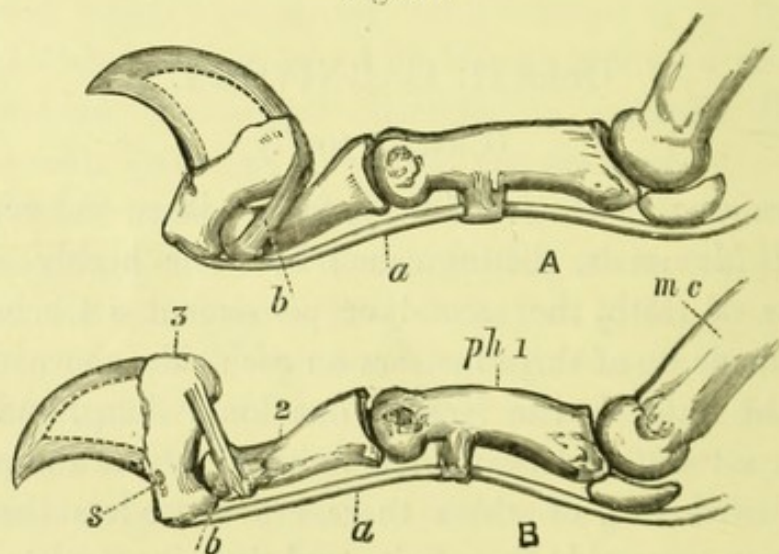
The *Carnivora*, or Beasts of Prey, form a large and very natural division of Mammals, distinguished by their highly specialized double sets of teeth, the second or permanent set being almost invariably made up of three incisors on each side, above and below, of which the outer is the largest, one long,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

They are divided, as already noted, into two great groups, of which the *Carnivora Fissipedia*, or Land Carnivores, are the first to claim our attention. Their skeletons are such as to represent perfectly the normal Mammalian type described on p. 61. Their limbs are adapted for walking, running, and climbing, but not for swimming, as are those of the second group. The zygoma is

broad and powerful, in correlation with the great development of the biting-muscles, and the lower jaw is articulated to the cranium by a closely fitting transverse hinge, which gives great strength and firmness to the joint, but entirely deprives the animal of the power of moving this 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" teeth, which are specially adapted for cutting up animal food. The shape of these teeth is highly characteristic of the different genera.

[Case 4.] The Cats, or *Felidæ* (Case 4, Divs. A to D), the most highly developed of the Carnivores, 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 $I. \frac{3}{3}, C. \frac{1}{1}$,

Fig. 31.



Bones of toe of 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.

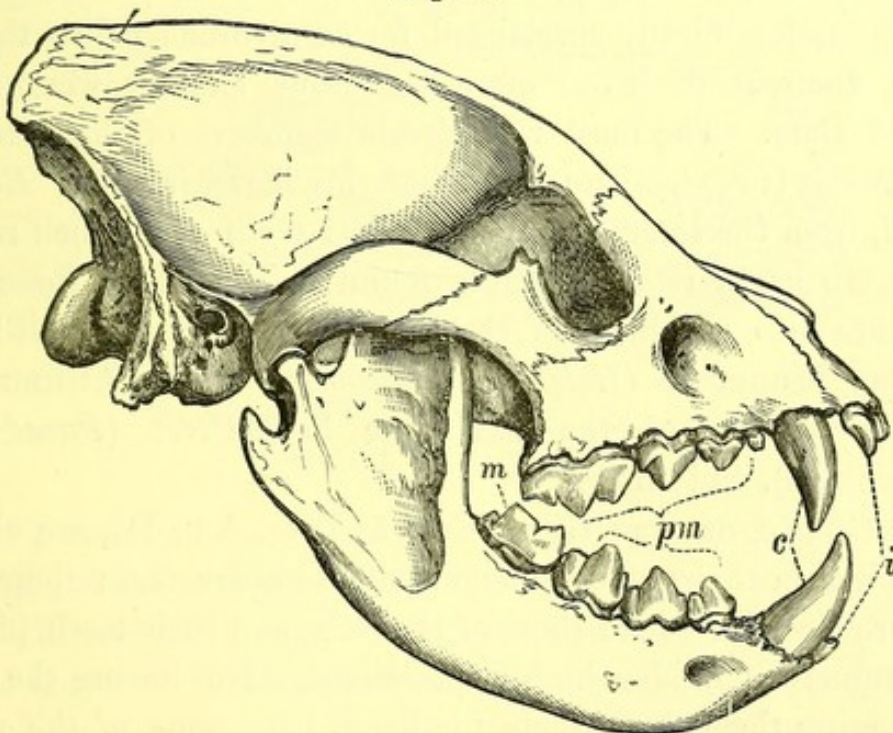
$Pm. \frac{3}{2}, M. \frac{1}{1} \times 2 = 30$; and the whole jaw is shorter in comparison with the length of the head, and therefore proportionally stronger. In the limbs the most noticeable characteristic is the peculiar

shape and articulation of the toe-bones, which has direct reference to the power Cats possess of retracting the claws. Fig. 31 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 none is it so much developed as in the present family.

Skeletons are exhibited of the Tiger, Leopard, Clouded Tiger, Lynx, Wild Cat, and other species, besides a series of the skulls of Lions, Tigers, and others of the larger Cats. A skeleton and several skulls of the Cheetah, or Hunting-Leopard, the most aberrant of the family, is exhibited in Div. A.

The Hyænas (Case 4, Divs. E & F) are strikingly characterized

Fig. 32.

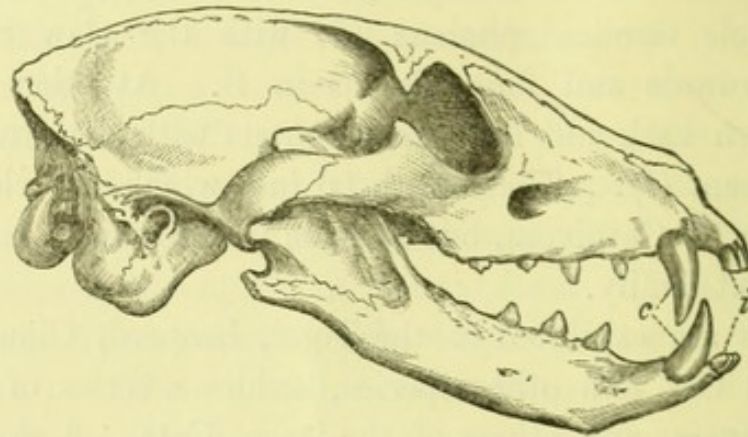


Skull of Hyæna.

by the enormous power of their teeth and jaws, and by the great height of the cranial crests for the attachment of the biting-muscles. The dental formula is I. $\frac{3}{3}$, C. $\frac{1}{1}$, Pm. $\frac{4}{3}$, M. $\frac{1}{1} \times 2 = 34$.

The Aard-Wolf (*Proteles cristatus*), although in many respects allied to the Hyænas, yet differs in a most remarkable manner in

Fig. 33.

Skull of *Proteles*.

its dentition and strength of jaws, the molar teeth being almost rudimentary and the cranial crests entirely absent.

The Civet-Cats and Mongooses together form the next family, the *Viverridæ* (Case 4, upper parts of Divs. E & F). They are in all respects less highly specialized for carnivorous habits than the *Felidæ*, their teeth being more numerous and far weaker than those of Cats. The most remarkable members of the family are the Foussa (*Cryptoprocta ferox*) of Madagascar; and *Eupleres goudoti*, from the same island, which has teeth very much reduced in size, so as to resemble those found in the Order Insectivora. There are also skeletons of the Spanish race of the well-known Egyptian Mongoose (*Herpestes ichneumon*), of the African Civet (*Viverra civetta*), of the Philippine Palm-Civet (*Paradoxurus philippinensis*), and others.

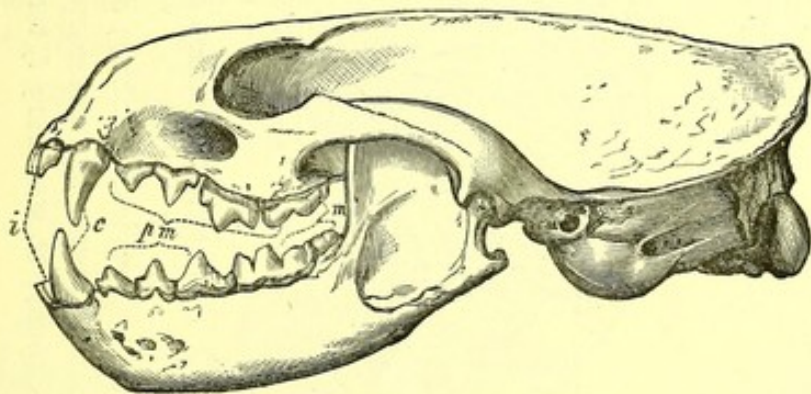
[Case 5.] The *Canidæ*, or Dog tribe (Case 5, Divs. A to D), are all very much alike in their osteological and dental characters; their skulls are more elongated than those of the Cats, and their teeth (fig. 27) more numerous and less highly specialized. Not having the power of retracting their claws, their toe-bones have none of the peculiarities of those of the Cats, but otherwise the bones of the skeleton are generally similar.

The teeth are usually 42 in number, viz. I. $\frac{3}{2}$, C. $\frac{1}{1}$, Pm. $\frac{4}{4}$, M. $\frac{2}{2}$. In one species, *Icticyon venaticus*, there are 38 only; while in another, the Long-eared Fox of South Africa (*Otocyon megalotis*),

the number is increased to 46 or 48, being the largest number present in any placental heterodont mammal. Of the specimens exhibited, the most noticeable are the skeletons of the African Hunting-dog (*Lycaon venaticus*), Red Wolf (*Canis jubatus*) of Buenos Ayres, Dingo, Coyote, &c.; and also the collection of skulls and skeletons of the various races of the common Dog (*Canis familiaris*) in Div. B.

The *Mustelidæ*, or Weasel family (Case 5, Divs. E & F), 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 the *Mustelidæ* have broad flattened skulls, low vermiform bodies, short legs, and feet fitted either for running, digging, or swimming. In the Sea-Otter (*Enhydra lutris*) the hind feet are modified into flippers, in which the fifth toe is the longest and stoutest, thus approaching the Fin-footed Carnivores or

Fig. 34.



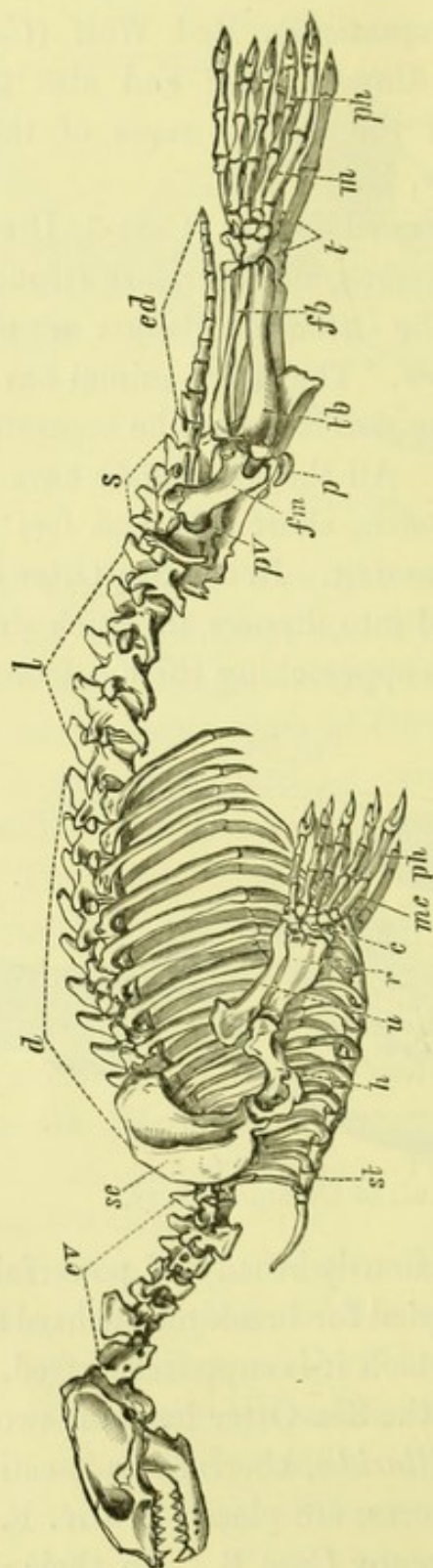
Skull of Common Otter.

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

The *Procyonidæ* and *Ailuridæ*, aberrant fruit-eating members of the great Order of Carnivores, are placed in Div. F.

The Bears (*Ursidæ*) occupy Case 6. In their skeletons, as in [Case 6.] their external appearance, they are heavy and clumsily built, and their bones are thick and massive. Their sectorial teeth have broad surfaces, and are but little adapted for cutting, their whole

Fig. 35.

Skeleton of Common Seal (*Phoca vitulina*).

