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# THE MUSEUM <br> 0 <br> NATURAL HISTORY. 

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## THE MUSEUM

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## NATURAL HISTORY;

BEING A POPULAR ACCOUNT OF TIE
STRUCTURE, HABITS, AND CLASSIFICATION OF TIE VARIOUS DEPARTMENTS OR

## THE ANIMAL KINGDOM:

 INCLUDING TIE LNSECTS DESTIRUCTIVE TU AGRICULTULE.

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## PREFATORY ADDRESS

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DR. COBBOLD, F.L.S.

To those whose minds are imbued with a love of Nature as she attires herself in the evervarying attitudes of organized existence-to those whose sympathies extend to objects placed beyond the narrow confines of their daily observation-to those who welcome truth in whatever phase she is discoverable in the physico-vital records of a past and passing world -to those who cherish glimpses of the Infinitc, and would fain tear aside the "veil that separates the seen from the unseen"-to those, in short, who "look through Nature up to Nature's God "-to such are we privileged to address ourselves !

The Museum of Natural IIstory is designed-in friendly eo-operation with other publications of a less scientifie stamp-to promote a sound appreciation of the scope and tendency of Zoological Science, and to convey an intimate knowledge of the structure, habits, and mutual relations of different animals. There never was a time when the demand for works in all departments of Natural Science was so wide-spread as it is at the present day, consequently we find Natural History information communicated to the public through various channels. In itself, this thirst after knowledge is a refreshing symptom of healthy progress; yct, we very much doubt if any permanent advantages are derivable from the perusal of those popular curiosity books and discursive magazine sketches which daily issue from the press; because in them the ostensible aim is rather to gratify the imagination than to afford accurate and enlarged conceptions of the structural, morphological, and functional peculiarities exhibited by the multitudinous organisms which Nature unfolds to our view. Rightly pursued and understood, the sciences of Natural History yield higher claim than this. Zoology, Botany, and Geology are fit and easily accessible sciences for training the mental powers of obscrvation, while, at the same time, if allowed to cxercise their full sway, they are eminently calculated to advance our social and intellectual interests.

In the daily walks of life, whatever direction our dutics may take, or whatever charaeter they may assume, nothing is more cssential than a well-regulated mind, able to observe, to store up, and to form a correct estimate of the value of facts ; and the possession of an intellect of this discerning habit is of immense advantage, not only in the aequisition of knowledge, but in the formation of correct opinions. It is admitted, indeed, that in so far as the requirements of a man of narrow sympathies are-concerned, a fair amount of the so-ealled eommon sense principle may be all that is alsolutely necessary for his peeuniary advanee-
ment; but, if we desire to obtain the higher intellectual developments of a well-regulated mind-such as the faculty of a retentive memory, a power of detecting the most subtile distinctions between one thing and another, and a thorough compreliension of our social position-we must look to the culture of our mental processes. The absence of a retentive memory is by no means indicative of original stupidity, want of industry, or lack of talent ; yet, those who would become masters of this valuable product of mental discipline, can only do so by pursuing some subject, the study of which involves a methodized and continuous process of abstract reasoning. Coufusion and obliviousness are often the result of indiscriminate olservation, and the lighest degrec of cerebral activity will fail to recall facts once familiarly known, unless the storchonse of the mind has been filled in a gradual and tentative manner.

In early times, the cultivators of Natural History scienee confined themselves, for the most part, to the mere collection of eabinct specimens, whose individual worth was estimated by comparative beauty or singularity of form, whilst the more important facts and phenomena respecting the relation of thesc animal, vegetable, and mineral bodies, the one to the other, were entircly overlooked. As years rolled on, the united energies of many hardworking naturalists projected only a few thin rays of light upon the chaos of accumulated faets, until at length the genius of Limneus and Jussieu, of Goethe and Oken, of Hunter and Ray, of Cuvier and Lamarck, eclipsed these feeble scintillations by the effulgent brightuess of their giant intellects. In later times, the Natural History sciences owe their rapid progress rather to the combined investigations of the many, than to the isolated efforts of the few, so that all the various departments of Zoology, Botany, and Geology acknowledge one or more presiding heads to whom they are severally indebted for their advancementsuch as Westwood in Entomology; Audubon and Gould in Ornithology; Bell and Dana in Crustaccology; Von Siebold in Helminthology; Busk and Allman in Zoophytology, and so forth. As a whole, however, Biological science has bcen impelled forward most significantly by those, who, in addition to their promotion of specialities, have given more or less comprehensive gencralizations, as exemplified in the writings of J. Miiller, Agassiz, Owen, IIuxley, E. Forbes, J. D. Ilooker, Lindley, Darwin and others. It is extremely difficult to estimate the combined value of independent and widely different rescarehes, such, for example, as those of Kölliker and Leydig in Histology ; of Van der Hocven and J. E. Gray in Zoology ; of Hermann Von Meycr and Leidy in Palcontology ; of Brongniart and Bowerbank in Fossil Botany, \&ce. ; and yct, if one mind could be found capable of retaining within its grasp the multitudinous facts which these and similar investigations have separately unfolded, we cannot doubt that a flood of light would be thrown upon their intermutual relations and special dependence on the objects by which they are surrounded. Notwithstanding this drawback, however, we are bold enough to state that men of science have now fairly realized the fundamental unity of plan pervading all-created nature throughout time and space. Those who look upon Botany, Zoology, and Gcology as so many distinet scienees, should bear in mind that the laws regulating the facts, which these rarions branches of study have generally brought to light, exhibit but one grand scheme of contriv-
ance, adaptation, and design. The philosophie and truth-loving naturalist perecives that in all epochs of the world's listory, in whatever condition its cosmical elements have appeared, the laws prevailing hitherto are the same as those in operation at the present day; and the singularly varied results that we now witness are regulated by the degree, direction, and conditions imposed upon those laws by the all-wise Creator, who alone is eapable of ordaining or abrogating their existence.

Having thus particularized the more palpable adrantages legitimately deducible from the pursuit of Natural History seience in its social, practical, and intellectual bearings, we are by no means willing to lalt, but, on the contrary, propose to advance yet another step, in view of enforeing a still higher claim for its consideration. Ere, therefore, we weigh anehor, and suffer our volume to brave the waves of public opinion, we invite attention to another argument, which shall serve as ballast for the outward voyage.

For Biological seience, that is to say, for Natural History in the widest aceeptation of the term, we claim especial consideration on the seore of morality, and, in doing so, we ean powerfully appeal to the honest convietions of one of her most favoured sons, whilst we take leave, at the same time, to add the testimony of our own less cogent experience. In the eminently philosophical address by Professor Huxley, "On Natural History, as Knowledge, Diseipline, and Power," delivered in the capacity of Fullerian Professor at the Royal Institution in 185̃G, the argument is stated thus:-"Let those who doubt the efficaey of seience as moral discipline, make the experiment of trying to come to a comprehension of the meanest worm or weed-of its structure, its habits, its relation to the great seheme of nature. It will be a most exceptional ease, if the mere endeavour to give a correct outline of its form, or to deseribe its appearance with aceuracy, do not call into exereise far more patience, perseverance, and selfdenial than they have casily at command ; and if they do not rise up from the attempt, in utter astonishment at the habitual laxity and inaccuracy of their mental processes, and in some dismay at the pertinaceous manner in which their subjective conecptions and hasty preconceived notions interfere with their forming a truthful comprehension of objective fact. There is not one person in fifty whose habits of mind are sufficiently aceurate to enable him to give a truthful deseription of the exterior of a rose !"

We cordially endorse these sentiments, and are perfectly satisfied that durable profit in seience rests, not merely with thase who have talent and opportunity to bring themselves into notice, but with those who, in adlition to these absolutely necessary adrantages, have learnt to discipline their minds in the moral qualities of courage, probity, and patience. Were it our intention to enlarge very fully on this topie, many illustrations of the moral effects produced by an investigation of the works of Nature might be brought forward; but, on such lofty ground, a cautious tread is necessary.

It is true that things familiarly known and understood often fail to leare their due impression on the mind ; yet this evaneseence is in a great measure counterbalaneed in those who
court philosophy in common things. Some phenomena, too, maintain their teleologic power, in spite of the deteriorating influences of familiarity, or the materialistic tendencies-falsely so called, if rightly viewed-of developmental hypotheses. What theories, we ask, shall nullify our independent conceptions of the final cause demonstrable in an examination of the marvellous mechanism of the Camcl's stomach-associated, as it is, with other co-ordinating structures in the same animal, almost equally significant? Our minds are not stultified, nor our reasonings fettered by the consideration that the stomachal compartments and their numerous water-cells are, after all, mere diverticula of the cosophagus! On the contrary, these morphological variations do but serve to indicate a uniformity of plan, harmoniously blended with the development of other tissues, oljects, and circumstances by which the creature is surrounded ; and, therefore, may we admit, with Lavater, that every organ is " an assemblage of incomprehensible effeets," whilst, at the same time, we recognize the fact, that cach bears a strict relation to all exterior organic and inorganic phenomena manifested throughout time and space; such a persuasion, however, does not, on the other hand, weaken our respect, or even admiration, for the man whose imagination is excited by the sudden discovery of a previously unscen marvel ; and whilst history has unfolded to us many curious illustrations of this kind-and a very memorable one in the casc of Sir Isaac Newton-we can, nevertheless, weli afford to do homage to the words of an eminent British surgeon. This distinguished man-unknown, we belicve, in the religious world-on opening the paunch of a Dromedary for the first time, paused to reflect on the beautiful structure there presented to his gaze, and then, on bended knee, exclaimed in solemn phrasc-"O God! how wonderful!" Such an utterance, deep and heartfelt, betokened, at all events, the moral power of the study of Comparative Anatomy ; and we know of nothing in the history of differentiating specializations, as they are pedantically termed, which can in the slightest degree invalidate the force of so virtual an expression of belief in the doctrine of final causes!

On this delightful theme we enlarge no further. Brevity in the cnunciation of our purpose may have failed to convey a duc estimate of the scope and tendency of Natural History science; yct, if haply the appetite has been augmented, the mind imbucd, the desire enlarged, and the will provoked in the direction our arguments have tended, we fear not now to invite our readers to a close acquaintance with the facts set forth in the prescent volume.

## ANOUTLINE

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## CLASSIFICATION OF MAMMALIA.

## FIRST GROUP-PLACENTAL AND VIVIPAROUS MAMMLSS.

Order
I. -Bimana, $\qquad$ Mominide; Man.

Simiadk; Monkeys of the Old World, i.e., Anthropoid Apes, True Apes, Monkeys Proper, and Baboons.
Celidac ; Monkeys of the New World, or American Monkeys.
Hapatide; Marmozets.
Order II.-Quadrumana, .........
Lemurida; ; True Lemurs.
Lichanotide; Indris.
Nycticelide; Loris, Galagos, Potto.
Tarsiede: Tarsiers.
Cheiromyider; Aye-aye of Madagascar.
Galcopithecida; Flying Lemur of Java.
Order III.-Cileiroptera, ......... $\{$

Vespertitionidc; Pipistrelle, Noctule, Serotine, Barbastelle, LongEared Bat, \&e.
Order III.-Cineiroptera, .........
Rhinolophider ; Horse-shoe Bats.
Phyllostomidre; Vampires, African Leaf Bat.
Pteropida; Kalong, \&e.
Order IV.-Insectivora,.......... $\left\{\begin{array}{l}\text { Talpidce; Moles, Star-Nose, Chrysochlore. } \\ \text { Soricide; Shrev-Moles, Shrews, Musk-Rat, Elephant-Mouse, Soleno- } \\ \text { don, Bulan, \&c. } \\ \text { Tupaiade; Tupaias. } \\ \text { Erinaceade; Hedgehogs, Tenrec, Sokinah. }\end{array}\right.$
[ Ursidce; Bears, Badgers, Racoon, Ratel, Glutton, Coatimondi, \&c.
Mustelidce; Weasels, Martens, Sable, Ermine, Otters, Skunk, Teledu, Grisons, \&c.

Order V.-Carnivora, ............
Viverride; Civets, Iehneumons, Genet, Rasse, Paradosure, Mangue, Galet, \&e.
IIycenides; Hyænas, Aard-Wolf.
Canidce; Wolves and Dogs, Foxes, Jackal, Fennec, Lycaon, Lalande.
Felider; Cats, Leopards, Lion, Tigers, Puma, Jaguar, Cheetah, Lyus, Ounce, Serval.
\{ Phocidar; Seals, Sea-Leopard, Sea-Bear, Sea-Lion, Sca-Elephant.
\{Trichecide; Walrus.
Sciuridte; Squirrels, Marmots, Flying Squirrels, Jelerang, Assapan, Sousilik.
Myoxicte; Dormice.
Dipodidce; Jerboas, Alak-Daargha.
Murider ; Niee, Rats, Hamster, \&e.
Arricolide; Voles, Water-Rat, Lemmings, Slepez.
Custoride ; Beaver, Musquash, Coypu.
IHystricidce; Poreupines, Shore-Mole, \&c.
Octodontide; Oetodon, Schizodon, Spalacopus, Habrocome, Ctenomys. Chinchillides; Chinchilla, Chincha, Viscacha.
Cavidce; Cavics, Agoutis, Capybara, Paca.
Leporides; Hares and Rabbits, Calling Hare, Ogotona.

| Order | Vili.-Edentata, | $\left\{\begin{array}{l} \text { Manidce; Pangolins or Scaly Ant-caters. } \\ \text { Myrmecophagidc; Truc Ant-enters, Tamandra, Aard-Tark. } \\ \text { Dasypide; Armadillos, Pichichiago. } \\ \text { Bradypidre; Sloths, Unau. } \end{array}\right.$ |
| :---: | :---: | :---: |
| Order | IX.-Ruminantia, . | $\left\{\begin{array}{l}\text { Bovide; Oxen, Bison, Buffaloes, Musk Ox. } \\ \text { Figosceridte; Goats and Shcep, Ibex. } \\ \text { Antilopide; Gnoos, Antelopes, Eland, Marte-Becst, Bubale, Prong- } \\ \quad \text { lorn, Ec. } \\ \text { Camelopartlide; Giraffe. } \\ \text { Cervide; Stags, Elk, Mcin-decr, Rocbuck, Muntjak, Musk-deer. } \\ \text { Camelicte; Camels, Llamas. }\end{array}\right.$ |
| Order | X.-Solidungula, ... | Equider; Horses, Zcbras, Quagga, Ass, Kiang. |
| Order | XI.-Pacirydermata, .. | $\left\{\begin{array}{l} \text { Elepheantide; Elcphants. } \\ \text { Rhinoceride; Rhinoceroses. } \\ \text { Hippopotamide; Hippopotamus. } \\ \text { Tupiride; Tapirs. } \\ \text { Suide; Boars, Wart-Hogs, Peccarics, Babyroussa. } \\ \text { Hyracide; Dasse, Daman. } \end{array}\right.$ |
| Order | Xil.-Cetacea, ......... | $\left\{\begin{array}{l} \text { Balcenider ; Mysticetc, Razor-back, \&c. } \\ \text { Catodontider ; Cachalot or Sperm Whalcs. } \\ \text { Delphinide ; Dolphins, Porpoise, Beluga, Narwhal. } \\ \text { Manatide ; Manatec, Dugong, Steller's Rhytina. } \end{array}\right.$ |

## SECOND GROUP-NON-PLACENTAL AND OVO-VIVIPAROUS MAMMALS.

Order XIII.-Marsuilalia,.........
Phalaseomyda; Wombat.
Macropides; IVangaroos, Potoroo, Tree-Kangaroos.
Phalangistide: Phalangers, Vulpine Opossum, Flying Plaalangers, Koala.
Percamelidce; Bandicoot Rats.
Dasyuride; Ursinc Opossum, Phascogales, Banded Myrmeculie, Thylacine.
Didelphider; Amcrican Opossums, Yapock.

Order XIV.-Monotremata,
\{Ornithorhynehicte; Duck-kill.
₹Taehyglossida: Porcupinc Ant-caters.


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> WILLIAM MACKENZIE.
> LONDON, GLASGOW, \& EDINBURGH.

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Mride; Quadrumana



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# THE MUSEUM <br> $O F$ <br> NATURAL HISTORY. 

## ZOOLOGY.

## VERTEBRATE ANIMALS-(vErtebrata.)

When the immortal Cuvier published his netr arrangement of the Animal Kingdom, he divided all animals into four principal sections, which we still find adopted, with some modifications, by most naturalists. The changes which have been made in the contents of these great divisions, in accordance with the progress of zoologieal science since the death of the great Freuch comparative anatomist, have principally affected the three lower groups established by him, and the limits of his first and highest division of animals, that of the Vertebrata, have remained withont alteration. This, indeed, is no more than might have been expected. The vertebrate animals are those whose existence has always, from various circumstances, been pressed most forcibly upon the notice of mankind. Vertebrate animals furnish the greater part of our daily food, and amongst them are to be found our most dangerous enemies, so that the mere instinct of self-preservation must have early led even the uncivilized man almost unconsciously to the study of their natural history. Hence, the knowledge of the differences and agreements in the structure of these creatures had made great progress, even in the popular mind, at a period when the greatest philosophers knew little of the remainder of the animal kingdom; and Limæous, in dividing the whole of animated nature into six classes, gave no ferver than four to the creatures which we now distinguish as Vertebrata.

The name of Vertebrata or Vertebrate animals, given to this great section of the Animal Kingdom, has reference to one of its principal characters, namely, the possession of a backbone (spine or vertebral column), composed of numerous joints (vertebrec) attached firmly to each other, but in such a way as, in most cases, to insure more or less flexibility.

The office of this bony column is twofokl. In the first place, by its enlargement into the hollow case called the slaull, and by the presence of apertures in each of its joints, which, when placed in their proper position, form a continuous tube or canal running down the back of the animal-it furnishes a protection for the brain and spinal marrow (spinal cord), the

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great centre of the nervous system, which in these creatures attains a high degree of development. In the second place, by affording support to numerous other bones, varying in form and arrangement according to the duties they have to perform, it constitutes the centre of the skeleton of these animals-a sort of bony framework which at the same time serves to protect the more important internal organs, and to furnish solid points of attachment for the museles by which the movements of the various parts are effected.

This framework of bones consists, in addition to the skull and spinal column already referred to, of the ribs, and of the bones of the limbs-the former, as is well known, constituting a series of long curved bones which inclose the eavity of the chest, and are for the most part movably articulated to the vertebre on each side. The opposite extremities of the ribs are also usually united to a single bone, which oceupies the centre of the anterior or inferior surface of the chest, called the breastbone (or sternum) ; and in most airbreathing Vertebrata the whole framework of the chest is capable of moving by the aetion of the muscles attached to the ribs, in such a manner as to increase or diminish the size of the carity inclosed by them, thus causing the lungs to be alternately filled with and emptied of the air necessary for respiration. The vertebræ which bear the ribs are usiually distinguished by sereral peculiarities of construction from those of the other parts of the spinal colnmn ; they are ealled dorsal vertebrce, or vertebræ of the back; those in front of them, forming the neck, are called corvical vertebre, and those behind them, which are usually of great size, are called lumbar vertebra, or vertebræ of the loins. The latter are followed by the vertebre which support the hinder extremities; and these again, in most of these animals, by a number of vertebre, gradually diminishing in size and completencss, whieh form the tail. These are the caudal vertebræ.

Of limbs in the Vertebrata there are never more than two pairs. The anterior limbs are usually attached to the body by being articulated to a pair of flat bones
called the shoulder-blades, which lie upon the ribs, and are kept in their proper position partly by the aetion of powerful museles, and partly by the support afforded them by one or two pairs of bones whieln spring from the front of the breast-bone ; these bones are often wanting. The linder extremities, on the contrary, are usually articulated to a strong bony ring or basin (the pelvis) whieh is firmly attaehed to the vertebral column below the loins; the vertebræ of this part of the spinc being also completely united to eaeh other, so as to form a single bony pieee (the sacrumı).

In the essential structure of the limbs there is a wonderful uniformity throughout the whole of this great group of animals. Eaeh limb consists of four distinet parts, which eorrespond exaetly in the anterior and hinder extremities, although, in conformity with the usages of human anatomists, they have received different names in the two pairs. In the fore-limb the bones are the arm-bone, the two bones of the fore-arm, the bones of the wrist, and those of the hand; in the lind-limb they are the thigh-bone, tho two bones of the sliank, the heel-bones, and those of the foot. The arm-bone and thigh-bone (humerus and femur) articulate respeetively with the shoulder-blade and pelvis; they are single bones, usually of a eylindrieal form. The fore-arm and the shank include two parallel bones (ealled the ulna and radius in the arm, the tibia and fibula in the leg), one of whieh, in eaeh member (the ulua and the tibic), is united by a hingelike joint with the lower extremity of the arm or thigh-bone, forming the elbow or the knee. The other bones (radius and fibul(a) are searcely, if at all, attached at this joint; they are consequently capable of rotating to a certain extent, and thus enable the hand or foot to be turned in various directions. It is to the broad extremity of these latter bones that those of the wrist and heel (carpal and tarsal bones) are attaehed; these are numerous short bones, paeked elosely together, but still eapable of a greater or less freedom of motion. They are followed by the bones of the hand and foot (metacarpal, metatarsal, and digital bones), which frequently form five rays of three or four joints in eaeh, starting from the wrist or heel. Of these the metaearpal and tho metatarsal bones constitute the palm of the hand and the sole of the foot in man; the digital bones, which are also called phalanges, form the fingers and toes.

It is not to be supposed, however, that all these parts present themselves to our notice with equal distinetness in every ereature formed upon what is ealled by naturalists the vertebrate type; in fact, we meet with an almost endless variety of modifications in the different regions of the body, but especially in the limbs; and the study of these modifieations, of the wonderful series of changes, by which the Creator of all things, submitting limself, as it were, to a selfimposed lav, has adapted the same general type of structure to the most dissimilar purposes, is not only one of the most interesting branehes of zoology, but also one of the most striking proofs furnished by natural theology of the prevalcuce of an intelligent design in Animated Nature.

It is the business of the philosophieal anatomist to investigate these marvellous modifieations of structure; to trace the plan by which the same organs have been adapted to the most different offices, and to endeavour, by dedueing therefrom the abstract or ideal form from which all the special structures presented to our observation may be derived by variations in the degree of development of the different parts, to obtain a type with which things, apparently the most dissimilar, may be compared: and thus to enter, as it were, into the mind of the great Designer of the universe. It is, however, unnecessary here to dwell at any length upon this most interesting branch of seience, and we shall therefore content ourselves with giving a very brief abstract of the gencral results which have been obtained by mueh earnest thought on the part of some of the greatest minds of the present century.

Aceording to the generally received views, the skeleton of a vertebrate animal is composed of numerous segments or vertebre (the latter term being used in an ideal sense). Even the skull itself is proved to consist of several vertebre developed in a remarkable manner-the bones of the face holding the same relation to those of the true skull, that the ribs do to the superior areh of the dorsal vertebre through which the spinal cord passes. The four limbs are appendages of two partieular vertebral segments; and similar appendages are met with in a rudimentary form upon other segments in some animals.

Regarding the skeleton in aceordance with these views, as consisting ideally of a series of similar segments, we find that it is by the suppression of eertain parts of some of these, and the greater or less development of others, that the varied forms of vertebrate animals are produced. The appendages eonstituting the limbs are, as already stated, usually suppressed eompletely in all but two segments, and the ribs often share the same fate in the neek, loins, and tail. In other eases the bones of one or both pairs of limbs are wanting, and in some of the lowest forms we find nothing left but the vertebral column itself, whieh sometimes is not even ossified, but consists of a gelatinous or eartilaginous cord, ruming, with little or no trace of any division into vertebre, from the head to the extremity of the tail.

Yet throughout all these variations the intelligent observer traees one uniform plan: the great centre of the nervous system always eonsists of a brain and spinal cord, supported in all but one instance, by a structure whieh may be recognized as a vertebral eolumn; the jaws are always supported by bones or eartilage beneath the skull, and their opening is always horizontal; the limbs are never more than four in number ; the heart is always museular, and conneeted with a distinet system of vessels, through whieh courses a blood, coloured red by inmumerable globules; and the organs of the four speeial senses (sight, hearing, smell, and taste) are almost always highly developed, and invariably placed in eavities of the face and head. The viseera are very similar in their nature thronghont the entire group, and the animals are always male or female, never hermaphrodite.

## Class I.-MAMMALIA.

In whatever light we consider the general arrangement of the animal kingdom, the Mammalia must always occupy the highest place in the system. Both in complexity of organization and in general intelligence, the mombers of this class, which even includes our own species, bear the palm from all other animals; and, if we descend to purcly utilitarian views, it is amongst the ranks of the Mammalia that we must seck for all the most valuable of those creatures which have been in every age most scrviceable to the human race, and have contributed most importantly to the progress of civilization. The noble and generous horse, who lends his back to the burden and his neck to the yoke with equal readiness; the brave and faithful dog, the constant friend and companion of man in all countries, and his firm ally in the subjugation of other animals; the camel, the far-famed "ship of the desert," without whose patient endurance and great strength the vast sandy plains of Africa and the desert steppes of central Asia, would have presented a more serious obstacle than even the ocean itself to the intercourse of the eastern nations; the cattle and sheep which constitute the riches of pastoral tribes, and without which an advanced civilization would be almost an impossibility: these are only a few of the important species of the class Mammalia, which have been in all timcs subjected to the dominion of man. We may seek in vain in any other class of animals for even a single species that may be compared with one of these.
Notwithstanding the great importance of the Mammalia, however, we have no English word to express the whole class, although the great majority of them may come under the denomination of beasts. The term quadrupeds, which also applies to the majority, is likewise inadmissible, both bccause it is equally applicable to many reptiles, and because some true Mammalia are not furnished with four feet. We are therefore reduced to the employment of the term mammals, to express the animals now under consideration in a general sense; as this term, derived from the Latin word mamma, a breast or teat, expresses the leading peculiarity by which these creatures are distinguished from all other animals-namely, that of nourishing their young, which are born alive, by means of a secretion produced by certain glands placed on the chest or abdomen of the mother.*
Independently of the physiological characters derived from the viviparous reproduction and the provision of milk for the nourishment of the young, which prevail in all the animals of this class, we find in other points of their structurc an abundance of pcculiaritics by

* The Germans have the expressive term Sïugethiere, or sucking animals, for this class. The term Mammiferes, or teatbearers, is in ordinary use ainongst French writers, and of course refers to the same character as the term Mammalia here adopted. The name Piliferes, applied to the class by De Blainville, in allusion to the hairy covering of most of the species, has never been much made use of.
which they may readily be distinguished from the rest of the Vertcbrata. They all breathe air by means of lungs, consisting of a minutely cellular structure, suspended freely in the cavity of the chest, and unconnected with any air-tubes or sacs penetrating the other organs of the body, as in Birds. The chest is separatcd from the abdominal cavity by a muscular and tendinous partition called the diaphraym, the movement of which, by enlarging the cavity of the chest, is onc principal cause of the inspiration of air. The heart contains four cavities, two ventricles for the propulsion of the blood through the arteries, and two auricles for its reception from the veins; this character is common to the Mammalia and Birds. The mouth is closed by fleshy lips, which are almost always movable; and the skin, with but few exceptions, is more or less covercd with hair.

The structure of the skelcton also furnishes most important characters in this, as in other classes of vertebrata. The bones are, for the most part, destitutc of air-cells, and where these exist, they do not communicate with the lungs. Most of the bones are solid, and those which posscss cavities (such as the thigh-boncs and arm-bones) have them filted with a peculiar fatty substance, well known as marrow. Air cavities in the bones are usually confined to the head, where they are commonly known as sinuses; these attain a great development in the ruminating quadrupeds, such as the sheep and deer, and in the elcphant the great sizc of the skull is mainly due to the large air-cells which scparate the two faces of the cranial bones.

The body of a mammal is usually divided into threc portions-the head, neck, and trunk; and thesc arc, in most cases, clearly distinguishable cvon in the living animal. In the skeleton, as will be seen by a glance at plates $32,33,34$, they are still more strongly marked, and we find that in this we may again divide the boncs of the trunk into several distinct systems-namely, the dorsal vertebræ, with the ribs; the lumbar vertebræ, forming the loins; and the sacrum, bearing the supporting arch of the hinder extremitics; beyond which the vertcbral column is usually continued into a gradually decreasing series of vertebræ, forming the tail.

The skull, including all the bones of the head, prcscnts the following leading characters in mammals:The cranium, or true skull, containing the cavity for the reception of the brain, is of larger comparative size in these than in any other Vertcbrata; its bones are immovably connected with each other, and with those of the upper jaw and face, a character which is peculiar to these animals. The occipital bone, which forms the base of the skull, and is pcrforated by the large aperturc for the passage of the spinal cord, bcars a pair of articulating tubercles by which the skull is attached to the first vertebra of the neck. The upper jaw is formed by two maxillary and two intermaxillary bones, which bear teeth in a single row along their
margins. The two halves of the lower jaw consist each of a single bone ; they are united in front either by a cartilage or by a suture, or sometimes, as in man, the two sides of the jaw are completely amalgamatcal so as to form one bony picce. The lower jaw in the Mammalia is articulated directly to the skull, without the intervention of any other movable bone.
The jaws, as already intimated, are furnished with teetl, and these exlibit a great diversity in their form and strueture. They are always implanted in sockets of the jaws, aud these are lined by a delicate membrane, so that the teeth are never anchylosed or completely united to the bone of the jaws. The teeth consist of a hard substance called dentine, defended by a coating of enamel, and covered by a layer of a third substance called cement. The latter is very thin on the crown or exposed portion of the tooth in man and many animals, which have teetl similar to those of the luman species; but in the teeth of many herbivorous mammals the cement acquires a great development, and vertical folds of this sulbstance and enamel penetrate the dentine of the crown, thus giving rise, as the teeth are worn away, to an uneven surface eminently adapted to the comminution of tough vegetable matters.
A few species are entirely destitute of teeth; in others a few of the teeth are wanting, or some of them undergo peculiar modifications to adapt them to particular purposes. But in the majority we find four different sets of teeth called respectively the incisors, or cutting teetli ; the canines; the premolurs, or false molars ; and the molars, or grinders. The incisors or cutting teeth are inserted in the intermaxillary bones in the upper jaw, and occupy the corresponding place in the lower one. Their number varies from two to ten, and their form is also subject to much diversity; but they are usually flattened transversely, so as to form a cutting edge across the front of eacl jaw.
The canines, so called from their large size in the dog, are also very large in all carnivorous mammals. In the human subject the upper ones are frequently called eye-teeth, from their being placed directly beneath the eyes. Of the canines we find one on each side in each jaw; the upper ones are inserted at the anterior angles of the maxillary bones, and the lower ones in a corresponding position in the lower jaw. When most largely developed, they form long, curved, conical, acute teeth, capable of inflicting the most serious wounds.
The premolars, which are usually three or four in number on each side, are generally separated by a short interval from the canines, which they frequently resemble in having only a single root ; their crown is nsually broad and tubercular or ridged, in a mamer more or less resembling that of the true molars. The latter, of which there are also commonly three or four on each side, are the largest and strongest of all the teeth, and are implanted in the javs by two or more roots, a character peculiar to the Nammalia, aud one which is often of the greatest importance to the paleontologist in detcrmining the nature of those fossil remains by which a certain lighth has been thrown mpon the former history of our planet. 'The molars, of all the teeth, are those which appear to mendergo the
greatest amount of modification to fit them to the habits and food of the animals. In the carnivorous forms we find them furnished with sharp cutting edges, and fitting toge ther like the blades of a pair of scissors; in those which prey principally upon insects, whose hard and slippery armour renders them rather difficult to be disposed of, the molars are furnished with a double row of slarp points, from which even the hardest beetle could not find it easy to escape; in those which, like the monkeys and our own sjecies, feed upon fruits or upori a mixed diet of soft animal and vegetable substances, the crowns of the molars are of a more or less cubical form, with the surface divided into several blunt tubercles by furrows which traverse it in different directions; and lastly, the strictly herlivorous species usually present an intermixture or alternation of the three substances of which the teeth are composed, such as produces a series of ridges upon their surface, as they are gradually worn down during the trituration of the food.
The teeth are produced from a pulpy germ or matrix contained within the jaw, and in the majority of the Mammalia the activity of this germ continues after it las served for the formation of the series of teeth first produced. These, which are commonly known as the mill-teeth, are shed at a certain period of life, when their places are taken by new teeth adapted to the increased size of the jaw. The milk-tectl include the incisors, the canines, and three or four molars on each side; the two former groups are replaced by new incisors and canines; the deciduous molars are shed to make room for the premolars, whilst the true molars are produced later than the other teeth, and are never changed. The teeth of the Mammalia are never shed more than once; but, in some forms, the formative pulps of some of the permanent teeth continue in activity during the whole life of the animals, and thus the teeth are constantly growing at the root. As these modifications of the teeth are usually characteristic of certain orders of Mammalia, they will be more particularly referred to hereafter, when the beautiful adaptation of their structure to the habits of the animals will be more clearly seen.
The gencral structure of the skeleton will not detain us long, as it nearly agrees with that alreally described (pp. 1,2), as the most perfect development of the vertebrate type. The vertohral column, or hack-bone, as it is usually termed, is divided into several regions, as has been already stated: these are called the cervical, dorsal, lumbar, and saeral regions, or the regions of the neck, back, loius, and sacrum; and the continmation of the vertebral column into the tail, when this exists, constitntes the caudal region. The same mames are applied to the vertebre composing each region.
Of the cervical vertebre there are almost invariably seven; and this is the only region of the body in which the number of vertebre is at all constant.* Whatever may be the length of the neck in these animals, the number of the vertebre is the same; the slort neck

* The mbly exeeptions to this rule are presented ly the Sloths, in which the neek contains cight or nine vertehne : nnd by the Southem Manatee (Monutus australis), which usually has only six cervical vertebrie.
of the human subject, and the enormously long one of thic giraffe, each contain scven vertebre, although the one constitutes only onc-seventh and the other thrcesevenths of the entire vertebral column. In the whales the vertcbre of this region of the body are completcly united together, to form a single bone. Except in the sloths, all the cervical vertebre are destitute of ribs, and the spinous processes gradually increase in height as we recede from the head. The first two vertebre, however, in the Mammalia, present peculiaritics of structure which have obtained them distinct names in all systems of anatomy. The first, called the atlas, forms a bony ring, bearing on its upper surface a pair of cuplike depressions for the reception of the prominent condyles or articulating tubercles of the base of the skull (sce p. 3) ; by means of this articulation the head is cnabled to move up and down. The second vertcbra is called the axis, from its possessing a pcculiar process which projects forward into the ring of the first, and artienlates with a flat surface on the inside of its anterior part. By this arrangement the rotatory movement of the head is effected.

The dorsal vertebre are usually thirtecn in number ; but this gencral rule is liable to many exceptions. The foremost dorsal vertebre usually have their upper spinous processes greatly devcloped, especially in animals posscssing long nceks or heavy heads; these processes and those of the postcrior cervical vertcbre give attachment to a strong ligament (the nuchal ligament), which powerfully aids in supporting the head, and in some animals is continued backward as far as the loins. The dorsal vertebræ arc distinguished from the rest by their bearing the articnlating surfaces for the ribs, which are confined to this region of the body. The ribs are long, usually slender, curved bones, which articulate by their heads with the bodies of two vertebre, and are nearly always supported by a tubercle against the transversc processes of the hinder of thesc. The anterior or true ribs arc united by cartilaginous picces with the stcrnum or breast-bone, whieh occupics the centre of the anterior or lower part of the chest. Bchind these arc some shorter ribs, commonly known as falsc or floating ribs, which are never united directly with the stcrnum, but only by the intcrmediation of a common cartilaginous band.

Of the lumbar vertcbre there are usually six or scven, but the number varies from two to ninc. They are usually larger in the body than the dorsal vertebre, and the lateral processes are often greatly developed; they are distinguished from the dorsal vertcbrex by the absence of ribs, and of the surfaces for the attachment of the lattcr. Bchind the lumbar region comes the sacrum, a single bony piece, which sometimes consists of ouly onc vertcbra, but is usually composed of threc or four amalgamated together, bearing traces of its compound nature in the apertures which indicate the original points of scparation of the distinct vertcbres. This bone gives a firm attachment to the pelvis, or supporting arch of the hinder limbs, which will be described in treating of those members. The caudal vertebre are usually numcrous, amonnting to as many as forty-six in the long-tailed manis. The smallest number of distinct joints is four ; but in the human
species, and in some others, the caudal region of the vertcbral column is reduced to a mere rudiment.
The structure of the limbs is nearly identical with the description of the typical conformation of the extremities of the vertcbrata already given. The antcrior limbs are always present in mammals; the postcrior are somctimes deficient. The former are articulated to a shoulder-blade or scapula, $Q$, a flat and somewhat triangular bone, usually provided with a strong ridge on its upper surface, which lics amongst the muscles upon the anterior ribs. The shoulderblades are frequently supported in their position by collar-bones or clavicles, which spring from the fore part of the sternum, and at the opposite extremity articulate with the lower part of the shonlder-blade. These, however, are sometimes wanting, or imperfcetly developed. The coracoid bones, which form an important part of the supporting arch of the antcrior members in Birds and lieptiles, constituting, in fact, a second and even more powerful pair of collar-boncs, only oceurs in its full development in one small group of mammals ; in the rest it is reduced to a rudimcutary condition and amalgamated with the shoulder-blade, of which it forms a small process.