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

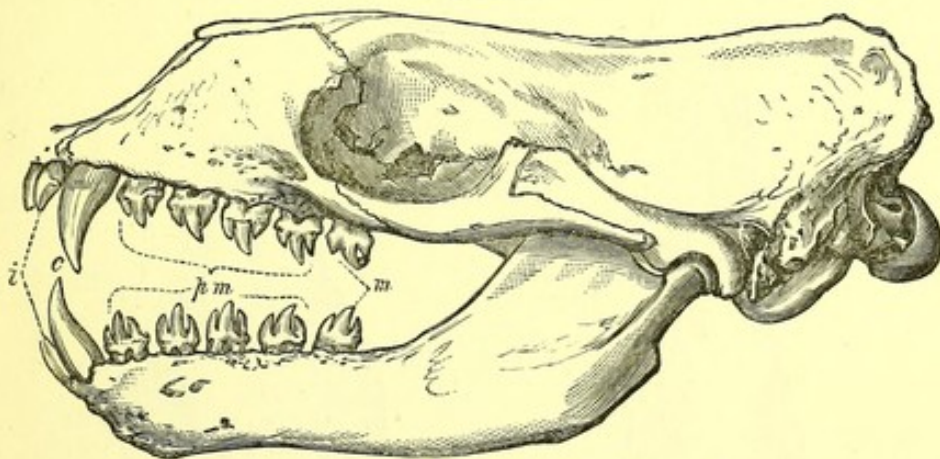
dentition being that of animals living as much on vegetables as animal food. They are wholly plantigrade, and their claws are non-retractile. They are a remarkably homogeneous group, there being but few differences between them other than their relative sizes and the proportions of their teeth.

Skeletons are mounted of a Brown Bear (*Ursus arctos*), of a Polar Bear (*U. maritimus*), and of an Ant-Bear (*U. eversmanni*), besides a large series of skulls of different species.

The second great division of the Carnivores, the *Carnivora Pinnipedia*, or Seals, is strikingly modified in general form, yet shows clearly its relationship to the Land Carnivores, and especially to the Bears. The skeleton of a typical Seal (fig. 35) is elongate, with a small skull, no clavicles, rudimentary tail, and limbs of which the upper bones are very short, while the hands and 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.

The skull (see fig. 36) has no postorbital processes, and the posterior teeth are not differentiated in the same way as those of

Fig. 36.



Skull of Sea-Leopard (*Leptonyx*).

the Land Carnivores, there being no specialized sectorial tooth, nor any flat tubercular teeth at the back of the mouth, all the teeth being long and sharp, with the points directed towards the throat, and forming admirable instruments for catching and hold-

ing such slippery prey as the fishes on which Seals feed ; but the teeth 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 Sea-Leopard (*Stenorhynchus leptonyx*) (fig. 36).

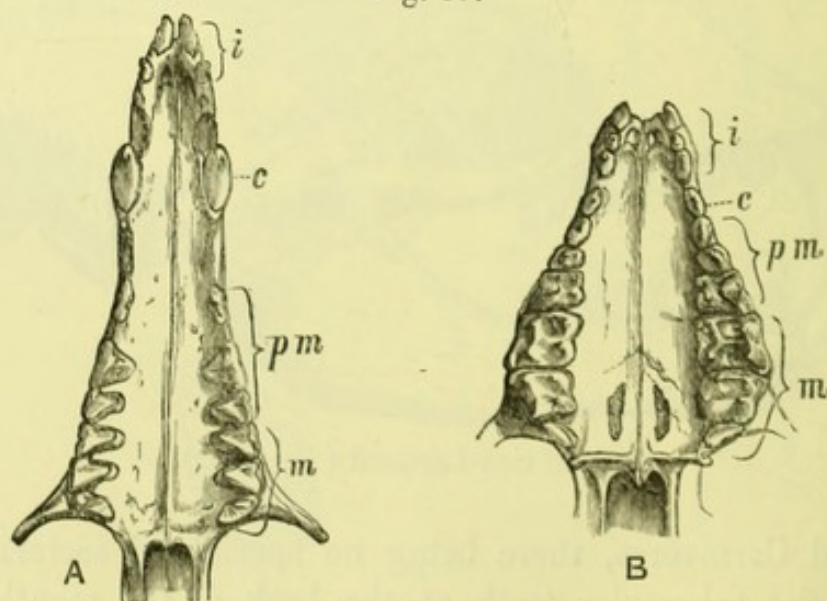
This description applies fully only to the true Seals or *Phocidæ*, the *Otariidæ*, or Eared Seals, resembling ordinary Carnivores far more, especially in the position of their hind limbs, as already explained on p. 21.

The Walrus is in many ways intermediate between these two families, but its dentition is very remarkable, the canine teeth being enormously developed, while all the other teeth are small and rudimentary and with flattened crowns. A skeleton of this animal is exhibited in the centre of the room, opposite to the other Seals, and several skulls and tusks are in Case 7, Division D.

Order III. INSECTIVORA.

[Case 8.] The Insectivora (Case 8 A) are a group of animals not easily defined by common osteological characters, and containing many forms in which 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

Fig. 37.



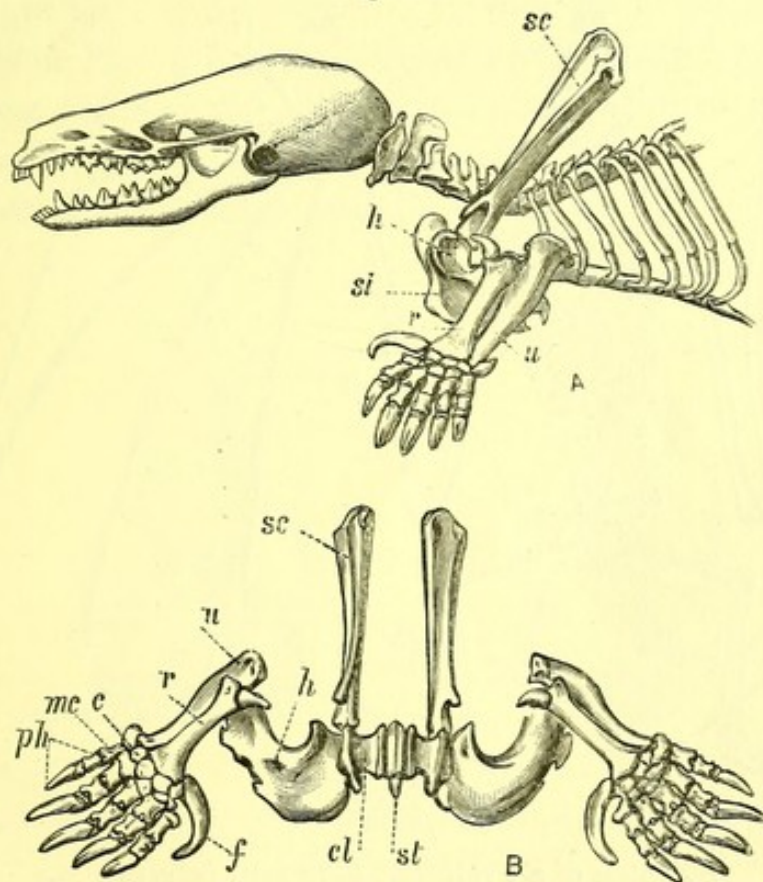
Dentition of (A) Tanrec (*Centetes ecaudatus*) and (B) Hedgehog (*Erinaceus europæus*).

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

Shrews and Moles, the incisors, canines, and premolars are by no means readily distinguished. Throughout the Order the premolars and molars are covered with minute, pointed cusps, suitable for crushing the insects on which, as may be gathered from their name, nearly all the Insectivora feed. The zygomatic arches are generally either weak or entirely absent. The dentition offers many important differences: thus the Desmans (*Myogale*) have enormous incisors and small canines, while the opposite is the case in the Moles (*Talpa*) and the Tanrecs (*Centetidæ*). And, further, the whole Order is divided into two groups, distinguished by the shape of the molars, which are either triangular and tricuspid, as in the Tanrecs and Golden Moles, or square and multicuspid, as in the Hedgehogs, Moles, and Shrews (see fig. 37, A & B).

Skeletons of all the chief types are exhibited; the most noteworthy are those of the Moles (*Talpa*) (fig. 38), in which the

Fig. 38.



Fore part of Skeleton of Common Mole. A, Side view. B, Front view of shoulder-girdle.

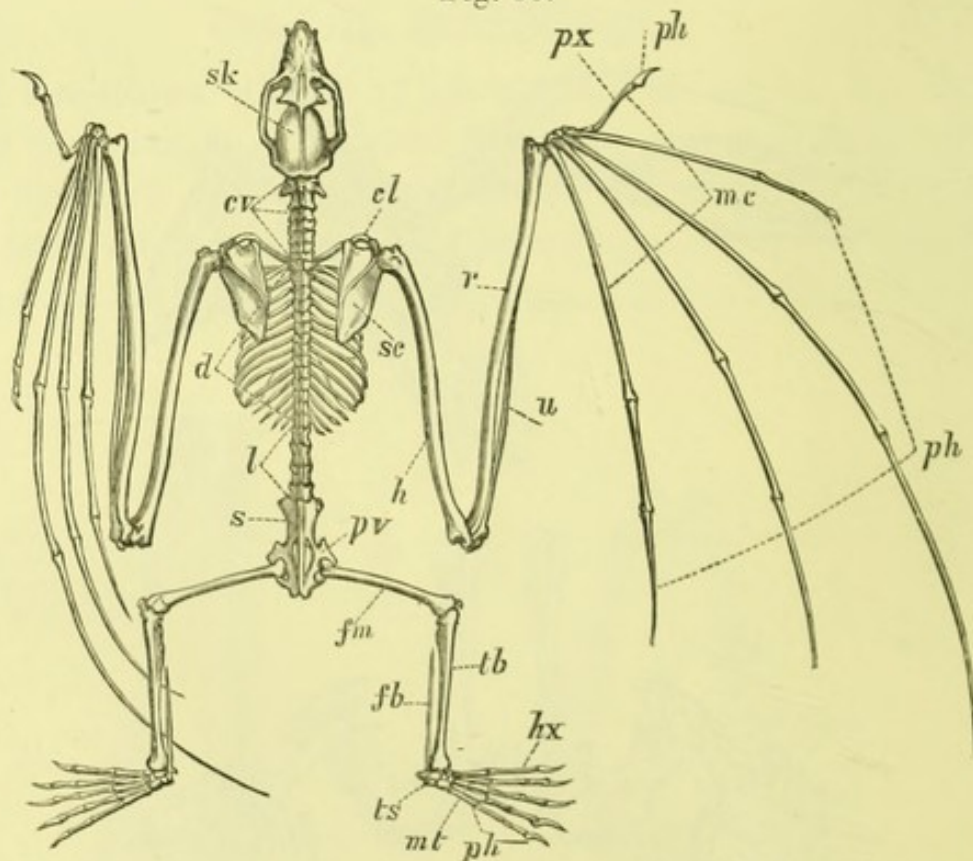
c, carpus; *cl*, clavicle; *f*, falciform bone; *h*, humerus; *mc*, metacarpus; *ph*, phalanges; *r*, radius; *sc*, scapula; *st*, sternum; *u*, ulna.

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 *os falciforme* (*f*), adding 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.

Order IV. CHIROPTERA.

[Case 8.] The Chiroptera, or Bats, are characterized by the possession of the power of flight; for this purpose the whole fore limbs are enormously elongated and strengthened, the finger-bones being especially long (fig. 39). The forearm is formed almost entirely by

Fig. 39.



Skeleton of a Fruit-Bat (*Pteropus jubatus*).

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

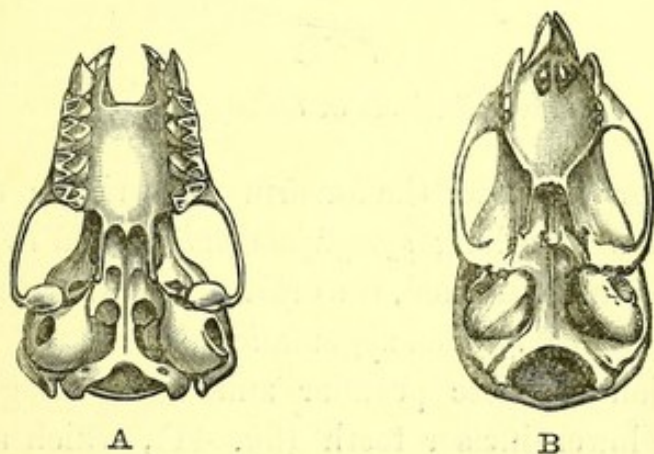
the *radius* (*r*), the *ulna* (*u*) being rudimentary. The thumb (*px*) is short, free from the flying-membranes, and provided with a claw (*ph*); while the other fingers are long, slender, and clawless, with the exception of the index, corresponding to our fore finger, which in some genera also possesses a claw. Clavicles (*cl*) are well developed in all the species.

The hind limbs, on the other hand, are thin and feeble, and different from those of all other mammals in that they are rotated backwards, so that the knee, like the elbow, is directed backwards. Those species which are provided with a flying-membrane between the hind legs have it supported by a long cartilaginous process or spur, which is attached to the heel.

Bats are primarily divided into two groups, *Frugivorous* and *Insectivorous*. The members of the first are distinguished by their generally large size, large, smooth, and comparatively blunt teeth, well-developed postorbital processes, and by the presence of three phalanges to their index fingers. To this group belong the large Fruit-Bats or Flying Foxes (*Pteropus*), represented by the skeleton of *Pteropus jubatus*, and other genera, all of which live entirely on fruit, and are restricted to the Old World.

The Bats of the insectivorous division are of small size, and have

Fig. 40.



Skulls of (A) Noctule (*Vesperugo noctula*) and (B) Blood-sucking Bat (*Desmodus rufus*).

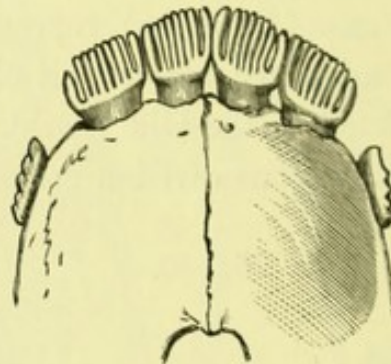
teeth covered with minute sharp-pointed cusps, as in the *Insectivora*; they have no postorbital processes, and only one, or rarely two, phalanges in their index fingers.

To this great group, containing five families and the great majority of the species, belong all our British species, the largest of which, the Noctule (*Vesperugo noctula*), may be taken as a typical insectivorous Bat. The most extreme modification of this type is represented by the Blood-sucking Bat (*Desmodus rufus*), whose molars are almost aborted as being practically useless, while its incisors are reduced in number to two, which are extremely large and gouge-shaped, and peculiarly fitted to cause a free flow of blood from their bite (see fig. 40).

Order V. DERMOPTERA.

[Case 8. In the so-called Flying Lemur (*Galeopithecus*), of which a
Div. A.] skeleton is mounted, the radius and ulna are partly joined to-

Fig. 41.



Lower Incisors of *Galeopithecus*.

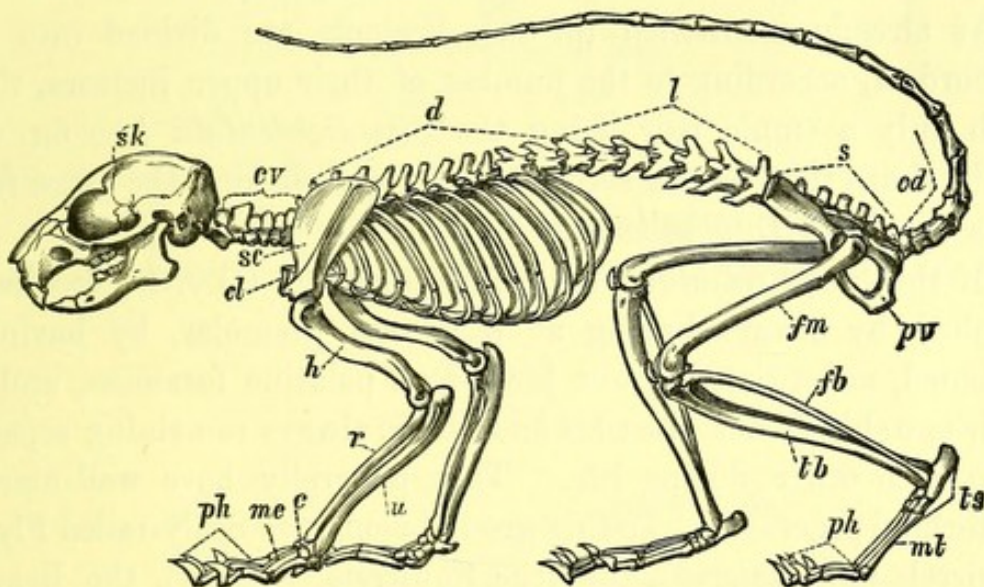
gether, in order to render the forearm more rigid ; the hip-bones are united below by a long *symphysis pubis* ; and in the skull the muzzle is broad and flattened, the orbit nearly surrounded by bone, and there is a well-developed zygomatic arch.

The dentition of these peculiar animals is altogether unique, especially the lower incisor teeth (fig. 41), which are of a very remarkable pattern, being so deeply notched as to appear like minute combs.

Order VI. RODENTIA.

The Rodentia, or Gnawing Animals (Case 8, Divs. B-F), are [Case 8.] characterized by their want of canine teeth and by the peculiar structure and great development of their incisors. The majority of Rodents have only a single pair of incisors above and below: these teeth are large, curved, and adapted to gnawing purposes by possessing sharp, chisel-like edges, formed by the hard outer coat of

Fig. 42.



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.

enamel, which is restricted to their front surfaces, and wears away much more slowly than the softer dentine or tooth-core. These teeth, besides, continue during the whole life of the animal to grow 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. The sharp edges of the teeth are preserved by frequent grindings against the opposite teeth. The clavicles are very varied in their development, being, as is usual throughout the Mammalia, complete from end to end in those forms, such as the Squirrels, in which the anterior limbs are used for grasping or climbing; while they are incomplete or absent in those which live a simple terrestrial life, and use their anterior limbs for walking or digging only.

The mandible is articulated to the skull by a longitudinal hinge, which gives a large amount of mobility and freedom to the jaw, at a corresponding sacrifice of strength and rigidity.

As already mentioned (p. 31), Rodents are divided into two Suborders, according to the number of their upper incisors, those with only a single pair being the *Simplicidentata* (see fig. 44), while those that have a second smaller pair behind the large front ones are called *Duplicidentata* (fig. 45).

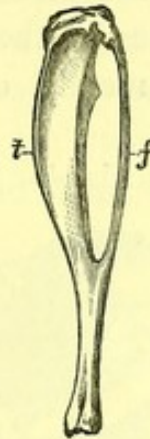
[Case 8.] Of the *Simplicidentata*, the Squirrel section (Div. B) are distinguished by always having at least one premolar, by having a flattened, not twisted, lower jaw, small palatine foramina, and by their two shin-bones, the tibia and fibula, always remaining separate from each other during life. They generally have well-marked postorbital processes. To this group belong the Scaly-tailed Flying Squirrels (*Anomalurus*), the true Squirrels (*Sciurus*), the Beavers (*Castor*), &c. The Beaver's incisors are, perhaps, the finest examples of gnawing-teeth, being the instruments with which that animal is able to cut down good-sized forest-trees, to build them up into dams for their dwelling-places.

The *Myomorpha*, or Rat tribe (Div. B), have a variable number of premolars (0-3), a flattened lower jaw, no postorbital processes, very long palatine foramina, perfect clavicles, and their tibia and fibula are always joined to each other about halfway down (see fig. 43). Of the large number of genera and species belonging to this tribe, there are exhibited skeletons of Dormice (*Myoxus*), common Rats and Mice (*Mus*), Voles (*Arvicola*), Bamboo-Rats (*Rhizomys*), Mole-Rats (*Spalax*), Pouched Rats (*Geomys*), Jerboas (*Dipus*), and numerous others.

The *Hystricomorpha*, or Porcupine tribe (Divs. C-E), have

almost invariably one premolar above and below, a peculiarly twisted lower jaw, variable palatine foramina, generally no postorbital pro-

Fig. 43.

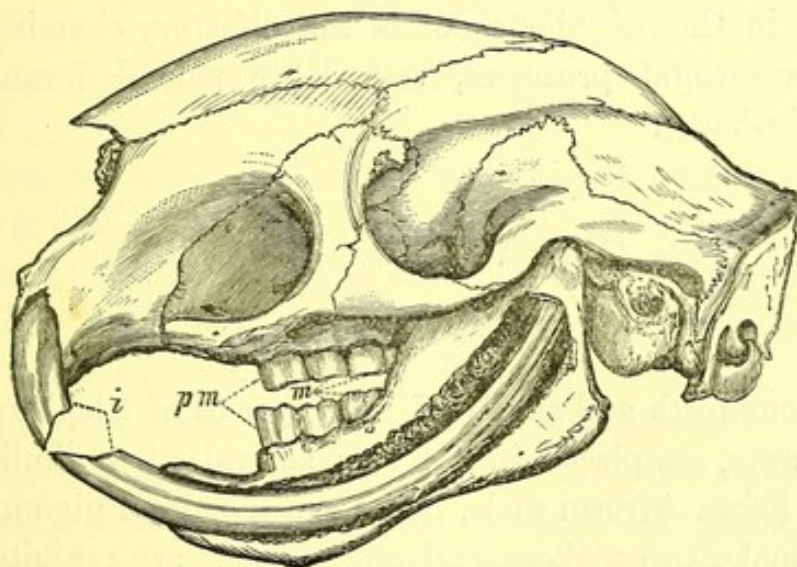


Lower hind leg of Rat.

f, fibula ; *t*, tibia.

cesses, and separate shin-bones. The animals forming this section are very variable both in size and osteological characters. The most noteworthy are the true Porcupines (*Hystrix*), which have

Fig. 44.



Skull of Common Porcupine (*Hystrix cristata*). The outer part of the bone of the lower jaw has been removed, to show the whole length of the lower incisor tooth.

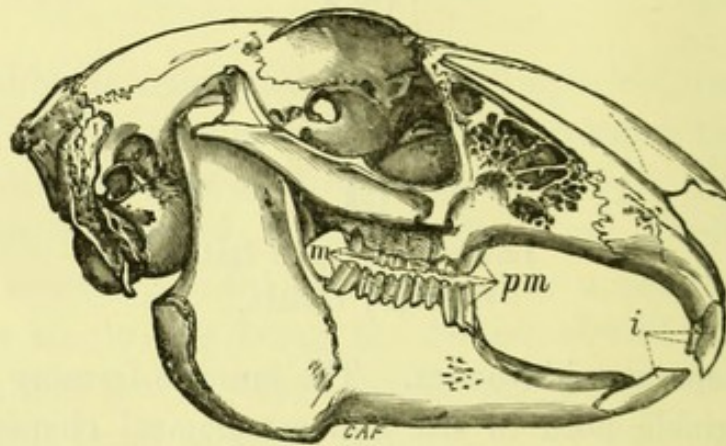
i, incisor teeth ; *m*, molars ; *pm*, premolars.

the facial part of the skull curiously dilated (see fig. 44) ; the Capybara (*Hydrochærus capybara*), the largest of the Rodents ;

[Case 8.] the Paca (*Cælogenys paca*), whose zygomatic arches are much enlarged and swollen, and protect a pouch opening into the mouth.

The second Suborder (*Duplicidentata*) (Div. F) consists of the Hares and Rabbits (*Lepus*) and the Pikas (*Lagomys*). Their chief peculiarity is that some bones of their skulls are singularly imperfect, consisting in parts merely of a sort of bony network,

Fig. 45.



Skull of Common Hare (*Lepus europæus*).

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

especially in the neighbourhood of the olfactory chamber. They possess postorbital processes, very large palatal foramina, and united shin-bones.

Order VII. UNGULATA.

Suborder PROBOSCIDEA.

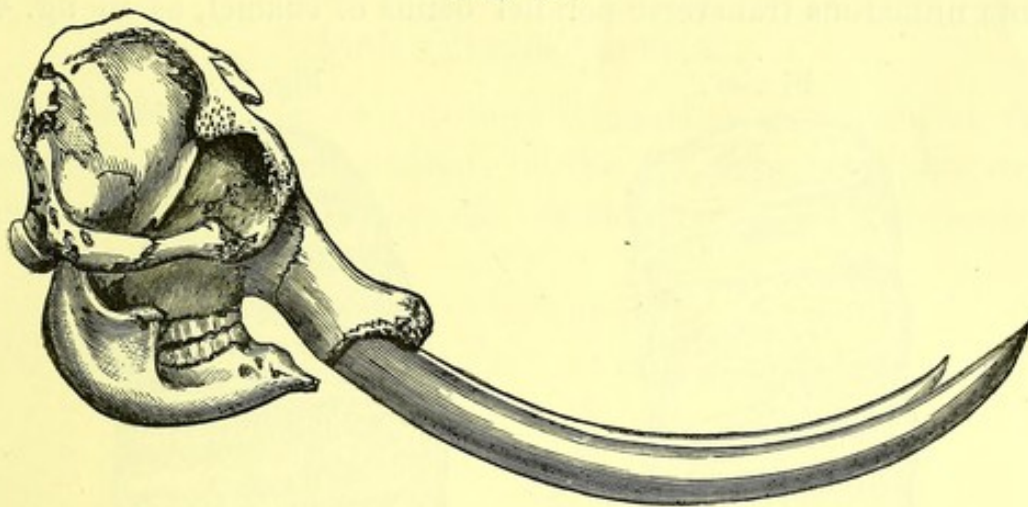
Numerous teeth and skulls of both species of Elephant, and of [Case 9.] different ages, are placed in Case 9 ; several other skulls and six skeletons (of an African male, Sumatran female, a gigantic Indian tuskless male, two tuskers, and one female) are exhibited in the adjoining Saloon.

The Elephants (Case 9) are characterized by the strength and solidity of all their bones, and by their incisor teeth being developed into long and formidable tusks.

Their skull (fig. 46) presents many special features : it is proportionately very large and high, and the occipital surface looks

obliquely upwards, instead of backwards as in other Mammals. The nasal aperture is on the top of the skull, and directed nearly vertically upwards; but in the living animal it forms the base of the elongated trunk, at the extremity of which are the real external nostrils. The great size of the skull, which is necessary for the support of the heavy tusks and trunk, is produced by an unusual development of air-cells in the cranial bones, so that the outer surface of the skull of an old elephant is often more than a foot

Fig. 46.



Skull of African Elephant (*Elephas africanus*).

distant from the inner wall of the brain-case, the latter increasing but little in size as the animal gets older. These air-cells may be seen in the longitudinal section of an Indian Elephant's skull in Division B; or, through the bullet-holes, in the skull of the old "rogue" Elephant mounted in the Saloon.

Elephants possess no lower incisors, and the single upper pair form the great ivory tusks; there are no canines; the molars are remarkable in that their succession does not take place in a vertical direction, as is usual among mammals, but from behind forwards. Never more than one, or portions of two, molars are in use at any one time, and as that is pushed forwards and finally falls out, the next one behind it takes its place. In this way six molars are successively brought into use and shed during the animal's life. The inverted skull in the Saloon shows the manner of this succession very well, the fifth tooth of the series being in place

both above and below, with the sixth and last one ready formed behind to take its place.

The crowns of these 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, the laminæ being themselves bound together side 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. 47. In the Indian species, however, the laminæ have flattened parallel sides, and thus the tooth-surface presents numerous transverse parallel bands of enamel, as in fig. 48.

Fig. 47.