The anterior limb itsclf usually consists, as previonsly stated, of the arm-bone or humerus, n ; the radius and ulna, $\mathrm{s}, \mathrm{T}$; the carpus or wrist, U ; the metacarpus or hand, v ; and the fingers, w. These parts all undergo great modifications, not only as regards their form and comparative size, but also by the amalgamation, or total suppression of some of their subordinate constituents. Thus, in the monkeys, Plate 34, fig. 111, we generally find all the parts fully developed, and almost equal in perfection to the same parts in man; in the carnivorous beasts, Plate 33, fig. 105, the various portions of the apparatus are still very distinct, but the great mobility they possess in man and the monkcys is alvcady considerably diminished, to adapt the limbs to the purposes of terrestrial progression; in the seals, Plate 34, fig. 114, and the cetacea, Platc 34, fig. 109, we still recognize the same parts, but with their mutual powers of motion still further limited, to fit them to act as paddles in the water. The ant-eater and the sloth, Plate 33, fig. 107, and Plate 34, fig. 112, also exhibit the samc structure, modified in its details to suit particular purposes, and in the latter case displaying a diminution in the number of fingers. With the exception of the aquatic scal and dugong, all the animals to which we have hitherto referred are cither terrestrial or arboreal in their habits; but in the bats, Plate 34, fig. 110, we find the anterior limbs adapted for the purpose of flight. In these the arm-bonc, n , is not very disproportionately elongatcd, but the bones of the fore-arm, s , the metaearpal bones, v , and the phalanges or finger-bones, w , are of immense length, and thesc, by stretching a leathery membranc which unites them, enable the bats to raise themsclves into the air, and to fly through that clement with great swiftness.
In the terrestrial animals to which we have alrearly rcferred, the radius and ulna were still capable of a ccrtain amount of rotatory motion, although not to the extent presented by the monkeys. In the herbivorous terrestrial mammals, the tocs are terminated by hoofs,
by which means the feet are at once admirably adapted for long-continued and swift motion, and completely deprived of all prehensile power. The faeulty of turning the fore-foot, consequently, becomes unneeessary, and we find, aecordingly, that in the hoofed animals, the radius is reduced to a perfectly rudimentary eondition, or amalgamated with the ulna, or altogether suppressed. In the hog, fig. 108, Plate 33, the metaearpal bones and phalanges, of which we find four series, remain distinct, but only the two middle toes reach the ground; the others terminating in the two little hoofs which project from the back of the foot in this animal. In the sheep, fig. 103, Plate 33, the amalgamation and suppression go still further; for here we find only one metacarpal bone and two toes, each covered by a hoof. In the horse, again, even the second toe is suppressed, and with the exception of the wrist, the whole limb is essentially composed of a single series of bones plaeed end to end. Thus, from the beautiful and delicate organization of the human hand, an organ capable of performing the most varied functions, down to the single toe of the horse, incased in a solid horny hoof, we find an uninterrupted series of steps, by tracing which we may see elearly how the great Designer, by merely modifying a single original plan, has produced creatures destined to play the most various parts in the grand economy of nature. And although we may attribute greater perfection to one form than to another, it must be remembered that such expressions are purely conventional, and that each creature, incomplete as the development of some of its parts may appear when compared with the same parts in other animals, is in reality as perfect, and as perfectly adapted to the purpose for which it was created, as any other; indeed, those very modifications of structure, which, at the first glance, would seem to be imperfections, arc found, by careful study, to constitute beauties instead of blemishes in the great spectacle of mature.

We find the same structure, and the same modifications of structure, in the posterior as in the anterior limbs; but in these the mode of attachment to the rest of the skeleton is usually of far greater strength and solidity. The bones of the pelvis, which here take the place of the shoulder-blades and collar-bones, are immovably fixed to the sacrum; and, although in the einbryo, and sometimes in the young mammal, there are three of these bones on each side, in the mature animal these are all completely united together ; in most cases, also, the two sides of the pelvis are firmly united in the median line below, so as to form a strong but irregular ring of bone.

Near the middle of each side of this ring is the socket for the articulation of the thigh-bone or femur, n , which is usually a long, cylindrical bone with a nearly globular head, set on it almost at a right angle. Below this, at the knee-joint, are artienlated the tibia and fibula, or shank-bones, $\mathrm{J}, \mathrm{K}$; and these are followed by the tarsus, L , inchuding the heel, the metatarsus, m , and the phalanges of the toes, N . The correspondence of these bones with those of the antcrior limb, will be at once seen by a glance at the figures of the skeletons, Plates $32,33,34$; and these also show clearly that the modifieations already described as oecurring in the fore-
leg, are aeeompanicd by corresponding changes in the linder extremities. The only mammals in which the hinder limbs are wanting are the Cctacea (whales, ete.), and in these the pelvis is represented by a pair of bones, united below in the form of the letter V , and suspended in the museles below the saerum, fig. 1 D .

The classification of the Mammalia still generally adopted, and the one which will be followed in the present work, is founded, with some important modifications, upon that of Cuvier, which in its turn was a great improvement upon the system proposed by Linnecus. The great Swedish naturalist divided the Mammalia into seven orders, distributed in three primary sections, called unguiculata, or clawed mammals; ungulata, or hoofed mammals; and mutica, or maimed mammals. The last section includes only the order Certe, formed by the whales and allied forms, in which as has already been stated, the hinder limbs are wanting. The hoofed mammals form two orders-the Pecona, or cattle, including the ruminating quadrupeds, and the Bellude, those which do not chew the cud. Of the four orders of clawed mammals, the first or Primates, distingnished by having two pectoral mamme, and by certain characters of the teeth, inchedes the human species, the monkeys and their allies, and the bats; the second, Bruta, in which the incisor tecth are wanting, is formed by the sloths, ant-eaters, and allied species; the third, Fera, includes the carnivorous mammals; and the fourth, Glimes, those which, like the rat and the rabbit, have two chisel-like incisors in each jaw.

Cuvier, following the general arrangement of Linnæus, also adopts the same indications of a division of the class Mammalia into three primary groups. But in the Cuvierian system we find no order Primates; and the species of which this Linnæan group is composed are distributed into three orders. Man, as the highest type of organization, is placed in a distinct order, called Bimana, or "two-handed;" the monkeys and their allics form a sccond order, that of the Quadrumana, "four-handed;" and the bats are associated with the greater part of the Linnæan Ferce, to form Cuvier's order of Carnassiers or Carnivora. Another portion of the Fera of the great Swede were, however, separated by Cuvier, on account of certain singularities in their organization and mode of reproduction, to form the order of Marsupiaux or Marsupialia, so called from the females having an abdominal pouch in which the young are protected for some time after their birth. Two other unguiculate orders are admitted by Curier. These are called Rongeurs, Rodentia (gnawers), and Edentés or Edentata (toothless mammals), by the French naturalist, and correspond with the Glires and Bruta of Limnæus. Cuvier's two orders of hoofed quadrupeds, the Pachydermes or Pachynermata, and the Ruminants or Ruminastia, correspond with the Limman groups Belluce and Pecora, and both systems are closed by the whales, etc., which form Cuvier's order of Cétucés or Cetacea.

The most important new feature in Cuvier's classification of the Mammalia eonsists in the establishment of the order Marsnpialia. These singular animals which, with the exception of the American opossums, are confined to Australia and the adjaeent comtries, are dis-


#### Abstract

tinguished from the rest of the mammals by the very imperfect eondition in which the young are born. In the ordinary mammals, when the embryo has attained it eertain degree of development, a vascular body called the placenta is produced, by which the union of the young animal with the mother is greatly inereased. This organ is never formed in the animals arranged by Cuvier in his order Marsupialia; their young are produced in an almost embryonie state, and the mother is usually furnished with an abdominal pouch containing the teats, which serves as a protection to the young animals during their helpless state. This character is referred to in the name given to the order, which is derived from the Latin marsupium, a pouch. In order to give the poueh a firmer support than it could derive from the abdominal muscles, the animals are furnished with a pair of peculiar bones (the marsupial bones), whieh spring from the anterior part of the pelvis; the presence of these bones constitutes one of the most important practieal charaeters of the group, as they oceur both in the males and females, and even in those species in which the pouch is deficient, or replaeed by a mere fold of the skin of the belly. Besides these characters, there are others of great importanee presented by the structure of the brain, in which, as in their reproduction, the Marsupialia evidently exhibit a marked approach to the oviparous elasses of Birds and Reptiles. In most of the Mammalia the two hemispheres of the brain are united, besides other bonds of union, by a large band called the corpus callosum; this is entirely wanting in the marsupials. The hemispheres themselves are smooth and smaller than in other mammals, leaving the olfactory and optic lobes and the cerebellum perfectly visible when the brain is viewed from above; characters whieh show a certain resemblance to those of birds. Taking the whole of the above peculiarities into eonsideration, nearly all zoologists have not only coineided in admitting the justice of Cuvier's separation of the


animal, presenting them as a distinet order of mammals, but have even gone beyond him, and regarded these creatures, with two singular animals referred by Cuvier to the Edentata, as forming a distinet subclass of mammalia, which has been denominated Aplacentalia or Acotyleclona, from the absence of the plaeenta, the must striking physiological character exhibited by its members. Most naturalists, although regarding the eharacters presented by the aplacental mammals as indieative of a lower pusition in the seale of organization than that oceupied by the rest of the elass, have not failed to pereeive that in the characters of the dentition, the limbs, and the general conformation of the body, they present a diversity almost as great as that manifested amongst the Placentalia, so that we find amongst them herbivorous, earnivorous, insectivorous, rodent, and even edentate forms; and thus arose the idea that the two subclasses of Mammalia were rather to be regarded as parallel and mutually representative series than as truly superior and inferior groups. This notion, earried still further, led some zoologists to ignore the section of aplacental mammals altogether, and to distribute its members amongst those orders and families of Mammalia with which, in their other characters, they seemed to be most nearly allied. As, however, these views were for the most part promulgated by writers who had some favourite theory of elassification of their own to support, they naturally died with the systems which gave them birth, although it is remarkable that in one of the most reeent and valuable works on the Mammalia,* we find the toothless aplacental mammals arranged with the Edentata as in the system of Cuvier, whilst the remainder of the subelass still stands as the order Marsupialia. Dr. Gray, of the British Museum, also places the toothless speeies with the true Edentata, whilst he follows Linnæus in placing the marsupials amongst the Ferce. $\dagger$
The system that will be adopted in the present work is shown in the following tabular view:-

## Subclass 1.-Placental Mamals.

## A. Unguiculate or Clawed.

Order 1. Brmana; the anterior limbs furnished with hands.
" 2. Quadrumana; furnished with four hands; the posterior thumbs opposable.
6. 3. Chemoptera; anterior limbs converted into wings, the fingers being very long, and connected by a membrane.
" 4. INSECTIVORA; four fect formed for walking; molar teeth broad, with sharp tubercles.
" 5. Carnivora; four feet formed for walking; molars narrow and sharp.
" 6. Pinnipedia; four feet formed for swimming only; molars narrow and sharp.
" 7. Ronentia; four feet formed for walking; no canine teeth; incisors two in each jarr, chisel-shapcd,
" 8. Edentata; four feet formed for walking or climbing; no incisors or canines in either jaw.

## B. Ungulate or Hoofed.

Order 9. Ruminantia; hoofs cloven ; incisor teeth wanting in the upper jaw; stomach complicated.
" 10. Solinunaula ; feet with a single toe and a solid hoof; incisor tecth in both jaws.
"11. Pachydermata; feet with two or more toes and hoofs; incisor teeth always in the upper jaw.
C. Mutilated or Defective.

Order 12. Cetacea; body fish-like; anterior limbs converted into paddles, posterior limbs wanting. Subclass II.-Aplacental Mammals.
Order 13. Marsupialia; tcats inclosed in a pouch, or between two folds of the skin of the belly; incisor and molar tecth always present; only one clavicle ; extcrnal ears.
" 14. Monotremata; with a single outlet or cloaca, for the urinary, gencrative, and intestinal organs; no pouch or extcrnal ears; teeth wanting or horny in texture ; clavicle double.

[^1]We have not thought it necessary to indieate in the history of the elassifieation of the Mammalia, the different steps by which Cuvier's arrangement has been modified so as to produce the fourteen orders shortly charaeterized above. These consist in the separation of the Chciroptera, Insectivora, and Pimipelia, from the Carnassicrs of the great French zoologist ; in the separation of the horses from the Paehydermata of Cuvier, to form the order Solidungula, and in the establishment of the order Monotrentata for the edentulous aplaceutal mammals, placed by Cuvier and some other authors with the Edentata.

In concluding this portion of our subject we must, devote a little space to the consideration of a new scheme of elassification of the Mammalia lately put forward by the distinguished British comparative anatomist, Professor Owen. Starting from the assumption that the brain, as the centre of the nervous systen, the most important of all the constituent elements of the animal body, must necessarily be modified in aceordance with the habits, instincts, and powers of the various creatures, Professor Owen has taken the structure of this wonderful organ as the foundation of his system ; and from the characters thus obtained he coneludes that the two subclasses of placental and nonplacental mammals are not of equal value, and that it would be more proper to divide the class into four subclasses. Of these the first, which Professor Owen denominates the LyencePIIALA, or "loosed-brained," are distinguished by the imperfect union of the two cerebral hemispheres, from the want of the corpus callosum already referred to; the hemispheres are smooth and small, exposing the
olfuetory and optic lobes and the ecrebellum. T'his subclass corresponds with our Aplacentalia.

In a second subelass the hemispheres of the brain are united by a corpus callosum, but are not much larger than in the preceding, leaving the greater part of the olfactory lobes and the cerebelluin exposed; their surface is slightly convoluted in a few of the largest species of the group, but in the majority they are smooth. From this circumstance Professor Owen proposes to call the animals of this subclass Lissencepinala.
'Those of the third group have the surface of the brain more or less convoluted, with but very few exeeptions. Hence they are ealled Gyrencephala. The cerebral hemispheres are much more largely developed in this than in the two preeeding groups, and cover more or less of the cerebcllum and olfactory lobes.

Lastly, in the highest subclass, the Arciencepiala, which includes only the hunan species, we find nearly the same cerebral charaeters as in the third group; but the hemispheres are much larger, forming the whole mass of the brain when viewed from above, and the convolutions are deeper and more numerous.

The animals belonging to each of these subelasses present certain anatomical peculiarities in common, which are carefnlly indicated by Professor Owen in his paper, and appear to lend considerable support to his views. The orders admitted by the learned professor are for the most part identical with those adopted in the present work; the differences in this respeet and in the general arrangement will be easily scen from the following table :-


The Pinnipedia (seals) have vanished from the list to take their old place amongst the Carnivora, and the Solidungula no longer figure as a distinet order ; but these losses are compensated by the division of the Cetacea into two orders, and by the establishment of the order Proboseidia for the clephants. The principal difference, besides these, between the classification proposed by Professor Owen and that adopted by the present writer consists in the mode of division of the rest of the hoofed quadrupeds. These, with Professor Owen, form the two orders Artiodactyla and Perissodactyla, or even-toed and odd-toed beasts-the former including the ruminants, the pigs, and the IHippopotamus ; the latter the horses, the tapirs, the IHyrax, and the rhinoceroses. It seems to the anthor, however, that this mode of arrangement, the prineipal merit of which consists in its allowing the assignment of a definite place in the system to
the remains of certain extinet species of Mammals, can hardly be regarded as natural when applied to those creatures, the whole of whose organization is known to us. The Ruminants appear to constitute a most natural and well-defined group, which camot, taking the mass of their characters into consideration, be properly associated in the same order with any other forms of quadrupeds ; so that the only course to be adopted would be that of establishing a separate order for the pigs and Hippopotami. This, however, does not appear to us to be necessary, and we shall therefore adhere in the present work to the old orders, Thminantia and Pachydormata.

As regards the general arrangement or sequence of the orders and the establishment of the subclasses proposed by Professor Owen, no one ean venture to give an opinion who has not thoroughly and patiently worked
over nearly the same. ground on the same principle of careful and conscientious investigation, in order, if possible, to obtain results which shall cither confirm the views advaneed by him, or show in what manner some fallacy may have crept into his generalizations. There can be no doubt that although this classifieation may not erentually be adopted as a whole, it must exereise an important influenee on the views of suceeeding
zoologists ; and we have therefore dwelt upon it here at considerable length, feeling that, although the requirements of a popular scientific roork eompel us to follow as elosely as possible those opinions whieh are most generally cntertained, the reader might fairly elarge us with neglect if we omitted to place before lim some aecount of a system which has justly acquired so mueh celcbrity.

## Order I.-BIMANA.

Altiougii it eannot be denied that man, in his physieal relations, is a member of the zoological scries, and, as suel, must occupy a place in our classification, it is not our intention, nor indeed is it compatible with the general scope of the present work, to enter at any length upon the consideration of the natural history of the liuman race. The study of this subject is far from being a purcly zoological investigation. It includes a careful examination of the political history of mankind, from the carliest reliable records down to our orvin days, in order that the student may acquire some notion of the migrations performed by different races or varieties of men, and the consequent displacements and intermixtures that have taken place. The moral and intellectual qualities of the various races liave also to be taken into consideration ; and, of late years especially, the eomparison of different languages, both as regards their verbal and grammatical accordance and diversity, has justly been regarded as affording a most valuable clue to guide the investigator in the labyrinth of tribes and nations. It is evident that a subject embracing such various investigations, and entering into the domain of zoology only by its pliysical aspect, cannot, with any propricty, be considered merely as a branch of zoological inquiry; and of late years the study of the natural history of man has been universally admitted to the rank of a distinct science, under the name of Etinology, or the scicnee of races.

If the reader will apply to himself the aphorism "Nosee te ipsum," the only character which Linnerns deigns to give of his Homo sapiens, although in a somewhat different sense from that in which it was intended by the Grecian sage, its author-he will find that he is in all points of structure a genuine and undoubted mammal ; and the comparison of his organization with that of one of the higher apes, especially the chimpanzec, will leave him in little doubt as to the near approach which thesc animals make in some respects to the human race. This rescmblance is so close in many particulars of structure, that we cannot coincide in opinion with those writers who hold that Man should on no account be admitted into the zoological series, an opinion founded principally upon the consideration of his intellectual faculties and moral qualities; nor can we even assent to Profcssor Owen's view, that the hmman race, regarded in its physical aspect, is so distinet in its charaeters from all other mammals, as to descrve to form a subclass by itself; but we are still further at varianee with those writers who, like some modern French zoologists, have reverted to the Linnean

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method, in so far as to revive the order of Primates for the reception of man and the monkeys-an intimate collocation of the hmman species with the lower animals which is exceedingly congenial to the views of those who hold the doctrine of the progressive derelopment of species, or the gradual production of one species from another, by virtue of a law of development pervading all nature.

Independently of purely intellectnal considerations, and of the comparative bulk of the brain which is connected therewith, and which of itself, with its eoncomitant effects upon the size of the skill and proportionately smaller derelopment of the faeial bones, would suffice to distinguish Man, even zoologieally, from the rest of the Mammalia-we hare to remark the perfect organization of every human being for an upright position, involving, as this does, great changes in all parts of the body. The foot is constructed so that the whole sole may be applied to the ground, forming with its arched instep a support at once firm and clastic. The bones of the sliank and ankle are so arranged as to confer great firmness and a ecrtain amount of mobility upon the foot; the knee is large and powerful, the thigh long and vory muscular, and the pelvis large, strong, and ehanged in its position so as to allow the whole lower limb to be brought under the centre of gravity of the body. In all these respeets we fund a great difference between man and the apes, which, being adapted for passing their existence in trees, have the hinder limbs far shorter than in the Iuman subject, the position of the pelvis different, and the articulations of the legs so arranged that the palms of their posterior hands are more or less turned inmards, or towards each other; hence, when an ape walks upright, he is rarely able to apply the whole sole of the foot to the ground, but waddles along upon the sides of his feet in an arkward and unecrtain fashion, very different from the firm, elastic tread of man. As we adrance upwards in our examination of the human body, we find the spinal column beautifully eurved to adjust it to the upright position, and the skull supported nearly in equilibrium upon the first vertebra of the neck; the occipital condyles, or articulating processes, being placed almost exactly under the centre of gravity of the whole head. Thus, the maintenance of an upright position is faeilitated in the human suljject by crery conccirable means, and the object of this modifieation is cridently to leave him at liberty to make full use of the beautiful and delicate mechanism whieh constitutes the hand of man. The monkeys, indeed, are all endorred
with grasping hands, and in the majority these are evelı furnished with opposable thumbs; but these thumbs are much shorter than in the human hand, and the fingers are far from possessing the same amount of independent mobility as those of man. It is to this great perfeetion of his hand, together with the power which lie possesses of making use of this organ, independently of the position of the other parts of the body, in other words, its complete removal from the system of locomotive organs, that man is mainly indebted for his capability of employing the intellect with which it is his proud prerogative to be endowed, and for his power of obtaining a mastery over all the rest of the animated creation. We cannot, in fact, imagine any modification of the human form which would render it a more fitting vehicle for the exercise of the mental powers possessed by man; nor can we conceive the performance of the various aetions instigated by those powers by the instrumentality of any other known form of organization. Thus, then, from the general structure of the whole body, we obtain sufficient evidence of the title possessed by the human species to rank as a distinct order in our classification, to stand out clearly at the head of the animated world, and not merely as the highest member of the group of monkeys.

The principal plysical characters by which man is distinguished at the first glance from all the other Mammalia are, therefore, as may be gathered from what we have already stated, his adaptation to an crect posture; the great perfection of his anterior members, and especially of his hands; the largo size of his brain and skull; and the comparative smallness of the facial boncs. Besides these we find other physical peculiaritics which equally serve to characterize the order Bimana. Each jaw contains tecth of thrce kinds, namely, four incisors, two canines, and ten molars; and these are of nearly equal height, and arranged in a continuous scries in each jaw, never cxhibiting that diversity of size, or the gaps scparating the canines from the incisors or molars, which occur in all other living mammals. The molars have their crowns uniformly enamelled, more or less cubical in form, and furnished with obtuse tubercles on the npper surface, a conformation indicative of the adaptation of the human species to a mixed diet. The skin is naked, or but sparingly clothed with hairs, except upon the head and some other parts of the body, and the nails are all flat and broad.

It is unnecessary to dwell upon the intellectual superiority enjoyed by the human race over the lower animals, as this must be sufficiently manifest to every one. The highest intelligence exhibited by an animal must be regarded as inferior to that of a child of two or three years old; and it is only the astonishment felt at witnessing the effects of education upon some of the most highly-endowed ercatures, that often leads the superficial observer to attribute to them a higher degree of reasoning power than they really possess. It is, also, in the nind of man alone that has been implanted that belief in the existence of a Deity and in the immortality of his own soul, which is the foundation of all religious sentiment-a sentiment which, although often debased by the most degrading superstitions, secms to be inherent in the hmman race.

There is one other manifestation of the intellectual powers of man that must not be altogether passed ovel itn silenee, namely, the fuculty of speech, or of producing and understanding articulate sounds. This appears to be peculiar to the human speeies; for, although there can be no doubt that in many animals there is some power of communicating intelligence from one individual to another, none of them possess a language. It is by means of this peculiar faculty that the progress of mankind is insured. It is by this that the knowledge acquired and the discoveries made in one age, or in one locality, are transmitted to later times or to distant countrics; whilst by the reduction of language to written characters, the insecmrity of oral tradition is got rid of, and the influence of every discovery is extended and inade more permanent.

We come now to one of the most difficult subjeets connected with the physical history of man-the question of the primitive unity or diversity of the luman species; in other words, whether the oriminal progenitors of the entire human population of the globe were perfectly identical in their cssential characters, or whether the diversity which we now observe in different races be the result of a primary specific difference. There is no doubt that when we compare together the extreme varictics of humanity, as, for instance, Europeans, Negrocs, American Indians, Chinese, and Australian savages, we may easily find in the form of the head and face, the colour of the skin, the nature of the hair and the general structure of the body, distinctive characters, such as in most cases of zoological investigation would lead us to regard these different forms as belonging to so many spccies. But this question, unfortunately, camot be so casily settled; becausc, between these extremes of diversity we find so many intermediate steps, so many points where the physical characters of different marked varieties seem to be intimately blended, that it is often impossible to say to which of two supposed species a given tribe of men is to be referred.

If we take the opposite supposition, namely, that all the varieties of man have been prodnced by the modification of a single species, or to put the matter more clearly, the progeny of a single pair, it is difficult to conceive that mere climatal influences and differences in the mode of life conld have produced such immense changes, not only in the colour, but also in the conformation of different tribes. One of the strongest physical arguments adduced in favour of the unity of the human species consists in the continued fertility of mixed races, even where the grounds for the establishment of distinct species are apparently the strongest-as, for instance, in the progeny of Europeans and Negrocs. But this argument is fallacious, as, although the majority of animal hybrids may be sterile, there are undoubtedly cases in which this rule is departed from ; indeed, it is not improbable that some of our most valuable domestic animals are hybrids. The test of colour, which is often relied upon as an indication of variation distinctly referable to a recognizable cause, namely, the influence of a greater or less degree of heat, does not always apply; for although we may state as a general rule, that the inlabitants of loot plains are darker than those of
colder or more mountainous regions, yet there are many important instances that may be adduced in opposition to the universal application of this rule : the most northern tribes are usually of dark complexions, and the natives of Australia and Van Diemen's Land are darker than many tropical nations. The varieties of domestic animals, which are so numerous and often so remarkable, have been produced, for the most part, by the artificial variation of the conditions of their existence; and where they are due to climatal influences, it must be borne in mind that the creatures lave been in a manner forcibly transplanted to their new abodes, which they would, in all probability, never have reached but by the instrumentality of man. With the human subject the case is different; his organization adapts lim for existence in all parts of the world where he can find the necessary supplies of food: with this restriction, no region is too liot or too cold for him, and this does not inerely apply to the indigenous races of each district, for the individuals of most races ean live and thrive in the districts originally belonging to other tribes; and in this case, as far as we know, the posterity of the new comers retains the characters of its original progenitors. This is remarkably slown in the present day in the United States of Ameriea, where the native American, the European, and the Negro, have now lived and propagated under the same conditions of climate for many years, without losing their original characters. Thus the difficulties are nearly equally great on both sides, and we only partially get rid of them by assuming that a multiplicity of individuals of the human species may have been originally created, and that the gradual intensification of the personal characteristics of these individuals in their descendants by constant intermarriage within the same families, may have given rise to the varieties whiel are now met with. Otherwise, if production from a single original pair be necessary for the establishment of the unity of the human species, we are forced to admit for it a much greater antiqnity of origin than is usually supposed; for we know from aneient Egyptian pietures that, in the Mosaic period, the physical characteristics of the IIebrews, Copts, and Negroes were as strongly marked as in the present day; and it is impossible to suppose that such important modifications of one and the same type would have been produced by climatal influences in the period intervening in our chronology between the cpochs of Noah and Moses, and that in the present day we should find different races still retaining their essential characteristies, after dwelling together for many ages in the same region. Moreorer, not to mention the chronologies of the Chinese and Brahmins, which appear to run into the opposite extreme to om own, we may refer to the statement of Professor Lepsius, that the chronology of the Egyptians may be traced up to the year 3900 B.C., and that the fourth dynasty, including the builders of the chief pyramids, commenced in the year 3430 B.C. He alds that "a thousand years at least, and probably still more, must be conjectured for the gradual growth of a civilization which had been completed, and had in part begun to degenerate at least 3430 years hefore our era."-(See Lepsius in Eumboldt's Cosmos, vol. ii.)

Mr. Leonard Horner, also, in his boring through the sediment of the Nile at Memphis, found a fragment of pottery at a depth of thirty-nine feet from the surface; and as it appears from unquestionable data that, during the last 3215 years, the average amount of sediment deposited has been three and a half inches in a century, this fragınent is regarded by Mr. Horner as a proof of the existence of man more than 13,370 years ago" of man, moreover, in a state of civilization, so far, at least, as to be able to fashion clay into vessels, and to know how to harden them by the action of a strong heat."-(Procccdings of Royal Socicty: 1858.) Perhaps the most probable conclusion at which we can arrive from the consideration of all this evidence is, that the whole liuman population of the globe belongs to a single species, modified by climatal and other inflnences, extending over a period of years so long that our authentic historical data relate only to a small portion of it.

As miglit be expected from the short reference already made to the innumerable shades of difference presented by different tribes of mankind, and the insensible blending of the one into the other, the discrimination of the prineipal varieties of the human species is by no means an casy task; and we accordingly find tlat nearly every writer on this intricate subject entertains peculiar views as to the affinities of particular tribes, or even as to the number of primary varieties which it is necessary to admit. Thus, Cuvier refers all the varied forms of mankind to three, Blumenbach to five, Pritchard to seven, and Piekering and Latham to eleven leading varicties. It is principally by the consideration of the structure of the languages that the number of varieties has been so greatly increased by the last-named writers. In their chief physical claracters most of the tribes of mankind may be conveniently referred to the five sections proposed by Blumenbach. These are the Caucasian or Iranian, the Mongolian or Turanian, the Malayan, the Ethiopian, and the American varieties.

1. Caucasians or Tranians.-This variety inclides all those nations which have made the greatest progress in eivilization. Their colour depends principally upon the country inlabited by them, the skin in those dwelling in temperate zones being white, more or less tinged with pink in different parts by the blood shining through it; whilst in the nations of warmer elimates the colour gradually becomes darker, and finally almost black. The hair exhibits similar, and, to a certain extent, corresponding variations in colour; in temperate climates it presents erery shade from red and yellowish-brown to black, whilst in the darker races of hot countries the last-named colour predominates; but in all cases the hair is straight or simply curled, but nerer crisp and woolly in appearance. The face is oval, and the forehead high, the facial angle approaching a right angle; the eyes are straight; the nose is usually narrow and prominent, and the lips are moderately full. The great Caucasian varicty extends from Ilindostan through Persia and the Caucasns to Enrope, of which the greater part of the inhabitants belong to it ; it also includes the nations inhabiting Arabia, Syria, and the northern and north-eastern parts of Africa. The latter,
amongst which we may notice the Arabs, the Jews, the Moors and the Abyssinians, constitute a great subvariety, distinguished by certain peculiarities, especially of langnage ; they are called the Semitic, Aramectan or

## Fig. 1.



Circassian.
Syro-Arabic races. They are considered by Dr. Latham to form part of the great African variety.
The remainder of the Caneasian races prineipally bclong to a sccond great stock-that of the IndoEuropeans, including the Hindoos, Persians, and all the European tribes, with the execption of the Magyars of IIungary, the Laplanders, Fins, and other Mongolian tribes of the extreme north, and the Basques of Spain, the remains of the ancient Iberians, whose affinities are not yet clearly aseertained. These tribes all speak languages which are considered to be derived from the Sanscrit. The true Caueasian tribes, such as the Circassians and Georgians, are distinguished from the rest by peculiarities of language, which would seem to indicate an affinity with the following varicty, whilst the appearance of the people, and especially the conformation of the skull, caused Blumenbach to regard them as the type of the white races.
2. Mongolians or Turanians.- In these races the colour of the skin also raries from the clear white complexion of the fairest Luropeans, through various slades of olive, tawny, or even yellow, to a dark yellowish-brown. The skull is rounder than in the European races; the face is broad and flat, with very prominent cheek-bones; the eyes are narrow and
small, with the outer angle drawn upwards, so that the direction of the opening of the eyelids is oblique; the nose is small and broad, and the lips usually thin. The Mongolian races are distributed over the whole of

northern and eastern Asia, thus ineluding the highly cultivated Chinese, Jipanese, and Siamese, the nomadic tribes which wander over the boundless plains of Central Asia, the Tibetans, the savage hill-tribes of northern Hindostan and the Tureomans of Western Asia. The latter are the original stock of the Turks, who have established their rule upon the ruins of the Greek: empire. It is to movements in the vast Mongolian populations of Northern and Central $\Lambda$ sia, propagated even from the confines of Chiua, that we are to ascribe those devastating invasions of barbarians which ultimately destroyed the western Roman empirc. Even in Europe, the remains of these conquering hordes are still to be found in the Magyars of Mungary, who only obtained a footing in their present domicile in the tentl: century of our cra. The inhabitants of Lapland and Finland also, with those of the provinces of Livonia and Esthonia, south of the Baltie, and of a large extent of country in the north and east of European Russia, belong to a Mongolian stoek, some of them being probably the aboriginal inhabitants of the districts which they at present occupy; whilst others have establisherl themselves where we now find them, by displacing other tribes, either of Mongolian or of Caucasian descent. At the north-castern extremity of the Asiatic
eontinent we tind the coast oceupied by the Esquimaux or Eskimo, as they are now frequently termed, whiel are also regarded as belonging to the great Mongolian variety. These people are remarkable from the faet of their extending from the Asiatie station just mentioned, through the Alcutian Islands to the continent of North Ameriea, all the Aretic shores of which, ineluding those of Greenland and Labrador, are peopled by Esquimaux tribes. It is by their means, therefore, that the ethnologieal connection between the old and new continents has been established; and it seems not improbable that, in the lapse of ages, all the varied tribes of Anteriean Indians may have been derived from Esquimaux progenitors. These tribes are, however, eonsidered to form a distinet variety of the human species.
3. Americans. - 'the skin in these raees is usually of a reddlislı elay eolour, sometimes copper eolour, but becoming brown or blackish in the hot tropical plains. The hair is long, straight, and usually eoarse ; the eyes are generally small, but not narrow and oblique as in the Mongolians ; and the nose is large, ligh, and often well formed. The forehead is retreating, and the elleekbones prominent. In its geograplical distribution the

Pis. 3.


American Indian.
American variety presents a remarkable peculiarity. The other raees appear to be more or less limited in their natural extension by degrees of latitude, that is to say, their tribes spread for the most part in an east and west dircetion, so as to preserve, within eertain limits, a sinilarity of elimate. The Ameriean man, on the contrary, has spread in the opposite dircetion, or from north to south, so that nearly from the Aretie cirele to the southern extremity of Patagronia, over a space of about one hundred degrees of latitude, the aborigines of Ameriea all belong to the same stock and cahibit strik-
ing eharaeters of rescmblanee, both in their physieal conformation and in the structure of their languages. They are for the most part in an uneivilized eondition, although, as is well known, the Mcxieans and Peruvians had attained to a ligh state of eultivation before the diseovery of the New World.
4. Malayans.- Ihe Malayan races, whieh are also ealled Occanic by Dr. Latham, are usually of a yellowishbrown eomplexion, but their eolour varies in intensity from a light brownish-ycllow to nearly black. Their lair is always blaek, usually straight, but frequently more or less curled; they liave gencrally a high forehead; narrow, but not oblique eyes; and a broad but not flattened nose. In the general pliysiognomy we often find an approaeh to the Mongolian races, some of which are, in faet, the nearest neiglibours of the Malayans; but in some instanees the expression of the face, and even the nature of the hair, present so much similarity to the Negroes, that the populations thus eliaracterized have oceasionally been referred to the negro type. The Malayan races inelude the inliabitants of the peninsula of Malacea, and of the eastern Areliipelago, together with those of the Paeific Islands, New


Guinea, Australia, and New Zealand. The natives of Madagasear are also Malayans. In the Negritos of Sumatra, Mindanao, and the New Hebrides, the negro characters make their appearance in a remarkable manner, as also in the Papuas of New Guinea and some of the neighbouring islands, in whieh the hair is of great length and strongly frizzled, standing out from the head on all sides, so as to present the appearanee of an enormous wig.
5. Etholinas.-The raees commonly, but ineorrectly, ealled Ethiopians, have the skin of various dark
tints, from deep brown to a nearly perfect black, and the hair sloort and woolly in its appearance. The forehead is depressed and the jaws prominent, in some

Fig. 5.


Negro.
cases so much so as almost to form a muzzle ; the face is flat, with the clicek-bones not very prominent; the nose is broad and flat; and the lips very thick. The

Ethiopian variety includes all the races of Africa, from the southern and western boundaries of the Semitic nations (Moors, Arabs, and Abyssinians) to the Cape of


Good Hope. The principal races are the truc Negroes of Central Africa, the Caffres and Hottentots; the Bushmen appear to be a degraded tribe of the latter.

## Order II.-QUADRUMANA.

Tire most essential character of this order is expressed in its name; the animals composing it are furnished with four grasping lands, and in the majority of them these are all provided with opposable thumbs. In some, however, the anterior extremities are altogether deprived of thumbs, so that the posterior fect alone are deserving of the title of hands; and this presence of truc hands on the hiuder extremities, constitutes the most constant character by which the Quadrumana are distinguished from the rest of the placental Mammalia. It occurs again in the non-placental opossums, and from this circumstance, some naturalists have thought fit to form a single group under the name of Pedimana, or Foot-handed animals, for the reception of the Quadrumana and opossums. The only exception to the character here given, presented by any animal which we refer to this group, is that exhribited by the Gateopithecus, or Flying Lemur, a creature which seems to unite the Quadrumana with the Cheiroptera or Bats, laving been placed, by different zoologists, sometimes in one and sometimes in the other of these orders. In this there are no opposable thumbs either on the anterior or posterior extremitics. From the peculiar
characters presented by the Gateonithecus, some zoologists, including Professor Van der Hocven, have eren regarded it as entitled to form a distinct order.
The principal distinctions between the Quadrumana and the Bimana have already been indicated under the latter head; we shall, therefore, confine ourselves here to a general statement of the characters of the present order. The conversion of the hind feet into hands, and the accompanying modifications of the general structure of the linder extremities, which, as we have already seen, prevent even the highest apes from easily maintaining the erect attitude natural to man, adapt the Quadrumana most admirably for their mode of lifc, which is, in most cases, strictly arboreal; and as those species which are not inhabitants of the forest, are dwellers amongst the rocks, the adrantage, even to them, of their hinder hands will hardly be denied by the most experienced cragsman. Amongst the branches of the trees, the apes and monkeys disport themselves with an agility and security astonishing to the spectator, and the great African baboons are described as scrambling up the faces of nearly perpendicular rocks with the greatest ease.

In the general form of the body we find a great diversity in this order. The apes and monkeys present a greater or less resemblance to the human species; the baboons are more quadruped in their appearance; and the lemurs resemble ordinary quadrupeds in their form. The development of the tail, also, is very variable; some, such as the apes, being perfectly destitute of this appendage, which is also rudimentary in scveral of the baboous, whilst the majority of the monkeys and lemurs are well provided with tails, and these in the American monkeys are often preliensile, thus furnishing these creatures as it were witl a fifth hand, which is of great service to them in their arboreal gambols.

The resemblance in the form of the brain and skull in the apes to that of the samo parts in the human species, is greatest in tho young animals, and it is owing to this, and to the fact that most of the specimens of the larger apes brought to Europe havo been very young, that we are to attribute the exaggerated notions frequently entertained with regard to the extent of this similarity. In the young animals the brain is larger even in proportion to the rest of the body than in fullgrown specimens; and as long as the dentition is confined to the milk teeth, the jaws are but little produced, so that the forehead is high, and the facial angle very large; but as the first teeth are slied and the permanent ones produced, the space requircd for their accommodation becomes greatly increased, and the jaws are necessarily prolonged, whilst no corresponding change takes place in the dimensions of the cranium, and thus the face eventually acquires the form of a prominent muzzle. In the change of tecth, the eanines acquire a great development, crossing each other, and intcrlocking like those of a carnivorous animal, so that the jaws of an adult ape or baboon present an aspect almost as formidable as those of one of the larger cats; and as a consequence of this great size of the canincs, gaps are left between these teeth and the incisors or molars, to permit the lodgment of the canines of one jaw by the side of those of the other. The molars, in form, greatly resemble those of the human subject.

The remaining general characters of the order may be dismissed in a few words. Except in the genus Gatcopithecus, already alluded to, the orbits, or bony sockets of the cyes, are completely closed, as in man. The external ears are usually small, but variable in form, sometimes resembling those of the human species, sometimes erect, as in the cat. The fingers are gencrally furnished with flat nails, but some species have curved, compressed claws, either on the whole or on some of the fingers. The mamma are almost always placed on the breast, and two in number; in the Galcopithecus, there are four pectoral teats; and in the Cheiromys, a doubtful species of the order, these organs are situated on the hinder part of the abdomen.
in their geograplical distribution upon the face of the earth, the Quadrumana must be regarded as a tropical group. They are found in the forests and rocky descrts of Southern Asia, of Africa, and of Soutl Anerica, where they live in troops, and feed principally upon fruits, often descending to plunder the gardens and ficlds of the inhabitionts. In Africa, the range of the
baboons extends as far south as the Cape of Good Hope; whilst a species of baboon-like monkey, the well-known Barbary apc, not only occurs on the southern shores of the Mediterramean, but even crosses to the European coast, and lives in numerous troops upon the rock of Gibraltar.

This is at present the most northern range of any species of the order Quadrumana; but the fossil remains of these animals found in some European tertiary formations prove, that at a former pcriod of the carth's history several species of monkeys and apes lived upon the continent of Europe, and even in England. In some fresh-water sands at Kyson in Suffolk, the tooth and part of the jaw of a Mracacus, a monkey allied to the Barbary ape, have been found; these strata belong to the eocenc, or earliest tertiary formations. In the miocene, or middle tertiary fresh-water strata, at Sansan in the south of France, M. Lartet in 1837 discovered the first known fossil remains of a quadrumanous animal, considered to be allied to the Gibbons, which are now confined to the islands of the Eastern Archipelago; and in 1856 that geologist also found in the same region, the lower jaw and humerus of a gigantic ape, larger than any known living or fossil species, and prescnting, in some respects, a nearer approach to the human species than even the chimpanzee. Other fossil species of monkcys have been found in the south of Europe at Montpellier and near Athens, both belonging to the Indian genus Semmopithecus. In the Sivalik hills of Northeru India, the remains of several species of monkeys have been discovered by Messrs. Falconer and Cautley, and there is no doubt that as the geological investigation of the warmer regions of the Old World advanees, other forms of Quadrumana will be found. The fossil monkeys which have been discovered in some caves in Brazil, belong to the same group as those now inhabiting the South American continent; these are considered to have lived in the plioecne, or latest tertiary period; and it is interesting to find that in this, as in some other cases, there was then the same difference in the type of the mammalian inhabitants of the two hemispheres, as at the present day.

When we examinc the rarious animals belonging to this order, we find that the greater portion of them may be included in two sections-the Monkeys (Simice) and the Lemurs (Prosimia). In the former, the incisors are always four in number in each jaw, and the rest of the dentition presents a cortain rescmblance to that of man; the nails of the fingers are similar, either flattened or elaw-like, and those of the thumbs always flat. In the lcmurs the number of incisors is variable; and the first finger of the hinder hands is always furnished with a curved, compressed claw. In both these groups the linder thumb is opposable, and this is also the case with the thumb of the anterior extremities, except in those cases in which it is rndimentary or altogether wanting. There are other points of relationship between these two sections, which may consequently be regarded as forming the trine Quadrumana; but, besides these, we have to dispose of two other groups, cach including only a single family, and but one or two species, the characters of which are
such as to render the justice of plaeing them in the present order almost a matter of doubt. These aberrant forms are the Cheiromys and the Gelcopithecus already alluded to.

Commeneing with the Simice or Monkeys, as undoubtedly the highest group of animals, and ineluding the speeies whieh approach most elosely to man, we find that these also present certain charaeters, agreeing most remarkably with the geographieal distribution of the creatures, by which they may be divided into two sections. The monkeys of the Eastern hemisphere have the nostrils plaeed elose torecther, and separated only by a narrow septum or partition; the Ameriean monkeys, on the contrary, have the nostrils placed wide apart on the sides of the nose, which is broad and flat. IIence the former are ealled Cutarrine, and the latter Platyrrhine monkeys.

## Family I.-SLMIAD A.

The Catarrhine monkeys, or monkeys of the Old World, eonstitute only a single great family, that of the Simiadx, the generi of which this is eomposed resembling eaeh other so elosely in their most essential peeuliarities, and often melting into eaeh other by sueh imperecptible gradations in their minor eharaeters, that not only is any further subdivision of them into aecu-rately-defined subordinate groups almost impossible, but it is sometimes difficult even to separate the genera themselves by well-marked peculiarities of structure.

All the Simiadie bear the same number of teeth as the human species, namely, four incisors, two canines, and ten molars and premolars in each jaw, making a total of thirty-two ; they also agree witl man in the general form and arrangement of the teeth, execpt that the incisors are more oblique than in any variety of the human raee, and there is always a vaeant space in the vieinity of the eanines. The tubercles of the molar teeth are obtuse. The tail is sometimes altogether defieient, and when present it varies greatly in length, being sometimes a mere tubercle, whilst in other eases it is longer than the body; but it is never prehensile at the tip. Naked raised patches or callosities oecur on the buttocks of nearly all the species; these are formed by a thickening of the epidermis supported upon a peeuliar process of the ischinm, and constitute a sort of natural cushion upon whieln the animals sit when taking their repose. In most eases, also, these monkeys are provided with cheek-pouches in which they stow away a supply of food for future consumption.

Traking the general characters of these animals into eonsideration, we may distinguish among them three prineipal groups-those of the Apes, Monkeys, and Baboons. In the first of these groups, or the true apes, the tail and eheek-pouches are cutirely deficient, and the buttocks are cither destitute of eallosities or have them very small. It is amongst these apes that we find the speeies most nearly approaehing man in their organization; and hence these animals are ealled Anthropoid or Anthropomorphous (Manlike) Apes, by most naturalists. Of the species at present known, the one which undoubtedly presents the greatest amount of resemblanee to man is

THE CHIMPANZEE (Troglorlytes niger). - By all authors, with the exeeption of Cuvier, and one or two who adopted the opinion of that great naturalist, the ehimpanzee has been regarded as the highest speeies of the apes; and the charaeter upon whieh Cuvier founded his preferenee for the orang-outan has been shown by later researelies to be fallaeious. Cuvier states that the volume of the brain and the prominence of the forchead is greater in the orang-outan than in the ehimpanzee; and later writers, following Cuvier, have defined the supposed difference in this respeet by means of the facial angle, saying that in the orang this angle is $65^{\circ}$, whilst in the chimpanzee it is only $50^{\circ}$. This, however, is due to the comparison only of animals of different ages, the forehead being far more prominent in the young animal than in older individuals of both species, from the projection of the muzzle inereasing as the creature approaehes maturity; so that, if adult specimens of the chimpanzec and orang-ontan be eompared together, the differenee will be fonnd to be very small, and, if anything, rather in favour of the chimpanzee. The limbs in the chimpanzee, also, more nearly resemble those of man in strueture ; the arms are not much longer than in the human speeies, whilst the legs considerably exeeed those of the orang in derelopment, both as regards their comparative length, their muscularity, and their capability of supporting the animal in an erect posture. Both in the ehimpanzee and the gorilla, the two species of the genus Troglorlytes, the number of ribs is thirteen, whilst the orang-outan has twelve ribs like the human subject.

The adult ehimpanzee measures nearly five feet in height when standing ereet. Its body is corered with long, coarse, black or blackish-brown hair, which is very thick upon the baek, but elothes the breast, belly, and limbs more sparingly; at the sides of the head and face the hair is very long, and hangs down in the form of whiskers; the faee and ears are nearly naked, and of a brownish flesh eolour; the cars nearly resemble those of the human speeies in form, but are very large; the eyes are rather small, and the lips thick. The hands and feet are nearly naked, and the lairs of the fore-arm are direeted towards the elbow, where they mect those of the upper arm, and usually project in a point.

The ehimpanzee is a native of the rast forests of the west eoast of Afriea, extending from the river Gambia, north of Guinea, as far as the district of Benguela, or over a space of ahout thirty degrees of latitude. It. lives among the trees, usually aroiding the neighlomorhood of man, but forming little luts with branches of trees for its protection from the weather, at an elevation of thirty or forty fect from the ground. Its food consists prineipally of fruits, and it is also fond of the sneculent terminal bud of the eabbage palm, whieh is likewise a favourite article of human food in tropieal regions. In the trees the chimpanzees are very aetive, and display astonishing strength and agility in their movements ; the adult males espeeially are exceedingly powerful, and from their being armed with large canine teetl are very formidable animals. The chimpanzees are deseribed by scveral travellers as arming them-
selves with elubs, with which they attack and often kill the negroes whom they meet with in the woods; and they are even said to assault the elephlants with the same weapons, and drive them out of their districts. These statements, if true, probably relate to the gorilla, as even the adult male ehimpanzee is said to fly from a man. In their sexual habits they are deseribed as being very disgusting; and, aecording to Dr. Savage (an Ameriean missionary to whom we are indebted for the aetual diseovery of a seeond speeies of Troglo(lytes), the Negroes liave a tradition that the elimpanzees onee belonged to the human race, but that they were expelled from society on account of the ineorrigible depravity of their habits.

The chimpanzee does not appear to have been clearly known to the ancients, and yet in a very old Carthaginian voyage, the Periplus of IIanno, we have a eurious aeeount of an animal whieh ean only be referred to this or the following species. At least five hundred years before our era the Carthaginians appointed Hanno, one of their admirals, to sail with a large fleet through the Straits of Gibraltar, for the purpose of founding Carthaginian eolonies along the Afriean coast. Aceording to the journal of this voyage, whieh has come down to us, the admiral set sail with no less than thirty thousand eolonists of both sexes, and coasting along the western shores of Africa, succeeded in establishing numerous colonies at different places. He deseribes the coast and its inhabitants, and evidently entered the Gulf of Guinea, in whieh he sailed until he reaehed a bay ealled by his interpreters the Southern Horn. "In the bottom of this bay," says the Carthaginian admiral, "there was an island similar to the one previously deseribed (in his voyage) ; this contained a lake, and in this lake there was another island inhabited by wild men. The women were most numerous; they were entirely covered with hair, and our interpreters ealled them Gorilloi. We pursued them, but could not eapture the men; they all eseaped us by their great activity, as they elimbed the rocks and defended themselves by throwing stones at us. We only eaught three women, who resisted by biting and scratching their conduetors, and we were foreed to kill them. We skinned them, and brought back their skins to Carthage." These skins were plaeed in the temple of Astarte in Carthage, where they remained until the taking of that eity in the year 146 b.C., as stated by Pliny, who, however, only mentions two of them, and ehanges the name of these wild men into Gorgones. The Gorilloi of Hanno, the Troglodytes, Satyrs, and other fantastic ereatures deseribed by the aneient naturalists, were regarded by them as monstrous varieties of the human raee, and the idea of their existence was probably derived from the imperfeet aceounts given by travellers of the Anthropoid apes. These notions continued to prevail throughout the middle ages, and it was not until a very recent period that they were replaeed by more eorrect views. Thus, even Linnæus describes a Homo Troglodytes, as a second speeies of man, in which he evidently confuses together the older narratives relating to both the elimpanzee and orangoutan; just as, in his genus Simia, lie combines these two species under the common name of S. Satyrus.

Yol. I.

It was not until the latter part of the sixteenth century, when the intercourse of Europeans with the west coast of Afriea beeame more extended, that the aecounts of travellers began to furnish more reliable information upon these large apes, although the earlier of these accounts are for the most part mixed up with fabulons narratives obtained from the Negroes. Andrew Battel, an English sailor, who was taken prisoner by the Portuguese in 1589, and resided for several years in Angola, mentions "two kinds of monsters," as lie ealls them, which inhabit the woods of that country ; of these the largest, which, he says, is of gigantie height, is called Pongo, and the other Enjocko, by the natives. The former is most probably identical with the newlydiscovered gorilla; the enjocko of Battel is, no doubt, the same as our chimpanzee; and we find from later sourees that in the district of the Gaboon, the Negroes give the name of $N^{\prime}$ 'I'schégo to the ehimpanzee. De Laval, a Frenchman, who published lis travels in 1619, mentions the oecurrenee of these animals in Sierra Leone, where he says they are ealled Burris, and adds that they may be trained "to perform all the duties of a household servant." He states that they "generally walk upright, upon the hind feet only ; they will pound grain or any other substance in a mortar, go to the well, fill their water-jars and earry them home on their heads; but if some person be not at hand to relieve them from their burden on their arrival, they let the jar fall, and begin to ery on seeing it broken." Jobson also deseribes an ape of five feet in height, ealled by the Negroes Quoja Vorau, whieh, aecording to him, ean be tanght to fetch water and to perform other household offices. De la Brosse, in his "Voyage to the Coast of Angola," published in 1738, refers to the speeies under the name of Quimpezé, but seems to have mixel up the ehimpanzee and the gorilla, for he describes the animals as attaining a leight of six or seven feet. He confirms many of the faets narrated by preceding travellers, and makes espeeial mention of the abduction of Negresses by these creatures, a habit whieh is so commonly aseribed both to the large apes and the baboons, stating that he was aequainted with a woman at Loango who lived three years amongst these animals. This aecount of the predilection of the chimpanzees for human coneubines is confirmed, from hearsay, by Smith, who visited the eoast of Guinea in 1744, and who says the animal is there ealled Mandrill; in fact, it appears that the name of Drill, commonly applied to one of the large baboons, really belongs to the chimpanzee, and that it is the root of the Greek word Gorilloi, given by Hanno as the name of his wild men. These narratives, with the exeeption of Battel's, probably refer both to the pongo and the enjoeko of the latter.
The first speeimen of the elimpanzee seen in Europe was a young living individual, whieh was brought to Holland towards the end of the seventeenth century. This specimen, which was from Angola, was described by Thlpius, who, however, confounded it with the orang-outan, in which, as already stated, he was followed by Linnæus. Buffon, also, who had the opportunity of examining at least one living specimen of the chimpanzee, did not reeognize its distinctness from the orang. It was first deseribed under the name of Simia

Troglocytes by Blumenbach ; and M. Geoffroy SaintHilaire regarded it as the type of the distinct genus Troglodytes, in which he has been followed by most subsequent zoologists. The anatomical structure of the chimpanzee was well deseribed as long ago as the year 1600, by an English anatomist, Tyson, in his "Anatomy of a ligmy," where he enters into a detailed exposition of the characters in which this animal resembles and differs from man.

The individuals which lave been brought alive to Europe and exhibited in our menageries, have all been young animals, usually abont two years old, and between two and three feet in height ; they ean, consequently, give us but little idea of the labits and disposition of the adult chimpanzee. They have all exlibited a striking amount of intelligence, and a gentleness and docility such as we hardly associate with the iden of a monkey. The individual observed by 'I'yson in 1699, is described by him as a gentle, affectionate, and harmless creature, which became much attached to the sailors on board the ship in which it was brought to England, embraeing them with the greatest tenderness, opening the breasts of their shirts, and clasping its arms aromed them. It showed a great aversion to some small monkeys which were brought home in the same ship, keeping at a distance from them, as if it considered itself a being of a superior order. It became fond of wearing clothes, would dress itself partly, and apply for assistance in any difficulty to some of the crew or passengers.

The celebrated French naturalist, Buffon, has given the following interesting accomnt of the chimpanzee observed by him, which he calls the Jocko, but confounds with the orang-outan. He says--"Its air was melancholy, its deportment grave, its movements measured, its disposition gentle, and very different from that of the other monkeys; it had none of the impatience of the magot (Barbary ape), the ferocity of the baboon, or the extravagance of the monkeys. It may be said that it had been well taught; but the others had also received their education ; a sign or a word was sufficient for our orang-outan; whilst the baboon required the stick, and the others the whip, as they only obeyed under the fear of chastisement. I have seen this animal present its hand to lead out its visitors, or walk about with them gravely as if it belonged to the company. I have seen it seat itself at table, unfold its napkin and wipe its lips, nse its spoon and fork to carry its food to its mouth, pour its drink into a glass, and touch glasses when invited; fetch a cup and sancer to the table, put in sugar, pour out its tea and leave it to cool before drinking it ; and all this withont any other instigation than the signs or words of its master, and often of its own accord. It was perfectly harmless; it even approached one with a certain respect, and presented itself as if to ask for caresses. It was excessively fond of sugar-plums,
but ate almost anything, although it preferred ripe and dry fruit to all other aliments; it drank wine, but in small quantity, and left it willingly for milk, tea, or other mild beverages."

I'his description is interesting, as showing the amount of education of which the chimpanzee is susceptible; but, perlaps, the most striking example of the intelli-
gence of this ape is recorded by the French traveller; De la Brosse, whose "Voyage to Angola" has been already referred to. One of two young chimpanzees purchased by this traveller, was taken ill on board ship. "He gave himself all the airs, and demanded the same eare as a human being; he was even bled twice in the right arm; and afterwards, whenever he felt indisposed, he would hold out his arm to be bled, as if conscious that it liad done him good."

Subsequent observations of other specimens in confinement lave not only confirmed the idea of the great intelligence and gentleness of the chimpanzee convered by the preceding extracts, but have also thrown more light upon the natural habits of the species, and enabled recent zoologists to correct some errors into which their predecessors had fallen. Thus Buffon, writing from recollection, states that lis Jocko "always walked upright on its hind feet, even when carrying heavy loads." The individnals sinee observed have shown that if this was the case, it must lave been a result of edueation. 'The chimpranzee, certainly, appears to have a greater power of sustaining itself in a nearly erect posture than the other apes; but in its natural mode of progression it exactly resembles the latter, its body being inclined forward in walking, and supported upon the anterior limbs, of which the knuckles are applied to the ground.
the gorilla (Troglodytes Gorilla), Plate 1, fig. 1. - We have alrcady, in treating of the chimpanzee, indicated that, from the narratives of the older travellers there has always been reason to believe that two large species of apes lived on the west coast of Africa. The curious recital of Hanno, already quoted (see page 17), may indeed apply to either species; but as early as the close of the sixteenth century, we have seen that Andrew Battel clearly indicates "two kinds of monsters" as inhabiting the woods of Angola: one of these is the chimpanzee; the other, he says, "is called Pongo in their language." Of the latter he states, that "the pongo is in all his proportions like a man (except the legs, which have no calves), but he is of gigantic height. The face, hands, and ears of these animals are without hair; their bodies are covered, but not very thickly, with hair of a dumnish colour. When they walks on the ground, it is upright, with the hands on the nape of the neck. They sleep on trees, and make a covering to shelter them from the rain. They eat no flesh, but feed on nuts and other fruit; nor have they any understanding beyond instinct. When the people of the comatry travel through the woods they make fires in the night, and in the morning when they are gone the pongos will come and sit romed it till it goes out; for they do not possess sagacity enough to lay on more wood. They go in bodies, and kill many Negroes who travel in the woods. When elephants happen to come and feed where they are, they will fall on them, and so beat them with their clubbed fists and sticks, that they are forced to run away roaring. The grown pongos are never taken alive, owing to their strength, which is so great that ten men cannot hold one of them. The young hang upon their mother's belly, with their lands clasped about her. Many of them are taken by shooting the mothers
with poisoned arrows." Another early English traveller, Jobson, and Pyrard de Laval, a Frenehman, appear to have combined the accounts of the Pongo of Battel with the chimpanzee, as was also done at a much later period (1738) by De la Brosse. The narratives of these writers have already been quoted. (See page 17.)
This view of the identity of the two African apes was adopted by Buffon, who regarded the pongo as the adult of the animal deseribet by lim under the name of the jocko, and at the same time eonfounded both with the orang-outan of the great Eastern Islands. Later naturalists, whilst admitting the specific and even generic difference of the orang and the chimpanzee, still referred all the accounts of the large Afriean apes to the latter; and it was not until the year 1829 that attention was called by Mrs. Bowdieh to the reported existence of a second species of ape on the West Afriean coast. At the close of a paper on the habits of the Diana monkey, published in Loudon's Magazine of Natural History, that talented lady refers briefly to the accounts which she had heard of the existence of an animal named Engé-enca in the countries to the north of the Gaboon river. She says:"The natives describe it as the largest of all monkeys, but of a breadth more tremendous than its height; they declare that one blow of its paw would fell a man to the earth. Both males and females are very much attached to their young, and the latter carry them about after death until they drop from their arms. They are fond of imitating men; walk upright; and laving seen the natives collect ivory, if they find a tusk, they carry it on their shoulders till they sink with fatigue." Although some of these statements are doubtless fabulous, others have been fully confirmed by recent authorities, and it is remarkable that this reference to the gorilla should have hitherto escaped the attention of naturalists. It was only in 1847 that certain evidence of the occurrence of a second species of African ape was obtained. In April of that year, Dr. Savage, an American missionary, on paying a visit to one of his confrères, Dr. Wilson, stationed on the Gaboon river (situated almost exactly under the equator), obtained several skulls of individuals, of both sexes and of different ages, together with some other portions of the skeleton of a large ape, which appeared to him to differ both from the orang and from the ehimpanzee. On his return to America, Dr. Savage, with the aid of Dr. Wyman, drew up a description of these bones, whieh was published in 1840 in the Boston Journal of Natural History; he ealled the species Troglodytes Gorilla, conceiving that it was identical with the Gorilloi of Hanno. In the following year, Professor Owen, who had reccived sketehes of the skulls from Dr. Savage, and had subsequently obtained some speeimens by the aid of Mr. Stutchbury of Bristol, described the species under the name of Troglodytes Savagei; and in 1849 an adult male specimen, preserved in spirits, was brought to Paris by Dr. Franquet, a French naval surgeon. A skeleton was subsequently procured for the British Muscum, where it has now been for some years; and within the last ferv months a fine male, nearly adult, and preserved in
spirits, was also obtained, and by this the title of the animal to rank as a distinet species has been finally established.

This speeimen, which is about five feet in height when plaeed in an erect position, has the face and the palms of the hands and fect naked and black. The head and neek are thickly covered with brownish grizzled hair of moderate length, which does not hang down at the sides of the face so as to form whiskers, as in the chimpanzee. The ears, also, are mueh smaller than in the latter species; they are placed very ligh and far baek on the sides of the head. The hair of the shoulders and upper part of the arms is grizzled; that of the back and loins has a sooty tinge. The fore-arms are covered with stiff, black hair, directed up towards the elbow as in the chimpanzee. The hair on the chest is very seanty; but the belly is more thickly clothed, and the hair of this part is reddishbrown, and exceedingly coarse and harsh, having a withered appearance. One of the most remarkable characters of the species, which is now commonly known as the Gorilla, is that the digits of both pairs of extremities are united together much further than in the chimpanzee, whose hands nearly resemble those of the human species; in the new species, on the contrary, the fingers of the hands are united nearly as far as the ends of the first phalanges, whilst in the hinder hands the union even goes beyond these, leaving only four little stumpy fingers free. The thumb of the anterior hands is comparatively small; but that of the hinder pair is of enormous size and power, and the whole foot forms a grasping apparatus of the most tremendous eharacter. From the eallous marks upon the knuckles it is evident that the Gorilla, when on the ground, walks upon all-fours, and that he does not apply the whole lower surface of the foot to the ground; in fact the digits of the hinder hands appear to be bent naturally in such a way as to render this impossible.

The inspection of the specimen abore described, which has been most admirably prepared, in spite of almost insuperable difficulties, by Mr. Bartlett, is quite sufficient to justify all the accounts given by travellers of the fearful powers of the gorilla. Although not fully mature, as is shown by the state of its dentition, the vast bulk of its body, far exceeding that of even the most powerful men, its long arms, and enormonsly large hands and feet, produce an impression of almost irresistible strength; and when we consider that besides this enormous grasping power-to attempt to escape from which would be utterly hopeless-the adult male is furnished with canine teeth as large as those of a carnivorous beast, set in immensely powerful jaws, of which the lower one, as evidenced by the great development of the crests upon the skull, is moved by temporal muscles of enormous bulk; we can easily imagine that such a creature must be one of the most terrible antagonists that a man could well meet with, and cease to wonder that the Negro elephant-hunters should dread him even more than the lion.

Whether the gorilla really attains the immense size of six or seven fect attributed to him by some travellers, is still rather doubtful. The specimen in the Paris

Museum measured about five feet four inches in total height; and a missionary named Walker is said to have obtained one measuring five feet eight inches, but this is the largest on record. Considering the structure of the animal, however, we ean easily believe Battel's statement that ten men would be unable to overcome a single adult even of this size; and the great dread which the natives entertain for it, coupled with the difficulty of transplanting such a hage carcass through its native forests to any place frequented by Europeans, is a sufficient explanation of our long ignorance even of the existence of the gorilla.

From the statements of Dr. Sarage and others, it appears that the gorilla inhabits the distriet through which flow the Gaboon and Danger rivers. Its dwelling is in the interior of the country, whilst the chimpanzee is met with on the coast. The tribe of Negroes inhabiting this district is called Mpongwe, whence, according to Dr. Wilson, is derived the name of Pongo, applied to the species by Battel-the native name of the animal being Engé-ena.

In their native forests the gorillas live in troops, which, however, are not so mumerous as those of the ehimpanzees, and consist prineipally of females; and all the natives who furmished Dr. Savage with information upon their habits, agreed in stating that there is only one adult male to each troop, and that as the young malcs grow up, they engage in contests for the superiority, when the strongest, by killing or driving off all the others, establishes himself as the chief of the band. The adult male, according to the statements of the Negroes, never meets a man in the woods without attacking him. When first seen, he sets up a fearful howling, the sound of which has been compared to the syllables tha-ah! kha-ah! opens his mouth to exhibit his terrible teeth, and contracts the skin of his face, so as to acquire an appearance of ineredible ferocity. The females and the young disappear with the first sound of battle, and the male then advanees upon his enemy in a state of perfect fury, repeating his eries at every step. Of course the hunter's only chance under such circumstances is to kill his assailant with a single shot; and as this is not always an easy matter, the Negroes are said to recommend the adoption of a course which certainly requires more coolness than falls to the lot of most men. The best plan of making sure of a gorilla, aceording to this account, is to allow him to approaeh until he grasps the barrel of the gun, and then to fire at the moment when, as his custom is, he is about to bite the muzzle. If the pieee miss fire, the gorilla is said to crush the barrel between his teetin, when, of eourse, he makes short work with his unfortunate antagonist. Henee, as we may suppose, the Negroes are not very anxious to go in pursuit of the gorillas, and only attempt their destruction in selfdefence, when they come suddenly upon them in journeying through the forest, or in their elephant-hunting expeditions. The destruction of a gorilla is looked upon as a most honourable exploit. Dr. Savage records a ease in which a Negro slave, liaving succeeded in killing an elephant, on his retnrn met with a male gorilla, which, being a good marksman, he shot, and soon afterwards, falling in with a female, killed her also.

These feats, performed in a single day, were looked upon as almost superiuman ; the fortunate slave was immediately set free, and pronounced the prince of hunters. Captain Wagstaff; who brouglit the first skulls of the gorilla to England, furnished Professor Owen with information of a somewhat similar nature, and added that when the natives suceed in killing one of these animals, they make a fetish of the skull; those bronght home by lim had been used in this way, and still exhibited traees of saered maks in the form of red and white streaks. Although the male is thus so formidable an enemy to man, Dr. Savage denies that there is any truth in the stories of their forcing Negresses to aecompany them to their retreats in the woods, or attacking the elephants with elubs, narrated both of this and the preceding sprecies by the older writers. These stories, however, are confirmed by a recent French traveller, M. Gautier Laboulaye ; but upon what authority does not appear. Their food, as stated by Battel, consists of nuts and fruits; and, according to Dr. Savage, they are especially fond of the acid fruits of some specics of Amomum, and of those of the oil palm (Eluïs guincensis), the Papaw (Carica papaya), and the Banana (Musa sapientum). They are also said to be partial to sugar-canes.
the orang-outan (Simia Satyrus). Plate 1, fig. 2.
The remarkable man-like apes of the great Indian islands, appear to have been entirely unknown to the ancients, unless Pliny's mention of Indian satyrs refers to the orang-outan. It is not, indecd, until the middle of the sevententh century, that we find any notice of these animals in the writings of Europenns. About this period, the Orang-outan is mentioned by Johnston in his "ITistoria Animalium," but described as brought from Augola. In 1658, howerer, some genuine observations npon the orang, were published in Holland; their author, Bontius, a Duteh physician residing in Batavia, having seen "several of these satyrs of both sexes" in that country. The English anatomist, Tyson, whose work on the ehimpanzee has already been quoted, also refers to the orang-outan, upon the appearance and habits of whieh he had obtained some details from a Freneh missionary, named Lecomte; and a little later, Leguat, a French royager, gave a description of a large ape which he saw in captivity in Jara, and which could only have been an orang-outan. The notices of the species then beeome more frequent in works on Natural History; but the two great authorities of the eighteenth century, Limmeus and Bufion, both agreed in regarding the great Indian and African apes as belonging to a single species. They were imperfectly distinguished by Gmelin, who still describes the pongo as a variety of the orang-outan, inhabiting both Java and Guinea. Sinee the chimpanzee has been clearly recognized as a species distinct from the orang, there has been a tendency to multiply the species of the large Eastern apes; and we find no less than six supposed species deseribed by difierent anthors, principally from peculiarities in the structure of the skeleton. It would appear, however, from the reeent observations of Mr. A. R. Wallace mpon the orangs of Borneo, that some
of the characters which have been chiefly relicd upon for the discrimination of thesc species are fallacious. The Bornean orangs all seem to be refcrable to two specics, the differenecs between which arc, as Mr. Wallace observes, well marked in the males, but much less distinct in the females. Both these species appear to be called Orang-outan, or "man of the woods," by the Malays of the coast of Bornco, but the Dyaks, who are more familiar with them, eall them Mias, and distinguish two or thrce kinds by particular names.

The largest species found in Borneo, and the onc which is most abundant there, may be regarded as the true orang-outan, or Simia Satyrus of Linnæus. It is called Mias Pappan, Mias Chappan, and Mias Zimb by the natives; the sceond name, according to Sir James Brooke, being applied to it by the Malays. The arms are of great length, reaching nearly to the heel when the arimal is in an erect posture; the body is covered with long reddish hairs, which form a long beard pendent from the chin; the hairs of the fore-arms are turned towards the elbow, in the same way as in the chimpanzee and gorilla; the face is naked, and, in the males, greatly expanded at the sides by two large fatty protuberances on the cheeks; the ears are small and rounded, and greatly resemble those of man in form; and the lips are very large, and eapable of being protruded and retracted to a great extent. The largest adult males met with by Mr . Wallace in Borneo, measured four feet two inches in height, from the crown of the head to the heel; but if we can believe the accounts of other travellers, the species must attain much larger dimensions. M. Temminek mentions his having heard of a Bornean specimen of five feet three inches in height; and a specimen from Sumatra, described by Dr. Clarke Abel, was said to measure about seven feet. The females are considerably smaller than the males.

In the orang there is a remarkably large guttural pouch descending in front of the sternum, and communicating with the wind-pipe, from which it may be greatly inflated with air. This occurs also, although far less developed, in the chimpanzee and gorilla.

The observations of M. Salomon Müller, and of Mr. Wallace, have furnished us with a tolerably complete history of the orang-outan in a state of nature. This animal lives in the lofty primæval forests of Borneo and Sumatra, but only in the swampy distriets, where the forest is unbroken, and the interlacing branches afford him a means of passing readily from tree to tree, without the labour of descending to the ground. Mr. Wallace describes it as a "singular and most interesting sight to watch a mias making his way leisurely through the forest. He walks deliberately along the branches, in the semi-crect attitude which the great length of his arms, and the shortness of his legs give him; choosing a place where the boughs of an adjacent tree intermingle, he seizes the smaller twigs, pulls them towards him, grasps them together with those of the trec he is on, and thus, forming a kind of bridge, swings himself onward, and seizing hold of a thick branch with his long arms, is in an instant walking along to the opposite side of the tree. He never jumps or springs, or even appears to hurry him-
self, and yet moves as quickly as a man can run along the ground beneath." Unlike the elimpanzec and the gorilla, it is a solitary ereature; Mr. Wallace says, that he has "ncver seen two adult animals together; but both malcs and females are sometimes aecompanied by half-grown young ones, or two or threc of the lattcr go in company."

When not disturbed, or in scareh of food, the orang appears to be sedentary in its habits. It slecps every night on a nest made by breaking off the leafy branehes of trees, and laying them over each other upon a forked horizontal branch, until it forms a bed so thick as to conceal it entirely from below ; in rainy wcather it is also said to cover itself in a similar manmer with small branehes and leaves, and to kcep its bed till about nine o'clock, when the sun has become hot enough to disperse the mists. The nest is usually placed at about fifty or sixty feet from the ground. As the same animal appears seldom to use these nests more than onee or twiee, they arc very abundant in places frequented by the mias.
The food of the orang-outan consists almost entirely of fruits; but when these are scarce, the tender shoots and leares of trees do not come amiss to him. An old male was onee found to have in his stomach fragments of the bark of trees of upwards of a foot in length. Aceording to Mr. Wallace they seem to prefer their fruit unripe, and many of them are intensely bitter; particularly the large, red, fleshy arillus of one fruit, whieh scems to be an especial favourite. Of another large fruit they only eat the small sced, and in seareh of this destroy great quantitics of the fruit. "The Durian (Durio zibethinus)," says Mr. Wallaec, "is also a great favourite, and the mias destroys large quantities of this delicious fruit, in places where it grows surrounded by lofty jungle, but will not pass over clearings to get at them. It seems wonderful how the animal can tar open this fruit, the outer covering of whieh is so thiek, tough, and densely covered with strong, conieal spines. It probably bites a few of these off first, and then, making a small hole, tears the fruit open with its powerful fingers." In some places the orangs appear to be somewhat migratory in their habits, moving after particular fruits of which they are fond; thus they are said to move into the southern parts of Borneo, and to make their appearance on the right bank of the river Dousson, at the period when the fruits of a certain species of fig (Ficus infectoria) are ripe. After this they disappear from those localities. They seem rarcly to deseend to the ground except in seareh of water, which they drink by taking a little up in their hands and letting it flow into the lower lip, which is protruded so as to form a sort of channel for this purpose. When on the ground they walk on all-fours, like the other apes, and appear to lave less power of maintaining themsclres in an erect posture than the chimpanzees. Some individuals, in confinement, have been scen to more along a flat surface by resting on the knuckles of their hands, and then throwing the body and legs forward in the mamer of a lame man on crutehes; this mode of progression is not natural to the speeics, as has been supposed, but appears only to be adopted by sickly individnals.