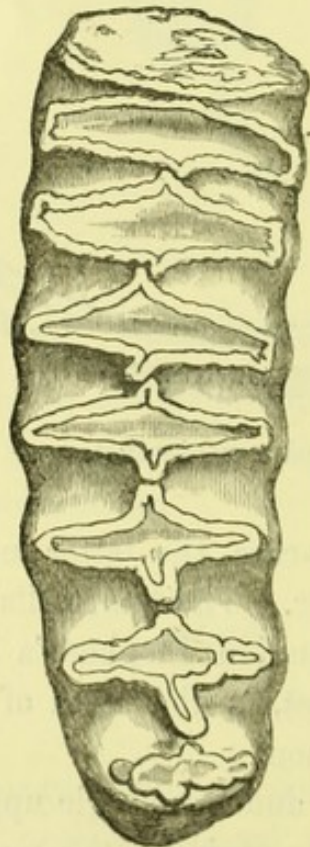


Fig. 48.



Molars of African and Indian Elephants.

Various modifications of these patterns have been found in the teeth of extinct Elephants, and a large number of species have been distinguished accordingly.

Suborder HYRACOIDEA.

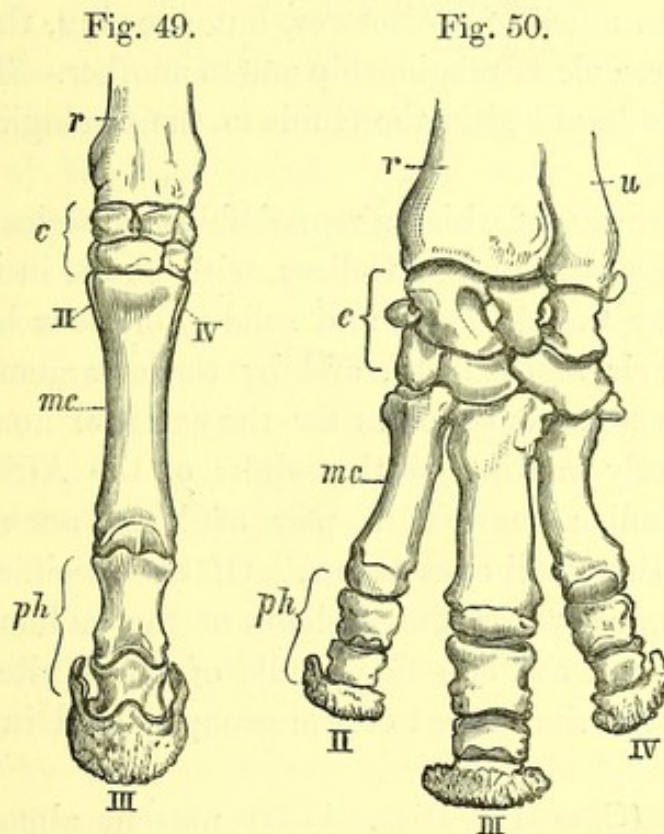
[Case 10.] The Coneys (Case 10, Div. A) are of small size, which alone is sufficient to distinguish them from their huge allies; but they

are also characterized by their peculiar dentition. The molars much resemble those of the Rhinoceros, whilst the incisors are quite unique in structure and shape, the upper ones being rootless like those of the Rodents, triangular in section, with one of the angles directed forwards, so that, by a somewhat similar mode of wearing as 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. $\frac{3}{3} \times 2 = 34$.

No extinct forms related to the Hyracoidea have been discovered.

Suborder PERISSODACTYLA.

The *Perissodactyla*, or Odd-toed Ungulates, composed at the present time, as already noted, of the Rhinoceros, Tapirs, and Horses, are characterized by the central line of the foot passing



Bones of fore foot of Horse and Rhinoceros.

c, carpus ; mc, metacarpus.

down the middle of the third toe, which is always the largest, the other toes being ranged in a receding series on each side of it

(see fig. 50). 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 by itself 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 entirely absent.

The three existing families of this Suborder, the *Rhinocerotidæ*, *Tapiridæ*, and *Equidæ*, are sharply separated by the structure of their molar teeth and by the numbers of their toes ; these families are, however, very closely connected by numerous intermediate fossil forms, the majority of which have been found in North America. Such are the *Lophiodontidæ*, the oldest Perissodactyles, from the Lower and Middle Eocene, allied to the Tapirs ; and the *Hyracodontidæ*, *Macraucheniidæ*, *Chalicotheriidæ*, and *Palæotheriidæ*, all more or less allied to *Rhinoceros*, but showing, the further we go back in time, a closer relationship one to another. These various fossil forms are described in the Guide to the Geological Galleries, pp. 21-23.

[Case 10.] The Rhinoceroses, of which a remarkably fine series of skeletons is placed in the centre of the Gallery, with skulls in Case 10, are characterized by the thickness and solidity of their bones, by the structure of their molar teeth, and by the enlargement of their nasal bones to serve as supports for the external horns. Incisor teeth are entirely 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. Of the specimens exhibited the most noteworthy are the skeleton of the Indian Rhinoceros (*R. unicornis*), and the two fine skulls of the White Rhinoceros (*R. simus*), by far the largest of the group, placed in the front of Case 10.

[Case 11.] The Tapirs (Case 11, Divs. A-D) present almost the same osteological characters as their ancestors, which are found fossil in deposits of Upper Miocene age ; they belong therefore to one of the oldest existing types of Mammals. Their molar teeth have two simple transverse crests on their crowns, very different from the highly complex enamel foldings of the teeth of Rhinoceroses and

Horses. Their nasal bones are small; their toes four in number on the fore, and three on the hind feet.

The Horses (*Equidæ*) (Case 11, Divs. E and F, and Case 12) [Cases 11 and 12.] of the present day consist of animals in which the gradual loss of the outer digits in the feet has proceeded further than in any other mammals, there being only a single toe on each foot (fig. 49); but in their ancestors, as shown in the Geological Guide, p. 23, the toes are present in greater numbers as we go back in time. Their molar teeth are large, quadrangular, and highly complex, the enamel-foldings being extremely numerous when compared with the simpler ones of the Rhinoceros and Tapir. In their skulls and teeth all the recent Horses and Asses show scarcely any difference, the species being merely separated by size, form of tail, colour, and other external characters.

Suborder ARTIODACTYLA.

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 these are present; the first, corresponding to our thumb, is (as in existing Ungulates generally) always absent. The metacarpal and metatarsal bones of the third and fourth digits are generally united, and form what is known as the "cannon bone." The premolars and molars are quite distinct in shape, the former being single- and the latter two-lobed. The dorsal and lumbar vertebræ together invariably number nineteen.

The Artiodactyles may be, as already noticed, p. 38, divided into two groups, Non-ruminants and Ruminants—groups characterized also by their dentition, the teeth of the former being covered with blunt, rounded cusps, and those of the second having two pairs of crescentic ridges on their surfaces.

The non-ruminating Artiodactyles are Pigs and Hippopotami. [Cases 13 and 14.] The first, which occupy Cases 13 and 14, have long narrow skulls, tuberculated molars, large curved canines, and four-toed feet, the bones of all the toes being separate, and not united to form a

cannon bone. The dental formula of the Common Pig is I. $\frac{3}{2}$, C. $\frac{1}{1}$, Pm. $\frac{4}{4}$, M. $\frac{3}{3} \times 2 = 44$, giving the same number and distribution of teeth as in the majority of Mammals of the earlier Tertiary periods, but which is now found only in the genus *Sus* and two genera of Insectivora.

Skeletons are exhibited of a Wild Boar (*Sus scrofa*), Wart-hog (*Phacochærus*), and Peccary (*Dicotyles*); and skulls, among others, of the Pygmy Hog (*Porcula salvania*), Babirusa (*B. alfurus*), and River-Hogs (*Potamochærus*). There is also (Div. E) an interesting series of upper jaws of Wart-Hogs, showing the variation they present in the presence or absence of the small upper incisor teeth.

[Case 15.] The Hippopotami (Case 15, Divs. A-D) possess broad skulls, huge lower jaws, and great canine teeth, which, if the corresponding tooth in the opposite jaw is lost, will continue to grow, forming great outwardly curved tusks, such as the one placed in Div. C. The molars are large, square, and complex. The dental formula of the common Hippopotamus is I. $\frac{2}{2}$, C. $\frac{1}{1}$, Pm. $\frac{4}{4}$, M. $\frac{3}{3} \times 2 = 40$; the skull of a fine skeleton of the Liberian Hippopotamus exhibited in this case shows only one lower incisor on the left side, but two on the right.

The Ruminant Artiodactyles have molar teeth with crescentic ridges. Their division into the *Tylopoda*, *Tragulina*, and *Pecora* has been already noted, p. 40.

The *Tylopoda*, or Camel tribe (Divs. E and F), differ from the other Ruminants in the presence of a pair of small incisor teeth in the upper jaw, in the absolute suppression of the outer toes, and in their having no horns in either sex.

The Camels are represented in Case 15 by a skeleton of the Dromedary (*Camelus dromedarius*) and by skulls both of that species and of the true Camel (*C. bactrianus*). Of the Llamas, there is a skeleton of the Alpaca (*Auchenia lama*), which shows the close affinity of these animals to the Camels, the skeleton and skull being merely smaller forms of the same type.

[Case 15.] The *Tragulina* (Div. E), containing the Common and Water Chevrotains, are distinguished by the long canine teeth of the males, by the shape of the "odontoid" process of the second vertebra, which is conical, by the presence of four complete digits to all the feet, all the bones of the leg being likewise fully developed, and by the spongy structure of the auditory bullæ.

The *Pecora* are characterized osteologically by the development of horns in the majority of the species, at least in the male sex, by the total absence of upper incisors, by their crescent-shaped odontoid processes, rudimentary or absent outer digits, incomplete fibulæ, and simple inflated auditory bullæ.

The families contained in this large and important group are:—

1. The *Bovidæ* (Cases 16 to 19), with simple, hollow, non-deciduous horns, supported by a long conical process of the frontal bone of the skull. Their teeth are as a rule longer than those of the *Cervidæ*, the “neck” of the molars being hidden beneath the bone; canine teeth are invariably absent.

The Oxen are represented, in the centre of the Gallery, by skeletons of a Piedmontese Bull from Tuscany; of a Buffalo from Assam (*Bubalus bubalis*); of the South- and Central-African Buffaloes (*Bubalus capensis* and *centralis*), of the Gour and Gayal (*Bibos gaurus* and *frontalis*), and of the European and American Bisons (*Bison bonasus* and *americanus*), placed side by side for the sake of comparison. Besides these a skeleton of the Sondaic Ox (*Bibos sondaicus*) and one of the Anoa (*Anoa depressicornis*), and numerous skulls and horns, are exhibited in Case 16, Div. F.

Of the Musk-Ox (*Ovibos moschatus*), male and female skeletons [Case 16.] are placed in Case 16, Divs. E and F, and several separate skulls and horns both here and on the top of Case 11.

Of the beautiful group of the Antelopes, the horns are exhibited along the tops of Cases 13 to 18, while of the skeletons the following deserve mention:—

the Sable Antelope (*Hippotragus niger*); the Sing-Sing Antelope (*Kobus sing-sing*); the Leucoryx (*Oryx leucoryx*); the Saiga (*Saiga tartarica*); the Chamois (*Rupicapra tragus*), both male and female: in Case 17. [Case 17.]

the Kudu (*Strepsiceros kudu*), which has proportionately the largest cervical vertebræ of all Mammals. (Case 18, Div. C.) [Case 18.]

the Eland (*Oreos canna*). (Case 18, Div. E.)

Of the Sheep and Goats the mounted horns are placed on Cases [Case 19.] 19 to 24, while in Case 19 there are skulls and skeletons of several of the different forms, such as the Wild Goat (*Capra hircus*), the Common Sheep (*Ovis aries*), the Barbary Sheep (*Ammotragus tragelaphus*), &c.

2. The family *Antilocapridæ* is represented, in Case 19, Div. F, by a skeleton and several skulls of its only member—the Prong-horn (*Antilocapra americana*), showing that, although the horn is itself bifurcate, yet its core remains a simple upright process of bone.

3. The *Giraffidæ*, like the last family, contains only a single species, the Common Giraffe (*Giraffa camelopardalis*), of which a skeleton is placed in the Saloon near the Elephants' skeletons, and [Case 20.] three skulls in Case 20, Div. A. The curious bony protuberance, almost forming a third horn, in the middle line of the face, already mentioned p. 47, is very conspicuous on the largest of these.

4. The *Cervidæ* have branched deciduous antlers entirely composed of bone; their molar teeth are short, with the neck above the bone of the jaw; the majority possess canine teeth, which in some species are very long. It is interesting to notice that the development of these teeth is in inverse proportion to that of the horns, the large antlered species having minute or deciduous canines, while the few hornless Deer are compensated by most efficient dental weapons.

[Cases
20–22.]

Skeletons are exhibited of—

the Reindeer (*Rangifer tarandus*). (Case 20, Div. C.)

the Fallow Deer (*Dama vulgaris*). (Case 20, Div. D.)

the Mule and Virginian Deer (*Cariacus macrotis* and *virginianus*). (Case 21.)

the Pudu (*Pudu humilis*). (Case 22, Div. B.)

the Chinese Water-Deer (*Hydropotes inermis*).

the Tufted Deer (*Elaphodus cephalophus*) (Case 22, Div. B), the two last being instances of hornless Deer with long upper canines.

The antlers of the *Cervidæ* are mounted on the tops of the Cases in the Mammalian Gallery.

Order VIII. SIRENIA, or SEA-COWS.

This remarkable Order differs strikingly in structure from all the others, although formerly these animals were placed with the Whales, on account of their aquatic habits and want of hind limbs. The Sea-Cows have rounded heads, very small eyes, no ears, a pair of anterior flippers, which they have the power of moving in all directions, no posterior limbs, but broad flattened tails,

placed, like those of the Whales, horizontally and not vertically as in fish; skin thick and hairless; only the lips are covered with stiff bristles.

Their bones generally are extremely dense, massive, and heavy, especially the ribs; of the posterior pair of limbs only two rudimentary pelvic bones remain, but no trace of true limb-bones. The anterior caudal vertebræ have well-marked chevron-bones, and in one genus (*Manatus*) there are only six cervical vertebræ, thus forming one of the very few exceptions to the general Mammalian number of seven. The fore limbs are developed into flat flippers, not showing externally any trace of fingers.

The skull is of a very peculiar shape and structure, the anterior part of both jaws being bent downwards, and unprovided with functional incisors. The molars are either absent, or very simple square teeth with transverse ridges, suitable for chewing water-weeds and other vegetable substances. The nasal organ, as in the Elephants, is placed very far back on the upper surface.

The Sirenia consist of three genera, one of which is generally believed to have been recently exterminated:—

(1) *Manatus*, the Manatees, with eleven molars on each side, of which about six are present at any one time; snout but little bent downwards; tail depressed and rounded, its posterior edge forming a semicircle; 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 quite unable to go on to the land itself, their whole lives being passed in the water. There are said to be three species of Manatee, namely:—the African Manatee (*M. senegalensis*); and two American, the Florida and South-American species (*M. latirostris* and *americanus*).

Stuffed specimens and skeletons of *Manatus senegalensis* and *americanus* are placed in the Saloon, and several skulls in [Case 22.] Case 22, Divs. D and E.

(2) *Halicore*, the Dugongs, with two tusk-like incisors, and five or six molars on each side; snout bent nearly vertically downwards; no nails on the flippers; tail broad, with the posterior edge nearly straight, somewhat as in the Whales. The

Dugongs inhabit the coasts of the Indian Ocean, from the Red Sea to Australia, living in shallow waters, and feeding, like the Manatees, on sea- 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—*Halicore tabernaculi*, the Red-Sea Dugong; *H. dugong*, the Indian; and *H. australis*, the Australian species. A stuffed specimen of the Red-Sea and a skeleton of the Indian species are placed in the Saloon, and a series of skulls of the other forms in Case 22.

(3) *Rhytina*, entirely without teeth, their place being taken by rough horny plates; snout moderately bent downwards; flippers short; tail with two lateral flukes, as in the Cetacea.

The only species of this genus is Steller's Sea-Cow (*R. gigas*), which formerly in numbers inhabited the shores of the islands in the neighbourhood of Behring Straits and Alaska. Its capture was so easy that the process of its extermination was accomplished within a short period after its discovery, towards the end of the last century. Happily, before its final extermination, a German naturalist in the Russian service, Steller, published an excellent account of its anatomy and habits; so that it is nearly as well known as its living allies. Many of its remains were discovered during the voyage of the 'Vega' in the region where it lived. A fragmentary skeleton and a nearly perfect skull, obtained from Behring Island, are placed in the Saloon.

Steller's 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 precisely similar.

Fossil Sirenians are known as far back as the Middle Eocene, the *Eotherium aegyptiacum* having been found in Egyptian deposits of that age. In later times the members of this Order, such as *Halitherium*, *Felsinotherium*, and others, were abundant in European seas, and their remains occur fossil in considerable numbers in Germany, France, and Italy: a single Miocene species has been recorded from Suffolk.

Order IX. CETACEA.

(See Cetacean Gallery, p. 104.)

Order X. EDENTATA.

The Edentata as a whole are characterized by the incomplete state of their dentition. In many forms teeth are entirely absent, while when present they are always composed of dentine and cement only (without enamel), and never form roots. In only one genus (*Tatusia*) is there any trace of a milk-dentition, one only (*Dasypus*) possesses premaxillary teeth, and in none is there any division of those in the maxilla into canines, premolars, and molars. [Case 23.]

The first family, the *Bradypodidæ*, or Sloths, have short round heads, five teeth above and four below. The vertebræ, owing to the inactive habits of Sloths, are almost entirely devoid of neural spines, and the whole vertebral column, especially in the neck region, is remarkably flexible and loosely united. The cervical vertebræ, which in all other Mammals, except the Manatee, are 7 in number, amount to no less than 9 in the Three-toed Sloths (*Bradypus*), while in certain of the Two-toed Sloths (*Cholæpus*) there are only 6. In *Cholæpus* the clavicle is attached to the coracoid, a peculiarity not occurring in any other Mammal. The pelvis is remarkable for being united to an unusually long portion of the spinal column, both the ilium and ischium being attached by bone to the latter. In old animals most of the carpal and tarsal bones ankylose together. In addition to the difference in the number of their claws, the two genera *Bradypus* and *Cholæpus* are also readily 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 *Cholæpus* 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 *Bradypus* and *Cholæpus* are placed in Case 23, Div. A.

Intermediate to a certain extent between the Sloths and Ant-eaters are certain huge fossil animals, found in the post-Tertiary deposits of South America, of which the best known is the Great Ground-Sloth (*Megatherium americanum*), of the skeleton of which an entire cast is exhibited in the Geological Gallery.

[Case 23.] The *Myrmecophagidæ*, or Anteaters, differ from the Sloths by their drawn-out snouts, entire want of teeth, elongate palate-bones, and long slender lower jaws. The most remarkable species is the Great Anteater (*Myrmecophaga jubata*), an animal with a long narrow head, more than a foot in length, the greater part of which is made up by the maxillary bones. There are no zygomatic arches to the skull, but little biting-power being needed. The clavicles are exceedingly rudimentary.

In the third family of Edentates, or Armadilloes (*Dasypodidæ*), teeth are present, generally $\frac{7 \text{ to } 9}{7 \text{ to } 10} \times 2 = 28$ to 38 in number, but in the Giant Armadillo amounting to $\frac{20 \text{ to } 25}{20 \text{ to } 25} \times 2 = 80$ to 100. These teeth are small and simple, with single roots. In the genus *Tatusia* a set of double-rooted milk-teeth precedes the simple one-rooted permanent ones. Zygomatic arch complete. Second and third, and often several of the other cervical vertebræ ankylosed together. The clavicles are well developed, and the whole anterior limb is enormously strengthened to support the huge digging-claws. The pelvis (as in the Sloths and Anteaters) is ankylosed to the vertebral column both by the ilia and ischia, and in one genus (*Chlamydophorus*) the dermal bony shield is united to the pelvis by vertical pillars.

The fossil forms referable to the *Dasypodidæ*, mostly found in the Pleistocene deposits of South America, are both numerous and interesting, many of them showing relations with still existing genera, while others, notably the huge Glyptodons (see Geol. Guide, p. 29), of which five genera are known, present characters so peculiar as to necessitate their being placed in a separate family.

Of the Old-World Edentates, the Pangolins, or *Manidæ*, are characterized by their entire want of teeth, elongated skulls, which are without zygomata, slender jaws, and by their long powerful tails, of which the vertebræ, numbering from 28 to 46, are provided with large chevron bones. The sternum is produced backwards nearly to the pubis, and the retractor muscles of the tongue are attached to its posterior part. There are no clavicles.

Scarcely any trace of fossil Pangolins has been found, a single species only having been recorded from the Upper Miocene of Sind ;

and some large animals from the Miocene of Europe, named *Macrotherium*, are doubtfully referred to this group.

The family of *Orycteropodidæ* contains one genus only, the Aard-varks, which have $\frac{8 \text{ to } 10}{8}$ teeth, of a highly peculiar and complex structure, each tooth consisting of a very large number of separate parallel dental systems, all closely packed together. In a transverse section they present an appearance not unlike that of a piece of cane. The zygoma is complete, and there are well-developed clavicles.

The Northern Aard-vark (*Orycteropus æthiopicus*), an animal of about the size of a pig, is represented by a skeleton in Case 23, Div. D.

Order XI. MARSUPIALIA, or POUCHED ANIMALS.

The principal characteristics 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 anterior edge of the pelvis. These are known as the "marsupial bones," owing to their close neighbourhood to the external marsupial 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 the last premolar, not preceded by milk-teeth. The incisors are generally unequal in number in the two jaws, ranging from $\frac{2}{2}$ to $\frac{5}{4}$. Dorso-lumbar vertebræ invariably 19.

The Marsupials are divided primarily into two great groups: the first possess, like the placental Carnivora, small and numerous incisors and large and sharp canines; in the second, 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. The former are called "Polyprotodont"† and the latter "Diprotodont"‡.

To the former group, carnivorous both in structure and habits,

* They are absent in one genus only, *Thylacinus*.

† "With many front teeth."

‡ "With two front teeth."

belong the Opossums, Dasyures, and Bandicoots; to the latter the Kangaroos, Phalangers, and Wombats, which, with but few exceptions, live chiefly upon vegetable food.

[Case 23.] The Kangaroos (Case 23, Div. E) belong to the second group; their dental formula, when fully developed, being I. $\frac{3}{1}$, C. $\frac{1}{0}$, Pm. $\frac{2}{2}$, M. $\frac{4}{4} \times 2 = 34$; some of the anterior grinding-teeth, however, are generally lost before the posterior are in position. The modifications of the bones of the hind feet accompanying their extraordinary "syndactylous" structure has been already referred to (p. 54).

Skeletons are exhibited of a large Kangaroo (*Macropus giganteus*) and of two kinds of Rat-Kangaroo (*Bettongia* and *Hypsiprymnus*).

Numerous fossil remains of animals allied to Kangaroos, some as large as a Rhinoceros, have been found in the fluviatile deposits of Australia, among which may be specially mentioned the huge *Diprotodon australis*, whose head is figured in the Geological Guide, p. 31.

The Phalangers (*Phalangistidæ*) differ from the Kangaroos by the possession of a large opposable hallux, and by the comparative shortness of their hind feet. Their teeth are remarkably variable in form and number, the ten genera of the family being founded almost entirely on these variations. The dental formula ranges from I. $\frac{3}{1}$, C. $\frac{1}{0}$, Pm. $\frac{2}{1}$, M. $\frac{3}{3} \times 2 = 28$, to I. $\frac{3}{1}$, C. $\frac{1}{1}$, Pm. $\frac{3}{3}$, M. $\frac{4}{4} \times 2 = 40$. In the aberrant *Tarsipes rostratus* the molar teeth are so reduced and variable that no definite number can be assigned to it. The feet are syndactylous, 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.

[Case 24.] The Phalangers vary in size from animals as small as a mouse, as for example *Acrobata pygmæa*, to others larger than a cat, such as the *Cuscus*. Skeletons are exhibited in Case 24, Div. B, of one of the latter genus (*C. brevicaudatus*), and of a Flying Phalanger (*Petaurus sciureus*).

The *Phascolomyidæ*, or 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. $\frac{0}{0}$, Pm. $\frac{1}{1}$, M. $\frac{4}{4} \times 2 = 24$. The incisors are large and cutting, with the enamel confined to their anterior

surfaces, as in the Rodentia, of which this family is generally considered to be the Marsupial analogue. The molars are strongly curved, and composed each of two parallel lobes. 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 feet show a slight tendency towards a syndactylous structure. All the three known species are represented in Case 24, Div. A, by skeletons and skulls.

The Bandicoots (*Peramelidæ*) present us with the first instance of a "polyprotodont" carnivorous dentition, that is 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. Their dental formula is I. $\frac{5}{3}$, C. $\frac{1}{1}$, Pm. $\frac{3}{3}$, M. $\frac{4}{4} \times 2 = 48$. On the other hand, their feet show a close resemblance to those of the diprotodont Kangaroos, so that these animals are in some measure intermediate between the two great groups of Marsupials. Their skeletons are placed in Case 23, Div. F.

The *Dasyuridæ* are the most highly developed carnivorous Marsupials, representing in this Order the true Carnivora of the placental series. The best known is the Thylacine (*Thylacinus cynocephalus*), whose skull strikingly resembles that of one of the Dog tribe. Its dentition is I. $\frac{4}{3}$, C. $\frac{1}{1}$, Pm. $\frac{3}{3}$, M. $\frac{4}{4} \times 2 = 46$, the teeth being sharp and cutting, and well suited to its predatory habits. Its feet are of the normal mammalian structure, and the marsupial bones represented by unossified cartilages only.

The Dasyures (*Dasyurus*) are smaller carnivorous forms, which correspond in their habits to the weasels, martens, and other small placental Carnivores, while the still smaller *Phascologales* and *Antechini*, 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. *Myrmecobius fasciatus* is remarkable for having the largest number of teeth known in any heterodont mammal, its dentition being I. $\frac{4}{3}$, C. $\frac{1}{1}$, Pm. $\frac{3}{3}$, M. $\frac{6}{6} \times 2 = 54$. The teeth are small and sharply cuspidate. Its external features and its habits have already been referred to (p. 56).

The last family of the Marsupials is the *Didelphyidæ*, or Opos-

sums, natives of America, which resemble in their dentition the *Dasyuridæ*, and in the structure of their feet the Phalangians, the hallux being opposable to the other toes, so forming a posterior pair of hands. Their dental formula is I. $\frac{5}{4}$, C. $\frac{1}{1}$, Pm. $\frac{3}{3}$, M. $\frac{4}{4}$, $\times 2 = 50$.

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

The fossil remains of *Didelphyidæ* are of special interest, 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.

Order XII. MONOTREMATA.

[Case 24.] The Monotremes (Case 24, Div. C) present many very 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 quite rudimentary as in other mammals, is large, and articulates with the sternum; the whole structure being of a very low and reptilian 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, but in *Ornithorhynchus* they are replaced by horny projections on its jaw. There are 19 dorso-lumbar vertebræ, well-marked sternal ribs, and a pair of large marsupial bones placed on the pelvis.

The two genera of the Order differ in many important respects, especially in the shape of the skull. *Ornithorhynchus* has a broad, flat rostrum, forked in front, which supports the beak, and in which the horny plates that take the place of teeth are implanted; while in *Echidna* the snout is long, narrow, and toothless, and forms merely a long tube for the lodgment of the tongue, as in the true Anteaters (*Myrmecophaga*). In the recently discovered *Proechidna bruiinii* from New Guinea, of which a fine skeleton is

mounted, the snout is nearly twice as long as the brain-case, and very much curved downwards, while in the common *Echidna* it is much shorter and curved upwards.