The orangs appear to have little fear of man, but will often stare down upon an intruder for a few minutes and then remove slowly to a short distance. When pursued, howerer, as they often are by the Dyaks, who kill them with poisoned arrows and eat their flesh, they manifest some alarm, and endeavour to get as quickly as possible into the loftiest tree in their neighbourhood, when they elimb rapidly to the higher branches, breaking off the smaller boughs in their passage, and throwing them down as if to intimidate their pursuers. This habit has been exaggerated by some travellers into a truly offensive action, and the orang las been described as throwing branches down at its enemies; whilst, on the other hand, M. Temminck has altogether denied that the creature breaks the boughs on purpose to throw them down. According to Mr. Wallace, however, this is actually the case, although, as he states, the orang "does not throw them at a person, but easts them down vertically." He adds that "in one case, a female mias, on a durian tree, kept up for at least ten minutes a continuous shower of branches and of the heavy spined fruits, as large as 32 -pounders, which most effeetually liept us clear of the tree she was on. She could be seen breaking them off and throwing them down with every appearauce of rage, uttering at intervals a lond pumping grunt, and evidently meaning mischicf."

In this way the orang remains at the top of the tree on which he has taken refuge, never venturing to descend either to attack his pursucrs, or to escape, by means of the interlacing lower branches, to another tree; but when badly wounded, he sets about making a bed similar to his ordinary nightly lair, on which he lays himsclf down to die. This nest effectually sereens him from below, and he will not quit it after it is once eompleted. Mr. Wallace states that he lost two speeimens in this way; they died upon their beds, and he could not get any one to climb up or cut down the tree until the next day, when decomposition had commenced.

The tenaeity of life in the orangs is exceedingly great, and it usually requires from six to twelve bullets in the body to kill them. An example of this tenacity of life was afforded by the Sumatran specimen described by Dr. Clarke Abel, and already alluded to on aecount of its great size. This animal was found at a place called Ramboon, on the north-west coast of Sumatra, by a boat's crew who had landed to procure water: He was upon one of a few trees standing in the midst of eultivated ground. On the approach of the party he came to the ground, but soon made lis eseape to another tree at a little distance, and was afterwards driven to take refuge in a small clump. Here lis movements were so quiek that it was very difficult to get a shot at him; and it was only after cutting down several of the trees that his pursucrs succeeded in shooting him. He reeeived five balls, some of which struck him in the body, when he relaxed in his exertions, and reclining exliausted on one of the branelies of a tree, romited a eonsiderable quantity of blood. "The ammunition of the lunters boing by this time expended," says Dr. Abel, "they were obliged to fell the tree in order to obtain lim; and did this in full
eonfilenee that his power was so far gone that they eould seeure him without trouble; but were astonished, as the tree was falling, to see him effeet his retreat to another with apparently undiminished vigour. In faet, they were obliged to eut down all the trees before they could drive him to eombat his enemies on the ground, against whom he still exhibited surprising strengtl and agility, although he was at length overpowered by numbers, and destroyed by the thrusts of spears, and the blows of stones and other missiles. When nearly in a dying state, he seized a spear made of a supple wood, which would have withstood the strength of the stoutest man, and shivered it in pieces. In the words of the narrator, 'he broke it as if it had been a carrot.' It is stated by those who aided in his death, that the human-like expression of his countenance and piteous manner of placing his hands over his wounds, distressed their feelings, and almost made them question the nature of the act they were eommitting. When dead, both natives and Europeans contemplated his figure with anazement. His statnre, at the lowest computation, was upwards of six feet-at the highest it was nearly eight;" but, from the examination of the skin, Dr. Abel concludes that he must liave been about seven feet in height.
M. Salomon Müller also mentions a inale orang, about four feet in height, which had been wounded by the Dyaks with poisoned arrows, and afterwards captured by them alive. Although suffering greatly from his wounds, this animal exhibited great strength and ferocity; he would rise slowly from his ordinary erouching position, and then, seizing a favourable moment, would dash impetuously towards the spectators, darting his long arms through the bars of his cage, and generally attempting to reach the faces of those nearest to him.

Like the other apes, it appears that the orang, when attaeked, never makes use of his large canine teeth to defend himself, but trusts entirely to the enormous strength of his long arms. His enemies, however, in the forest solitudes which he frequents are very few. In Sumatra, the tiger may occasionally pounce upon an unlucky orang, when on his way to the water; but in Borneo, the only inhabitant of the forests that would be at all a formidable enemy to the orang is the Bornean bear, and as this animal is alnost as exclusively devoted to a regetable diet as the orang himself, it is hard to see what cause of quarrel ean arise between them. Mr. Wallace says-" The Dyaks are unanimons in their statements that the mias never either attacks or is attacked by any animal, with one execption which is highly curions, and would hardly be credible were it not confirmed by the testimony of scveral independent parties, who have been eye-witnesses of the circumstance. The only animal the mias measures lis strength with is the crocodile of these regions (Crocodilus liporcatus?). The account of the natives is as follows:-'When there is little fruit in the jungle, the mias goes to the river side to eat the fruits that grow there, and also the young shoots of some palm-trees which are formd at the water's edge. The crocodile then sometimes tries to scize him, but he gets on the reptile's back, beats it with his hands and feet
on the head and neck, and pulls open its jaws till he rips up the throat. The mias always kills the crocodile, for he is very strong. There is no animal in the jungle so strong as he.'"

The female orangs, like the other large apes, produce ouly one young at a birth, and this clings for a considerable time to the long hair of its mother's body, and is thus carricd about; the four limbs of the mother being left at perfect liberty. In fact, so little does the presence of a young one impede the movements of the mother, that Mr. Wallace mentions his having shot two females, bearing their young in this way, without being aware of the existence of the latter until both fell to the ground. It is by shooting the mothers that the natives obtain nearly all the young orangs whieh they sell to Europeans.

For some time after their birth, the young orangs appear to be nearly as helpless as the human infant, although of course the mere fact of their supporting themselves by grasping the hair of their mother, is evidence of a far greater amount of strength than is possessed by a young child. Mr. Wallace has published a most interesting account of the habits of an "infant" orang-outan which he obtained by shooting its mother, from which we shall extract a few passages. He fed it with rice-water out of a bottle with a quill in the cork, which, after one or two trials, it sucked very well. "When a finger was placed in its mouth, it would suck at it with remarkable vigour, drawing in its little cheeks with all its might, thinking, no doubt, it had got hold of the right thing at last, and wondering that all its exertions could get no milk out of it. It would persevere for a long time, till at last it gave up with despair and disgust, indieated generally by a very baby-like seream." It was quiet when nursed, but eried when laid down alone. When being washed it winecd, " and made ridiculously wry faces" when the cold water was poured on its head, but it enjoyed being rubbed dry, and was partieularly delighted with being brushed. At first it clung vigorously with its four hands to anything that was within its reach; and on one oceasion having caught hold of its owner's whiskers and beard, elutched them so tightly that he had considerable difficulty in getting free. From the want of its natural grasping exereise, Mr. Wallace found that his baby orang was getting rather weak in its limbs, and he therefore eontrived a sort of ladder upon which it might lang. This, however, did not answer ; the sticks not affording it a convenient hold for all its four hands. It would hang for a time by two hands only, and then, getting tired of this posture, would move one hand over to the opposite shoulder to grasp its own hair; when "thinking, no doubt, that that would support it much better than the stick, it would leave hold with the other hand, and come tumbling down on to the floor." Mr. Wallace then prepared a sort of artificial mother for it, by rolling up a piece of buffalo-skin into a bundle with the hair outside. This suited it much better, but, unfortunately, it was only too natural. "The poor little creature thinking it had reeovered its mother was continually trying to suck. It would pull itself np close by the strength of its arms, and try everywhere for a likely place, but only succeeded in getting moutlifuls of
wool, when of course it would be greatly disgusted, scream violently, and if not reseued would soon let itself fall."

When fed with a spoon this infant orang indieated its approval or dislike of the food offered to it by the most ludierous changes of its countenance-lieking its lips, drawing in its cheeks, and turning up its cyes, like a true epicure, when the food was to its taste-turning the mouthful about with its tongre, and pushing it out between its lips when it was not palatable. If the same food was contimued it would scream and kick violently, exactly like a baby in a passion. About a month after it eane into Mr. Wallace's possession, it began to show some signs of learning the use of its legs. When laid on the floor it would push itself along, or roll over, and when left in its cradle would lift itself up into an ereet posture, and once or twiee suceceded in tumbling out. It did not, however, grow, or gain strength-a circumstance which Mr. Wallace attributes to his being unable to feed it with milk; and it died in a miserable state after being in his possession abont three montlis.

The specimens of the orang-outan which have been brought to Emrope lave been, for the most part, young individuals. In their general habits, their gentleness and docility, they resemble the chimpanzecs; but appear scarcely to be so lively as those animals. Like them, they exhibit a great affection for men, and especially for those who have the care of them; they also sometimes manifest considerable attachment for other animals, especially eats, but appear to entertain a sort of eontempt for other monkeys, although they will oceasionally condeseend to play with them. Like the chimpanzee they learn to sit at table, eat with a knife and fork, drink from a glass, ete.; they sometimes acquire a taste for intoxicating drinks, and under the influence of this have even been known to steal both wine and spirits.

Full-grown specimens do not appear to bear eaptivity, and indeed their great strength and feroeity render them dangerous. Nevertheless, some of the older travellers, such as Leguat, Bontius, Dobsonville, and Relian, mention their having seen large speeimens in confinement in Java; and some of these, from their size, must have been adult or nearly so. The accomnts of these travellers ascribe a wonderful amount of modesty to these apes, especially the females; the last-mentioned writer says that both the male and female "were very bashful when you looked fixedly at them, and the female would then throw herself into the arms of the male and hide her head in his breast. This touching sight I have witnessed with my own eyes."

Of the second species of orang found in Borneo, called Mias Kassu by the natives (Simia Mrorio of Professor Owen), Mr. Wallace says that its habits are precisely similar to those of the larger species, from which it is distinguished by the absence of the fatty excrescences on the cheeks, and by the much greater comparative size of the teeth, and especially of the canines in the males. The females of the two species appear to be searcely distinguishable, except by the differenee of size, and by the smaller ones having the two middle incisor teeth in the upper jaw proportionally larger, a character
which also occurs in the smaller males. Mr. Wallace also heard the Dyaks mention a third kind of orang under the name of Mias Rambi, which is said to equal the large species in size, but to be destitute of the cheekexcrescences, and elothed with very long hair. Mr. Wallace supposes it to be founded on specimens of the large orang, in which the excresccuces have been but little devcloped. The other described species of the genus Simica appcar to have been estallished on insufficient charaeters.

That we have devoted so much space to the natural history of the preceding large apes-the chimpanzec, the gorilla, and the orang-outan-is to be attributed to the interest which attaches to these creatures, as forming, next to our own species, the highest members of the animal kingdom. This circumstance, and the exaggerated notions frequently entertained of the extent to which these creatures approach man, both in their structure and endowinents, have led us to dwell upon them at far greater length than will be necessary in treating of the rest of the Quadrumana, and also to eonfine ourselves principally to their history in a state of nature, in which, alone, their truc character ean come frecly into play.
the gibbons, or Long-Armed Apes (Genus IIylobates). -The remainder of the true apes all belong to the genus Hylobates, the species of which are now commonly known as Gibbons; they are the Longarmed Apes of the older writers on zoology. They are all inhabitants of the region of the East Indies-a few living on the continent of Asia, whilst the majority are confined to the islands of the Eastern Archipelago, cspecially Sumatra, Java, and Borneo.
Pliny's reference to satyrs living in the East Indies is probably founded partly upon the imperfect accounts of gibbons which had reached him. Thus he says, that "Tauron mentions a savage tribe, under the name of Choromando, which have no speech, but utter horrid screams; they have hairy bodies, fiery eyes, and teeth like dogs;" and adds that "Negasthenes relates that amongst the nomade Indians there is a tribe which, instead of a nose, have only two holes; they have bandy legs, which they ean twist about like snakes, and are ealled Scyritc." Marco Polo states that the inhabitants of Java were in the habit of shaving and embalming the bodics of gibbons, which they then sold as pigmies to the merchants who visited their eoast in search of drugs and spices. This was probably done in still more ancient times, and it may have been by such means that the ancients became aware of the existence of these so-called satyrs.
The gibbons have the arms still longer in proportion than the orangs, but, like them, have the hairs of the fore-arm turned up towards the elbow. They have the palms of all the hands naked; the thumbs of the forchands are cleft very low down, so that the metaearpal joint of the thumb is not included in the palm of the hand, and the thumbs thus appear to consist of three joints; the first and second toes are more or less united, and this is also sometimes the case with the second and third. The sknll is smaller than in the orangs, and the brain is smaller, and presents a greater resemblance to that of the monkeys, and less likeness to that
of man than the same organ in the ehimpanzec and orang. The intelligence of thesc apes is also inferior. A further difference from the other apes is to be found in the presenee of callosities upon the buttocks of the gibbons-a eharacter which is of importance as indieating an approaeh to the monkcys. With one exeep-tion-that of the siamang-they appear to be quite destitute of the large sacs appended to the wind-pipe, which occur in the orangs, and also, but rather less developed in the chimpanzee and gorilla, and even in some of the lower monkeys. The number of ribs varies from twelve to fourteen.
The general habits of the gibbons appear to be rather sedentary than otherwise. Their movements are slow ; their nature gentle, and rather melancholy ; and they do not appear to lose their milduess of disposition so much as the other apes, as they increase in age. They live in troops in the forests, and usually raise a tremendous howling noise in concert in the monning and cvening. Of the rather numerous specics of gibbons described, we need only refer to a few of the best known. The first species that was accurately described and figured was-
THE WHITE-HANDED GIBBON (Hylobates Lar)the Grand Giblon of Buffon, which was placed by Linnæus, in the earlier editions of his "Systema Naturæ," in the same genus with the orangs and the human species. This animal, which is between two and three feet in height, is of a uniform black or brownish-black colour, with the exception of the backs of the four hands, and a broad band encircling the face, which are whitish. The blaek laair of the body and limbs is erect and woolly; the white hair of the hands is coarse, harsh, straight, and depressed. It is an inhabitant of the peninsula of Malacca, of Siam, and probably also of some neighbouring regions. The living speeimen observed by Buffon is described by him as being " of a tranquil nature, and of gentle manners. Its movements were neither very lively nor very precipitate. It received gently what was given it to eat; and it was fed on bread, fruit, almonds, etc. It had a great dread of cold and moisture, and did not live long out of its native country."

THE HOOLOC (Hylobates Hooloc) is another eontinental species, found principally in the district of Assam, as far north as the 28th degree of latitude. It is one of the largest species, measuring, when full grown, upwards of four feet in height. It is covered with harsh, shining, black hair, with a broad white or greyish band across the forehead, above the eyebrows.
Their food consists principally of fruits; but they also eat some kinds of grass, and the young shoots and leaves of the peepul and other trees, which they chew, swallow the juice, and then reject the indigestible part. They are said to go in herds of from one hundred to one humdred and fifty individuals, raising a howling noise, which may be heard at a great distance. Dr. Burrough, who forwarded an aceount of the habits of this species to Dr. Harlan, says that "they are easily tamed, and when first taken, show no disposition to bite, unless provoked to anger, and even then manifest a reluctance to defend themselves, preferring to retreat to some corner rather than to attack their enemy;" but, according
to Mr. Owen, as quoted by Mr. Blyth, they oceasionally attack the natives, and bite them severely; and Mr. Owen himself was once surrounded by a troop of them, which he disturbed whilst washing themselves in a stream, and felt convinced that, had he not taken to his heels, they would have attacked him. The same gentleman states that these apes appear to destroy large snakes. His attention was once attracted by the noise made by them in some trees over his head. On stopping to examine into the eause of the uproar, he was disagreeably startled by the sudden fall of a python, six or seven feet in length, which was bitten in many plaees, and nearly dead.

According to Dr. Burrough the hoolocs walk ereet with great easc, balaneing themselves by raising their arms above their lieads; but if urged to greater speed they drop their hands to the ground, and assist themselves forward, jumping rather than rumning. If they sueceed in making their way to a grove of trees, they swing with such astonishing rapidity from branch to braneh and from tree to tree, that they are soon lost in the forest. In confinement they are gentle and tractable, and appear to entertain some affeetion for their master. In drinking they dip their hands into the liquid and then suck their fingers; but when very thirsty, they will take up the vessel containing their drink with both hands, and carry it to their lips, so as to get a more considerable draught. A specimen in Dr. Burrough's possession was fed prineipally upon fruits, boiled rice, and bread and milk, but would also eat eooked animal food, especially chicken and fried fish; he rejected becf and pork; he liked eggs, coffee, and chocolate, and was very fond of insects, searehing in the crevices for spiders, and if a fly chanced to come within his reaeh, would dexterously eateh it in one hand. Hence we may infer, that insects constitute a portion of the natural food of the hooloc, and probably also of the other gibbons. The cry of the specimen just referred to, was a loud and shrill whoowhoo, whoo-whoo.

The hooloc was eonsidered by Mr. Ogilby to be probably the origin of Pliny's Scyritce, and described by lim, in consequence, under the name of Hylobates Scyritus.

THE SIAMANG (Hylobates Syndactylus) is the largest and most powerful species of the genus, and is entirely of a black eolour, with the exception of a few hairs of a reddish tinge upon the eyebrows and chin. The hair is long and coarse, but glossy; the belly is nearly naked, and the throat eompletely so ; it ineloses a large sae communicating with the larynx, which ean be filled with air at the pleasure of the animal, and when thus distended forms a huge goitre-like swelling of the neck. This sac, which exactly resembles that of the orang-outan, is supposed to assist in augmenting the power of the tremendous voice of this animal; it also indieates an approach, on the part of the siamang, to the higher apes, whicl, like him, oceur in the forests of Sumatra.

The siamang was the first speeies of gibbon in which the union of the first and sceond digits of the hinder hands was notieed; and indeed this character is presented by this animal so mueh more strongly than
in the other species of the genus, that it well deserves the name of Syndactylus, applied to it by Sir Stamford Raffles. This peculiarity lias even induced Dr. Gray and M. Boitard to propose the formation of a separate genus for its reception.
M. Duvaucel, who diseovered this species in the neighbourhood of Bencoolen in Sumatra, states that the siamangs are very common in the forests, where they assemble in numerous troops, led by a chief, whom the Malays believe to be invulnerable, prohably beeause he is more powerful, active, and difficult to get at than the rest. These troops salute the rising and setting sun with the most terrifie eries, which may be heard at a distance of several miles, and which, when near, stun those whom they do not frighten. 'This is the morning call of the mountain Malays, but to the inhabitants of the towns it is a most insupportable annoyance. By way of compensation, they preserve a most profound silence in the daytime, at least if their rejose is not disturbed. M. Duvaucel adds, that they are slow and heavy in their gait, so that they may be casily eaught when surprised, especially on the ground; but, on the other hand, their vigilance is so great, and their sense of hearing so delicate, that it is by no means an easy matter to surprise them, as at the least noise, even though it be at a mile's distance, they take to flight. On the ground they advance by jerks, using their long arms like erutcles. When one of a troop is wounded it is immediately abandoned ly the rest, unless it happens to be a young one, when the mother stops, falls with it, and, uttering the most lamentable eries, attacks the enemy with open mouth and extended arms. Under ordinary cireunstances also, the females, according to M. Duvaucel, bestow an amount of care upon their offspring which seems almost to belong to a rational sentiment. He says-" It is a emrious and interesting spectacle to sce the females carry their young to the river, wash their faces in spite of their childish outcries, and altogether bestow upon their cleanliness a time and attention, which, in many cases, the ehildren of our own species might well enry."
In eonfinement the siamang, aceording to M. Diraneel, is gentle, but stupid and sluggish; in fact, from his aceount it would appear, that the very gentleness of the animal is merely due to its apathy. Mr. George Bennett, however, who obtained a speeimen of this animal at Singapore in 1830, has published a far more favomrable aecount of its endowments. Mr. Bennett describes his speeimen as always walking erect when on a level surface, sometimes holding his arms down so as to assist himself, by touching the ground with his knuckles oecasionally, but more usually raising them over his head, ready to scize a rope and climb up on the approach of danger. This animal preferred vegetable food, and was especially fond of carrots; when these were put uron the table for dinner, the siamang, although usually very decorous in his bchaviour, immediately forgot his good manners, and it was not without some diffienlty that he could be prevented from attacking them uninvited. "A piece of carrot," says Mr. Bennett, "would draw him from one end of the table to the other, over which he would walk without disturbing a single article, although the ship was
rolling at the time; so admirably can these creatures balance themselves." He would drink tea, eoffee, and chocolate, but never acquired a taste for wine or spirits; he was excessively fond of sweet things, and sometimes attempted to lift off the lid of the jar in which some cakes were kept; he would eat animal food, especially fowl ; and a lizard having been canght on board was placed before him, when he instantly seized it, and devoured it greedily. This specimen exhibited great attachment to his master, and when first sold to a European owner, made his eseape several times, in order to get back to a young Malay who had brought him from Sumatra to Siugapore. He exhibited considerable activity in climbing about the rigging of the ship, was greatly irritated when confined or disappointed in any way, and on passing the Cape, finding the temperature too low to allow of his sleeping on the maintop, as had previously been his habit, he showed an eager desire to be taken into his master's arms, and to be permitted to pass the night in the cabin, for which he afterwards evineed such a decided partiality, that, on the ship getting again into warmer latitudes, he would not resume his old station in the maintop, but showed a strong determination to remain where he found himself so comfortable. We cannot quote farther from the interesting account of Mr. Bennett; but the preceding statements will be sufficient to show that the endowments of this animal are far higher than we should be led to believe from the statements of M. Duvancel.
THE AGILE GIBBON (Hylobates Agilis).-The agile gibbon, which is called Unglac-puti by the Malays (Unglia being apparently a generic name for the gibbons) is, like the siamang, a native of Sumatra, where it was discovered by M. Duvancel. It is, however, far less numerous in the forests of that island than the siamangs, and is more frequently met with in pairs than in troops. The colours of the agile gibbon are more variegated than those of the preceding species; the heard and shoulders, the inside of the arms and legs, and the whole front of the body being of a deep coffecbrown colour ; whilst the occiput, the whole of the back, except the shoulders, and the outside of the thighs are pale brownish-white. The sides of the face are adorned with bushy white whiskers, and a narrow white band runs aeross the forehead above the eyebrows.
M. Duvaucel coutrasts the agility of this gibbon with the comparative sluggishness of the siamang as described by him; but it seems probable, from the narratives of other observers, that the difference between these two species in this respect is far less than M. Duvaucel would make it appear. In describing its surprising activity, the French naturalist says-" It escapes like a bird, and like a bird can only be shot, so to speak, flying ; scarcely has it perecived the most distant approach of danger when it is already far away. Climbing rapidly to the tops of the trees, it there seizes the most flexible branch, poises itself two or three times to secure its balance and acquire a sufficient impetus, and thus elears, time after time, without effort as without fatigne, spaces of forty feet and upwards." The same writer adds, that although deprived of the guttural sac, so conspicuous in the siamang, its cry
is very nearly the same, so that either this organ does not produce the effect of increasing the sound usually attributed to it, or it is replaced in the present species by some analogous formation. This cry is compared to the syllables wou-wou, frequently repeated with peculiar modnlations. A somewhat similar cry would appear to be common to most of the gibbons, and several of the species, the present one amongst others, receive the name of Wor-wou from the Malays.

One of these is the Cinereous Gibion (H. Leuciscus), a native of Java and the Molucea Islands, specimens of which are occasionally brought to Europe. Of the habits of this and the other species in a state of nature, scarcely anything is known ; but we may presume that they are very similar to those which we have been describing.

The second group of the Simiadæ, that of the true Monkeys, differs from the apes just described by the constant presence of callosities upon the buttocks, and by the alinost constant presence of check-pouches and a long tail. The arms are never so disproportionate in length as those of the apes; and yet the general strmeture of the borly is much further removed from that of man. In their cliaracter, also, the monkeys generally exhibit a great difference from the apes-they are vivacious and petulant in their deportment, and usnally very capricious in their temper; presenting in these respects a marked contrast to the grave and somewhat melancholy nature of the species previously described. It is in the East Indies, in the same region inhabited by the orangs and the giblons, that we find those monkeys which are most distinguished from the rest of their tribe by ape-like characters; though even here we meet with species of a more animal type, and resembling their Afriean brethren; whilst the great majority of the latter present a wider divergence from the apes, and gradually approach the baboons.
THE HOONUMAN (Semnopithecus Entellus).-The Indian monkeys above alhnded to form the gems Semnopithecus of F . Cuvier, which is characterized by the slender form and long limbs and tail of the species, by the want of cheek-pouches, and by the presence of thumbs on the fore-hands. The eanines of these monkeys are but slightly developed, and the molars have their tubercles so arranged as to form transverse ridges -a structure which indicates that the animals rather feed upon the leaves and tender shoots of plants than upon frnits; and this is also shown by the structure of the stomach, which is very long and much dilated in parts, especially at the anterior end into which the nesophagns or gnllet opens. These dilated portions being separated by constrictions, the stomach aequires a coniplieated appearance, somewhat resembling that of the ruminant quadrupeds. It is a remarkable fact in connection with this peculiarity of structure, that the stomachs of these monkeys often contain bezoars, or concretions of a similar nature to those found in many Ruminants, and which are so highly prized by eastern nations. The monkey bezoars are said to be of more value than those obtained from the Ruminants.
The hoonuman, which is for many reasons one of the most interesting species of this group, is a large
monkey-the old males measuring nearly five feet in height-of a yellowish or greyish-white colour, darker on the back, limbs, and tail, and with the face and lands black. The hair above the eyebrows forms a sort of projecting fillet across the front of the head; the face is bordered on each side with light whiskers, and the chin is furnished with a beard, which is peaked and directed forwards. As the animals increase in age the fur becomes darker, until it is of a nearly uniform rusty brown colour.

The hoonumau is an exceedingly abundant monkey in India, especially in Bengal. During the summer it migrates northwards into the hills, travelling as far as Nepaul, and even to the elevated plain of Boutan. It is regarded with great veneration by the Hindoos, who lave even deified it, and assigned it a high place in their almost imnumerable multitude of gods. They look upon the destruction of a hoonuman with the greatest horror, and believe that the perpetrator of such a crime will certainly die within a year after its commission. M. Duvaucel, from whom we have already quoted, gives an amusing account of the difticulty which he experienced in obtaining specimens, in consequence of this superstitious feeling. As soon as he was seen abroad with his gun, he was surrounded by crowds of natives, who employed themselves assiduously in chasing the monkeys out of gunshot ; and during a whole month that a small family of hoonumans remained at Chandernagore, where he was residing, his house was constantly surrounded by Brahmins, who tormented him by ineessantly beating tomtoms and drums to scare the four-handed divinities from so dangerous a neighbourhood. On entering the holy city of Goalpara, he saw the trees everywhere covered with these long-tailed deities, which immediately fled with loud cries, whilst a dozen Hindoos surrounded the traveller and endeavoured to impress upon him the danger he would incur by molesting or injuring animals which were nothing less than metamorphosed princes and herocs. Passing on, however, he says he met a princess so seductive that he could not resist the temptation of cultivating a nearer acquaintanee with her. He levelled his gun and fired; but then, to quote his own words, he "became witness of a scene which was truly touehing and pathetic. The poor animal, which had a young one ou leer back, had been hit near the heart; feeling herself mortally wounded, she collected all her ronaining force for the eftort, seized her young one, and was just able to throw it up into the branches of a neighbouring tree, before she fell and expircd at his feet. An incident so touching," adds M. Duvaucel, " made a greater impression on me than all the discourses of the Brahmins; and the pleasure of obtaining a speeimen of so beautiful an animal, was, for once, incapable of contending against the regret which I felt for having killed a creature which appeared to be bonnd to life only by the most estimable and praiseworthy feelings."

As might be anticipated, these monkeys, being protected from all injury by the superstitions of the inhabitants, abound to such an cxtent, and feel so little fear of man, that they become a positive nuisance to those whose minds are not so constituted as to enable them to regard the hoonuman in the light of a divinity.

They take up their abode in the topes or groves of trees which the Hindoos plant around their villages, and are often so numerous in the towns that Sir James Forbes considered that in Dhuboy there were more monkeys than human inhalitants. They visit the houses of the natives, who willingly provide them with food; and in the villages they often plunder the peasants, who, however, regard their visits as a high honour. At Dhuboy, according to Forbes, the roofs of the houses seemed to be entirely appropriated to the accommodation of the monkeys, and the same writer gives a ludicrous account of his having been compelled to remove from a shady verandah, in consequence of the pertinacious pelting administcred to him with fragments of tiles and mortar from the roof of an opposite house by these animals. He also dcscribes a curious mode of revenge sometimes adopted by the Hindoos of that town, in whieh the hoonumans are the principal agents. It appears that before the commencement of the rains, about the middle of June, it is usual to turn all the tiles on the roofs of the houses. The tiles are not fixed with mortar, but accurately adjusted one over the other, so that, if this operation is performed just before the setting in of the rains, the roof will be watertight during the wet season, and afterwards a few gaps are of little consequencc. It is at this period, when the tiles have been turned and the first rains are hourly expected, that the Hindoo who lias a grudge to gratify repairs at night to the house of his adversary, and strews a quantity of grain over the roof. This is soon discovered by the monkeys, who assemble in great numbers to pick up their favourite food; and, as mueh of the grain raturally falls between the tiles, they soon ncarly unroof the house in their efforts to get at it.
In other respects they appear to be exeeedingly misehievous and destructive. They often descend in troops upon the cultivated fields; and it is said that when the troop is pretty numerous, they will strip a maize field of moderate size in a few hours. The disposition of the males, also, is described as so libidinous, that it is not safe for a woman to pass their haunts. The only return they make for all the damage they do, and all the kinduess shown them by the natives, is that, according to Forbes, they frequently destroy poisonous snakes. They seize them by the neek when asleep, and then, "running to the nearest flat stone, grind down the head by a strong friction on the surface, frequently looking at it, and griming at their progress. When convinced that the renomous fangs are destroyed, they toss the reptile to their young ones to play with, and seem to rejoice in the destruction of the common enemy." The tigers and other carnivorous quadrupeds of India, having no such scruples as those of the human inhabitants of the country, are said to wage a constant war with the hoonumans. The tiger is described as taking up a position at the foot of the tree in which the monkeys have taken refuge, when his roaring so frightens them that they tumble down and he devours them at his leisure.
The cause of the veneration in which the hoonuman is held by the Ilindoos, which, indeed, is also extended, although in a less degree, to other monkeys, is doubtless partly to be ascribed to the Brahminical doctrine
of metempsychosis, but probably still more to its suppposed derivation from one of the personages of their mythical history. In the great cpic poem of the "Ramayan," which is devoted to the exploits of Rama, an incarnation of Vishulu, that hero contracts an alliance with Hoonuman, ling of the monkeys, in his war with the Rackshasas of Ceylon. I'hroughont the war Hoonmman plays the principal part, next to Rama limself; but laving stolen a mango-tree from a garden in Ceylon for the purpose of giving it to the Hindoos, he was condemmed to have his face and hands blackened, a mark of disgrace which his deseendants continue to bear to the present day. According to another aecount, Hoomman was condemned to be burned by the giant from whom he stole the mango, but escaped with no greater injury than the singeing of his face and hauds. We learn also that Hoonuman endeavoured to set Ceylon on fire, by means of a lighted tar-barrel tied to his tail; but, finding unexpectedly that this appendage was not fire-proof, he hastened to the IIimalayas and dipped it into a lake at the souree of the Ganges, which bears the name of Bhunderpouch or "Monkey's tail" to this day. The Hindoos believe that every year a single monkey is sent by his fellows to take his station on the snowy peak of a mountain which rises from the sacred lake, and there keeps watch mutil he is relieved from his severe duty in the following scason.

THE DOUC (Scmnopithecus Nemews).-The douc or Cochin China monkey is remarkable in this family for its vivid and varied colours. It has the face naked and yellowish; the top of the head, and the whole of the lack and sides, grey; the shoulders and thighs, as well as the hands and feet, black; the arms white ; and the legs deep chestnut. The face is surrounded by white whiskers, and the tail and a patch on the rump are also white, contrasting curiously with the clarker fur in the vicinity.

This beautiful monkey, which attains a height of upwards of four feet, is a native of Cochin China, where it oecurs in great abundance in the forests; but from the little commerce carried on with that comntry, scarcely anything is known of its habits, and specimens are even rare in our museums. It was long regarded as the type of a distinct genus, characterized by the absence of callosities, which, however, it is now found to possess. The error arose from the circumstance that Buffon, who first described the species, had only a barlly-stuffed specimen, in which the skin had been allowed to shrink, so as to conceal the callosities.

THE BUDENG-(Semnopithecus Maurus)-an inlabitant of Java and Sumatra, presents a remarkable contrast to the preceding species in the uniform black colour of its long silky lair. The young animals are reddish-brown. A frill of upright hair runs across the forchead, and the cheeks are adomed wtth a pair of large pointed whiskers, directed backwards. This species is said by Dr. Iorsfield to be exceedingly abundant in the forests of Java, where it lives in the trees, in troops of fifty or more. It would appear, from the statements of the same author, that it is liardly safe to approach them in the forests, not from any danger of an attack, but because the commotion
produced in the troop by the sight of a man often causes them to break off the dead branches of the trees, which are then precipitated on the spectator. The natives often hunt them for the sake of their fur, when they kill them with stieks and stones. This species is also called Lutung or Lotong, especially in Sumatra; according to Dr. IIorsfield its name in Jara is Budeng, and another monkey is known as the Lutung, although the budeng is also sometimes called Lutuny Itam, or Black Lutung, the second species being denominated Lutung Mera, or Lied Lutung. The latter (S. Pyrrhus) is comparatively rare, and is a great favourite with the natives, who keep it as a pet about their houses. Of the other species of Semnopithecus very little is known; they are rather numerous, and inhabit the same countries as the preceding.
the kahau, or Proboscis Monkey (Nusalis Larcatus),-Plate 1, fig. 3.-'lhis curious monkey agrees very elosely with the Semnopitheci in its general characters, but differs from them in the singular form of the nose, which, in the male especially, looks like an absurd caricature of that prominent and important nember in the human comitenance. It is principally from this circumstance that the kahau has been regarderl as constituting a distinct genus.

The nose in the male forms a curved fleshy proboscis; in the female it is much smaller; and terminates in a sharp point, from which it slopes directly to the upper lip. The nostrils in both sexes are placed on the inferior surface. The tail, as in the preceding monkeys, is very long; the hair is of a reddish tawny or chestnut colour all over the body, paler in front; and the loins in the male are marked with pale spots. The face, which is naked, is described by some authors as of a bluish colour; but Mr. A. Adlanis states, that in a live female examined by him it was of a bright brickdust red. The hair of the clin, neek, and shoulders is longer than that on the other parts of the body, producing somewhat the appearance of a mame.

The kahau is a large monkey, the adult males often measuring four feet and a half in height when in an erect posture. It is a native of Borneo, where it lives in numerons troops upon the trees in the neighbourhood of rivers, and is said to move amongst the branches in a more deliberate fashion than most other monkeys. According to the old Dutch naturalist, Wurmb, however, the kalau wonkd appear to exhibit more activity in the morning and evening at least, when, he says, they may be seen "leaping with astonishing force and rapidity from one tree or branch to another, at the distance of fifteen or twenty feet." IIe ards that the natives will have it, that, when thus occupied, the monkeys hold their noses in their hands, doubtless from a fear lest so ornamental an appendage should meet with some injury; but this, he says, he has never seen. When disturbed, it emits a short, impatient cry, described by Mr. Adams as something "between a suceze and a scream, like that of a spoilt and passionate child;" other accounts compare this cry to the word lahan, whence is derived the name usually applied to the animal. It wonld appear, however, that its true native name is Bunta-jan. It is deseribed as a fieree and violent animal.

The kahau is only known to iuhabit the great island of Borneo, where the Dyaks assert that these monkeys are men who have retired into the woods to eseape taxation. How they subsequently became ornamented with tails does not appear. The species is also said to oceur in Sumatra, the peninsula of Malacea, and Cochin China. From the statement of MI. Geoffroy St. Hilaire, -that the ambassadors sent by Tippoo Sahib to Paris, just before the French revolution of 1789, recognized the stuffed specimen in the muscum there as an animal of their country to which they aseribed a high, moral, and intellcetual character-it would appear, also, that this, or a similar species, should oceur in IIindostan proper. None of these localities, however, rest upon any sufficient testimony; and in the ease of 'Tippoo's ambassadors, it seems probable that they may either have seen specimens bronght as captives from the far east, or that they may have confoumded this monkey with the hoonuman.
the guereza (Colobus Guereza).-Although the majority of the African monkeys belong to a group presenting well-marked differences from the Indian species above described, there are, nevertheless, some of them which exhibit a close rescmblance to the Scmnopitheei, both in structure, character, and mode of life, and may be regarded as the African representatives of the Asiatic group which has hitherto oceupied our attcution. The stomach has the same sacculated strueture ; the dentition is identical, and the molar tecth are found to be worn down by use, indieating that the creatures live upon the leaves and buds of trees, rather than upon fruits; the check-pouches are wanting, the body and limbs are slender, and the tail long. The Colobi are, however, distinguished from their Indian relatives, and, indeed, from all other monkeys of the Old World, by a most important charaeter, namely, the total absence or rudimentary condition of the thumbs on the anterior members; iu most cases the metacarpal bone of the thumb is alone present, and in those species in which this is followed by a single small joint, the ouly external indication of a thumb is a mere tubercle, of not the least service in prehension.