In both *Ornithorhynchus* and *Echidna* the anterior limbs are more powerfully developed than the posterior, the humerus especially being exceedingly thick, and provided with large ridges for the attachment of muscles, reminding us of a similar development in moles and other digging mammals.

CETACEAN GALLERY.

UNTIL the erection of the west wing of the Museum the specimens of Whale-like animals, for which, on account of their large size, no place can be found in the portion of the Museum galleries already completed, are lodged in a room, temporarily arranged for their reception in the basement, and approached by a staircase leading from the Bird Gallery. The room has unfortunately the disadvantages of not being well lighted, and of being intersected by massive columns which interfere with the complete view of any of the larger skeletons; nevertheless, the specimens will be safely preserved in it until such time as better accommodation shall be found for them, and visitors can, with very little difficulty, study most of the important peculiarities of these gigantic and very interesting members of the Animal Kingdom.

As it is almost impracticable to preserve the skins of the larger species of Whales, owing to the quantity of oil with which they are saturated, the exhibition of the characters of these animals is chiefly limited to their skeletons, assisted by drawings of their external form. The general appearance of many of the smaller kinds is, however, shown by stuffed specimens and coloured casts.

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 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 "fusiform" or spindle-shaped, passing anteriorly into the head, usually without any distinct constriction or neck, and posteriorly tapering off gradually towards the extremity of the tail, which is provided with a pair of lateral, pointed expansions of skin supported by dense fibrous tissue, called "flukes," forming together a horizontally-placed triangular propelling organ, notched in the middle line behind, with which the animals scull themselves through the water. The characteristic form of the tail is well seen in any of the smaller stuffed specimens in the Gallery, and in that preserved and attached to the great skeleton of the Rorqual, to be spoken of presently.

The head is generally large, in some species attaining to even more than one third of the entire length of the animal, and the aperture of the mouth is always wide, and bounded by stiff immobile lips. The fore limbs are reduced to the condition of flattened paddles, encased in a continuous skin, showing no external sign of division into arm, forearm, and hand, or of separate fingers, and without any trace of nails. There are no signs of hind limbs visible externally. The general surface of the skin is smooth and glistening, and devoid of hair, although in most species the mammalian character of hairiness is just indicated by the presence of a few fine bristles in the neighbourhood of the mouth, which either remain through life, or are to be found only in the young state. Immediately beneath the skin, and intimately connected with it, is a thick layer of fat, held together by a dense 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 nearly all 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, as in the analogous dorsal fin of fishes, assists to keep the animal in an upright position when swimming through the water. The eye is small; and the aperture of the organ of hearing extremely minute, and without vestige of a pinna or external ear. The nostrils, generally called "blowholes," open separately, or by a single valvular aperture, not (except in the Sperm Whale) 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 vertebral column 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 together into a solid mass. None of the hinder vertebræ of the body are united together to form a "sacrum" or to join the pelvis, as in mammals in which the hind limbs are fully developed. The lumbar and caudal vertebræ are numerous and large, and capable of very free motion in all directions. Beneath the latter are large chevron bones which project downwards, and give increased surface for the attachment of the powerful muscles that move the tail. There are no bones supporting the lateral "flukes" of the tail or the dorsal fin.

The skull is modified in a peculiar manner. The brain-case is short, high, and broad, almost spherical in fact. The nostrils open upwards, immediately in front of the brain-case, and before them is a more or less horizontally prolonged beak or "rostrum," extending forwards to form the upper jaw or roof of the mouth. In detail the form of the skull varies much in different groups.

There are no collar-bones or 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 forearm (the radius and ulna) are distinct and very much flattened, as are all the bones of the hand. There are usually five fingers, though sometimes the first, or that which corresponds to the thumb of man, is wanting. 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. As these bones are in the living animal concealed in the flesh and not connected with the spinal column, they are often lost in preparing the skeletons, and hence are absent in many of the specimens in the Gallery. To the outer side of these, in some Whales, small bones are attached which represent the bones of the limb proper. In the great skeleton of the Rorqual (*Balænoptera musculus*), at the further end of the Gallery, a little nodule of bone, scarcely larger than a walnut, has been fortunately 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 apparently useless rudimentary structures has a deep bearing upon the origin and past history of Whales, and their relationship to the other Mammalia.

The animals of the Order *Cetacea* abound in all known seas, and some species are inhabitants of the larger rivers of South America and Asia. Their organization necessitates their passing their life entirely in the water, as on land they are absolutely helpless. They have, however, to rise very frequently to the surface for the purpose of respiration; 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, quite unlike that of a Fish, whose movements are mainly in straightforward or lateral directions. The position of the respiratory orifice or nostril on the highest part of the head is very 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. Of the numerous erroneous ideas connected with natural history, few are so widespread and still so firmly believed as that the *Cetacea* spout out through their blowholes water taken in at the mouth. The fact is, the "spouting," or more properly "blowing," of the Whale is nothing more than the ordinary act of breathing, performed at longer intervals than is the case with land animals. The moment the 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 highly charged with watery vapour, in consequence of the natural respiratory changes. This, rapidly condensing in the cold atmosphere in which the phenomenon is generally observed, forms a column of steam or spray, which has been erroneously taken for water. It also often happens, especially when the surface of the ocean is agitated into waves, that the animal commences its expiratory puff before the orifice has quite cleared the top of the water, some of which may thus be driven upwards with the blast, tending to complete the illusion. In hunting Whales the harpoon often pierces the lungs or air-passages of the unfortunate victim, 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 always follows severe wounds of the respiratory organs of other mammals.

All the Cetacea prey upon living animal food of some kind. One genus alone (*Orca*) eats other warm-blooded animals, as Seals, and even members of its own Order, large and small. Many feed on fish, others on small floating crustaceans, pteropods, and medusæ, while the principal staple of the food of many is constituted by the various species of cephalopods, especially *Loligo* or Squid, and its allies, which must abound in some seas in vast numbers, as they form almost the entire support of some of the largest members of the Order.

In size the Cetacea vary much, some of the smaller Dolphins scarcely exceeding four feet in length, while others are the most colossal of all animals. It is true that most statements of their bulk found in general and even zoological literature are greatly exaggerated; but even when reduced to their actual dimensions (which will be mentioned hereafter with the different species) some of the existing Whales exceed in size that of any animal living either at present or in former times of which we have any certain evidence.

With some exceptions the Cetacea are timid, inoffensive animals, active in their movements, and very affectionate in their disposition towards one another, especially the mother towards the young, of which there is usually but one, and at most two, at a time. They are generally gregarious, swimming in herds or "schools" (so termed by the whalers), sometimes amounting to many hundreds in number, though some species have hitherto only been met with either singly or in pairs.

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

The existing members of the Order are separated into very distinct Suborders, having important differences in their structural characters, and with no transitional or intermediate forms. These

are the Toothed Whales or *Odontoceti*, and the Baleen Whales or *Mystacoceti*.

Suborder I. ODONTOCETI, or DELPHINOIDEA.

Among other important anatomical characters, these have no baleen or whalebone, but always possess teeth, which are generally numerous, but sometimes few and quite rudimentary in size and function. The upper portion of the skull is more or less asymmetrical. The olfactory organ is absent. The two branches of the mandible or lower jaw come in contact in front by a flat surface of variable length, but always constituting a true symphysis. Several pairs of ribs are connected with the elongated sternum by means of costal cartilages, which are often ossified. The external respiratory aperture or blowhole is single, the two nostrils uniting before they reach the surface, and usually in the form of a transverse crescentic valvular aperture, situated on the top of the head.

Family PHYSETERIDÆ.

The members of this family are united by several common characters of the skull and vertebral column, by never having functional teeth in the upper jaw, and by their costal cartilages never becoming ossified.

The most interesting member of this family is the great Sperm-Whale or Cachalot (*Physeter macrocephalus*), of which the skeleton of one which was cast ashore on the rocky coast of Caithness, near Thurso, in June 1863, is mounted in the central hall of the Museum. It is 50 feet long (measured in a straight line), which is about the average length of a full-grown specimen of this animal, and appears never to be greatly exceeded, notwithstanding the exaggerated statements of their attaining 80 or 100 feet in length. It feeds chiefly on cephalopods and fish, and is one of the most extensively distributed of Cetaceans, being met with, usually in herds or "schools," in almost all tropical or subtropical seas, but not occurring, except accidentally, in the Polar Regions. Those that appear occasionally on the British coasts are solitary stragglers, usually, if not always, old males, as in the present instance. The oil contained in the great

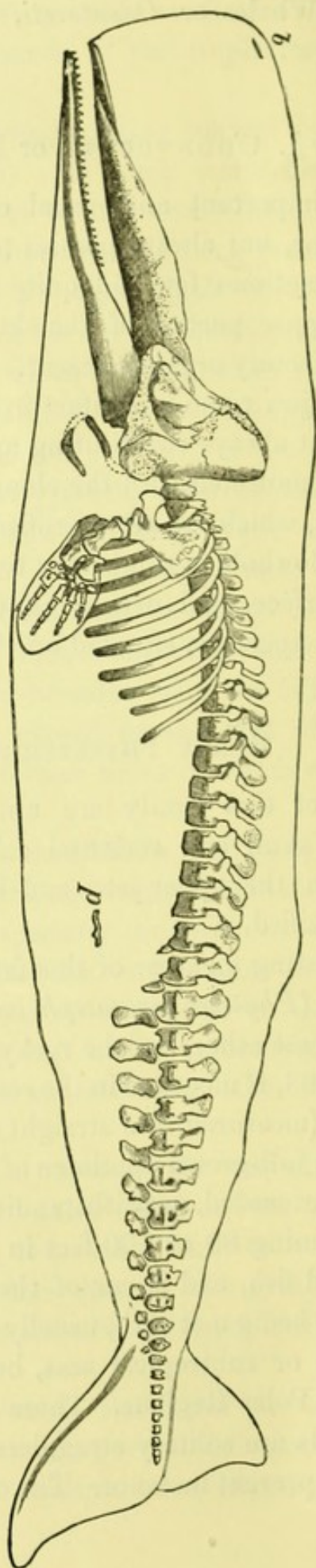


Fig. 51.

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

Skeleton and outline of animal: *b*, nostril or blowhole; *p*, rudimentary pelvic bone.

cavity above the skull, when refined, yields "spermaceti," so much used in the manufacture of candles and of ointments, and the thick covering of blubber which everywhere envelops the body produces the valuable sperm-oil of commerce; hence this animal 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, and is found floating on the surface of the seas which they inhabit. Its genuineness is attested by the presence of fragments of the horny beaks of the cephalopods on which the Whales feed.

A large skull of a Sperm-Whale, which has been in the Museum since the end of the last century, is placed in the anteroom through which the Cetacean Gallery is entered, and the remarkable form of the lower jaw, with its numerous stout conical teeth, is shown in a specimen suspended to the ceiling near the entrance of the Gallery.

Nearly allied to the Sperm-Whale, but of very much smaller size, is *Kogia breviceps*, of which but few specimens have hitherto been met with. The skeleton exhibited is from the neighbourhood of Sydney.

The Ziphioid Whales, or *Ziphiinæ*, a section of the *Physeteridæ*, constitute a very interesting group, of which most of the different forms are represented in the collection by skeletons and skulls. They resemble the Sperm-Whale and *Kogia* in having no teeth in the upper jaw (or if present they are in an exceedingly rudimentary state, and attached only to the gum of the mouth, not fixed in the bone), but differ, inasmuch as in the lower jaw the teeth, instead of being numerous, are reduced to one, or very rarely two, pairs. These are situated either quite at the front extremity of the jaw, as in *Ziphius* and *Hyperoodon*, or near the middle, as in *Mesoplodon*. In one 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 in the Table-Case) curve round and meet over the upper jaw, so as almost to prevent the mouth from opening. This remarkable disposition of the teeth has been found in so many individuals that it must be looked upon as 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 animal of this group found in the British seas is *Hyperoodon rostratus*, of which are exhibited a complete skeleton of an adult female, taken at Whitstable, Kent, in 1860, and the skull of a very old male from the Orkneys, in which the bony crests, rising on each side from the upper jaw, have attained such an extraordinary development, that it was long supposed to be the type of a distinct species, called *H. latifrons*. It has, however, now been shown, that while in the young of both sexes the crests are quite small, in the female they remain permanently of the size shown in the skeleton, and in the male they gradually increase as age advances. This animal is an inhabitant of the northern parts of the Atlantic Ocean; 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."

Family PLATANISTIDÆ.

On the left side of the door, near the first window, is a Case containing a stuffed specimen, skeleton, and several skulls of the very curious freshwater Dolphin of the rivers of India (*Platanista gangetica*). It 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 Brahmaputra and Indus, ascending as high as there is water enough to swim in. The eyes are exceedingly small and imperfect in structure, and it appears to be quite blind. It feeds on small fish and Crustacea, 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 stuffed specimen, is a single slit, placed lengthwise, and not transverse to the head as in most Dolphins, and the dorsal fin is merely a low ridge. The skull has a very remarkable form, having on the upper surface a pair of large, compressed, bony crests, which overarch the aperture of the nostrils and base of the rostrum, and nearly meet in the middle line above. The upper and lower jaws are exceedingly long and narrow, and armed with numerous slender, pointed teeth, which undergo some curious changes of form as life advances.

In the next Case are the skeleton and some skulls of another freshwater Dolphin, *Inia geoffrensis*, from the Upper Amazon and its tributary streams, and also of a very remarkable species, *Pontoporia blainvillii*, from the estuary of the Rio de la Plata, of very small size, with exceedingly 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. Both of these have some relationship with the Platanista, although in many characters they approach the next group, or true Dolphins.

Family DELPHINIDÆ.

A very numerous group, composed of the animals commonly called Dolphins and Porpoises, although some of the larger members are also dignified by the name of Whales. Skeletons of most of the genera are exhibited, and also a large series of skulls (those of the smaller species being in the Wall-Cases at the end of the room nearest the door). There are also stuffed specimens of many species, and papier-maché models (made for the Smithsonian Institution, Washington, and exhibited at the International Fisheries Exhibition of 1883), showing very well the external form and colour of the animals when fresh.

The principal genera are :—

Delphinus. The true Dolphins, Bottle-noses, or, as they are more commonly called by seafaring people, "Porpoises," are found in considerable abundance in all seas. They are all among 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-pointed teeth, are well adapted; but some appear also to devour crustaceans and mollusks. They are mostly gregarious, and the agility and grace of their movements in the water are constant themes of admiration to the spectators of the scene when a "school of Porpoises" is observed playing round the bows of a vessel at sea. The old genus is now much subdivided—*Lagenorhynchus*, *Tursiops*, *Prodelphinus*, *Sotalia*, *Steno*, *Cephalorhynchus*, being names applied to its various sections; *Delphinus* being now generally restricted to the common Dolphin of the Mediterranean, *D. delphis*, and its immediate allies.

This species is met with, though not frequently, on the English coast, a stuffed specimen from Cornwall being shown in the Gallery. There are also casts of the heads of a pair of this and of *Tursiops tursio*, from the Atlantic coast of North America.

Fig. 52.

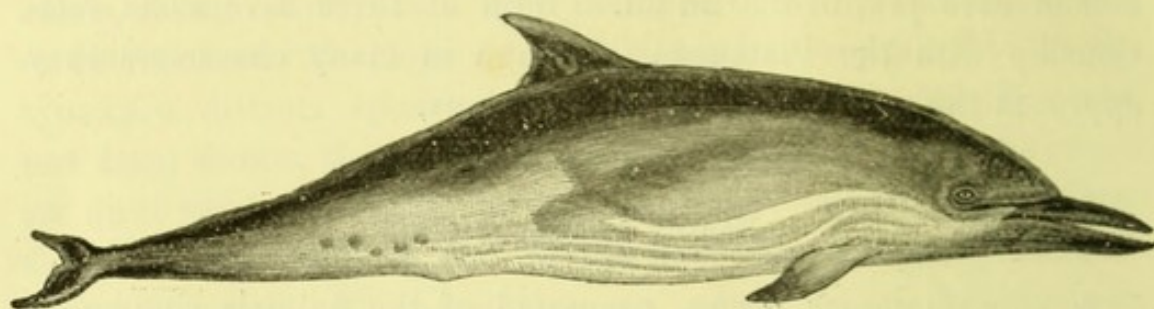
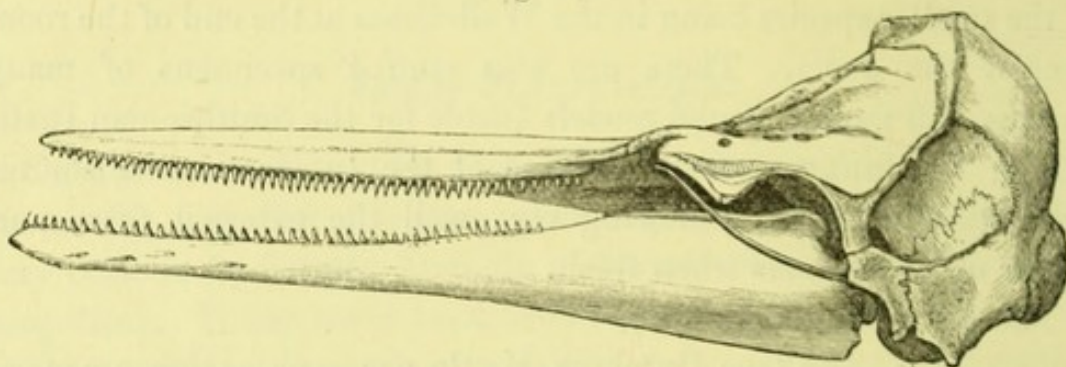
Common Dolphin (*Delphinus delphis*).

Fig. 53.



Skull of Common Dolphin.

Grampus has no teeth in the upper, and but few in the lower jaw. *G. griseus*, about 13 feet long, and of very variable colour, is occasionally met with off our coasts: the skeleton is that of an adult female, taken in mackerel-nets, near the Eddystone Lighthouse, February 28th, 1870. There are also a stuffed specimen and skeleton of a very young individual, taken a few days afterwards near the same place, and coloured casts of the heads of an adult and young from North America.

Globicephalus has also few and small teeth, but they are present in both jaws. It is characterized externally by the rounded form of the head and the very long and narrow pectoral flippers. The best known is *G. melas*, the Pilot-Whale, Ca'ing-Whale, or Grindhval

of the Faroe islanders, which attains a length of 20 feet, and is of nearly uniform black colour, except the middle of the under surface, which is lighter. They are extremely gregarious, and mild and inoffensive in disposition, feeding on cephalopods. Their eminently sociable disposition constantly leads to their destruction, as, when attacked, they instinctively 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 Faroe Islands or the north of Scotland. They are widely distributed. Specimens in the collection from New Zealand are indistinguishable from those taken in the Northern seas.

Fig. 54.

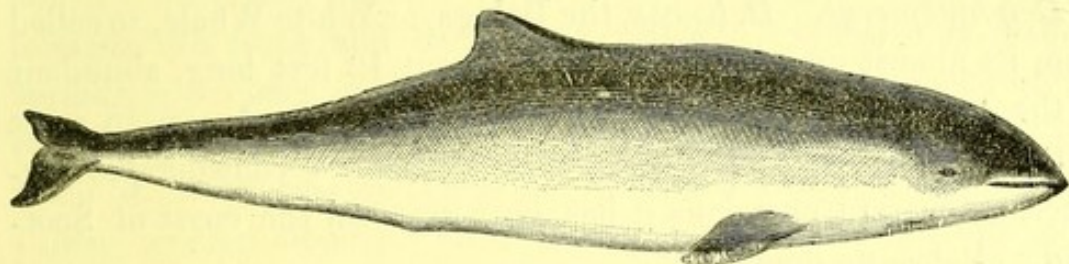
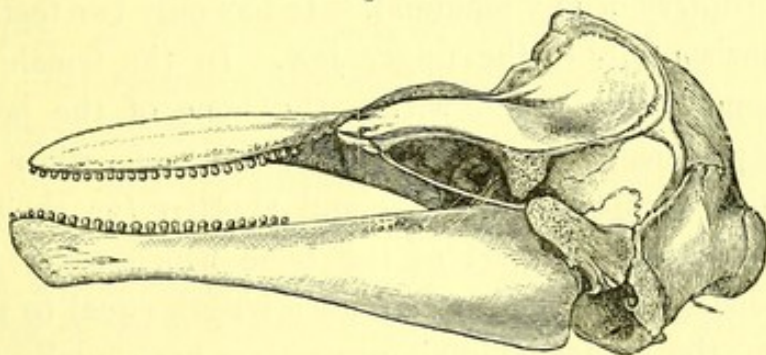
Porpoise (*Phocaena communis*).

Fig. 55.



Skull of Porpoise.

Phocaena. *P. communis*, the common Porpoise, is the best known and most frequent Cetacean on our coasts. It and its immediate allies differ from all the other *Delphinidae* in the form of their teeth, which, instead of being conical and pointed, have compressed spade-shaped crowns. Its external form is well seen in the coloured model of an American specimen.

Orca. Very different in structure and habits from the last is the genus *Orca*, containing the "Grampuses" or "Killers"; powerful animals, with numerous formidable teeth, high-pointed dorsal fin, and very broad rounded flippers. They are found in almost all seas from Greenland to Tasmania, and are distinguished from all 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 and various species of their own order, not only the smaller Porpoises and Dolphins, but they also combine in packs to hunt down and destroy full-sized Whales, as wolves do the larger ruminants.

Orcella. *O. fluminalis* is a small species found in the Irawaddy river, from 300 to 900 miles from the sea, of which a perfect skeleton is exhibited.

Delphinapterus. *D. leucas*, the Beluga, or White Whale, so called from its almost pure white colour, is about 12 feet long, 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 dorsal fin.

Monodon monoceros. The Narwhal, or Sea-Unicorn, resembles the Beluga closely in everything but its teeth, as will be seen by comparing their skeletons. Its dentition is, however, perhaps the most extraordinary of any mammal. It has only two teeth, both of which lie horizontally in the upper jaw. In the female both remain permanently concealed within the bone 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 some very rare cases both teeth are fully developed, as in the fine skull exhibited near the skeleton. The Narwhal inhabits the Arctic regions, where it is tolerably abundant and gregarious, feeding on various species of cephalopods, small fish, and crustaceans. The use to which it puts its tusk (often erroneously spoken of as a "horn") is not known.

Suborder II. MYSTACOCETI, or BALÆNOIDEA.

Although the so-called "Whalebone Whales" have rudimentary teeth developed at an early period of life, these soon disappear, and their place is occupied in the upper jaw by the baleen or "whalebone." This consists of a series of flattened, horny plates, between three and four hundred in number on each side of the mouth. They are placed transversely to the long axis of the mouth, with very small interspaces between them. 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 apex fray out into long bristly fibres, so that the roof of the Whale's mouth looks as if covered with hair, as described by Aristotle. The blades are longest near the middle of the series, and gradually diminish towards the front and back of the mouth. Baleen (as seen in various specimens in the Table-Case near the further end of the room) 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 Whale, *Balæna mysticetus*) in which it has attained its fullest development. Its use is to strain the water from the small marine mollusks, crustaceans, or fish upon which the Whales subsist. In feeding, they fill their immense mouth with water containing shoals of these small creatures, and then, on their 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 by which the Whalebone Whales are distinguished from the Toothed Whales, may be mentioned:—The external openings of the nostrils are distinct from each other, and consist of a pair of longitudinal valvular slits on the top of the head; the two sides of the upper part of the skull are symmetrically developed; the organ of smell, though small, is formed as in other mammals. The branches of the lower jaw are greatly curved outwards in the middle, and are 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 very dilatable 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 sac under the bill 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 articulates only with a single pair of ribs. There are never any ossified sternal ribs.

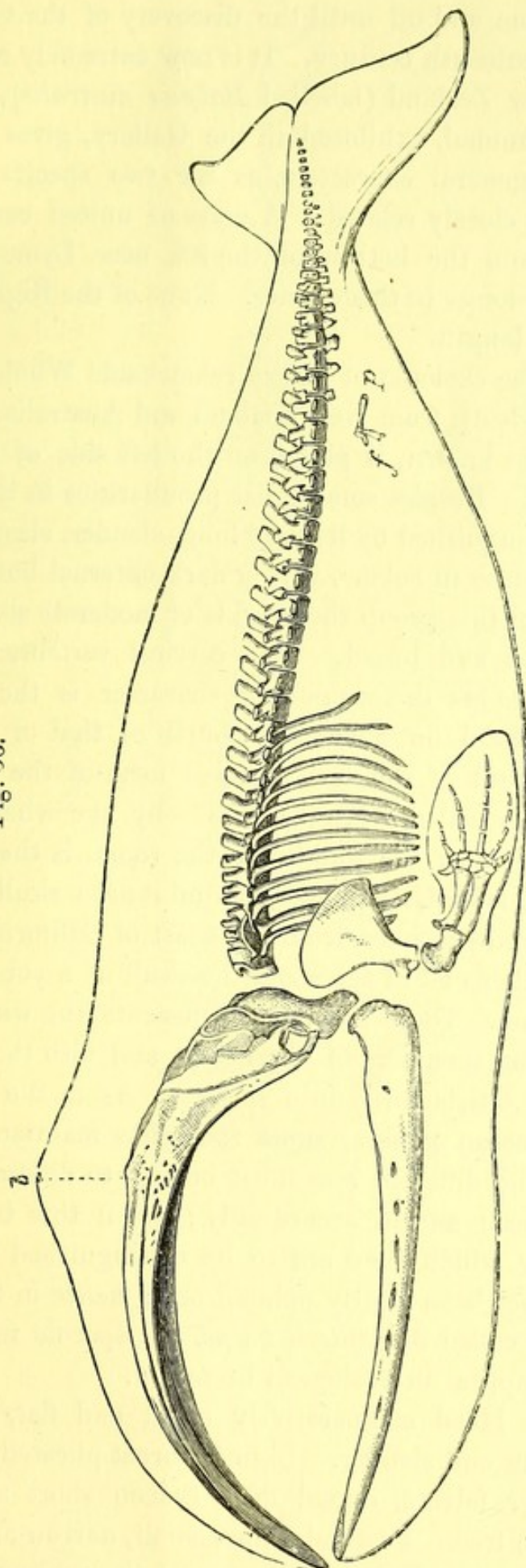
The Whalebone Whales represented in the collection belong to four distinct types or genera.

Balæna (Right Whales). Skin of throat smooth, not furrowed. No dorsal fin. Cervical vertebræ united into a single mass. Pectoral limb broad and short, with five fingers. Head very large. Baleen very long and narrow, highly elastic and black, as seen in the specimens near the window at the further end of the room.

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. It never leaves the ice, and so is not an inhabitant of the seas round our islands, but is hunted every summer in Baffin's Bay and the seas round Spitzbergen by ships fitted out at Dundee and Peterhead. The Museum at present only possesses a skull of this most interesting animal; but a carefully executed coloured model, on the scale of one inch to the foot, presented by Captain David Gray, gives a good idea of its external appearance.