The guereza is the only species of this group upon whose habits we have any information. It is about the size of a eat, and of a decp black colour, with the cheeks, throat, and sides of the neek white, and with a large quantity of long white hairs, growing from the shoulders, sides, and rump, and hanging down in such a manner as to eonecal the whole lower part of the body. The extremity of the tail is, in like manner, eoncealed by long white hairs.

This beautiful monkey, whieh is a native of Abyssinia, was mentioned by the old traveller Ludolf, who supposes it to have been the Callithrix of the ancients, a eonjecture which seems very probable from the deseription of that animal given by Pliny. Ludolf says that it is ealled Foulies in Ethiopic, and Guereaza in the Amharie dialect, and these two names are giren with some variation by later travellers.

Dr. Riippell, who first accurately described the gucreza, iuforms us that it resides in small families in the loftiest trees, and usually in the neighbourthood of some stream. It is restless and lively in its habits,
but not noisy; its food consists of wild fruits, seeds, and inscets; and, unlike the ordinary monkcys, it never commits any depredations upon the cultivated grounds. In allusion to its harmless nature, and to the constant persceution to which it is subject, for a reason which will be hereafter mentioned, Ludolf says that a eurious rhyme is current in some parts of Abyssinia, which may be translated as follows :-

> "I give no man painI eat no man's grainThey hate me in vain!"

The same traveller notices the tenderness of constitution of this monkey, whieh is confirmed by other observers, from whose narratives it would appear that the guereza will not endure confinement, but pines to death in eaptivity in the course of a few days.

The fur of this animal is much prized in Abyssinia on account of its beauty ; and in the provinces of Damot and Gojam, where the gucrezas abound, they are destroyed in great numbers for the sake of their skins, which, aecording to Dr. liiippell, fetch as much as five shillings each in the market of Gondar. Mr. Salt places the value rather lower, saying that they sell for about half a dollar. They are chicfly employed in ornamenting the shields of the native soldiers; and the distinguished traveller last quoted, states that every man in 'Tigré wears a picee of this skin as an ornament on lis shicld. The skins are also sometimes sewn together, when they form a beautiful covering for a eouch, but their cost prevents their being put to this use by any but the eliiefs.

Several other monkeys of this genus are found in the tropieal regions of Africa, especially on the western coast, whence the skins of some long-laaired black species are imported iuto Europe, and used in the mauufacture of muffs. There is mueh uncertainty as to the number of species, about half a dozen having been described, which are considered by some anthors as simple varieties of one or two. This is owing in a great measure to the imperfect condition of the skins which reach this country. They are highly prized by the Negroes, who make caps of them, and will pay from twenty to thirty shillings apicee for them ; and as it is only the skin of the body that is raluable as a fur, the hunters never take the trouble of skiming the head and legs.

The great majority of the African monkeys belong to the group called Guenons by French authors, forming the genus Cercopituects of zoologists. These monkeys have the face somewhat produced into a muzzle, but rounded at the extremity; cheek-pouches are always present; the eycs are prominent, not shaded by projecting cyebrows; and the tail is long, usually longer than the body. They are distinguished from a nearly-allied group-that of the Macaques, all the species of which are inhabitants of tropical Asia-by the last molar in the lower jaw having only four tubereles on its surfice; whilst in all the remaining monkeys and iu the haboons, this molar exhibits one or two additional small tubercles at its posterior portion. Iu all these monkeys the eanines of the ruper jaw are greatly dereloped, especially in the males, in
which they aequire a formidable length as compared with the size of the animal; and from their being acute at the point, and very sharp along the hinder edge, they constitute most dangerous weapons, which the old males of most species know well how to use.

Besides the presenco of cheek-jouches, the Cercopitheei present another character of distinction from the Indian Scmnopitheci and the African Colobi, which, although of sccondary importance, and common to them and many of the maeaques and baboons, it is still necessary to mention. This is the annulated nature of the fur, arising from the individual liairs not being of the same colour from the root to the tip, but marked with rings of dilferent colours, by which means the fur acquires a minutely speekled appearance; and the general tint of the animal is usually quite different from any of the distinct colours which are to be found in its fur.

In their structure and form, as in their character, these animals may be regarded as the types of our notion of a monkey; they are nearly equally removed from the apes on the one hand, and from the baboons on the other. Unlike the mild and gentle Semnopitheci and Colobi, they are petulant, capricious, and often spiteful, especially when old; whilst on the other land they are, for the most part, free from the sullenness and moroseness which are usually characteristic of the baboons. 'Ihey live in the forests, each species usually confining itself to some particular district, where the animals live in large troops, under the chieftainship of the old males ; and the imroads of one species or tribe upon the region over which another has arrogated the dominion to itself, are highly resented by the latter, of which the whole community immediately unites to repel the aggression. Even in confincment this party feeling is maintained; and it is not uncommon in large menagerics, where numerous monkeys of different kinds are kept in the same cage, to see those of one species combine their powers to defend one of their brethren against the bullying of some larger oceupant of their common prison. In their native forests, these monkeys keep at a distance from human habitations, and usually frequent the banks of streams. They feed principally upon fruits and seeds, but also cat the buds and young shoots of trecs, and occasionally diversify this vegetable diet with a repast of birds' eggs or insects, although thcy appear to be less addieted to animal food than the baboons.

The genus Cercopithecus includes those monkeys of the Old World which are most commonly brought to Europe, and also those which have most frequently produced young ones in our menagerics. The female, nonder these circumstances, carries the young one in her arms mitil it has aequired strength enough to cling firmly to her hair, when, having all her hands at liberty, slic is able to spring and climb about with as much activity as if she had no burden. The male is sometimes, if not always, an exceedingly bad father, quarrelling with the female, and ill-treating the young one. M. Is. Geoffroy St. Hilaire, mentions, that in 1837, when a female of the Griet (C. Grisens) lad a young one in the Jardin des Plantes at Paris, the male was obliged to be removed, in consequence of his
unnatural behaviour to his infant offspring; while, in the very next cage, several male baboons were to be seen surrounding two females with their young ones, earessing the two mothers with the most lively demonstrations of tenderness, pressing them in their arms, embracing them almost like human beings, and quarrelling anongst theinselves for the pleasure of nursing the little oncs, which, after passing from arm to arm, were faithfully returned, each to its own mother."
Of the numerous species of this genus known to naturalists, we can only mention a few. Amongst these-
the talapoin (Cercopithccus Talapoin) is the one which, in the gentleness of its disposition and the slenderness of its form, would appear to approach most elosely to the preceding monkeys; it has been separated by Geoffroy as a distinct genus, on account of the large development of its brain, the shortness of its muzzle, and especially the small size of its hinder molars, of which those of the lower jaw liave only three tubercles.

The talapoin is the smallest of the monkeys of the Old World. Its fur is of a grecuish tint, with the lower surface of the body and the inside of the limbs greyish-white; the hairs of the forchead are raised, so as to form a sort of tuft; the whiskers are yellowish, and the face flesh-coloured, with the nose and ears dark-brown or black. It is a native of Western Africa, but is less commonly brought into Europe than many other species inhabiting the same locality, although its gentleness and intelligence render it onc of the most interesting of the uld World monkeys. In captivity it is very lively and amusing.
THE MONE (Cercopithecus Mona) is a species nearly related to the talapoin, which it rescmbles in the clegance of its form, and in its intelligence. It is a little larger than the talapoin, but is still one of the smallest of the Simiado, and its colours are very beautiful. The head is of an olive-green colour, mixed with golden-yellow; the forchead is covered with whitish hairs, and on each side of the face is a large bushy whisker of a straw colour; the back and sides are brilliant chestnut, mottled with black; the legs and tail are black, speekled with grey, and on each hip, immediately in front of the root of the tail, is an oral spot of the purcst white-a character which is peculiar to this species; the throat, the lower part of the body, and the inner surface of the limbs, are also pure white.

The mone inhabits the western coast of Africa, and is usually brought to Europe from Senegal. Its name of Mona is a sort of gencric name for monkey in some parts of the south of Europe, and was applied to this species by Buffon, who also identified it with the Cebus of the ancients, although without sufficient reason. In confinement it exhibits a remarkable amount of amiability, being more doeile and less petulant and capricious than most other monkeys, so that it may be allowed far more liberty, although the males not unfrequently change their character for the worse as they increase in age. MI. F. Cuvier has published an interesting account of mindividual of this species, whiel lived from its youth mpwards in the menagerie at Paris,
and preserved its gentleness even after it had arrived at maturity. This specimen exhibited wonderful address in getting at any object that pleased him; he would open eupboards by turning their keys, or undo knots, and had aequired an adroitness in poeket-picking that would have done eredit to a pupil of Mr. Fagin, performing this operation with so much delieacy that his hand eould not be felt, although the person whose poekets were under examination might be perfectly aware of what was going on.
the diana monkey (Cercopithecus Diana) which is said to be called the Roloway on the Gold Coast, and Exquima in Congo, is a larger and stouter speeies than either of the preeeding, but is still distinguished amongst the monkeys of this genus by the elegance of its form, and the gentleness and playfulness of it eharaeter. Its general eolour is a mixture of black and grey, with the face, the hands, and the extremity of the tail deep black; down the back runs a broad band of a deep ehestnut-red eolour; on the forehead there is a white band, curved so as to form a very open ereseenta eharacter which indueed Limmus to give the speeies the name of the goddess of the ehase ; and the whiskers and beard are also pure white. The latter appendage forms one of the most curious charaeters of this monkey; it is rery long and pointed, resembling, as Mr. Ogilby says, "the formal cut of the peaked beard whieh we see in some old paintings about the time of Henry VIII.;" and the monkey appears to regard it as highly ornamental, taking great eare to keep it trimmed and neat, and holding it in his hand when he is about to drink, to prevent it from eoming in contaet with the water. Mr. Ogilly says that the first time he observed this strange action, the ludierous effeet of the creature's solieitude about his beard made him laugh outright; the monkey, after looking up for a moment as if in astonishment at this sudden explosion, appeared all at once to disenver its eause, and no doubt regarding it as a personal insult, flew at the offender most vieiously, and was only prevented by the shortness of his chain from inflieting a severe and summary punishment upon him.

As a general rule, however, the diana monkey is exeeedingly good-tempered, and very lively and playful. A most interesting account of a specimen of this speeies was communieated by Mrs. Bowdieh to Loudon's Magazine of Natural History, vol. ii. This monkey, whieh had reeeived the name of Jack, belonged to the eook of the ship in which Mrs. Bowdieh returned from Afriea. Teasing was one of his principal aceomplishments, and he seems to have brought the art to a great state of periection. He would pull off the men's eaps and throw them into the sea, a habit whieh is said to be eommon in nantieal monkeys; he wonld knoek over the parrot's eage for the pleasure of drinking the water as it triekled along the deek, steal the tea out of the sailors' mugs, or abstraet the pieces of biscuit whieh the men had put between the bars of the grate to toast, and earry off the carpenter's tools. But his favourite amusement consisted in riding the pigs, in which he was a great adept. "Whenever the pigs were let out to take a run on deek," says Mrs. Bowdich, "he took his station
behind a eask, whenee he leaped on the back of one of his steeds as it passed. Of course the speed was inereased, and the nails he stuck in to keep himself on produced a squeaking; but Jaek was never thrown, and beeame so fond of the exereise that he was obliged to be shut up whenever the pigs were at liberty." Several smaller monkeys were on board the ship, and of these he was very jealous, going so far as aetually to throw two of them into the sea. On a third lie exereised his spite in a most ludicrous fashion. The sailors had been painting the ship's side with a streak of white, and on going down to dinner left their paint and brushes on deck. This excellent opportunity was not lost upon Jack; he ealled a little blaek monkey to him, and when the poor little beast eame and erouched at the feet of his superior, the latter scized him by the nape of the neek, dipped the brush into the paint, and immediately covered his vietim with white from head to foot. This absurd spectacle caused Mrs. Bowdich and the steersman, who had both been wateling his proeecdings, to burst into a laugh, upon which Jack dropped the whitened monkey and seampered up into the rigging, whilst the unhappy little subjeet of this practieal joke began lieking himself, and was ouly preserved from being poisoned by a thorough washing with turpentine. During this operation, the author of the mischief was peeping down through the bars of the maintop, with evident enjoyment of the eommotion that he had oeeasioned. Fear of punishment, lowever, kept him aloft for three days, until hunger compelled him to come down, when he dropped suddenly into Mrs. Bowdieh's lap, as if to seek for protection. The skin of the diana monkey forms a beautiful fur, and is frequently used for that purpose.
THE WHITE-NOSED MONKEYS (Ccrcopithecus Nictitans and Pctaurista), which are also nearly related to the mone, and inhabit the same eountries, are distinguished by having a large white spot upon the nose. The best known of these is the Lesser White-nosed monkey (C. Petaurista), which is one of the quietest and most playful species of the group; and from its familiarity and amusing habits is always a great favourite with the visitors to our menageries.

THE CALLITHRIX (Cercopithecus Subreus), so called because Bufton supposed it to be identical with the Callithrix of the aneients, belongs to a seetion of the genus in whieh the form is more robust, and the character generally far less amiable, than in the preceding speeies. It is also ealled the Green monkey; and the Cape de Verd monkey, the latter name indicating one of its dwelling-plaees; it also oceurs in Senegal. It is a handsome speeies, about the size of a large eat; the fur of the baek and sides is of an olive-green colour, mixed with brown, that of the belly is yellow, and the whiskers are yellowish. It is very hardy, and is consequently eommon in menageries, where its restless playfulness renders it attraetive; but its temper becomes unecrtain as it grows older, and the adult males are often rery spiteful.

THE GRIVET (Cercopithecus Griscus) is a nearlyallied, but smaller speeies, whieh is also frequently imported into Europe. It is a native of Nubia and of several provinees of Abyssinia, where it is a farourite
with the inhabitants, who often keep specimens in their houses. The grivet was also well known to the ancient Egyptians, and is often represented on their monuments.

THE PATAS (Cereopithecus Ruber), an inhabitant of Senegal on the west coast of Africa, is one of the monkeys most commonly imported into Europe. It is about the size of the callithrix, and of a general reddish fawn colomr, with the lower part of the body and the inner surface of the limbs pale grey. Across the forehead there is a blackish band, and the extremity of the nose is covered with very short black hairs. In confinement the patas resembles the two preceding species in its character, being very lively and playful, but at the same time so capricious in its temper that any approach to familiarity with it is attended with danger. In a state of nature, according to the old French traveller Brue, the patas possesses a great share of curiosity, coming down from the tops of the trees to the lower brancles to examine the boats passing beneath them; but when the first novelty wore off, the monkeys, says he, " became more confident, and began to pelt us with rotten branches and other missiles, not always of the most delicate description." This compliment being returned by the sailors with their gums, by which some of the monkeys were killed and others wounded, they did not allow themselves at first to be intimidated, but renewed the assault with great determination, until finally perceiving that the odds were against them, they scampered nimbly out of range of the guns, and afterwards contemplated the boats from a safer distance.
THE NISNAS (C. Pyrrhonotus), is a species very nearly allied to the patas, with which it was formerly confonnded. It is, however, a stouter animal, and presents several distinctive characters, espceially the whiteness of a portion of the nose. The nisnas is a native of Abyssinia and Nubia; it was well known to the ancient Licyptians, and is often represented in their sculptures. It is also supposed to be the ecbus of the Greek writers on natural history.

The group of the Macaques, already referred to as distinguished from the Cercopitheci by the presence of an additional (fifth) tubercle on the hindmost molar teeth in the lower jaw, nevertheless presents a close resemblance to the preceding group in its general characters. In fact, the characters of the species of these groups shade so gradually into each other-the Cercopitheci becoming insensibly macaque-like, and the macaques baboon-like in their general structure-that some writers have proposed the abolition of the group of the macarues altogether, by uniting the more monkeylike macaques with the Cercopitheci, and the more baboon-like species with the baboons. At the same time, as the macaques, with but two or three exceptions, are all inhabitants of Asia, where they well represent both the Cercopitheci and baboons of $\Delta$ frica, it seems desirable to retain the group on account of its convenience in regard to zoological geography.

The macaques are, in gencral, of a more robust form than the other monkeys; the muzzle is prominent, but rounded off at the extremity, and the tail is very variable in length, being sometimes as long as in many

Cercopitheci, sometimes reduced to a mere tubercle, and in two species altogether wanting. In their general habits they resemble the Cercopitheci, but their evil passions acquire a strength proportioned to their usually larger size and greater physical power; and although they are less disgusting and ferocious than the baboons, they are far more so than the other monkeys.
the sooty mangabey, or White-eyelid Monkey (Cereoeebus Fuliginosus). We have already stated, tlat although the inacaques are strictly speaking an Asiatic group, they liave a few representatives elsewhere. Amongst these are the mangabeys or whiteeyelid monkeys which inhabit Africa, and most closely rescmble the common monkeys of that continent in their general form, in the length of the tail, and in their liabits. The mangabeys are, however, distinguished from the ordinary monkeys and from the other macaques, by a peculiarity in the structure of the hands-all the fingers buth of the fore and hind hands being united by webs which extend at least as far as the first joint, whilst between the first and second fingers of the hinder hands, the web reaches nearly to the tip. I'hey are also characterized by the dead white colour of the upper eyelids, which gives them a singular aspect when brought into view by those perpetual blinkings in which all monkeys are fond of indulging.

The sooty mangabey, which is the commonest species, is of a sooty grey colour on all the upper parts of the body, the tail and the outer surface of the limbs; the chin and throat, and the lower parts of the body are brownish ash colour. This monkey is a native of the west coast of Africe, but nothing is known of its habits in a state of nature. In captivity it is familiar and gentle, exceedingly active and full of grimace, throwing itself into such ludicrous attitudes that, as M. F. Cuvier observes, "it might be supposed to be provided with a greater number of joints than other monkeys," or tumbling and dancing in an absurd fashion to attract the attention of the visitors, from whom it hopes to obtain a reward for its agility. Mr. Ogilby mentions that a "specimen in the menageric of the Zoological Society was very fond of being caressed, and would examine the hands of his friends with the greatest gentleness and gravity, trying to pick out the little hairs, and all the while expressing his satisfaction by smacking his lips, and uttering a low suppressed grunt." This habit appears to be a favourite one with the species, as many specimens cxhibit it.
Two other species of these monkeys are known-the Coldared Mavgafey (Cereoebus Collaris), and the White-crowned Mangabey (C. Athiops); they are both said to inhabit the west coast of Africa.
THE BONNET MONKEY (Macacus Sinicus), the Toque of some authors, was called the Bonnet Chinois by linfon, from an erroneous notion that it was a native of China; it is now known to come from the Malabar and Coromandel coasts, and probably inhabits the whole sonthern extremity of the peninsula of Hindostan. It also lives in a wild state in the Mauritius, but has been introduced into that island siuce its occupation by Europeans.

The bomet monkey is a species frequently brought to Emrope for exhibition ; it is about the size of a large
cat, of a greenish-dun colour on the upper parts and greyish below, and has a long tail. The whole of the face is naked, wrinkled, and of a dingy flesh colour ; but the most striking character of the species is to be found in the arrangement of the hair of the crown, which is long and dark-coloured, and instcad of standing erect, spreads in all directions like rays proceeding from a cominon centre, lying upon the surface of the head in the same way as the hair of a scalp wig. It is from this character that the animal has received the name of the bomuct monkey. A somewhat similar disposition of the hair occurs in a nearly allied specics, the Crownect Monkey (Macacus Pileatus), but this is of a reddishbrown colour, and the hair of the head is nearly erect. In its native country the bonnet monkey meets with an amount of veneration almost equal to that shown in Bengal to the loonuman (see p. 27); although very destructive in the gardens and ficlds, it is forbidden to kill them, and the natives assemble round any person guilty of this offence, and give him no peace until he has paid for a sumptuous funcral for his victim. Such at least is the account given by Buchanan of the state of matters in Mysore, which, in all probability, relates to this monkey; and that traveller adds, that the proprietors of gardens used to hire men of a particular class, whlo captured the monkeys and squirrels (which, it would appear, arc equally sacred) in nets, and then conveycd them to some distant village; but as everybody resorted to the same means of getting rid of such troublesome neighbours, the gardeners soon formd that the monkey-catchers were the onlypeople who benefited by these proceedings, and accordingly gave them up.

In confincment, the bonnet monkey is a most amusing fellow when young, as all his actions are performed with an amount of gravity which is exceedingly ludicrous. Of all the species usually kept in our menageries, the bonnet monkeys exhibit the most striking external marks of mutual affection. When two or three are kept together they are constantly to be seen hugging or nursing each other, or carefully searching in the fur of their companions for the fleas and other vermin which doubtless harbour there in sufficient abundance to render their destruction a matter of gratification. At all cvents this appears to be the feeling of the monkeys, who make it an affair of mutnal advantage; for whilst one fellow exlibits the most exemplary patience, lying at full length, and submitting to have every part of his fur investigated by the sharp mails and sharper eyes of his companion-the latter rewards himself for his trouble by inmediatelyde vouring any of his friend's troublesome guests that may come under his fingers. Where a specimen of this monkey has none of its own species to contract an intimacy with, it will content itself with some other animal, and a kitten is not unfrequently given to it as a companion. Under thesc circumstances, as Mr. Ogilby remarks, "nothing can execed the ridiculous caricature of lumanity which it presentspetting, nursing, and hugging the unfortunate kittcn, at the imminent risk of choking it, with all the gravity and fondness" of a child similarly employed. When adult, however, the deportment of the bonnet monkey becomes entircly changed; instead of the playful good temper of the young animals, the old

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males exhibit a morose, sullen, and spiteful disposition, which renders it dangerous to attempt any familiarities with them, and the aspect of the animal changes at the same time, and acquires a fcrocity which accords but too well with his temper.
THE MACAQUE (Macacus Cynomolgus) is another long-tailed species which is also frequently brought to Europe. It is a larger and more robust species than the bonnet monkcy, which it rescmbles in most of its structural characters, and in its disposition. The colour of the upper parts of the body and the onter surface of the limbs is greenish-hrown, the lower surface and the inside of the limbs are greyish-white. 'The tail, when not injured, is about as long as the body; but the macaque has a curious habit of gnawing the end of his tail, and it is a very common circumstance to see specimens with this member considerably abbreviated, most probably in this way. The hair of the crown of the head usually forms a sort of ridge, or crest, rumming from back to front, and appearing as though it had all been brushed up towards the middle. A specimen which exhibited this peculiarity was described by Buffon under the name of the Aigrelte.

The macaque is far more widely distributcd than the bonnet monkey, bcing found not only on the continent of India, but also on several of the large islands, especially Java, Sumatra, Bornco, and Celebes. According to Dr. Horsfield, it is the commonest monkey in the forests of Java, where it is a great favourite witl the natives, who constantly domesticate it and keep it in their stables, under the impression that its society is advantageous to the horses. In the European menagerics the macaque appears to thrive; it supports the se verity of our winters better than most other monkeys, and has been several times known to breed in Europe. It is remarkable that, under these circumstanees the female has generally deserted lier offspring, although other nearly-allied species have not only bred in confinement, but have tended thcir young with the greatest care. The habits of this animal in captivity are similar to those of the bonnet monkey, but the old males become even more ferocious and spiteful.

THE WANDEROO (Macacus Silenus) is one of those species of macaques in which the tail is only about a third of the length of the body. It measures from three feet to three feet and a lialf in height, and is of a robust form; its hair is of a black or blackish colour, as is also the naked skin of its face and paws, but its head is surrounded by a long thick mane of greyish hair, resembling an enormous wig falling down upon the shoulders, in the style of that remarkable head-dress which is still thought to confor such dignity upon our judges, and perhaps justly, for between this ornament and the habitual gravity of its countenance, the wanderoo acquires a singular air of wisdom and importance, which, in the monkey at any rate, is excecdingly ludicrous. Its tail is tufted at the extremity.

The name of Wanderoo, commonly given to this monkey, is said to be its ordinary denomination in Ceylon, of which island, and the adjacent coasts of continental India, it is an inhabitant. It is said, also, by some writers, to advance far towards the north at certain seasons of the year, and sometimes even to
aseend the IIimalayas nearly to the region of perpetual snow. According to Father Vineent Maria, a Carmelite monk, this monkey would appear to occupy quite an aristocratic position amongst the other quadrumanous inhabitants of the Malabar coast. The old missionary tells us that "the other monkeys pay such profound respect to this species, that they humiliate themselves before him, as if eapable of appreciating his superiority and pre-eminence," and the magnificence of his wig seems even to produce an impression on the human inhabitants of Malabar, for the worthy father adds, that "the princes and great lords hold him in much estimation, because he is endowed above every other with gravity, capacity, and the appearance of wisdom. He is casily trained to tho performance of a varicty of ceremonies, grimaces, and affected courtesics, all which he accomplishes in so scrious a mamer, and to such perfection, that it is a most wonderful thing to see them acted with so much exactness by an irrational animal." Mr. Ogilhy is probably in the right when he attributes the submission of the other monkeys to the wanderoo, rather to his physical than to his moral superiority, and the behaviour of several specimens which have from time to time been exhibited in this country lias proved that the wanderoo is not superior to his congeners in sagacity. Robert Knox, another old traveller, tells us, that in Ceylon this monkey does little misehief, but lives in the woods, feeding on the leaves and buds of trees.

THE BRUH (Macacus Nemestrinus), deseribed by Buffou under the name of the Maimon, is of a more robust form than the wanderoo, and has the tail much shorter, slender, nearly naked, and slightly curled, which has given origin to the name of the Pig-tciled Monkey, originally applied to this species by Edwards. The bruh is of a blackish-brown colour on the back, becoming lighter beneath and on the limbs; its face is fleshcoloured. It is an inhabitant of Sumatra and Borneo, and is described as being more docile and intelligent than its nearest allies; but this amiability of charaeter would seem to disappear with age, although even old specimens are said to cxhibit less ferocity and sullemess than the other large macaques. According to Sir Stamford Rafles, the natives of Sumatra are fond of domesticating the bruh, whose docility they turn to good account. They train it to climb the cocoa-nut trees for the purpose of picking the fruit, and it is said to show great diserimination in selecting the ripe nuts, of which, moreover, it picks no more than its master requires.

THE BHUNDER (Macacus Rhesus) is a species very nearly related to the brulh, with which it was indeed confounded by Cuvier. It is, however, furnished with a rather longer tail; and this appendage, instead of being slender and naked, is thick and well covered with lair; the upper surface of the body is of a greenishgrey colour, the individual lairs being annulated with light dun and dark brown; the lower surface and the inside of the limbs are light grey, and the eallosities are bright red. The skin is remarkably loose and flaccid, langing in folds even in the young animals; and this peculiarity, which occurs, although to a somewhat less extent, also in the brulh, enables these mon-
keys to be fattened to such a degree as to exhibit an enormous corpulence.

The blunder is a native of continental India, where it occurs abundantly in Bengal, and is also found in Assam, Nepal, and Simla. The loommman is the only other monkey whieh lives in these provinces, and the blhunder appears to slare with this sacred species in the respect of the natives. Captain Williamson tells ns that in many places revenues are allotted for feeding whole tribes of bhunders under the eharge of a fakecr, or other mendicant priest, who ckes out the regular revenues attached to lis oflice by charitable contributions levied upon travellers principally by the monkeys, who show themsel ves most aceomplished beggars. They never molest any one, unless some eause of offence is given; but then they bite severely, and a trifling eircunstance may produce the necessary initation. Mr. Johnson also confirms these statements, and mentions that at a place called Bindrabun, "more than a hundred gardens are well eultivated with all kinds of fruit, solely for the support of these animals, whieh are kept and maintained by religious endowments from rieh matives." The same writer tells us on good authority, " that in the district of Cooch Beliar, a very large tract of land is actually considered by the inlabitants to belong to a tribe of monkeys which inhabit the neighbouring hills, and when the natives eut their different kinds of grain, they always leave about a tenth part piled in heaps for the monkeys. As soon as their portion is marked out, they come dorn from the hills in a large body and carry off all that is allotted for them, stowing it under and between the rocks in such a manner as to prevent vermin from destroying it. On this grain they chiefly live; and the natives assert that if they were not to have their due proportion, in another year they would not allow a single grain to become ripe, but would destroy it while green. It does not appear whether this singular and primitive payment of tithes has been settled by mutual agreement betweon the matives and the monkeys; but in other places, where no such arrangement is described as existing, the monkeys come frecly in search of their dues into the houses, and carry off whatever they prefor with perfect impunity. In fact, the destrnetion of one of these animals is looked upon as a licinous crime by the Hindoos; and the writer last quoted mentions that two young oflieers who had shot at a blunder, were pelted with sticks and other missiles by the fakeers and other inhabitants of lindraboun, where the supposed outrage took place, until the elephant on which they rode was driven into the river, where both the young men, as well as the driver of the elephant, were drowned. Nevertheless, the respect thus manifested for the monkeys does not prevent the jugglers who swarm in India from teaching these animals mumerous trieks ; and, according to Captain Williamson, "it is very diverting to see these littlo mimies counterfeiting the gait and motions of various professions, and especially corroborating by their actions the deluge of flattery which the jugglers pour forth in praise of everything relating to the English character. Their antics are so excellently: just on these oceasions, that many limman professors of the mimic art might, without the smallest
disparagement, take a lesson from these diminutive imitators."

The bhunder is one of the few species of Simiadro which lave produced young in our menageries, and, under these circumstances, the female exhibits a wonderful degree of affection for her offspring. In a ease reeorded at great length by M. F. Cuvier, the young animal eontinued for the first fortnight of its existence firmly elinging to the hair of its mother, with its mouth eonstantly applied to her nipple, only changing its position oceasionally in order to cross over to the other side, but constantly turring its eyes to wateh everything that oecurred in its vicinity. At the end of a fortnight the little ereature detached itsclf from its mother, and then, from the very first, exlibited an address and preeision in its movements which could hardly have been antieipated. Still the mother watehed it with anxious eare, always ready to assist it in any difficulty into which it might fall during its gambols, and elasping it in her arms whenever she thought it was threatened with any danger. At the end of six weeks, however, when the young one was ready for more solid nutriment, this otherwise affeetionate mother displayed a singular amount of selfish greediness, driving her offspring away from the front of the eage whenever their food was put in, so that it was only by stealth that the poor little beast contrived to seeure a share of what was going.
Several other spceies of maeaques inhabit the continent of Asia and its islands; but amongst these we shall only mention the Ursine Macaque (M. Ur sinus), and the Red-faced Macaque (M. Speciosus), in which the tail is reduced to a mere tuberele, and the Black Macaque (Macacus Niger), in which there is no traee of that appendage. The sccond of these speeies is remarkable as being the only monkey inhabiting Japan; and the third prescnts some peculiar charaeters, which have eaused it to be raised to the rank of a distinet genus, under the name of Cynopithecus.
the magot (Inuus Sylvanus), or Barbary Ape, as it is frequently ealled, is the last speeies of the group of macaques to which we shall refer; it is remarkable as being the only monkey found in Europe. It differs from the rest of the macaques in having the posterior tubercle of the hindmost molar in the lower jaw divided into three parts by two little furrows, and from nearly all of them by the total absence of a tail.
The magot, when full grown, stands between three and four feet in height, and is of a robust form. The general colour of its fur is a yellowish olive-green, pale or greyish beneath; the face is of a dingy flesh-colour, much wrinkled, and marked with irregular brown spots; and the hairs surrounding the face are of a dirty grey. It usually goes on all fours, and appears to prefer rocky and mountainous distriets for its habitation, where this quadruped mode of progression is the most practieable one. In its character it closely resembles the other macaques, being lively, intelligent, and docile when young, but becoming morose and intractable with increasing years. The vivaeity and playfulness of the young and half-grown animals, have always rendered them great favourites with the itinerant showmen of Europe, and the magot has been well known in this
way from time immemorial. He has, however, another and still more important claim upon our attention : during the long series of years when the dissection of the human body was strictly prohibited, the anatomists of Europe derived all their notions of anatomy from the structure of this animal. Galen's deseription of the anatomy of man was almost entirely drawn from his dissections of the magot; and many years afterwards, when Vesalius published his great and valuable work, "De eorporis humani fabriea," the surgeons of the old sehool refused to aecept the new views therein brought forward, and adhered resolutely to Galen in all points when there was a difference between the statements of the rival anatomists. Some of the most distinguished physieians of the sixteenth century aetnally wrote treatises in support of the old notions; aud it was not until Camper, two eenturies later, proved that Galen's descriptions applied only to the magot, that we may eonsider the question to have been finally settled.
The chief home of the magot is in the monntainous parts of Northern Afriea, in Algeria, and Moroceo, where these animals reside in the forests in large troops, and are said to attack and drive array the beasts of prey which intrude upon their domains, although no doubt they often fall a prey to the leopard, and some of the smaller eats which abound in Northern $\Lambda$ friea, and whieh, by the facility with which they elimb trees, may easily steal upon them unawares during the night. Their food in a state of nature, according to M. Desfontaines, consists of "pine-cones, chestnuts, figs, melons, pistachio nuts, and vegetables, which they carry off from the gardens of the Arabs, notwithstanding all the pains they take to exelude these misehievous animals. While they are committing their thefts, two or three mount to the summits of the trees and of the highest roeks to keep wateh, and as soon as these sentinels see any one or hear a noise, they utter a cry of warning, and immediately the whole troop takes to flight, earrying off whatever they have been able to lay their hands on." M. Desfontaines adds, that "in the wild state, they generally bring forth only a single young one, whieh, almost as soon as it is born, mounts on the back of its mother, embraces her neek with its arms, and is thus transported in safety from place to place ; sometimes, however, it remains firmly attached to the breast."

The origin of the eolony of this speeies, which still lives upon the rock of Gibraltar under the special protection of the English garrison, has frequently been a subject of disenssion; some naturalists thinking that the species must have been imported into the south of Spain, as some of its Eastern allies have been into the Mauritius. It would appear, howerer, that the extreme southern part of the Spanish peninsula harbours a considerable number of terrestrial animals, which are otherwise peculiar to the opposite shores of Africa; and, aceording to some authors, the magot itself occurs in a wild state upon other mountains of Andalusia, and even of Granada. Ancient writers also are silent with regard to the oceurrence of their Pithecus, whieh was undoubtedly the present species, in any other part of Europe; although Procopius, a Greek writer of the
sixth century of the Christian cra, mentions man-lilic apes inhabiting Corsica. In the absence of all positive evidence, one way or the other, we can only suppose that the magot, with the other African forms of animals which occur with him in Southern Europe, may lave extended his range into the latter region at a period when the two continents were united. Even then it would be curions that the European representatives of the species should contine themselves to a bare rock at the most sontherin point of the peninsula, as if anxious still to be within sight of the shores which undoubtedly constitute their truc home, but from which they are for ever excluded. This, however, may perhaps be explicable upon the supposition, that important changes of climate may have taken place in Spain since the disruption of the continents at the Pillars of Herculcs.

The group of the Buboons at which we now arrive, and which closes the scries of Old World monkeys, resembles the macaques in most of its characters, differing principally in the form of the face, which, in the baboons, is produced into a snout and more or less truncated, or, as it were, cnt off at the extremity. They have small eyes, placed closer together than in any of the preceding groups of monkeys; the hindmost molars in the lower jaw are furnished with one or two aecessory tubercles as in the macaques; and the tail, which is usually short, is placed very high up on the rump.

The baboons are all of considerable size, larger than the other monkeys, but usually smaller than the true apes. They are of a robust form, with stout powerful limbs, upon which they usually go upon all fours; they are, in fact, the most animal of the Simiadr. Their jaws are enormously powerful, and armed with immense canine tecth, with which they are able to inflict very severe wounds upon their adversaries. They usually take up their abode amongst the rocks, and are confined to the African continent, in all parts of which some species are found. One species also oceurs in Arabia. They are ferocious and disgnsting in their halits, and during the breeding season the postcrior callosities, which are of large size and generally of a bright red colom, become so turgid and conspicuous, as to give the creatires a most repulsive aspect. In confinement, even the females seem to delight in exposing these disgusting features to the gaze of the spectators, whilst the males usually exhibit the lasciviousness of their nature in such an odious light, that they can rarely be exposed freely to the public. In many cases they have been known to notiee women amongst the spectators before their cages, sometimes even selecting the youngest and handsomest for this questionable compliment, and evincing their preference by momistakeable gestures; so that there can be little doubt, that had they the opportunity, they would resort to violence for the gratification of their passions.
THE MANDRILL (Papio Mormon), llate 2, fig. 4. The mandrill, the largest and most powerful of the baboons, belongs to a genus in which the tail is very short, forming a small naked process which stands up
perpendicularly to the spinal column. The head of this baboon is of large size, a circumstance which is due principally to the enormons development of the facial bones; in tlic males, especially, these bones form a long muzzle, on the sides of which are a pair of large bony protuberances; the upper canines are of immense size ; the lower jaw is enormously powerful and armed with sharp canine teeth; the surface of the sknll exhilits strong ridges for the attachment of the muscles; and no one who looks at the eutire skull of a mandrill, can doubt for a moment that the creature possessing such formidable weapons and such powerful means of setting them in motion, would be as terrible an antagonist as almost any beast of prey.