Besides the Greenland Whale there are several other members of the genus, distinguished from it by having heads somewhat smaller in proportion to the body, and with shorter baleen, and a larger number of vertebræ. These inhabit the temperate seas of both northern and southern hemispheres; and although divided by zoologists into several species, in accordance with their geographical distribution—*B. biscayensis*, of the North Atlantic; *B. japonica*, of the North Pacific; *B. australis*, of the South Atlantic; and *B. antipodarum* and *novæ-zelandiæ*, of the South Pacific—their distinctive characters, if any, have never been fully made out, from want of sufficient specimens in museums. The first named was the Whale formerly regularly hunted by whalers from the Basque sea-ports of France and Spain, and the main source of

Fig. 56.



Greenland Right Whale (*Balena mysticetus*).

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

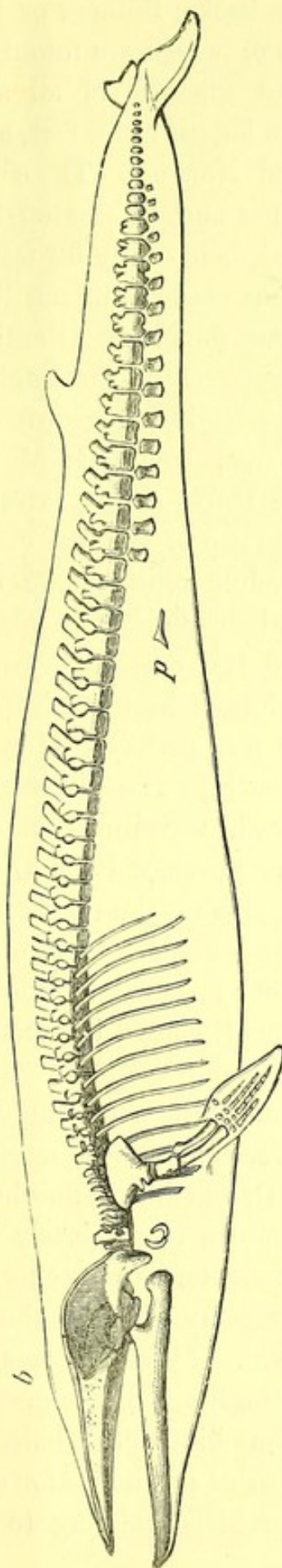
supply of whalebone and oil until the discovery of the Greenland Whale in the seventeenth century. It is now extremely rare. The skeleton from New Zealand (labelled *Balæna australis*), of a not quite full-grown animal, exhibited in the Gallery, gives an excellent idea of its general characters, as the two species, if really distinct, are most closely related. A mass of united cervical vertebræ, dredged from the bottom of the sea near Lyme Regis, in 1853, probably belongs to this species. None of the Right Whales exceed 50 feet in length.

Neobalæna. The skeleton of a very remarkable Whale of small size (less than 20 feet), from New Zealand and Australia, of which very little is as yet known, is placed on the left side of the room, near the windows. Besides some great peculiarities in the form of its bones, it is distinguished by its very long, slender, elastic baleen, which is nearly white in colour, with a dark external border.

Megaptera. In this group the head is of moderate size, and the baleen-plates short and broad. The cervical vertebræ are free. The most conspicuous distinguishing character is the immense length of the pectoral fin, about one fourth of that of the entire animal. On account of the low rounded form of the dorsal fin, they are commonly called "Humpbacks" by the whalers. The skeleton exhibited, near the middle of the room, is that of a not quite adult animal from Greenland. Behind it are a skull and some bones of a full-sized specimen from the coast of California. There is also at the further end of the room the skull of a young animal from New Zealand. These specimens illustrate the wide geographical range of the members of the genus, and also the difficulty of dividing them satisfactorily into species. As in the case of so many other Cetacean genera, some zoologists maintain that the animals inhabiting different seas must belong to different species, and they have been named accordingly; but if this is the case, the characters by which they are to be distinguished from each other have not yet been clearly pointed out: hence in this collection they are all called *Megaptera boops*, the specific name under which they first appear in zoological literature.

Balænoptera. Head comparatively small and flat, pointed in front. Body long and slender. Skin of throat plicated. A small triangular, rather falcate, dorsal fin. Baleen short and coarse. Cervical vertebræ free. Pectoral flipper small, narrow and pointed, with but four fingers. This genus contains the various species of

Fig. 57.



Common Rorqual or Fin-whale (*Balænoptera musculus*).
 Skeleton and outline of animal : *b*, position of blowholes ; *p*, pelvic bone.

Rorquals, Fin-whales, Fin-backs, Finners or Razor-backs, as they are variously called, some of which are found in almost every sea. Among them is the most gigantic of all animals, *Balænoptera sibbaldii*, which attains the length of 80 feet, and is common in the seas between Scotland and Norway. The skeleton suspended in the Gallery, near the further end, on the left-hand or window side, is that of a young animal, being only 52 feet in length. Almost of equal colossal proportions is the Common Rorqual (*Balænoptera musculus*), found throughout the North Atlantic and Mediterranean, and often stranded on some part of the English coast. The very complete skeleton of a perfectly full-grown animal, 68 feet long measured in a straight line, from the Moray Frith, Scotland, where it was captured in 1882, shows extremely well the osteological characters of this group of Whales, even to the small pelvic bone and rudimentary nodule representing the femur or thigh-bone. The baleen or "whalebone" is in place in the mouth, and the flukes of the tail and the dorsal fin are also preserved, and suspended near their original position. Behind this skeleton is one, equally large, but less perfect. It was prepared from an animal stranded at Plymouth in 1831, and was formerly exhibited in many parts of England, travelling round the country in a number of vans, but was purchased for the Museum in 1848. There is also on the left side of the room, near the windows, the skeleton of a very young animal, taken on the coast of North Wales in 1846, the different form of the bones of which, owing to their incomplete development, caused it formerly to be taken for a distinct species.

Another species, not uncommon on the English coast, is the small *Balænoptera rostrata*, which never reaches 30 feet in length. Beside a skeleton from Greenland is another from New Zealand (*B. huttonii*), which resembles it so closely that it is difficult to assign any distinctive characters to it except the colour of the whalebone, which, of a creamy white in the Northern, is almost black in the Southern form. Much information is still required before we can determine the limits of the geographical distribution and variation of the various kinds of Whales, and more especially do we need a larger number of specimens for study and comparison before many important problems relating to their natural history can be solved.

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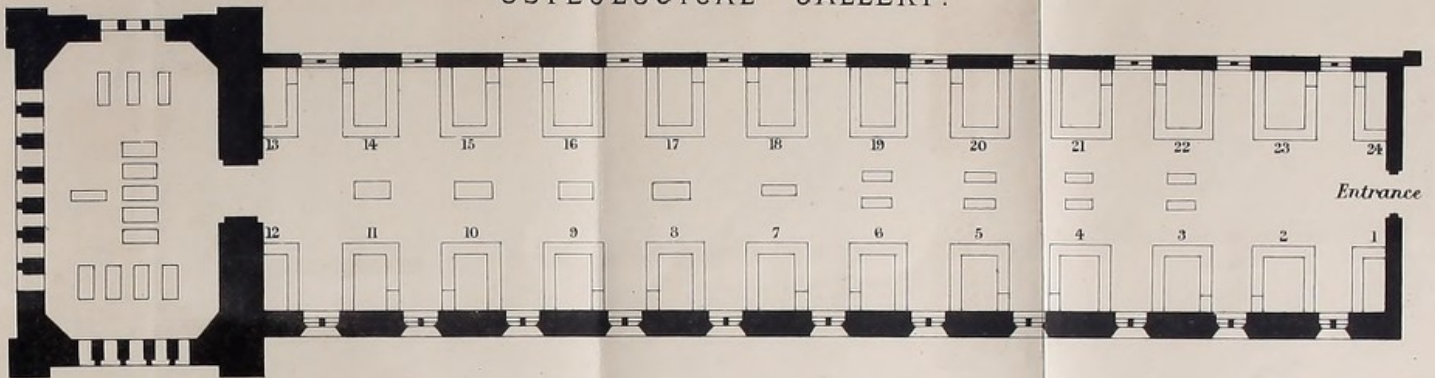
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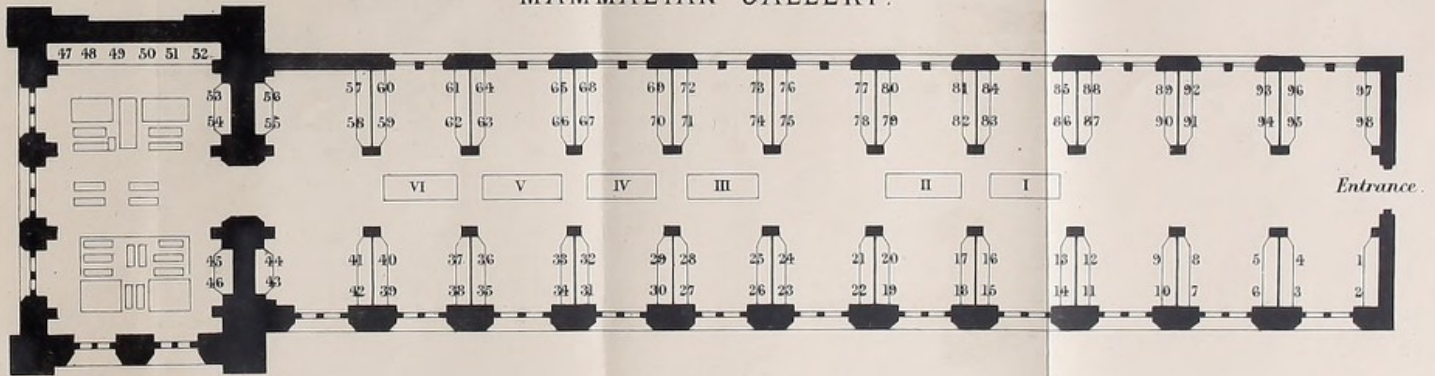
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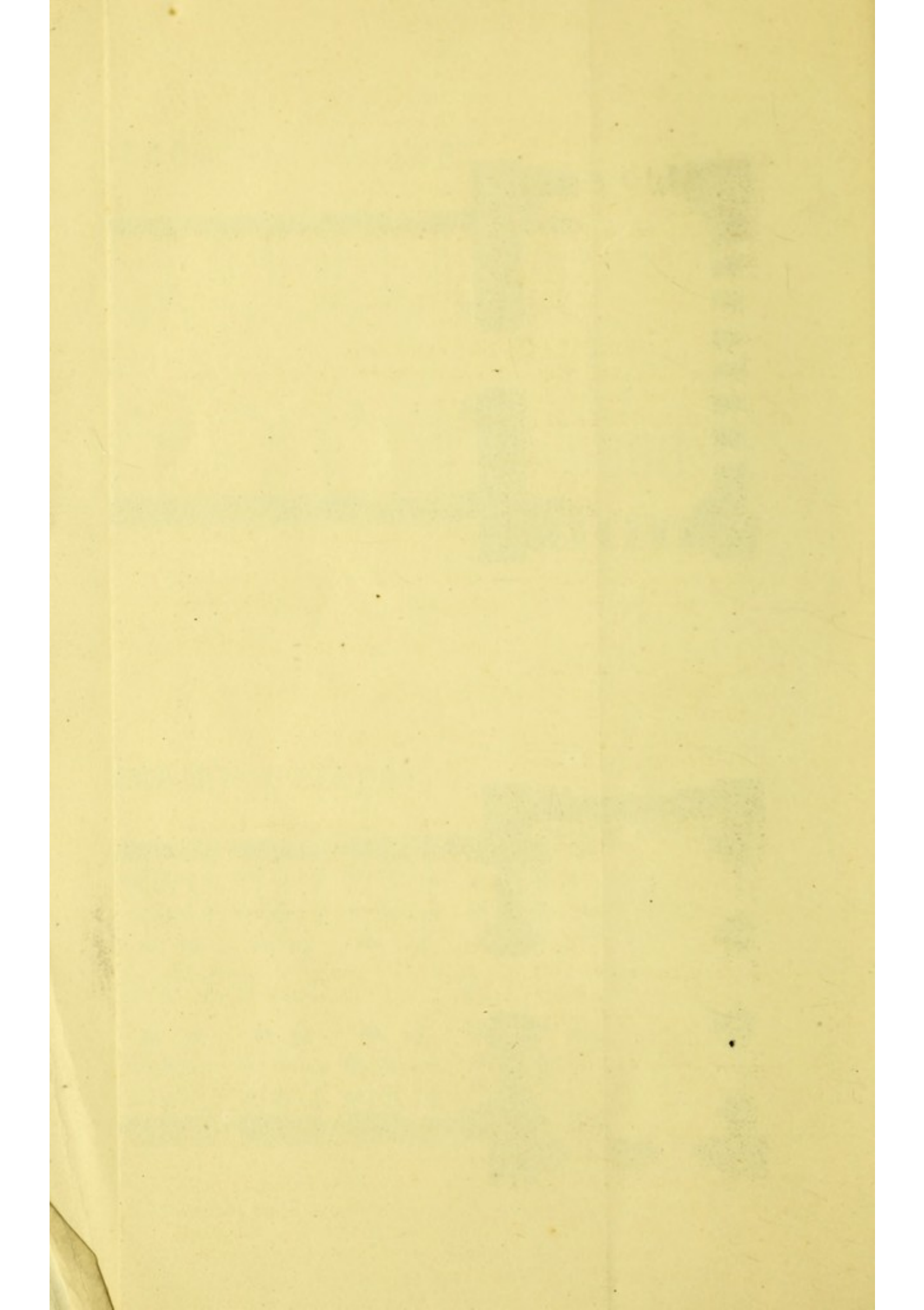
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