The adult male sometimes attains a height of upwards of five fect when standing upright. The general colour of the fur on the back and sides is a light olive-brown, and on the lower parts of the body a silvery grey. On the forehead and crown of the head the hair is directed upwards, giving a curious appearance to the head; the face is naked, and the protuberant sides of the nose are strongly ridged and marked with bright red, light blue, and purple. The callosities are large, and of a bright red colour. In the females and young males, the muzzle is shorter and less protulicrant than in the old males, and of a uniform blue colour.
The native country of this formidable animal is the western coast of Africa, especially in the district of Guinea, where it appears to have bcen often confounded with the chimpanzee in the stories related by the Negroes to travellers. It is known to the natives of different districts by a variety of names, amongst which Smitten, Choras, Boggo, and Barris are recorded by authors; the latter name is the one given to the gorilla by De Laval (see p. 17), and we have already stated that the name of Drill, now commonly applied to the following species, and which evidently forms part of the name under which the present animal is known, really belongs to the chimpanzce. Considering the vicious character of the mandrill, we may, perhaps, suppose that many of the narratives of travellers, with regard to women being carried off into the woods hy monkeys, apply rather to this species than to the chimpanzee, although both of them are charged with this crime. The mandrills are also deseribed as associating in large troops, and driving away other wild animals, including even the elcphants, from the districts of the forest in which they choose to take up their quarters, whilst their hmman neighbours are afraid to pass through the woods in which they reside, except in large companies and well armed. In a state of nature the mandrills live principally upon fruits, althongl, like the other baboons, they donbtless often devour small animals, and they are said sometimes to make a descent mpon the negro villages, and phunder them of everything eatable. In captivity they eat almost anything, and usually acquire a strong taste for intoxicating liquors. A fine specimen which was exhihited many years ago at Exeter Change, and which had retained his youthful tractability to a later period than is usual with the male baboons, was in the laalit of drinking his pot of porter daily, accompanying this indnlgence with a pipe, which he smoked with great gravity.

When thus engaged he would sit in his chair with his pot of porter in one hand, and no doubt he would have been as indignant as little 'Iony Weller, had he been offered a pint instead of his customary allowance. This mandrill bore the appropriate name of ILappy Jerry, and his reputation was so wide-spread that he was actually honoured with an invitation to Windsor Castle from his Majesty Gcorge IV.

THE DRILL (Pupio leucophaus) is another species of short-tailed baboon very nearly allied to the mandrill, and, like it, an inhabitant of the Guinea coast. It is rather smaller than the preceding species; its fur is of a more greenish colour ; the sides of the muzzle are less protuberant, and the skin of the face is entirely black. It was originally deseribed as a distinct species by Pennant, under the name of the Wood Buboon; but little or nothing is yet known of its habits in a state of nature, although in these it probably resembles the mandrill.

THE CHACMA (Cynocephalus porcarius) belongs to another genus of baboons, in which the tail is of moderate length. The chacma is the largest species of this genus, equalling a large mastiff in sizc and form, exceeding it in robustness and strength. It is of an olive-black on the back, with the sides and belly paler; the whiskers are greyish and the face brown. It is an inhabitant of the Cape of Good Hope, where it lives in the mountains amongst the rocks in troops of three or four hundred together. Travellers through the passes of the Cape Mountains describe the noise made by the baboons, when they see the loaded waggons intruding upon their territory, as something terrific; and slould the travellers outspan for the night in the vicinity of their habitations, the yells and howlings of the baboons are kept up all night, so as effectually to scare sleep from the intruders' cyelids, and make them long for the first dawn of day to recommence their toilsome march. Sometimes, however, it would appear that the baboons take matters more quietly, sitting peaceably on the summits of the rocks and gazing down upon the train of waggons; should they be within reach of the rifles of the travellers they scramble away immediately, elimbing up the faces of nearly perpendicular rocks, by the help of certain ereeping plants which, in many plaees, form a network over the rocks, and from the use to which the baboons put them, are called by the boors Monkeys' ladders. Their movements under such circumstances are said to be indescribably anusing, but they eannot always be observed in safety; for the haboons sometimes attack travellers by throwing stones down upon them.

The food of the chacma, like that of the other baboons, consists partly of fruits and roots, and partiy of animal substances, such as insects, lizards, and the eggs of birds. In search of vegetable aliments, the troops often descend into the cultivated districts, where they do great damage. From this circumstance, coupled with their ferocity and other evil qualities, the chacmas are regarded with much autipathy by the Cape boors, and this feeling appears even to be shared by the dogs; for we are told that there is no other animal which they attack so readily, or with so mueh determination. Such are the strength and ferocity of
the chaema, however, that some of the dogs generally pay dearly for their temerity, and the boors would almost prefer setting their dogs upon a lion, to letting them go in pursuit of one of these animals." Even the leopard, which inhabits the same districts as this powerful baboon, and feeds principally upon the females and young males of the chacma, often meets with a disappointment when he ventures upon an old male.
Notwithstanding these bad qualities the young chacmas are often domesticated at the Cape, when they are said to show great docility, and to fulfil thie important office of keeping guard and giving notice of the approach of a stranger as well as or better than a dog. They are also trained to perform some other uscful duties. Sometimes a smith will be seen with a chacma attending to his fire, or a peasant committing the guidance of his oxen to one of these animals ; but in whatever way they may be employed, they require to be always under the eye of the master. They are also noted for the sagacity with which they reject any unwholesome food, so that a Hottentot will never tonch anything that has been refused by a chacma. This renders it exceedingly difficult to poison them, and M. Pucheran mentions a ease in which one of these animals actually abstained for ten days from touching some poisoned food which had been prepared to kill him. From the account given by M. Le Vaillant of one of these baboons which was in his possession in Africa, they would appear to be good-tempered, amusing, and even affectionate; but these good qualities in all probability wear off in comse of time, as the adnlt specimens which have been kept in menageries in Europe, have exhibited all the ferocity and other disgusting qualities of their congeners.
the derrias (Cynocephalus Hamadryas). Several species of baboons are found abundantly in the northeastern part of the African continent, in Nubia, Abyssinia, and even in the mountains of Arabia. Amongst these the most celebrated is the derrias, a large species, standing about four feet in height when erect, which is remarkable from its haring the whole fore part of the body, as far as the loins, covered with long shaggy hair, whilst that of the hinder quarters is short; so that the creature has not unaptly been compared to a elipped French poodle. In its havits the derrias closely resembles the preceding species.
By some writers this is considered to be the ape Thoth, so commonly represented upon Egyptian monuments, usually in a sitting posture, but variously cmployed. He was the emblem of Hermes (Thoth) the inventor of letters and of the art of writing, and Horapollon, an ancient author, relates that whenever one of these baboons was brought to the temples, he was met by a priest who presented him with tablets and pen and ink, to ascertain whether he really belonged to the family of those who understood writing.* Subsequently the thoth appears to have become the symbol of the supreme judge of the souls of men; and in this capacity he is frequently represented with a pair of scales, in which the good and bad actions of those before him

[^2]are to be weighed. Ehrenberg thinks, with some probability, that the singular head-dress whieh is so frequently represented on Egyptian monuments, was an imitation of the remarkable hairy covering of this sacred monkey.

THE COMMON BABOON (Cynocephatus Papio), the last speeies to which we shall refer, is a native of the western coast of Afriea, where it appears to be execedingly abundant. Of all the baboons it is the one which is most frequently brought to this country, and its good temper, familiarity, and curious habits when young, render it a great favourite with the visitors to menageries. As it inereases in age, however, it acquires the same repulsive habits as its allies, although perhaps in a somewhat less degree, and in some cases the adult males have been known to retain mueh of their youtlful doeility. It also exhibits great intelligenee.

The general colour of this baboon is reddish-brown; the whiskers are light fawn eolour' the faee ncarly black, and the callosities reddish-violet. It is one of these Simiadre which support the elimate of Europe with least ineonvenience, and it has frequently bred in our menageries. The adults, and even the males, exhibit much attachment to the young animals, nursing them with great tenderness whilst they are very young, and treating them afterwards with far more kindness than is usually shown by monkeys in captivity towards their offspring.

With the baboons we terminate the long series of interesting species whieh constitate the family Simiade, and at the same time the first section of the great tribe of Simise or monkeys. In these, as already stated (p. 14), the nostrils are placed elose together and separated only by a narrow partition; whilst in the second section of the Simise the nose is broad and flat and the nostrils separated by a wide interval. We have already adverted to the remarkable zoological distribution of these two nearly-related groups of animals ; the first section, Catarrhine, being restricted to the eastern hemisphere, while the Platyrihine, or Flat-nosed monkeys arc as exclusively confined to the New World. In the Old World, as we have seen, the monkeys are alnost cxelusively inhabitants of tropical regions, and this is still more decidedly the ease in America, where these animals are confined to the forests of the hottest parts of the sonthern continent.

Although the species of American monkeys are exceedingly numerous, they present no such varicty of form and habits as their eastern brethren, and we shall therefore be able, by selecting a few of the more striking speeies, to give the reader a good idea of the whole group. They are all of small or medium size, and arboreal in their habits; all are destitute of checkponches and eallosities, which are possessed by the majority of the Old World species; their food is of a mixed animal and vegetable nature ; and in their dispositions they are usually good-tempered, docile, and intelligent. Nevertheless, with all these characters in common, the American monkeys present certain structural peculiarities, by which they may be divided into two distinet families.

## Family II.-CEbIDA.

The first and most important of these families is that of the Cebidæ, whieh is at onee distinguished from all the other monkeys by a most important character, namely; the presence of four additional molars-there being six of these teeth in each side of each jaw; so that, the number and distribution of the other teeth remaining the same, there are in all thirty-six tecth in this family, whilst the rest of the monkeys lave only thirty-two. From the sceond family of American monkeys the Cebidec further differ in having the fingers all furnished with flat nails. With but one or two exceptions they lave very long tails, and in most cases these organs are prehensile at the tip, so that these creatnres are, as it were, provided with a fifth hand, which is of the greatest service to them in their rapid and agile movements amongst the branches of the trees.

THE RED HOWLING MONKEY (Nycetes Senieulus), Plate 2, fig. 5. The Howlers, or howling monkeys (Mycetes), are the largest and most robust of the American monkeys, appearing in some respects to represent in the New Continent the orangs and chimpanzees of the Old World. Their jaws are large and powerful, and armed with strong teeth, the structure of which indicates their food to be prineipally of a vegetable nature. Their colours are usually reddish or brown, and they are furnished with a long and wellfurred tail, which has the tip naked on the lower surface, and is strongly prehensile.

The most remarkable peeuliarity of these animals, and the one to which their name of howlers refers, consists in the fearful noise which they produee every morning and evening, and often during the night, which, according to Humboldt and Azara, may be heard at a distance of more than a milc. Azara compares the noise "to the ereaking of a great number of ungreased carts;" and Waterton states that, on hearing the howlers in the primæval forests of Guiana, "you would suppose that half the wild beasts of the forest were collecting for the work of earnage ; now it is the tremendous roar of the jaguar, as he springs on his prey; now it changes to his deep-toned growlings, as he is pressed on all sides by superior foree ; and now yon hear his last dying moan beneath a mortal wound." It is still a question whether these terrible howlings are produeed by a single monkey at a time, or by a general chorus of a whole tribe; but the Indians fully believe that one of the mmber commences the concert. Maregrave, in his "Natural History of Brazil," published in 1648, gives us, evidently from the reports of the Indians, a very cireumstantial account of the proceedings of the howlers. He says that every morning and evening these monkeys assemble in the woods, and that one of them then perehes himself in the highest plaee he can reach, and makes a sign to the others to sit around him. He then eommences his diseourse, with a voice so loud, that, aecording to our author, it might be supposed that the whole of them were howling together, althongh they sit in the most decorous manner in perfeet silence, listening to the roeiferation of the self-elected preacher. When the latter ceases, however, he makes another sign with his
hand, when the assembly indemnifies itself for the previous restraint by bursting at once into clamour. Marcgrave adds, that they again become silent at a sign from the chief, who then resumes his howling for a time. When he ceases the assembly breaks up. This tale evidently contains great exaggerations; but it is quite possible that one of the monkeys may commence the howling, and the reports of more trustworthy travellers prove that a single individual is quite capable of producing a most unbearable noise.

The structure by which these creatures are enabled to give utterance to sounds apparently so out of all proportion to their size, is of a very curious naturc. The two sides or branches of the lower jaw are enormously enlarged, so that they form a pair of bony plates desconding vertically from the skull, and, when seen from the side, appear fully as large as the latter. Between these is a rounded bony ease, consisting of the central part of the hyoid or tongue-bone, inflated into a thin hollow ball. This receives a membranous pouch, which communicates with the larynx, and it is by the reverberation of the voice in the hollow space thus formed, that it acquires the tremendous power to which we have just referred.

In their habits the howlers are dull and morose; their movements are slow; and they live in small parties moder the guidance of a chief, who is always an old male. The latter is said to place himsclf in an elevated situation, to guard against the approach of danger to the little band under his care; but, notwithstanding this precaution, the animals may be easily approaehed, although it would appear to be by no means safe to stand under the trees occupied by them, as a sudden fright sometimes produces very disagreeable effects. In passing from branch to branch, the howlers, in common with many other American monkeys, make use of their tail as a fifth hand; and so great is its prehensile power, that, even after the animal is killed, it not unfrequently remains suspended by the tail. In some places they are eaten by the Indians, after being roasted on a spit; but the resemblance of the body of one of these monkeys, when skimned, to that of a child, always causes Europeans to regard such food with a feeling of repugnance. The female produces only one at a birth, which she carries on her baek.
The Red Howler (Mycetes Scniculus), called the Alouate by Buffon, and the Royal Monlicy, or King of the Monlieys, by the South American Indians, is a native of Guiana, where it inhabits only the woods in the lower grounds. Its length, to the root of the tail, is usually twenty-two inches, and the tail is of about the same length. The general colour of the hair is a fine red, brighter on the head and limbs; the face is naked and black. Several other species are found in different parts of the South American continent. Amongst these, the most abundant and most widely distributed appears to be the Brown Howler (M. Ursinus), which oceurs in several provinces of Brazil. It is the monkey whose habits furnished Marcgrave with the foundation for the story given above, and this has obtained for it the name of the Preacher monkey.

THE HORNED NONKEY (Ccbus fulucllus), Plate 2,
fig. 7. The Sapajous, Sujous, or Capuchins (Cebus), also called Weepers, from their plaintive cry, include a considerable number of American monkeys. In their general form they resemble the howlers, but are always of smaller stature and less robust form. Their heads are short and rounded, and their tails, although prehensile, are destitute of the naked space at the extremity, which gives that organ, in the howlers and spidermonkeys, such a firm grasp of any olject round which it may be coiled. Their hands are furnished with perfeet thumbs, both on the fore and hind limbs.

In nearly all the species the face is bordered by a profusion of long hair, which gives the little creatures a most formidably-whiskered appearance, and the top of the head is often similarly provided. In the horned monkey the lair of this part forms two strong black tufts, which give the creature the appearance of being fumished with horns. Its general colour is chestnut red, with the chest and belly bright red, and the limbs and tail brown. It is an iuhabitant of Brazil and Guiana.

These monkeys live in troops in the boundless forests of the South American continent, where they feed upon fruits, seeds, insects, and corn, and also upon small birds and their eggs. In their turn they furnish a considerable portion of the food of the small carmivorous quadrupeds, such as the ocelots, which abound in the Ameriean forests, and which are very arboreal in their habits. The sajous are of a gentle disposition, and easily tamed, when they may be taught a number of amusing tricks. They are frequently brought to Europe, not only for exhibition in menagerics, but also to be carried about by itinerant musieians, who teach them to go through a variety of evolutions, such as firing off a small gmm, and sweeping up the platform on which they are exhibited with a miniature broom. Their intelligence is very considcrable: they will break a nut which is too strong for their teeth by beating it between two stones; and a specimen which was living some years ago in the menagerie at Paris, would light a lucifer match by rubbing it upon the wall of his eage, and then hold it in his fingers and watch it burning without the least fear. Rengger, in his "Natural History of the Mammalia of Paraguay," mentions several circumstances illustrative of the high degree of intelligence possessed by these monkeys. They peel oranges, and tear the wings and legs off the larger insects before eating them. When a living bird is given to them, they first bite a hole in the skull, through which they extract the brain, then pluck off the feathers, tear the bird limb from limb, and finally gnaw the flesh off the separate bones. On giving an egg to a young one for the first time, he would break it very clumsily, and make a shocking mess with it; but in a short time he learnt by experience to break the end gently against a solid body, pick of the pieces, and then suck out the contents without losing a drop. This mode of sucking egrs is also adopted by the spider-monkeys, and some others. But perhaps the most remarkable instance of intelligence presented by the sajous is the following:-Rengger lad been in the habit of giving his specimens small quantities of sugar twisted up in paper. One day he inclosed living wasps in the papers, and the unfurtu-
nate monkeys, opening their prizes ineautiously, were severely stung. But this was never afterwards the ease; for, becoming wise by experience, they always held the papers up to their ear's before opening them.

The species most frequently brought to Europe is the Brown Sajou, or Weeiter Monkey (Cebus Apella), which is exceedingly abmendant in Cuiana, and also occurs in Brazil and other parts of South America. It measures about fourteen inches to the root of the tail, which is between two and three inches longer than the body. It is of a reddish-brown colour, darker on the back, head, limbs, and tail, but with the upper part of the arms tawny or greyish-yellow.
the coaita (Aleles Puiscus), llate 2, fig. 6. The Coaita is one of the most widely distributed of the wellknown American monkeys to which the name of Spider monkeys has been given, in allusion to the great length and slenderness of their limbs. It is found over the greater part of the South American continent, from Brazil and Guiana in the West, to Peru in the Last. In common with the other species of its genus (Ateles), it is totally destitute of thumbs on the anterior members, which thus consist only of four fingers, the only trace of the thumb being an imperfect metacarpal bone, completely concealed within the skin. The tail, like the limbs, is very long, and exhibits a piece of naked callous skin on the lower surface at the tip; this, conpled with the great muscnlar power of the tail, renders it, like that of the howlers, a most powerful prehensile organ, and the animals use it freely as a fifth hand in almost all the transactions of life. The agility of movement displayed by these curious creatures when springing freely about in their arboreal home, is in a great degree due to this fifth hand; grasping a branch with it, they swing to and fro in the air, until gaining a sufficient impetus, they launch themselves towards some other object; and thus with the aid of the long limbs, passover great spaces with inconceivable rapidity. Even when confined in menageries they exhibit astonishing agility. We are told also by Dampier and Dacosta, that when these monkeys want to pass a river, or to get from one tree to another at a little distance, withont descending to the ground, they form themselves into a sort of chain, each clinging to the other by his tail; the whole then swing to and fro, until the lowest individual at the free end of the chain contrives to get hold of the olject to be attained, when he draws up the rest, and the whole pass over.

The conita measures about two feet in length to the root of the tail, and is covered with long black hair, except upon the face which is naked and brown. They live in the forests in troops, but frequently descend in search of nourishment to the plantations, especially the Indian-corn fields, which they plunder to an extent that is anytling but agreeable to the owners. Their booty is carried ofi to be eaten at leisure in the woods, and here again the tail comes into play; for an old negro told Mr. Garduer, that he had often seen the coaita making off with three ears of Indian corn, one in its month, one under its arm, and the third in its tail. The eoaita, and the other spider monkeys, also feed to a certain extent upon animal substances, such as inseets, molluses, birds' eggs, and even small fishes;
and those which reside in the vicinity of the sea are said sometimes to descend to the coast, and regale themselves with marine luxuries, especially oysters, which they are ingenious enough to break between two stones. They are said also to alop,t the same course with uuts which are too hard for their teeth to crack, and their general intelligence is very high, certainly higher than that of any other American monkeys, and inferior to that of few of the Ohd World.

In eaptivity the conita is very gentle, and soon becomes tame. It is impatient of cold, and rather melancholy in its aspect, but exceedingly amusing from its agile gambols. An interesting acconnt of a tame coaita will be fonnd in Mr. Garduer's "Travels in the interior of Brazil." It became a favourite of his whole party, and especially cultivated the friendship of a large mastifi which accompanied them on their journey. On the march, Jerry, as the monkey was called, always rode on the back of his eanine friend, but he was not at all particular as to whether his face was towards the head or tail of the dog, except in going down hill, when he always turned his face forwards; and to prevent limself from being ignominiously stipped over the head of his charger, made use of his tail as a crupper, by twisting its prehensile extremity round the root of the dog's tail.

THE SQUIRREL. MONKEY (Callithrix sciureus), Plate 3, fig. 8. The Squirrel monkey, Suimiri or Tce Tce, is undoubtedly the prettiest, the most amiable, and probably the most intelligent of the whole tribe. The length of its head and body is only about ten inches; its tail, which is scarcely prehensile, measures thirteen and a lalf; its general colour is olive-grey, with the arms and legs reddish or orange-coloured; and the face is bare and whitish, with the nose black. Its eyes are large, soft, and lustrous, giving the little creature an expression of intelligence, heightened by the form of its head, in which the skull is of very large size as compared with the facial bones. The skull, with its inclosed brain, is in fact larger in proportion to the size of the animal than that of any other monkey, so that, if we may take the mere size of the brain as a measure of intelligence, we may casily account for the superiority of this interesting little creature.

The squirrel monkey lives in the forests of Guiana and Brazil, feeding principally upon froits and insects. Its tail is of little use to it in its arboreal gambols, bint it appears to employ it in keepiog itself warm, by winding it round its body. In captivity it is gentle and affectionate, and one of the most interesting of the monkey tribe. Lumboldt has given some interesting details with regard to individuals in his possession. When he spoke to them for some time, they listened with the most marked attention, but soon raised their hands to his lips, as if to catch the words as they escaped. They recognized the objects represented in engravings, even when not coloured; and when the figures of insects and fruits were shown to them, they stretched out their hands towards the paper, and endeavoured to seize their simulated food.

THE DOUROUCOULI (ATyctipithecus trivigatus). The large eyes of the delicate little squirrel monkeys to which we have just referred, indicate probably that
their period of aetivity is to a certain extent noeturnal; but in the douroncouli, this eharacter is earried to a far greater extent, and this animal and its allies are known to sleep through the day, and to roam about at night in seareh of their food. Their eyes, like those of the eats, are luminous in the dark; their voiee is very strong, and, aecording to Humboldt, resembles that of the jaguar. It seems probable, indeed, from a statement made by that author in his "Aspects of Nature," that the eoneert of fearful noises heard during the night in the forests of tropieal America, and usually attributed to the howling monkeys alone, is due to the eombined efforts of many different voealists.

The douroneouli shelters itself in the holes of large trees, and aceording to Ilumboldt, lives in pairs, and not in troops, like most other monkeys. Spix, however, says that he has seen them going about in bands. The tail is long, but not prehensile, and the animal winds it round its body when in repose. The ears are almost entirely concealed by the long hairs on the sides of the head; the eolour of the firr on the upper parts of the body is grey; the lower parts are orange, and this colour also appears on the sides of the neek. The foreliead exhibits three black lines, diverging baekwards; and the tail is yellowish-grey, with the tip black. The length of the head and body is about ten inehes, and that of the tail eleven. The douroneouli feeds prineipally on inseets, and also on small birds, which it easily surprises when they are asleep.

## Famiry III.-HAPALID压.

The Marmozets (Ifapulidee), forming the third family of the Quadrumana, and the seeond of the Ameriean monkeys, are distinguished from the Cebidæ, to whieh they are in other respeets very elosely allied by the absenee of the additional molar tooth, whieh, in the latter, oecurs on each side in eaeh jaw. Thus the total number of their teeth and that of the different kinds of tectl becomes the same as in man and the higher Quadrumana of the Old World. The tubereles of the molars are also more aeute than in the Cebidæ, indieating that the marmozets are more addieted to an animal diet, and, in faet, a great part of the nourishment of these ereatures eonsists of insects, eggs of birds, and even small birds themselves, when these come within reaeh of the earnivorous little monkeys. Their tails are long and well-furred, but never prehensile.

The marmozets are all of small size, rarely exceeding tlat of a squirrel ; their heads are small and rounded; their ears usua!ly provided with tufts of hair; the thumbs of the anterior hands are searecly opposable, but those of the liinder pair are completely so, and these are furnished with flat nails whilst all the rest of the fingers bear elaws. In every partieular of their organization these monkeys show themselves to be inferior to the rest of the great group of Simix, and to approach more closely to the ordinary mammals, whilst the almost complete absence of convolutions on the surface of the brain wonld seem to indieate a degree of intelligenee far below that, not only of the other Quadrumana, but even of the majority of the placental Mammalia. In this respeet, indeed, the marmozets
appear to approaeh the squirrels, with whieh they also have some other analogies; they are ineapable of the edueation which most of the other Simix and some of the Cebidæ in partieular, may be brought to receive, and their instinetive faeulties are very highly developed. The extent of their intelligence will be seen from the particulars recorded by Audonin of the behaviour of two marmozets observed by him. In a pieture they could reeognize their own likeness, and those of flies, loeusts, and beetles, the latter of whieh they endeavoured to seize with great avidity. The pieture of a cat, on the other hand, and that of a wasp, eaused them to shrink with terror, and when oecupied in eatching the flies whieh entered their eage, which they did with ineredible dexterity, the appearance of a wasp attracted by a piece of sugar fixed in the bars, drove them at onee to take refuge at the bottom of their eage. Astonished at this instinetive dread of an inseet whieh they eould never lave seen before, Audouin took a wasp and brought it near the two marmozets, when they immediately hid their heads between their fore hands and elosed their eyes. But as soon as he substituted for the wasp, a grasshopper, a bectle, or some other harmless inseet, they darted upon it greedily and devoured it with the greatest gusto. Sugar and sweet fruits also eonstituted favourite artieles of food with them, and they possessed the art of sueking eggs in great perfection. They would not eat flesh; but when a small living bird was given to them, they would seize upon and kill it, then open its skull and devour the brain, at the same time lieking up any blood that might flow; they would also sometimes eat the bill, the tendons of the feet, and some other parts, but always avoided the flesh. Mr. A. R. Wallaee during his voyage up the Amazon had an opportunity of observing many similar labits in speeimens of several speeies of this family, whieh he kept in eonfinement.
M. Audouin states that his marmozets recognized those who had the eare of them, but this is opposed to the obscrvations of most other naturalists, and must have been due to peculiar conditions in the individuals observed by the great Freneh entomologist.

In their native regions, the luxuriant forests of South Ameriea, these elegant little monkeys live amongst the trees in small troops, displaying, amongst the branehes, an agility almost as great as that of the beautiful little inhabitant of our own woods - the squirrel. Their aetivity, however, is noeturnal. They produce as many as three young ones at a birth, whieh is an additional indieation of their approaeh to the lower Mammalia; for the rest of the Quadrumana, and even the Cheiroptera, usually produee only a single young one; and, as if to show this more elearly, it sometimes happens that when they breed in eaptivity, the mother will destroy one or more of her offspring, a eireumstance which oceurs still more frequently with the true Carnivora, and some of the Rodentia. Their young are born with their eyes open.

From the foregoing aecount of the intellectnal qualifieations of the marnozets it is cevident, that the high esteem in whieh they were formerly held as pets must hare been due almost exelusively to the clegance of their form, and the agility of their movements; but
whatever may lave been their peculiar claims to such an honour, there is no doubt that in the sixteenth, seventeenth, and cighteenth centuries they were the favourite companions of the most fashionable ladies of Europe, and probably had even more tenderness lavished upon them than is bestowed upon the lap-dogs of the present day. We find the work marmozet applied to young children as a term of endearment by several writers of the last century. A remarkable indication of the early prevalence of the taste for lanving marmozets as pets, rendered the more striking by the absurd anachronism involved in it, is furnished by the fact that Guido has introduced one of these animals into his picture of the $\Lambda$ buduction of Helen.

Of this gromp, which includes ouly a single genus, the species appear to be rather numerous, about thirty having been already described, whilst, from the accounts given by recent travellers, there can be little doubt that many more remain to be discovered. As, however, they are all very similar, both in structure and habits, we shall only refer to a few of the best known species.

THE COMMON MARMOZET (Jacchus vulgaris), Plate 3 , fig. 9 , a native of Brazil, is of an ash colour, with the rump barred with brown, and the tail variegated with darker and lighter rings; the head and back of the neck are of a reddish-brown colour, and on the sides of the head, both before and behind the ears, are numerous long hairs of an ash colom. It measures about eight inches in length, whilst its tail is nearly eleven inches long.

THE BLACK-TUFTED MARMOZET ( $J$. penicillatus), also a native of Brazil, closely resembles the preceding, but has the head and the tufts of long hair about the ears black; the latter character also occurs in the White-headed Marmozet ( $J$. leucoceplalus), in which, however, the whole front of the head is white, whilst the general colour of the fur is reddish.
the marikina (J. Rosalia), Plate 3. fig. 10, belongs to a section of the marmozets which has been regarded by M. Geoffroy Saint-IIilaire as forming a distinct genus (Millas), characterized by laving the lower incisor teeth short and broad, whilst in the rest of the family they are long and narrow. It is a beautiful little creature of a golden yellow colour, with the head and shoulders covered with long hair, forming a sort of mane, which has obtained it the name of the Lion morliey from some authors. It occurs in several parts of South America, especially in Guiana, Brazil, and Peru, and, from the beauty of its silky fur, its gaiety, and gentleness, it was formerly one of the greatest favourites of all the marmozets. The species was first described by Brisson, from a living specimen in the possession of Madame de Pompadour.

THE PINCHE ( $J$. (Edipus), another pretty little species inhabiting the same countries as the marikina, has the long hairs confined to the forehead and the crown of the head, where they form a sort of crest or tnft of a white colour, the general colour of the frur being a tawny brown, with the lower parts white, the face black, the ears reddish, and the tail red at the base and black at the tip.

The marmozets close the great and interesting group
of the Simix, which, as wre have seen, includes those species which approach most nearly to humanity in their structure, and exceed all other animals in natural intelligence, whilst the last members of the series cannot be regarded as greatly superior, in either respect, to creatures which the necessities of classification compel us to place at a great distance below them.

In the sccond group of the Quadrumana, that of the Prosimice or Lemurs, the general animal character of the species is equally if not more strongly marked than in the marmozets, and yet every species exhibits the quadrumanous character in perfection, the thumbs of all the four extremities being opposable. They are distinguished from the Simix, as already stated (p. 15), by the presence of a claw upon the first finger of the hinder hands, although the thumbs and the remainder of the fingers on both pairs of hands are almost invarially furnished with flat nails. The incisor teeth are variable in number, being frequently unequal in the two jaws; the caninies are always present, and insually of considerable size, and the molars, of which there are either five or six on each side, are often acutely tubercular, indicating an insect dict.

The whole of the Prosimixe are inhabitants of the Old World, and the majority of them are confined to the large island of Madagascar, where they are almost the only representatives of their order.

## Family IV.-LEmurid.

Of the specics peculiar to the remarkable island of Madagascar, by far the greater number belong to the family of the Lemurida or true Lemurs. In these the general form of the body greatly resembles that of a cat set rather high upon its legs; the thumbs are all opposable, and the first finger of the forchands well developed; the muzzle is elongated and pointed something like that of a fox, from which circumstance the name of Fox-nosed monkeys has frequently been applierl to the lemms. The cyes are large and placed on the front of the head, the body is clothed with a thick soft fur, and the tail is long and full.
But the most positive distinctive claracter of the family consists in the number of the tecth, of which there are thinty-six, namely, four incisors, two canines, and six molars in each jaw. The mper incisors usually form two pairs, separated by a small space, and placed almost perpendicnlarly in the jaw ; the lower ones are much longer, and project almost in a horizontal direction; the mper canines are much longer than the lower ones, and the salient tubercles of the molars indicate frugivorous habits.

These beantiful animals, of which numerons species, varying in size from that of a marten to that of a large cat or fox, occur in Madagascar, are nocturnal in their habits, coming forth in troops from their liding-places at sundown to exhibit their wonderfnl activity amongst the branches of the trees, through which they sweep with a swiftness and silence that induced Limnens to compare the species known to him to lemures or ghosts. Their food, as alrearly remarked, consists to a great extent of fruits, but they also feed freely on insects,
and, like all the lower Quadrumana, have a great liking for eggs and young birds, which they may seize with great ease during their nocturnal expeditions through the forest. The females produce only a single young one at a birth, and attend to this with the greatest tenderness. At first they earry their offspring about in their arms, the little creature aiding its mother's efforts by clinging to her breast; but as the young lemur increases in size, it coils itself round her middle, and is thus carried about.
In eonfinement the lemurs are lively and playful, and the elegance of their forms and gracefulness of their actions render them most pleasing objccts in our menageries, where, notwithstanding the tropieal tenderness of their constitution, they have been known to live for many years, and even to breed. They exhibit less intelligence than the higher Quadrumana, but at the same time are destitute of the ferocity which often characterizes the latter as they increase in years. In general the lemurs are very gentle and harmicss, fond of licking the hands of their visitors, and testify their contentment by a curious purring noise. According to the observations of M. F. Cuvier upon the mongous, the claw of the first finger of the hinder hands is frequently introdueed into the ear and kept there some time, for what purpose does not appear; the use of the projecting incisors of the lower jaw seems to be to act as a sort of eomb in cleaning the fur, which the animals are very fond of doing, not unfrequently performing this good office for each other.
the Ring-tailed lemur (Lemur Catta), or Macaco, Plate 3, fig. 11, is one of the most elegant, and, at the same time, one of the best-known species of this family. It is about the size of a large cat, and its general colour is a delicate ashy grey; the sides of the head and face, the throat, chest, and belly, are white; and the long bushy tail is beautifully marked with broad rings of black and white. The form of the head in this species is perhaps more clegant than in any other lemur; and the vivacity and intelligence of its appearance are heightence by its white, pointed, and erect ears. In its manners also it is usually the most amiable and playful of all the lemurs, and appears to feel more affection than any of them for its master.
THE MONGOUS (Lemur Mongoz), is another specics which is frequently brought to Europe, and indeed appears to be one of the most abundant in its native country. It is a little larger than the ring-tailed lemur, and its body is entirely clothed with a thick coat of tawny woolly hair. The sides of the face are ornamented with a pair of orange whiskers, the top of the head is black in the male, grey in the female, and the tip of the tail is also black. In speaking of the agility of this speeies M. F. Cuvicr mentions that an individual in his possession was able to spring from the ground to the branch of a tree, at a height of at least ten feet.
The only other species of the genus Lemur to which we shall refer is the Pied Lemur (L. Macaco), which is remarkable for the distribution of its colours, consisting in large irregular patches of blaek and white. The tail and hands are entirely blaek, as are also the face and muzzle; a large black patch surrounds the shoulders and neck, and a still larger one oceupies nearly the
whole of the baek, leaving only a comparatively narrow white band between it and the pateh on the shoulders. This is the most usual arrangement of the black and white in the pied lemur; but it varies eonsiderably, and specimens have been seen in which only the tail, the hands, and the muzzle were black. This speeies appears to be of a fierecr character than most of its congeners; some French travellers declare it to be as feroeious and eruel as a tiger, and M. F. Cuvier records an instance of a pied lemur which liad lived for some time on good terms with a mongous having turned upon his companion the night after a change had been made in their abode, and utterly destroyed him.
Besides these true lemurs the forests of Madagasear nourish several other species belonging to this family, whieh have been regarded as belonging to distinct genera. Most of them belong to the genus Cheirogalcus, and the most important charaeters by which they are distinguished from the rest of the lemurs consist in the greater roundness of the head, the comparative shortness of the muzzle, and the larger size of the eyes. The latter character would indicate a more decidedly nocturual activity than prevails even among the lemurs.
the cheirogaleus milit, one of the few speeies of this group of the habits of whieh we know anything, and at the same time one of the largest of them, measures about fourteen inches in length, exclusive of the tail, which is rather longer than the body; it is eovered with a thick silky fur of a tawny-grey colour on all the upper parts of the body, and white beneath. Its legs are very much shorter than in the ordinary lemurs. $\Lambda$ speeimen in the menageric of Paris passed the whole day sleeping in a nest which it made for itself with lay, and the whole night in active movement. Its agility was so great that it could spring to a height of six or eight fect. It fed upon fruits, bread, and biseuits. The Cheirogaleus Murinus, described long since by Brown as the Little Macauco, is the smallest of the Lemuridx, its body measuring only about six inches in length; it was described by Buffon in his manuseripts under the name of the Madagasear rat.

## Fanily V.-LICHANOTID AE.

The preceding are not, however, the only quadrumanous inhabitants of Madagascar. The forests of that remarkable and still imperfectly-explored island, nourish another family of these animals, regarded by some writers as standing in the same relation to the lemurs as the anthropoid apes to the ordinary monkeys. These are the Indris, which are distinguished from the preceding by the presence of only thirty tecth. The anterior teeth in the lower jaw are, however, plaeed almost horizontally as in the lemurs.

THE INDRI (Inctris Brevicaulatus), Plate 3, fig. 12 , is exceedingly remarkable in its form, and also deserves notiee from its being the largest known speeies of the entire group of the Prosimix or lemurine Quadrimana. When in an erect position the indri measures upwards of three feet in height. Its tail is exceediugly short, indecel almost rudimentary, and its hind legs very long-circumstances which render it the most
manlike of all the lemurs. Its fur is very soft, long, and thick. Its general colour is black, with the throat and buttoeks whitish. In its nature the indri is deseribed as being very gentle, and, although not remarkable for intelligenee, it is said to be so far suseeptible of edueation that the natives of Marlagasear, who honour it with the appellation of the Man of the woods, sometimes train it to hunt, probably for birds.
If the information that we possess upon the habits of the preeeding speeies be seanty enough, we know still less with regard to the other members of this family, whieh indeed are very few in number. They differ from the indri in having the tail, which in that animal is so greatly abbreviated, well developed and furred, and also in some partieulars of their dentition upon whieh we need not dwell.

## Family. VI.-NYCTICEBIDA.

The animals of this family, whieh ineludes the greater part of the lemurine forms found out of Madagasear, are distinguished from the preceding families by the more acutely tuberculate form of their molar tecth, which must be regarded as indicative of their insectivorous habits, and from those of the following family by their having, like the lemurs, a curved claw only on the first finger of the hinder hands. In the number and arrangement of their teeth they agree with the lemurs. They are strictly nocturnal animals, and, like most other animals of similar habits, have the eyes very large. The speeies are found in India and Africa.
THE BENGAL LORI (Loris gracilis), Plate 4, fig. 13, as indieated by its name, is an Indian species. It oecurs in Bengal, Assam, Silhet, and the Malayan peninsula, and also in the island of Ceylon. The lori measures about a foot in length, and is of a greyish fulvous eolour, with the lower surfaee of the body whitish, and a white band runuing down between the cyes, and surrounding the nose. It has a rounded head, with small ears and a short pointerl nose. Its body and limbs are slender, the first fingers of the hands are short, and the tail is altogether wanting. Its fur is very thiek and soft. The habits of the loris are strictly noeturnal. They reside in large forests, usually in mountainous distriets, and pass the days sleeping in the holes of trees. At sunset they eome forth, and move slowly about amongst the branches, seeking their food, which consists partly of fruits and the tender leaves of trees, and partly of inseets, small birds, aud mice. When on the ground their long slender limbs seem unable to support them, and they move, as described by M. F. Cuvier, in a manner somewhat resembling that of a very young puppy. Henee many writers have eompared them with the sloths, and it is remarkable that they exhibit an arrangement of the arteries supplying the anterior limbs somewhat resembling that which prevails in those singular creatures. M. Gervais justly compares the slow and eautious movements of the loris to the semiparalytic gait of the ehamelcon.
In their nature the loris are gentle and inoffensive, and not destitute of intelligenee, as will be seen from the following extracts from an interesting aceount given by

Sir William Jones, the celebrated oriental seholar, of a specimen which lived for some time in his possession. "To me," says Sir William, "who not only constantly fed him, but bathed him twice a week in water aceommodated to the seasons, and whom he elearly distinguished from others, he was at all times grateful ; but when I disturbed him in winter, he was usually indignant, and seemed to reproaeh me with the uneasiness which he felt, though no possible precautions had been omitted to keep him in a proper degree of warmth. At all times he was pleased at being stroked on the head and throat, and frequently snffered me to toueh his extremely sharp teeth; but at all times his temper was quick, and when he was unseasonably disturbed, he expressed a little resentment by an obseure murmur, or a greater degree of displeasure by a peevish ery, espeeially in winter, when he was often as fieree on being mueh importuncd as any beast of the woods. From half-an-hour after sunrise to half-anhour before sunset, he slept without intermission, rolled up like a hedgehog, and as soon as he awoke he began to prepare himself for the labours of his approaching day, licking and dressing himself like a cat. He was then ready for a slight breakfast, after which he commonly took a short nap; but when the sun was quite set, he recovered all his vivaeity. Ilis ordinary food was the sweet fruit of this eountry. Nilk he lapped eagerly, but was contented with plain water. In general he was not voracious, but never appeared satiated with grasshoppers, and passed the whole night whilst the hot season lasted in prowling for them. When a grasshopper or any insect alighted within his reaeh, his eyes, which he fixed upon his prey, glowed with uneommon fire, and having drawn himself back to spring on it with greater force, he seized the victim with both his fore paws, but held it in one of them while he devoured it."
Another species of lori (L. tardigradus), is fomme in some of the islands of the castern archipelago, such as Java, Sumatra, and Borneo. It is rather smaller than the preceding species, and has a rudimentary tail, from whieh and other characters it has been regarded by some writers as forming the type of a distinet genus (Nycticebus). The Javanese lori has also been described as a distinct species.
THE POTTO (Perodicticus Potto) is the first Afriean species of this family to whieh we shall refer. It is distinguished from all the rest of the Quadrumana by the rudimentary form of the first or index finger of the foreliands, which is redueed to a mere tubercle furnished with a little elaw. The potto is a thick-set animal, with short limbs and a long tail. Its size is about that of a small cat. Its cars are of moderate size. Its general eolour is a reddish-brown, with the extremity of the tail blaek. M. Yan der Iloeven mentions, that in two specimens observed by him, "the spinous processes of the last five cervical and of the first two dorsal vertebre are long, and pieree through the hairy integument of the baek, with a weak horny eovering." The potto is a native of the forests of the coast of Guinea, espeeially abont Sierra Leone. Like the lori,

* The individual described by F. Cuvier is said by him to have slept sitting in a crouching posture.
whieh it resembles muel in its general eharaeters, it is a noeturnal animal, slow in its motions, feeding partly upon fruits and tender leaves, and partly upon inseets and other animal matters.

THE SENEGAL GALAGO (Galago seneyalensis), Plate 4, fig. 14.-The galagos, whieh eonstitute the remainder of this family, are elegant squirrel-like ereatures, with rounded heads, large eyes, large membranous ears, and long tails. They differ from the potto in the elongation of the tarsal portion of the foot, and in the greater development of the first finger of the hands. In their dentition and most of their other eharaeters they agree with the preeeding speeies. Like these they are noeturnal animals, living amonyst the branches of the forests, where they prey upon small birds and inseets. Fruits also eonstitute a portion of their nourishuent.

The Scnegal Galago, whieh is the best known species, is an elegant little ereature rather larger than a squirrel, of a grey colour, with a reddish tinge on some parts, and with the lower surface paler or whitislı. It inhabits a considerable portion of the Afriean eoutinent, oeenring in Sencgal, Caffraria, Alyyssinia, and Mozambique. It was first diseovered in the first-mentioned loeality by the eelebrated Adanson, who deseribes its habits as intermediate between those of the monkeys and squirrels. It appears from the statements of the great- Freneh voyager and of later observers, that the galagos prineipally inhabit the great forests of aeaeias whieh furnish the gum-arabie of eommeree, and that the Moors who bring them down from their native haunts give them the name of Gum animals, and deelare that they feed upon that substanee. It appears, indeed, that they will eat gum when offered to them; but they show a very deeided preference for inseet food, those which have been olserved in eaptivity being always on the wateh for inseets, exhibiting considerable excitement when they only hear the sounds produced by these animals, and seizing upon any unlucky vietim that may eome within their reaeh with the greatest avidity. In their native haunts they display great agility upon the trees, amongst the branches of which they are always sporting at hight, springing suddenly upon their inseet prey with a veloeity greatly aided by the length of their hinder limbs. They nestle in holes of the trunks of trees, whieh they line with soft beds of grass and herbage for the reeeption of their young.

Several other species of galago have been deseribed -all from the Afriean continent. The largest is the G. crassicaulatus, an inhabitant of Mozambique and Port Natal, whieh is about the size of a rabbit.

## Family VII.-TARSIID AE.

The galagos, as already stated, are distinguished from the other members of their family ly the great length of their tarsus, and the large size of their ears; in these respeets they show an evident approach to the little ereatures whieh form the present family, and whieh might, perhaps, be ineluded in the same group with them without mueh violenee to a natural system. The tarsiers, however, exhibit so many
peeuliar eharaeters, that althongh only a single species of the group is well-known, this may well be regarded as the type of a distinet family. The eharacters by whieh this is distinguished, independently of the elongation of the tarsus, are the presence of only two ineisor tecth in the lower jaw, the uniformity of position of the four upper ineisors, whieh do not stand in two pairs, and the existenee of elaws upon both the first and seeond fingers of the hinder hands.

THE TARSIER (Tarsius Spectrum), Plate 4, fig. 15, the only species of this family whose existence ean be regarded as well established, is an inhabitant of several islands of the Indian arehipelago, especially Celebes, Borneo, and Banea; it also oceurs in the Philippine Islands and Sumatra. It is an elegant little creature, about the size of a common rat, clothed with a suft reddish-brown fur, and furnished with a long slender tail, the extremity of whieh is tufted. The most remarkable peculiarity in its strueture is the conformation of the hinder extremities, which are of great length, and upon whieh this little animal is described as leaping about in the forest like a frog. The tarsi are much elongated and very slender, but the feet are considerably widened at their extremity, and the toes exhibit a singular relative proportion. The imer toe, the opposable thumb of the hind feet, is large and powerful, but its next neighbour is the shortest of all; the next toe and the outermost one are about equal in length, and that between them is the longest. By this means the foot aequires a singular bmehed and deformed appearanee, whieh, however, is probably in some way eonneeted with the habits of the animal.

The tarsier is a gentle, inoffensive, noeturnal animal, whieh may be easily tamed; when it exhibits both intelligence and affeetion to those who lave the eare of it. It resides in the damp forests of the islands above mentioned, where it is said by Dr. S. Miiller to frequent the tops of the trees, and its food is deseribed by different writers as eonsisting partly of fruits and partly of inseets. The malays eall it Podje, and, aeeording to Sir Thomas Raffles, the natives of Sumatra have sueh a superstitious dread of it, that if they chanee to see a tarsier upon one of the trees in the vicinity of their riee fields, they will immediately abandon the spot from a fear that some misfortune will otherwise befall them. The true position of this eurious creature was long a matter of doubt, some autloors having arranged it with the jerboas, and others with the marsupial animals.

## Family ViII.-CHEIRONYID A.

We have already stated (pp. 15, 16) that besides the Simix and Prosimic, or, as they may be ealled, the Monkeys and Lemurs, two other families are eommonly plaeed in the present order, although the peeuliaritios of their strueture are so remarkable that their true position may still be regarded as a matter of dispute. This is espeeially true of the present family, whieh wouk seem to eonstitute a connceting link between the widely distant orders of the Quadrumana and Rodentia, partaking so much of the eharaeters of both, as to have been plaeed alternately, by different zoologists, sometimes in one and sometimes in the other of those orders.

THE AYE-AYE (Cheiromys madagascariensis), fig. 7, the only known species of this family is, as implied by its specifie name, a native of Madagascar, where it was first diseovered by the eelebrated l'rench traveller Sonnerat. The name, Aye-aye, conferred upon it by him is said to have been borrowed from the expressions of surprise uttered by those natives to whom he showed


The Aye-Aye (Cheiromys Madagascariensis).
his speeimen, and who had never seen such a ereature before; it was, however, supposed by him to be the native name of his new-found treasure, and is now generally received as the name of the animal.
In its general appearance the aye-aye is intermediate between the galagos and the squircels, with the latter of which animals it is placed by those zoologists who refer it to the Rodentia. When adult it measures abont eighteen inches in length, and its tail almost as much more. It is clothed with a thick fur composed of two kinds of hair ; a thiek woolly down close to the skin, and longer smooth hairs, which form the outer cont. The general colour of the fur is a palo rusty brown, with the faee and throat lighter ; the tail is bushy, and the ears very large and naked. But the most remarkable characters of the animal are, as may be supposed from its doubtful position in the system, to be sought in its structure. The dentition, which, as a general rule, may be regarded as the best eharaeter by which to determine the systematic position of a mammal, wonld seem to indieate the justice of placing the aye-aye amongst the rodents; the incisor teeth, as in those
animals, are two in number in caelı jaw, long, stout, and elisel-like, and the camines are altogether defieient; but the molar teeth, four in the upper and three in the lower jaw, although arranged in the same way as in the Rodentia, present certain characters which are not usual in that order. I'he skull, in its form, has some analogy with that of the galagos, and the bony orbits are complete-a eharacter which does not oceur amongst the rodents.

Thus the eharacters to be drawn from the head and teeth leave the true position of the aye-aye still very doubtful, and it is only from the structure of the members that we are induced to place this animal with the Quadrumana. The bones of the forearms are distinct thronghout their whole length, and both these and the bones of the wrist resemble those of the lemurine animals. The forchands, however, are very peenliar in their structure, the thumb is not opposable, the fingers are execentingly long and thin, the fourth being the longest, and the third the thinnest; all are terminated by large nail-like elaws. In the hinder-hands, on the contrary, there is a distinctly opposable thumb, and the claw of the first finger is eridently more elongated and awl-shaped than those of the others, in the same way as in the true lemurs. Another singular charaeter is the position of the teats, which are situated on the groin.

The aye-aye wonld appear to be rare even in its native forests; only three sprecimens have been brought to Enrope, and these are in the museum of the Jardin des Plantes at Paris. This rarity may, however, be due to the habits of the animal, which is a strietly nocturnal ereature, sleeping during the day coneealed in holes in the gromnd. It is deseribed as being execedingly sluggish, but we still know little or nothing of its general habits and food. According to Somerat it is insectivorous, and employs its long fingers in drawing larve from their holes in the trees; but the specimens which lived for two months in his possession were fed with boiled rice, which they took up with their hands, "using the slender fingers," as Somerat expresses it, "in the same way that the Chinese employ their chop-sticks." Other writers have supposed the aye-aye to be a frngivorous animal, and it must be confessed that the form of its molar teeth do not indieate an adaptation to an exelnsively insect diet.

## Fanily IX.-GALEOPITHECID 2.

Notwithstanding the singnlar characters presented by the animals forming this family, the last that we shall refor to the order Quadrumama, their position in the system is by no means so puzzing as that of the Cheiromys; in fact there can hardly be a cloubt that they form a connecting link between the two contignous orders of the Quadrumana and Cheiroptera, so that the only question is whether we shall place them with one or other of these orders, or, as has heen done by Pro-
fessor Van der Hœeven, admit a distinet order for their reception. The latter course does not appear to us to be at all necessary, and we think it will be evident from the following deseription of the conformation of these singular ereatures that their affinitics are much closer to the lemurine quadrumana, than to the bats.

THE GALEOPITHECI, or Flying Lemurs, differ from the rest of this order in the want of opposable thumbs on all the feet, these being composed of five digits of nearly equal length, arranged in the same plane, and united to each other by a membrane (fig. 8). The limbs are rather long and slender, and on each side of the body, taking its rise from the neek and extending to the wrists, ankles, and even between the hinder limbs to the very extremity of the tail, is a broad hairy membrame, looking, at the first glance, like an ample cloak, in which the ereature might wrap itself up warmly in ease of need. The office of this membranous expansion is, however, very different; when in use it is widely extended by means of the limbs, and then serves its possessor in the way of a parachute, enabling him to spring from tree to tree at great distances. Hence the name of flying lemurs by which the galeopitheei are commonly known. But it must not be supposed that this action constitutes true flight; it is


IInd foot of Galeopithecus volans.
merely a parachute-like sailing through the air; the impetus being given by the spring of the creature from an elevated position, the expanded membrane buoys it up for a considerable distance, although it has no power to sustain or elevate itself in the air by its own exertions. A similar structure, adapted to the same end, oceurs in the flying squirrels, and flying phalangens, and it is widely different from the true wings by which the bats are enabled to take their swift and noiscless flights through the dusky evening air.

In the general form of the skull the galeopitheci resemble the lemurs, but the orbits are open behind as in the bats. The structure and arrangement of the teeth are, however, different from anything we meet with in any other group of mammals. The incisor tecth are four in number in each jaw, lut those of the upper jaw are placed quite at the sides, in a line with
the molars, so as to leare a wide vacant space in front above the lower ineisors. The hindmost of the upper incisors are also remarkable for having two roots, a

Fig. 9.


Lower incisor tecth of Galeopithecus volans.
character which does not occur in any other mammal. The lower incisors are inclined forwards as in the lemurs, broad and flat, and with their crowns enriously cleft in such a way that they resemble small combs (fig. 9); the eanines are wanting in the upper jaw, small and notched at the edge in the lower one; and the molars are six in number on each side of each jaw, and sharply tubercled.

Of the other characters presented by these singular ereatures we need only notice that they possess two pairs of teats, all placed npon the breast.
the flying Lemur (Galeopithecus volans), Plate 4 , fig. 16 , is a native of several of the large islands of the eastern seas, especially Java, Sumatra, and Borneo, and also of Penang, Siam, and the peninsula of Malacea on the continent of Asia. It is of a blackishgrey colour above, with some whitish spots, and of a tawny-grey beneath; its feet are blackish, and its total length about eighteen inches.

In the luxuriant forests of the countries abovementioned, the flying lemurs exist in considerable abundance, but they are said to select partieular spots for their dwelling-places, especially gentle hills covered with young trecs, in the thick branches of which they find a seenre retreat, and quietly sleep away their days. The night is the season of their activity, and then they may be seen springing obliquely from one tree to another, often at a distance of a hundred yards or more, at the same time uttering a hoarse, eroaking, disagrecable noise. On the ground, however, they are very helpless, advancing by a succession of little awkward leaps until they reach some object which they can ascend, when they climb up by the aid of their claws, somewhat in the manner of a eat. They feed upon fruits and joung leaves, preferring those of the cocoa, palm, and the Bombax pentandrum, to the plantations of which, surrounding the native villages, they often do much injury. According to some authors they do not adhere strietly to a vegetable diet, but feed also upon insects, and even upon small birds when they can scize them.

## Order III.-Cheiroptera.

To this small and well-marked class of mammals, it must be confessed, naturalists have not given that attention which the subject demands. Though for the most part composed of individuals of comparatively insignifieant bulk, they have nevertheless important elaims upon our consideration, both on account of the singular and characteristic modifications of organic structure they exhibit, and in respect of the part they play in the economy of creation.

With regard to the habits of the bats and their manner of living, the first and most conspicnons peculiarity presented to ordinary observation has reference to their mode of flight, and the agency by which this function is performed. As the majority of our readers are aware, their titular name Cheiroptera, or Wing-handed family, points at once to the members of the body, primarily concerned in the office of flying; but while the flight of birds is immediately brought about by a development of special integumentary appendages in the form of feathers, we have here the same purpose served by a membranous extension of the skin itself. The membranc is extremely delicate and elastic, extending in front from the neck and sides of the body to the extremity of the fingers of each upper limb, and bchind to the tail and to the heels of the feet. It is thus that nature displays her indefinite resources, being in no way hindered by snch arbitrary laws as operate in the fabrication of works of art. Look at the character of a bat's flight. Generally speaking its aerial progression is easy, regular, and sustained. It has a veloeity sufficient to insure the overtaking and capture of its swiftest inscct prey; while its strength is such as to enable the maternal parent to carry one or two young ones on her back at the same time, during her passage throngh the air. Considering the solidity of their bony framework, and the absence of such air cavitics as are found in birds, it would at first sight appear that bats have relatively a greater specific §ravity than birds, and consequently a greater degree of aerial pressure to contend with. This apparent disadvantage, however, is more than cominterbalanced by a proportionably greater extent of surface presented by the wings as compared with the weight of the body, than obtains in the feathered tribe. We have here in short all the essential conditions for a rapid aerial progression, namely, an appropriate form, a weak specific gravity, and a special modification of the anterior locomotive organs, forming an elastic extensile membrane. These conditions enable the Chciroptera to realize a capacity of flight second only in degrec of perfection to that of birds. In no other family of the first great division of the animal kingdom is this physiological action witnessed, unless indced we are to cxalt the leaping powers of the Galcopilhccus volans to a species of flight. This animal, more faniliarly known as the flying cat, or flying lemur, is also provided with an elastic membrane of a more limited extent than that of bats, but covering and connecting together the anterior and posterior extremities; this strueture is not
only incapalle of raising the creatnre in the air, but performs rather the office of a parachute than that of an organ of flight.

The remarkable adaptations thus rendered subservient to the purposes of flight, are further, and jerhaps more cogently, illustrated by referring to the skeleton (Plate 34 , fig. 110). Here we find the solid framework of the body more or less attemnated in all its elements, with the view of imparting lightness on the one hand, and of retaining strength on the other. Every bone indicates the care taken to provide against any unnecessary weight. The sknll is elongated from before backwards, and its constituent parts thinned out in a striking manner ; this elongation, however, is less conspicuous in those bats which feed on insects, and there are several other cranial peculiarities indicating greater strength in the insectivorous than in the frugivorons species. Among thase may be mentioned an increased breadth in the form of the jaws in the carnivorous lind, this group also having the cusps of the tecth sharp and pointed, while those of the fruit-eating section are broader, blunter, and deeply grooved longitudinally. All the bats display four eanine teeth, but the number of incisors and molars or grinding teeth varies considerably. Of the latter there are never less than three on either side of eaeh jaw, while very frequently we find five in the upper and six in the lower, an arrangement which is oceasionally reversed. With regard to the incisors, or cutting teeth, there are usually two or four in the neper jaw, and two, four, or sometimes six, in the inferior jaw. The baekbone, or chain of bones, termed the vertebral colnmn is chiefly remarkable for the large size of its spinal or neural canal, and the comparative breadth and strength of the bones of the neck. The vertebræ, to which the ribs are attached are eleven or twelve in number, according to circumstances; bint those succeeding are more rariable in this respect, from four to seven being assigned to this so called limbar region. The bones of the tail, or coccygeal vertebræ, exhibit a still more striking irregularity, and present, as it were, a gradual dwindling away towards the delicate filamentary extremity in those species of Vespertilio where they are most numerous. In the gemms Pteropus, indecd, there is no tail whatever, but in the species of Noctula we find sir bones, while as many as twelve occur in the genus above mentioned. All the ribs, with the exception of the first pair, have an extraordinary length, relatively more, we may say, than occurs in any other mammalian family. The breastbone, or sternum, is also mmsmally long and broad, the anterior part, or manubrimm, as it is called, having a surprising lateral expansion in certain of the genera, and most conspicuonsly so in the horse-shoe bats. In all the species this portion of the little flat chain of bones, collectively termed the sternum, is provided with a more or less prominent central ridge on the under surface, evidently corresponding to the exaggerated kecl-like process developed in birds to give attachment to the strong peetoral muscles. We also
discover an increase of development of the other bones which enter into the constitution of the shoulder. The clavicles are elongated and much arched superiorly, the bladebone or scapula being likewise very surprisingly developed, more especially in the insect-devouring species. All these arrangements beautifully illustrate the adaptability of this mechanism to the peculiar habits of the Cheiroptera, while they at the same time afford to the inprejudiced truth-seeker the most satisfactory evidences of creative design. The teleological argument, indeed, may be still more vigorously euforced by a consideration of the osseous elements which enter into the formation of the arm, forearm, and hand. To a certain extent we have already touched upon this mechanism, when speaking of the characteristic function of flight. It is here, therefore, only necessary further to observe, that the upper extremity of the humerus or first bone of the arm is large and rounded, while the remainder is cylindrical and slender throughout. The two bones of the forearm, namely the radius and ulna, are curiously modified; the former being extremely long, and the latter only faintly represented by a slender styliform process, or in some cases by a mere rudimentary flat bony nodule. By this significant disposition of parts all rotatory motion is cffectually prevented, and those movements of promation and supination, so essential to the welfare of the human and quadrumanous species, are entircly dispensed with. Had not these changes of structure been introduced, the comfort, nay the very existence of these creatures, would have been jeopardized. Such is the foresight of the Divine Architect! And before concluding this part of the subject, we have further to observe that six small bones enter into the framework of the wrist, two behind, and four in front; one of the former row being singularly bulky, probably because two other carpal bones, usually assumed to be absent, do in reality enter into its constitution. Succeeding these are the immensely elongated metacarpals and wire-like fingers, the phalanges of which diverge from one another in the expanded condition of the wing, and spread out to reach the lower margin of the elastic skin membrane formerly described. The second digit is the shortest, and the third the longest, while the thumb is comparatively insignificant, and terminated by a hooked phalanx. Finally, the bones of the pelvis, and those of the lower limb, although they share in the general diminution of the osseous fabric quantitively, do not.in other respects relatively exhibit those deviations from the normal type of skeletal structure which obtain in the shoulder and superior extremities.

Before proceeding to consider the habits of Cheiroptera, there are several other interesting peculiarities of organization which cannot pass unnoticed. One of the most important of these is the great development of the ears among those bats living upon insects. In some species the external auricles attain a prodigious size (fig. 10), being frequently as large as the head, and occasionally nearly as long as the entire body; and this curious feature is, moreover, combined with an increased development of the internal acoustic apparatus, and a special enlargement of that part of the auditory organ termed the cochlea. The eyes of bats are
small, and in those kinds which have large ears they are almost concealed from view. The skin, generally, is


Head of the Long-eared Bat (Plecotus auritus).
clothed with a soft downy hair, except on the winged and interfemoral expansions. The sense of smell is remarkably acute, more particularly in the insecthunting group. Here again we find an increasel development of the external organ, precisely analogous to the external ear. Certain individuals are provided with leaf-like appendages attached to the nostrils, and consequently we are fairly entitled to prosume that, as in the case of hearing, the auricles are created with the obvious intention of catching sonorous vibrations, so also are the nasal leaflets designed to collect the odorous particles emitted from the bodies of the insects on which these animals prey (fig. 11). The sense of touch is likewise exceedingly sharp. For a long time

Fig. 11.


Head of the Greater IIorse-shoe Dat (Rhinolophus ferrum-eqninum).
it was a question with maturalists how the Cheiroptera regulated their flight in cares and recesses of almost absolute darkness, there being no doulbt as to the well ascertained fact that their movements, under these circumstances, were conducted with the same skill, ease, and rapidity as in twilight. To solve this problem the eminent physiolorist, Spallanzani, instituted a serics of cruel experiments. He actually deprived a number of bats of their sight by extracting the ejes, and filling the sockets with pieces of leather. They were then
permitted to fly about, while various obstacles were placed in their way. Even in this unhappy condition the poor creatures avoided every linderance, knowingly turned sharp corners, and passed througli threads suspended from the cciling of an apartment, when the intervening spaces between the scveral cords scareely execeded in width the lateral diameter of the animals' bodics from wing to wing. The results of these experiments have been sinee confirmed. The astonishing phenomena thus cxhibited at first indueed Spallanzani to belicve in the existence of a sixth scuse, and this opinion appeared to receive general favour. It was rescrved, however, for the illustrious Cuvier to suggest that the faculty in question resided in the winged and interfemoral expansions of the skin, and was immodiately due to the high sensibility of that structure. This membrane was then, as now, well-known to be cxtensively supplied with nerves, but it still remains to be demonstrated whether these nerves terminate in special tactile corpuseles, or touch bodies, such as Wagner not long ago discovered in the tips of the human finger, or whether any other specialization of neural tissue may not be present. In the phyllostomes, or leafy-mouthed bats, the tougue presents a eurious sucking apparatus, consisting of numerous proeesses on the surface; and these acting together emable them to draw in the juices of the animals or fruits on which they feed. In regard to the digestive organs we find modifications of structure coordinating with the varying characters of the teeth in the two principal cheiropterous groups. Those fecding on insects present a simple stomach, such as we sce in the ordinary Carnivora, whereas this organ in the frugivorous species displays characters more in harmony with the complicated stomach of vegetable-feeding quadrupeds.

The habits of the bat family are nocturnal or crepuscular. During the day they lic concealed in dark recesses, and arc to be sought for in the hollow cavities of trecs, in holes of walls, and in rocky caverns; having an especial liking for ancient ruinous buildings, among whose arehitectural irregularities they discover most appropriate hiding-places, suspending themselves by their hind feet, the head being directed downwards. As the shadows of evening approach with gradually decpening gloom and silence, our twilight-loving friends steal forth from their various sung retreats. The soft moist air of closing day, no longer heated by the summer's sm, is favourable to the chase, while the aecumulating sweetness of the balmy air, aggravated, it may be, by the occasional hum or buzz of some insect wanderer as it flits by the lonesome retreat of a half-awakening phyllostome, ean no longer be resisted. The contraeted crnmpled-up wings are now unfolded; the drooping aurieles become expanded and erect; the hom for action has arrived, and one by one each issues forth with eomforting expectancy. Such being the preparatory attitude and bchaviour of our aronsed phyllostome, let us now direct our thoughts to the objects of pursuit-what of them? Thus may we soliloquize. Poor insects! you too have issucd forth on your self-sceking errands. Hither and thither you glide on in dreamy unconscionsness of the destiny that awaits you. But in carrying out nature's provision for
your abundant increase, you have, as it were, execeded the proper bounds. Though we acknowledge this cxecss is more apparent than real, you eannot entirely lay claim to our sympathy. We admit it is no fault of yours, yet, there you are, sometimes disputing possession of the air by your intolerable profusion. You have propacated too fast. Like a healthy shmb you have vegetated too actively, and, in a numerical point of view, your very budding outbids all human calculation. To us your success in this particular has become a nuisance, and our welfare is involved in your partial abrogation. I am glad to see the cliciropterous destroyers are at hand, for to them your multiplicity is an occasion of rejoicing. Talk of destruction! In early days the swift-winged arrow did its appointed work, and to-day, alas! the deadly rifle slays its numerous lmman victims. But watel yon tiny vespertilio, sce with what skill she stecrs her rapid flight. One after another each fluttering vietim disappears, as with sudden stroke its course is finished by the flittermouse's grasp. Sic transit gloria insectorum. Yet this mode of living is imposed upon the Vespertilio as a wise necessity. She not only purifics the air of superabounding insect forms, but at the same time, sceures her proper sustenance; she supports her delicate fabrie by the legitimate employment of her means, and accomplishes ihis purpose without oceasioning prolonged pain or unnecessary torture. How suggestive and beautifully true to nature, therefore, are the sacred psalmist's words-" Thou openest thine hand, and fillest all things living with plenteousness."

Another halit among Cheiroptera must not pass unnoticed-we allude to hybornation. This remarkable state of inactivity occurs during the winter season, and is a provision of uature not so much brought about by the mere existence of cold, as by the circumstance of the supply of inscet food being stopped. It is well known, indecd, that some animals belonging to the insectivorous mammalia, properly so called, hybernate in tropical countries during the summer months, for the excessive heat and dryness of the atmosphere eauses the same searcity of insect life. Whatever may be the explanation of the changes produced in animals so circumstanced, it will be readily understood that those oceurring under opposite conditions must be equally. astonishing. IIcre we have a strangely-modificil existence-a meagre semblance of vitality-at the portal of whose doors death seems ever ready to enter in and elaim possession. Suspended in the secret recesses of his temporary grave, our little bat expericuces the chill of those coming events that east shadows befure them. But a short time sinee we watched his acrial flittings, as he joyously snapped up his prey; but his pastime is orer, not a few insects have perished, and the larve of others lic huried in the earth, hoping to assume the more perfect imago form in the approaching spring. Left in this apparently forlorn condition, the bat gives itself over to a profound repose, while a scries of plysiological changes steal over him such as Professor Owen has thus faithfnlly portrayed-" The breathing becomes gradually slower than in ordinary sleep, the pulsations of the leart diminish in force and froquency, the supply of
stimulating arterial blood to the muscles and the brain is progressively reduced, relaxation of the muscular fibres is converted into stiff inaction, and sleep sinks into stupor : at length respiration entirely ceases, and with it those chemical changes in the capillary circulation on which animal heat mainly depends. The preservation of life in its passive or latent state is now due to the irritable property of the heart's fibre, which is excited to contract by the blood in its present dark or carbonized state, and continues to propel it slowly over the torpid frame during the whole period of hybernation. This slow circulation of venous blood through both the pulmonic and systemic vessels is the only recognizable vital act during that period, and the material conveyed by the absorbents into the circulating fluid is sufficient to counterbalance the slight waste thus occasioned. So long, therefore, as the state of torpidity continues, the bat is independent of supplies from without; but it purchases that independence by a temporary abrogation of its vital faculties. Cold, senseless, motionless, and asphyxiated, its entry into death's chamber is prevented only by its being brought to his rery door." Such is the sacrifice which this semicadaverons state involves, yet its superinduction furnishes the means of warding off the otherwise inevitable consequence of death by starvation. On the approach of summer the vital forces resume by degrecs their wonted functions, and the species again takes part in the pleasures of active life.

With all our boasted national intelligence, it is surprising to how great an extent the minds of the people are still imbued with childish superstitions. The records of our police courts have recently demonstrated the prevalent existence of this barbarous ignorance, in a manner which ought to excite the deepest national self-reproach. Even the harmless, playful, slender little bat, as it innocently chases its lawful prey, is foolishly dreaded as an ominous visitant; and when by any chance an open window gives it entrance to some airy dwelling, what consternation marks the countenances of its human occupants. Ah! exclaims one, there will soon be a death in this house. Yes! replics another, it is a warning to prepare! Stupid peasant, and yet still more senseless lady. Can you not shake off such vain associations? What is there, we ask, in these accidental domiciliary visitations to occasion mystery, horror, or alarm? Let the simple statement of these creatures' habits which we have just given, invite you to admire and caress the beings you have hitherto regarded with gloomiest forebodings.

Bats are found in all quarters of the globe. There is no considerable portion of the earth's surface which eannot produce some members of the family; but, as in quadrumana, certain generic types are common to one country, while, on the other hand distinetive peculiarities characterize those of another. In our own islands, and in Europe, all the species are inseetivorous, and most of them belong to the great family of Vespertilionide, being unprovided with those peculiar nasal leaf-like appendages formerly described. With regard to the distribution of bats in time, our readers will anticipate their recent origin in a geological point of view. The few and fragmentary remains with
which we are at present acquainted, have, for the most part, been found in the pleistocene, or newest deposits of the tertiary age. Some cheiropterous fossils found in the old caves of Kient's Mole, near Torquay in Devonshire, and in the Mendip hills of Somersetshire, are clearly referable to existing species, while those procured from the lower eocine formation at Kyson, near Woodbridge in Suffolk, and those taken from the Norfolk crag deposits, also helong to existing Emropean genera. The fossil forms found in America appear to be connected with the comparatively recent pliocene formation. Finally, it is worthy of remark, that no remains of extinct Cheiroptera belonging to the frugivorous class are at present known.

## Family I.-VESpertilionide.

The group of individuals associated under this head do not exhibit foliaceous nasal appendages. They are all insectivorous in their habits. They display ten incisive or cutting teeth, namely, four in the upper, and six in the lower jaw. There are, as usual, four canines, but a rariable number of molars or grinding teeth. The ears are not remarkably conspicuous, that is to say, very seldom longer than the head, and they are disconnected at the lower part. The fingers are unprovided with claws. The tail is generally a little exserted beyond the investing interfemoral membrane.

THE PIPISTRELLE (Vespertilio pipistrellus).-On the authority of the Liev. Leonard Jenyns and Professor Thomas Bell, we are entitled to consider this species as the common bat of Britain, par excellenee. Some time ago, these gentlemen took considerable pains to show, and they moreover conclusively established the fact, that the form of bat invariably deseribed in the older British natural history works as the common bat of our country, although extremely abundant in continental Europe, was in reality referable to a species, indigenous indeed, yet comparatively rare in this country. The bat here spoken of as scarce, is the mouse-coloured vespertilio. The pipistrelle is a diminutive ereature, and is only an inch and a half in length when fullgrown. Its ears have an oral-triangular form, and are about two-thirds longer than the head, being cleft at the outer margin. In a state of repose it is commonly detected in the crevices and fissures of old brick walls, and especially in all kinds of recesses connected with human habitations. Gnats and other members of the dipterous class seem to constitute its favourite food, but it would be difficult to limit its clooice in this particular. Mr. White, in his oft quoted "Natural IIistory of Selborne," gives an interesting account of the feeding of a tame bat, which in all likelihood was an example of the species we are now discussing. IIe says it was wont to "take flies out of a person's haud; if you gave it anything to eat, it brought its wings round before the moutl, hovering and liding its head, in the manner of birds of prey when they feed. The adroitness it showed in shearing off the wings of flies, which were always rejected, was worthy of observation, and pleased me much. Insects seemed to be most acceptable, though it did not refuse raw flesh when offered;
so that the notion that bats go down elimneys and gnaw men's bacon, scems no improbable story. While I amused myself with this wonderful quadruped, I saw it several times confute the vulgar opinion, that bats when down on a flat surface eannot get on the wing again, by rising with great case from the floor. It ran, I observed, with more despateh than I was aware of, but in a most ridieulous and grotesque manner." These latter remarks lave received ample confirmation from the observations of several distinguished naturalists. Speaking of the pipistrelle, Mr. Bell states, as the result of his experience, that this bat is capable of rumning along the ground with greater celerity than any other species with which he is aequainted; whilst its power of climbing showed a " corresponding degree of agility." He adds, "I have often seen the pipistrelle rise from a plain surface with a sort of spring, instantly cxpand its wings, and take flight. This was repeated by a single individual several times in the course of an hour, and without the slightest appearanee of difficulty or effort; it was, on the contrary, evidently a natural and nsual action." The error, therefore, of the commonly-entertained notion respecting the bat's inability to rise from the surface of the ground, is clearly manifest, and if further proofs were wanting, we might furnish additional evidence to this effect from equally trustworthy sources.
THE NOCTULE ( I espertilio noctul(a).-This is commonly known as the Great Bat of Britain. It is a large species, measuring very nearly three inches in length; nevertheless, it is not, as erroncously stated in some works, the largest of our indigenous Cheiroptera, seeing it is considerably exeeeded in size by the mousecoloured bat above mentioned. The head is rounded and broad transversely; the muzzle being short, wide, and abruptly truncated. One of the most striking features in this bat, is the length and extent of the wings, measuring in the full-grown individual, while outstretched, at least fifteen inches from tip to tip. As might be cxpected, this large amount of wing surface gives a corresponding power of rapid flight; for the performance of this funetion it is, indeed, eminently distinguished, and exhibits a particular liking for the higher regions of the atmosphere, where it rapidly glides along uttering wild discordant cries. The most interesting and detailed observations on record respecting the habits of this creature, are those communicated to the Zoologieal Society of London by Mr. Daniell. In the published proceedings of that body it is stated, that "on the 16th of May, 1834, Mr. Daniell procured from Hertfordshire five specimens of the Vespertitio noctula, four females and one male. The latter was exccedingly restless and savage, biting the females, and breaking his teeth against the wires of the cage, in his attempts to cscape from his place of confinement. Ite rejected food, and died on the 18th. Up to this time the remaining four continued sulky; but towards crening, they ate a few small picees of raw beef, in preference to flies, beetles, or gentles, all of which were offered to them; only one of them, however, fed kindly. On the 20th one died, and on the 22nd two others, each of which was found to be pregmant with a siugle foctus. The survivor was tried with
a variety of food, and evincing a decided preference for the hearts, livers, et cetera, of fowls, was fed constantly upon them for a montl. In the course of this time, large flies were frequently offered to her, but they were always rejected, although one or two May-chafers (Mclolonthe vulyaris) were partially eaten. In taking the food, the wings were not thrown forward, as Mr. Daniell had observed them to be in the pipistrelle; and the food was seized with an action similar to that of a dog. The water that drained from the food was lapped; but the head was not raised in drinking, as in the pipistrelle. The animal took considerable pains in eleaning herself, using the posterior extremities as a comb, parting the hair on either side from head to tail, and forming a straight line along the middle of the back. The membrane of the wings was cleaned by forcing the nose through the folds, and thereby expanding them. Up to the 20th of June, the animal fed freely, and at times voraciously; remaining during the day suspended by the posterior extremities at the top of the cage, and coming down in the erening to its food. The quantity eaten sometimes exceeded half an ounce, although the weight of the animal itself was no more than ten drachms. On the 23rd, Mr. Daniell observing her to be very restless, was induced to watch her proceedings. The uneasiness was continued for upwards of an hour; the animal remaining all this time in her usual attitude, suspended by the posterior extremities. On a sudden she reversed her position, and attached herself by her anterior limbs to a cross wire of the eage, stretching her hind legs to their utmost extent, curving the tail upwards, and expanding the interfemoral membrane so as to form a perfect nest-like carity for the reception of the young. In a few moments the snont of the young one made its appearance, and in about five minntes the whole of its head was protruded. The female then struggled considerably until the extremities of the radii had passed ; after which, the young one, by means of a lateral motion of its fore limbs, relieved itself. It was born on its baek, perfectly destitute of hair, and blind. The mother then eleaned it, turning it over in its nest ; and afterwards resuming her usual position, placed the young in the membrane of her wing. She next cleaned herself, and wrapped up the young one so closely as to prevent any observation of the process of suekling. The time occupied in the birth was seventeen minutes. At the time of its birth, the young was larger than a newborn mouse ; and its hind legs and elaws were remarkably strong and serviceable, enabling it not only to eling to its dam, but also to the deal sides of the cage. On the 24 th, the animal took her food in the morning, and appeared very careful of her young, shifting it occasionally from side to side to suckle it, and folding it in the membranes of the tail and wings. On these occasions her nsual position was reversed. In the crening she was found dead; but the young was still alive and attached to the nipple, from which it was with some diffieulty remored. It took milk from a sponge, was kept earefully wrapped up in flamel, and survived eight days; at the end of whieh period its eyes were not opened, and it had acquired very little hair. From these observations, it is crident that the
period of gestation in the noctule exceeds thirty-eight days." Accorling to the observations of Mr. White of Selborne, this species does not make its appearance on the wing until the latter part of April, and not after the month of July. The same authority first noticed that the body of the noctule emitted an offensive odonr. Throughout Europe it may be said to be a common species. In Dr. Gray's catalogue of specimens preserved in the British Museum, this bat is called Noctulinia altivolans, the latter word indicating its most characteristic habit.

THE SEROTINE (Vespertilio serotimes).-This is a moderate-sized bat, having a length of little more than two inches and a half, exclusive, of course, of the tail. The ears are tolerably large, the body being clothed with a long, soft, downy covering of a reddish-brown colour above, and gradually shading off to an obsenre yellow tint at the under part of the body. Mr. Bell salys, "It appears to liave very much the habit of the noctule, at least as far as regards its late appearance in the spring, and its somind and long-continued slumber. It flies from evening till morning, when the state of the atmosphere is favourable. In France, where it is far from being rare, it frequent forests, where it flies among lofty trees. It is also commonly found amongst the huge piles of wood in the timber yards of Paris, seek." ing its place of repose on the tops of the highest piles. With us it appears to be a rare species, not having litherto been found anywlere but around London. Its flight is slow; it shuns society more than most other lats, being generally found either solitary or in pairs. It has only one young one at a birth-about the end of May in France, probably somewhat later in this country. It is found in Germany, Holland, France, and Switzerland." In the catalogue of Mammalia preserved in the British Muscum, this species is designated Scotophitus serotinus.

THE MOUSE-COLOURED BAT (T'espertilio murinus). -There can be no doubt that this is the largest of our indigenous Cheiroptera, as it far exeeeds the noctule in length, measuring three and a half inches from the muzzle to the base or root of the tail. It is, as we have before stated, a common species in continental Europe, but exceedingly rare in Britain. The head is elongated, and narrower in front than obtains in any of the foregoing specics; the eycs are conspicuous, and placed well forward; the cars are broad at their base, but markedly pointed at their tips. Its habits are gregarious, and it has a special fondness for old buildings. It is a very pugnucions animal, and it may be remarked that its general appearance seems to indicate such a ferocity of disposition. Moths appear to constitute its prineipal insect food. In the British Mnscum catalogue this is also classed under the genus $S$ otopheitus.

Natterer's bat (Vespertilio Nattereri). -In accordance with a distinguishing character which more or less marks this species, Mr. Bell desiguates it the Reddish-grey Bat. The rules observed in naming species are of necessity very arbitrary; and althongh, to the eye of a well-trained practical naturalist, a variation of colour is readily appreciated, by the general observer of nature differences in this respect are easily orerlooked; unless, indeed, they exhibit the most pal-
pable significance. Independent of the opportunity of variety afforded by the introduction of anthors' surnames into our natural history nomenclature, it also offers an agrecable medinm for diffusing the names of distinguished naturalists among those who cannot be expected to know, in all cases, to whom science is indebted for its adrances in ancient or even more modern times. Thus, for the sake of illustration, it is doubtless agreeable to the general reader to be aware that the Dr. Natterer, whose name is cmployed in connection with this bat, was a celebrated $\Lambda u s t r i a n ~ m a t u r a l i s t, ~$ who greatly extended our knowledge of the animals of Germany, and who, during his travels in the comparatively new field opened up to him on the Brazilian continent, accumulated a prodigions amount of materials and facts, which have since enlarged the borders of natural history science in various departments. Having said thus much, partly by way of apology for adopting the above English specific title, we have now to observe that this species is scarecly two inches long. The head is small, as compared with the species just described, while the muzzle is pointed and narrow. The ears are about the length of the head, while the little appendage in front, looking like a second ear in some species, and called the tragus, is particularly thin and styliform. In regard to its habits but little has been noticed; nevertheless, Mr. Bell has recorded some interesting observations respecting three examples, which were obtained from one of those well-known artificial caverns in the chalk-pits at Chiselhurst in Kent. "These specimens continued alive for a short time, feeding on bits of raw meat, and exhibiting great familiarity not only towards their companions, but with myself, eating from my hand, and allowing me to meddle with them without evincing fear or anger. One of them was one morning found dead, and partially eaten by his companions; and the remaining two died shortly afterwards. They were active in their labits, ruming about the cage, and climling with great aggility. Their attitude when running on a plane surface was more horizontal that that of the long-eared bat, though perhaps less so than the pipistrelle, which rans along almost on its belly." Natterer's bat has hitherto, we believe, only been captured in the eastern comities of England. This species will be found in the British Mnsenm catalogne, under the combined generic and specific name of Myotis Nattercri.

THE PARTICOLOURED BAT (Tespertilio discolor).This is a well-marked form, and one of the most attractive of the species hitherto seen in this country. It derives its name from the peenliar mottled colour of the fur, the tips of the hairs on the back being of a light-grey colour, while their roots have a rich chestnut hue. On the under surface of the body the hairs are still variegated, but they exhilit a much lighter shade. The particoloured bat measnres rather more than two and a half inches in length. The ears are of moderate size, the eyes being particularly small. Througlout Europe this species appears to be everywhere scarce, and only a single example has been taken in England. The specimen in question is now in the British Muscum, and is named in the eatalogue Scotophitus discolor. It was obtained at Plymouth.

BECHSTEIN'S BAT (Vespertilio Beclisteinii).-Only a single example of this elegant species has at present been procured, we believe, in this country. The specimen was captured at the new forest in Ilampshire, and is preserved in the British Museum. In the catalogue it is designated Myotis Bechstcinii. It appears to have a decided preference for woods and thickets, and takes up its diurnal abode in hollow trecs. It is somewhat exclusive in its habits, mixing only with individuals of its own kind, and then only in small companies. Bechstein's Bat rather exceeds two inches in length; the muzzle is a little attenuated and pointed, while the ears are scarcely longer than the head.

DAUBENTON'S BAT (Vespertilio Daubentomii).Throughout Europe this mammal appears to have a pretty wide distribution, and in the United Kingdom it has been taken at the far nortli of Scotland. It is very little longer than the preceding, but the head is considerably shorter, and less pointed in front. The ears are comparatively short, and slightly notehed at the extermal margin. Its flight is low and rapid, and it frequents the neighbourhood of still waters.

LeISELR'S BAT (Vespertilio Leisleri).-Mr. Bell appropriately describes this bat under the cognomen of the Hairy-armed Bat, on account of a remarkable band of hair which passes along the wing membrane at the under surface of the forearm. A solitary specimen has been obtained in this country, and is preserved in our great national muscum, and recorded in the catalogne under the generic title of Scotophilus. Its habits and places of resort are similar to those of the above species. It is two and a half inches in length; the head is compressed and pointed anteriorly; the ears are short and broadly curved at the upper part.

THE WHISKERED BAT (Vespertilio mystacinus). --The maseuline title in which this little animal rejoiecs is imparted to it on account of certain long fine hairs attached to the upper lip; and, whatever may be affirmed by the learned, we think it offers but a feeble a pology for the said development. However, the bat is not proud ; on the contrary, Mr. Bell avers that it is a "timid and restless species." The living specimen procured by this gentleman, instead of accommodating itself to the lively society of others of the cheiropterous family with which it was associated both in eaptivity and freedom, obstinately refused food and perished. Its length rather exceeds an inch and a half; the ears are not so long as the head, and they are somewhat notehed at the outer margin. This bat has been taken in several of the southern counties of England.

THE BARBASTELLE (Barbastcllus commumis).This is a very well marked bat, differing from all the preceding in several peculiarities, although it has the ordinary length of two inches. The ears are united below over the forehead, while the nostrils are situated on the npper surface of its short, truncated muzzle. 'The fur is darker than usual, being nearly black over the region of the spine. The ears are remarkably broad, and of a more or less quadrilateral form; they are irregularly folded at various points, and rather deeply eleft at the outer margin. The eyes are singularly minute, and seem to be almost included within the auricles. According to Mr. Bell, howerer, this is
not actually the case. The eminent naturalist just named, kept a specimen in confinement for several weeks, and the account he has given of its labits are too interesting not to be recorded in cxtenso. "It was taken during a rery liard frost in the latter end of Dccember, in a large claalk cavern at Chiselhurst in Kent, which is excavated at the bottom of a shaft seventy feet deep. In this cavern, during very severe frosts, several species of bats are found to retreat; and on this occasion I received with the barbastelle a specimen of Vespertilio mystacinus, three of V. Nattereri, and several of Plecotus uuritus. My little prisoners, when brought into a warm room, soon began to exhibit signs of rivacity; and the barbastelle, with the others, fed readily on small bits of meat and drank water. IIe was a timid animal, and did not evince the slightest disposition to become acquainted with me. He would take his food, however, with his companions, and was accustomed to rest with them in a cluster at the top of the box in which they were placed. The barbastelle certainly became torpid more readily than any of the others, and more completely so ; but when awake, evinced extreme restlessness, and was incessantly biting with great violence at the wires of his lox. When suffered to fly about the room, he flew rery low, and less actively than any other under similar cireumstances; and he was fond of lying before the fire on the hearth-rug, where he appeared quite to luxuriate in the warmth. Whilst the long-eared bats showed much attachment to each other, and became rery familiar with me, the barbastelle remained sullen and apart, until at length I found that he was an object of persecution on the part of his more active companions, one of whom I detected in the act of giving lim a severe bite on the back of the neck. This oceasioned his immediate removal to another box; but this sharp discipline probably hastened his death, which took place about a wreek afterwards, though he continued to eat till the day before he died. The specimen was a male, and apparently an adult." The barbastelle has been frequently eaptured in England; but it is better known on the continent, especially in France.

THE LONG-EARED BAT (Plecotus auritus).-This is one of the most attractive members of the cheiropterous family, and, as its name implies, is possessed of singularly-conspicnous auricular appendages. We have purposely deferred the consideration of it until now, becanse it exhibits marked aftinities with the family which will next occupy our attention. In this bat the ears are more than double the length of the head, and very nearly as long as the entire body, being about an inch and a half from base to apex; the tragi, or lesser ears, as they were termed by old authors, are themselves about lialf an inch long. It is not, howerer, in the mere extent of these appendages that their attractiveness is to be considered; it is rather owing to their exquisite transparency, and the power the creature possesses of expanding and contracting them in such a manner as to produce the most elegant festoon-like foldings, or, from the regularity of the flexures thus formed, ever and mon displaying a beantifnl feathery appearance (fig. 12). In a state of decp repose the wings lie donbled up and concealed under
the arms, while the lesser cars, erroneously so called, still maintain their ordinary posture. When tameda condition which it can be readily taught to appreciate -the long-eared bat exhibits a most amiable disposi-
tion; and in these days of vivaria it would not surprise us to hear of some person who liad started, what might be termed a eheiropterarium. It would not, however, be placed under the management of such superstitions

Eig. 12.


The Long-eared Bat (Plecotus auritus).
individuals as we have formerly described. Yet, seriously, if any doubt the feasibility of such a scheme, or the interest which such a step might ereate, let them first peruse the experiences Mr. Bell has recorded of our long-eared friends subjected to a state of eaptivity. He says-"I have frequently watehed them when in confinement, and have observed them to be bold and familiar even from the first. They are very eleanly; not only cleaning themselves after feeding and at other times with great assiduity, but occasionally assisting each other in this office. They are very playful too, and their gambols are not the less amusing from their a wkwardness. They run over and against each other, pretending to bite, but never harming their companions of the same species; though I have seen them exhibit a sad spirit of persecution to an unfortunate barbastelle which was placed in the same eage with them. They may be readily brought to eat from the hand; and my friend, Mr. James Sowerby, lad one dnring last summer (1836) which, when at liberty in the parlour, would fly to the hand of any of the young people who held up a fly to it, and pitching on the hand, take the fly without hesitation. If the inseet were held between the lips, the bat would then settle on its young patron's check, and take the fly with great gentleness from the mouth; and so far was this familiarity earried, that when either of my young friends made a humming noise with the month in imitation of an insect, the bat would seareh about the lips for the promised dainty." What think you of this? Let the hypereritieal secptic give his attention! Some people, we know, are shocked at the iden of making friends with what they are pleased to term a horrid bat-a creature, which, in their estimation, is almost a represcntation of Satan himself-a creature, say they, whose actions will not bear the light of day-an eventide wanderer, whose boon companions are "spirits of exil and goblins damned"harpies, they say, such as "fell upon the hastily-spread
tables of Virgil's hero and his friends, and pollnted, whilst they devoured, the feast from which they had driven the affrighted gnests"-beast and bird united monsters, whose prerogative it is to reveal whispered utterances of secret thoughts profound! Hence! hence! ye broad-winged devils, hence! Reminiseenees of dark and bloody deeds long past already overspread our frame-freczing chills now enervate and paralyze our souls! Begone, begone, revolting ereatures! misshapen forms! who can doult your horrid mission? who abide your thriec-accursed presence?

Whether real or fancied, such hare been the imagiuings of the ignorant and superstitious of ancient times, whilst to poet and painter alike our innocent and harmless Vespertilios have furnished ample material for mysterious and overwrought pietures. Virgil, in his third Fneid, represents Æneas and his companions as making a descent upon the ecoast of one of the Ionian islands. Procceding inland, they next sceured from the plains a quantity of eattle, and forthwith prepare themselves a feast, when, lo! the bats appear, aud thus we may freely render into English the imaginary senne which he there depicts-"Suddenly, from the mountains, the harpies descend with terrijie riolence, shating their wings, and uttcring piseeing crics! Our rich deintics are torm asunder and polluted by their foul grasp! We retrat under the shetter of an orerhanging rock, and, relighting our fires, resolve once more to pepare the desircl feast! Alas! here come the noisy crowd again, to pollute one precious boot? with their hooked talons and horrid mouths! 'To arms! Let us wage war upon the drcudful race! Are your swords drann? From you lofty spot Misenus gives the signal! The trumpet sounds! Away we rush to the attack, 'to violate with the surord these filthy lirds of the sca!' All in rain! Unharmed, with suift impetuous flight they disampear
bencath the stars, leaving our spoil half-eaten and corrupt!" Such in brief are the sentiments conveyed by the poct Virgil, who usually speaks of our eleciropterous friends as so many "dreadful and filthy birds" (rlire obscenceque volucres); in one place, however, a character is introdneed in the form of an ill-starred proplictess, who advocates their cause, calling them "immocent larpies (insontes harpyias)."

In conelusion we may remark, that during the state of repiose, the long-cared bat is generally found in old buildings and under the roofs of houses, and when on the wing it emits a sharp shrill cry. If placed on the ground, it moves forward by a peenliar jerking action from side to side, at the same time keeping the liead well raised. In the published eatalogno of Mammalia preserved in the British Muscum, this species is denominated Plccotus communis.
THE SWIFT-FLYING THICK-LIPPED BAT (Molossus velox), I'late 5, fig. 19. This speeies lives on the Brazilian continent, and certain of the aljoining West Indian islands. In common with several others of the cheiropterous group iulhabiting the north-east coast of South America, it is usually known as the Bull-dog Bat, but this latter term is now better understood to apply exclusively to that particular species of the so called bull dog-bats, which is indicated in the catalogne of Mammalia preserved in the British Musemm mader the title of Noctilio Anericanus-a bat also obtained from the coast of Brazil. The genus Molossus is marked by the presenee of large ears and a short head, which is abrupt and swollen at the muzzle. The tail is long, and projects beyond the square-slaped intercrural membrane. The teeth are twenty-eight in mmber, that is, four incisors, four canines, and five molars on either side of the upper and lower jaws.

## Family II.-RHinolopilid Ae.

The group of bats associated under this head, though correctly soparated into a distinet family, do not, in their liabits at least, depart very materially from the insectivorons Vespertilionida already deseribed. Their distinguishing characteristic consists in the possession of a mombranous appendage, which in some species is remarkahly complicated. In those instances where this membrane is domble, the form of the anterior division is more or less leart-shaped, the posterior division having the aspect of an creet lancoolate leaf with the apex directed towards the forehead. The ears are invariably large, separated from one another, and destitute of that usually narrow process called the trergus. Occupying the situation of this latter strmeture, however, we frequently find a lobed and projeeing membrane developed from the base of the external margin of the auriele.

THE GREATER HORSE-SHOE BAT (Rhinolophus Fervem-equimum). -The fimily eharacters above given sufficiently explain the general form of the integumentary appendage which constitutes so conspieuous a
feature in this and other members of the horse-shoe bats, and imparts to them a strikingly hideons aspect (figs. 11 and 13). The greater horse-shoe bat is about


The Greater IIorse-shoe Bat (Rhinolophus ferrum-equinum).
two-and-a-half inches long, exclusive of the tail. The head is elongated and swollen towards the muzzle; the anterior leaf-like appendage embraces the nostrils, and has the remarkable horse-shoe shape from whenee the English name is derived. Between this and the posterior laneeolated appendage, there is a cup-shaperl cavity surmomed by a sort of overlapping crest. With respect to the use of these complieated structures, various suggestions have been offered; but on the whole, as we have already hinted, they are rather to be regarded as extensions of the smelling surface, with the view of accumulating odorons particles, than as subserving any other office. In concealment this bat is only found in the very darkest and most gloomy recesses, where the light of day can gain no access, and where a noiseless solitude reigns supreme. Natural eaverns among rocks, or subterrancan chambers artificially hewn out in quarries now long ago forsaken, are its loved retreats. From these situations it issues forth to seek its twilight repast on maychafers and their insect associates.
THE LESSER HORSE-SHOE BAT (Rhinolophus hipposideros). - Both this and the foregoing are European species and found in England, thongh neither of them can be said to be very common. At one time the present species was supposed to be only a varicty of the greater horse-shoe lat; but maturalists no longer entertain any doubts as to their respective distinetness from one another. One of the principal marks by which this form is distinguished, consists in the presence of an additional filiform nasal appendage placed immediately in front of the ordinary laneet-slaped process which occupies the frontal region. On account of this structure, the eminent zoologist Geoffroy named the species Thinolophus bihastatus, while to the greater horse-shoe bat he applied the specifie title of Thinolophus unihastatus. In other structural particulars, and in their lahits, the two kinds bear a very close resemblanec.

THE NOBLE HORSE-SHOE BAT (Rhinolophus nobi-lis).-This is one of the largest and rarest individuals of the horsc-shoe family, measuring four inches in length, and liaving from tip to tip of the wings a latcral expansion of nearly twenty inches. It was first described by Dr. Horefield, who informs us that in the native language of the Javanese it is termed Kébbetéli. The body is clothed with a soft downy covering, the hairs of the fur being extremely fine and long. According to Mr. Oyilby's description, the "nasal apparatus consists of a broad membrane, strctching transversely across the nose in the form of a shelf. The sides are bounded by several parallel folds, and inferiorly it constitutes a scmicircular envelope, which has a short obtuscly rounded point in the middle." The colour is brownish above and greyish beneatll. In the British Museum catalogue it is designated IIipposideros nobilis.

## Family III.-PHYLLOSTOMID AE.

The Phyllostomes are, in common with the preceding family, possessed of complex nasal appendages. The typical species have four incisors in each jaw, of which the lower are very sinall, and are placed quite in front of the four canines. The latter are remarkably large, the number of the molars being variable, though there are generally five on cither side of each jaw. The tongue is flat, elongatcd, and extensile, and clothed with papillæ in snch a manner as to produce a kind of sucking organ, the lips being also provided with rows of regularly-disposed tubercles. The cars are of moderate size, and furnished with a tragus. The forefinger is composed of two phalanges, and the middle finger of four. They liave very considerable power of running along the ground. The tail is generally short. In some instances it is altogether absent.

THE VAMPIRE BAT, (Phyllostoma spectrum), Plate 5, fig. 18.-Few members of the great mammalian series have excited morc interest than this celebrated bat. From the earliest times its blood-sucking qualitics have been memorialized; and there can be little doubt, as will be presently shown, that its propensities in this respect are truly formidable. In seeking food they appear willing to attack any description of animal coming within their reach; exhibiting, however, a special fondness for the blood of cattle, upon which they fasten themselves while their victims are asleep. Compared with many others of the bat family, it is a huge creature, about the size of a magpie, and measuring upwards of two feet from the tip of one wing to the other. With regard to the various accounts given by travellers as to their ferocious and sanguirorous habits, we prefer to select the authentic statements of Mr. Stedman, who was himself bitten by a vampire, not only on account of their circumstantiality, but also because of the apparently trustworthy source from which they proceed. Captain Stedman thus speaks of these rampires:-" Knowing by instinet that the person they intend to attack is in a sound slumber, they generally alight near the feet, where, while the creature continues fanning with its cnormons wings, which keeps one cool, he bites a piece out of the tip of the great toe, so very small, indced, that the head of a
pin could scarce be received into the wound, which is consequently not painful; yet through this orifice he continues to suck the blood until he is obliged to disgorge. He then begins again, and thus continues sucking and disgorging till he is scarcely able to fly; and the sufferer has often bcen known to slcep from time into ctcrnity. Cattle they gencrally bitc in the car, but al ways in places where the blood flows spontancously. IIaring applied tobacco-ashes as the best remedy, and washed the gore from myself and my hammock, I observed several small heaps of congealed blood all round the place where I had lain upon the ground, on examining which, the surgeon judged that I had lost twelve or fourtecn ounces during the night." Whatever may be thought of this narrative, it scems generally agreed, that while ccrtain of the Phyllostomata live principally on the juices of fruits, there are others that have a special appetite for the blood of the higher animals, and even of man himself. From this circumstance it would mainly appear, that the supposed existence of certain imaginary spectral monsters, termed vampires, which, in all ages, have been belicred in and dreaded by the superstitious, has its origin in the actual mode of life displayed by these creatures. A distinguished writer has observed that, "upwards of a century ago, there prevailed in several districts of Hungary an epidemic dread of vampires, which lasted some ycars, and gave birth to many extraordinary stories. It was beliceed that in screral places, those among the dead who belonged to the class of vampires, arose nightly from their graves and sucked the blood of the living, who fell into consunptions and perished; that those who had died in this manner became infected with vampirism ; and tlat the only way of exterminating the plague was by disinterring all the suspected vampires, and, if it were discorered that they exhibited the tokens of their hideous character, burning them to ashes, or driving a stake through their middle. The attestations which these grotesquely fearful tales received, are among the most singular instances of human credulity recorded in all the ammals of superstition. They are, in many instanees, related on the authority of the pastors, and other most credible persons of villages and towns, who depose to haring been themselves witnesses of the scencs beheld on opening the vampires' graves. Some, indecd, had aetually secn the spectres themsclyes on their nightly cxeursions; but more gencrally the subscriptions are by persons present at the inspection of the dead bodies; when, if the subjeet was a true vampire, he was generally found of a florid and hale complexion; his hair, head, and nails had grown; his mouth, hands, ct cetera, were stained with fresh blood; his eyes open and brilliant. Sometimes when the stake was driven through him, he was heard to utter eries like those of a living person. It was beliered that the consumption produced by the sucking of the rampire could be cured by eating earth from his grare." Such is a specimen of the follies displayed by the profoundly ignorant and superstitious. Surpassing strange it is, that intellectual human beings can be sufficiently debased to allow a suggestive idea to gain such entire possession of the frame. That many of the parties believed what they
stated to be strietly true, we have no mamer of doubt; for the phenomena of mental abcrration thus produced, are strictly analogons to those cerebral manifestations which a weak mind exhibits when allowed to be under the controlling power of another. This is the true solution of mesmerism, as the writer of this article can confidently state, from having cxperieneed on his own person all the ordinary mental changes, absurdly termed electro-biological, sometimes voluntarily foreed upon the mind by his own ideal associations, at other times superinduced by submission to a so-ealled mesmerist. It were well if these practices and their kindred superstitions could be eternally abandoned by the asccudaney of a strong-minded intelligence, coupled with a due supply of eommon sense; and thus shall humanity rejoice in the possession of the mens sana in corpore sano. In some parts of Europe, ceven at the present day, vampircs are belicved in, and this is particularly the case in the island of Crete, where the speetres are termed Katakhanàs. The Plyyllostome, captured by Mr. Darwin while it was engaged in removing blood from the neek of a horse, is, we believe, refcrable to this genus.
THE AFRICAN LEAF BAT (Megaderma frons). The members of this genus were formerly classed with the Vespertilionidx proper, but their affinities connect them more closely with the present family. In many respects they differ from the typieal Phyllostomata. They have no cutting teeth in the upper jaw, though in the lower they have the typical number. They have, it is true, the usual four canines; but of the molars there are only four on either side of the upper, and five on either side of the lower jaw. The membranous apparatus of the nose is complieated, there being three distinct leaflets, "one vertical, one horizontal, and onc inferior of the horse-shoe form." The cars are particularly striking, being ample, oval, furnished with a tragus, and so united over the region of the forehrad as to impart a heart-shaped outline to the


Ilead of the African Leaf Bat (Megaderma frons).
entire physiognomy, morc eonspicuously, perlaps, than obtains in any other speeies (fig. 14). The Megaderms are also blood-suckers, and it is probable that their power of suction is facilitated by the absence of incisive tecth in the upper jaw; indeed, the very
bones themselves-i.e., the intermaxillaries-in which the incisires are normally implanted, are only represented in this genus by a minute cartilaginous plate. The Megaderms are confined to the Eastern hemisplhere. This speeics is obtained from Senegal and Gambia on the coast of New Guinea, West Africa. In the cataloguc of bats contained in the British Museum it is marked Lavia frons.

## Fanily IV.-PTEROPIDIE.

The bats elassed together under this common title are signifieantly distinct both in habits and structure. 'They are almost cxclusively frugivorous. Their heads are clongated and hairy. The grinding teeth have flattish tubereulated erowns, with a central longitudinal groove. The ears are not furnished with a tragus. The fore-finger consists of three phalanges, and is seldom armed with a claw. The tail is frequently wanting, or, when prosent, very short; the abrogated interfemoral membrane being represented by narrow folds conneeted with the imner margin of the logs. These bats have a wide geograplical distribution over the Eastern hemisphere.
THE KALONG (Pteropus celulis), Plate 5, fig. 17.This is one of the best known, and at the same time the largest of the frugivorous lats. The body is abont two fect long, while the expanse of the wings from tip to tip is sometimes fully five feet. It is gregarions in its habits, and extremely momerous in the islands of Sumatra and Java; and to those whose livelihood depends upon the culture of fruit gardens, it proves an ineorrigible enemy. The graphie account given by Dr. Horsfield merits special quotation, containing as it does almost all that we know of their destructive propensities, and the plans adopted to sceure immunity from their attacks:-"Numerous individuals sclect a large tree for their resort, and, suspending themselves with the claws of their posterior extremities to the naked branches, often in companies of several hundreds, afford to a stranger a very singular spectacle. A species of fig, in labit resembling the Ficus religiosa of India, which is often found near the villages, affords them a very favourite retreat, and the extended branches of one of these are sometimes covered by them. They pass the greater portion of the day in sleep, hanging motionless; ranged in suecession, with the head downwards, the membrane contracted about the body, and often in elose contact, they have little resemblanee to living beings; and, by a person not accustomed to their ceonomy, are readily mistaken for a part of the tree, or for a fruit of uncommon size suspended from its branches. In general, these societics preserve a perfeet silence during the day; but if they are disturbed, or if a contention arises among them, they emit sharp piereing shrieks; and their awkward attempts to extrieate themselves when oppressed by the light of the sum, exhibit a ludierous spectacle. In eonsequence of the sharpness of their claws, their attachment is so strong that they cannot readily leave their hold without the assistance of the expanded membranc; and if suddenly killed in the natural attitude during the day, they continue
suspended after death. It is necessary, therefore, to oblige tliem to take wing by alarming them, if it be desired to obtain them during the day. Soon after sunset they gradually quit their hold, and pursue their nocturnal flight in quest of food. They direct their course by an unerring instinct to the forests, villages, and plautations, occasioning incalculable mischief, attacking and devouring indiscriminately every kind of fruit, from the abundant and useful cocoa-nut which surrounds the divelling of the meanest peasantry, to the rare and most delicate productions which are cultivated with care by princes and clicfs of distinction. By the latter, as well as by the European colonists, various methods are employed to protect the orehards and gardens. Delicate fruits, such as mangoes, jambus, lansas, ct cetera, as they approach to maturity, are ingeniously secured by means of a loose net or basket, skilfully construeted of split bamboo. Without this preeantion little valuable fruit would escape the ravages of the kalong. There are few situations in the lower parts of Java in which this night wanderer is not constantly observed; as soon as the light of the sun has retired, one animal is seen to follow the other
at a small but irregular distance, and this succession continues uninterruptedly till darkness obstructs the view. The flight of the kalong is slow and steady, pursued in a straiglit line, and capable of long continuance. The chase of the kalong forms occasionally an amusement of the colonists and inhabitants during the moonlight nights, whieh in the latitude of Java are meommonly sercne. He is watched in his descent to the fruit trecs, and a discharge of small shot readily brings him to the ground. By this means I frequently obtaincd four or five individuals in the course of an hour." Several other species of this remarkable genus are known, and in the year 1855 we had an opportunity of watching the behaviour of a specimen of P'teropus cclulis in the collection of the Zoological Society, Regent's Park. Notwithstanding, however, the great eare taken to kcep it alive by the necessary degrce of artificial heat, our treacherous climate proved too much for it. Still more recently the society proeured a living example of an allied species, namely, the Shoulder-knot Bat (Epomorphorus Whitii) from Wcst Africa; but this laas likewise perished. These bats fed principally upon raisins.

## Order IV.-INSECTIVORA.

Setting aside for a moment the remarkable deviations of structure witnessed in the formation of the wings and nasal appendages in the preceding order, we appear to pass by a very natural transition to the insectivorous mammalia, properly so called, at least, when departing from the insect-feeding series of the bat family. Baron Cuvier, be it observed, placed the Cheiroptera at the head of his third great order of unguiculated quadrupeds, collectively termed Carnassiers; regarding the few frugivorous bats then known as aberrant departurcs from the real carnivorous type. As, however, the principal point of similarity connected with these groups consists in the cutting character of the grinding teeth, it will be understood that many other structural considerations, of equal importance in the cyes of naturalists, have determined the propriety of treating certain insectivorous mammals muder a separate order. Professor Owen, as we have seen, cven places both the Cheiroptera and Insectivora in his lissencephatous subelass-an arrangement which, based on cerebral characters, separates these orders still further from the true carnivora, and brings them nearer the rodentia. The insect-eating bats also resemble the order at present under consideration, by their conical elevations on the molar teeth, while many of the insectivora likewise hybernate, passing the winter in a torpid state. A common character, prevailing more or less throughout the entire order, is noticed in the remarkable uniformity pervading the whole dental series, reudering it at first sight somewhat puzzling to recognize and separate the teeth into their ordinary triad divisions-incisives, canines, and molars. In the more typical forms the canincs assume their ordinary conspicuity, being also widely separated from cach other, while the incisives are correspondingly small

In some members the dental elaracters approximate towards the Rodentia by the elongated form of the anterior incisors, the remaining cutting teeth, together with the canines, being even shorter than the molars. Certain of the Quadrumana also have a dentition very like this. The head is lengthened, and its constitnent bones more slender than in true Carnivora. Another cogent difference from the last-named family lies in the presence of well-devcloped collar bones or clavicles, which are only occasionally scen in the carnivorons mammalia in a very rudimentary condition. The limbs of Insectivora are generally short, and, with one or two notable execptions, rather feeble; the feet are furnished with five toes, and in walking the whole sole or palm is applied to the ground, forming a characteristic mode of progression termed plantigrade, and shared by a large seetion of the Carnivora proper; the under surfaces of the feet arc also consequently destitute of hair. The lateral integumentary expansions seen in Cheiroptera hare entirely disappeared, while the nature of the epidermal covering varies considerably in differcut genera; the tail is sometimes very short. In this order there is no creal appendage to the large intestinc. The two mammx are situated on the abdominal surface. The rarious species fecd principally upon insects, and like the bats are frequently nocturnal and subterrancan; a few of them have arboreal liabits.

## FAMidy I.—TALPID 天.

The group of species associated under this title are familiarly termed Moles ; and althongh, on a superficial examination, there does not appear much to invite us to the contemplation oi their structural and functional
peculiarities, yet, we venture to assert, if any one will undcrtake to make a close acquaintance with their anatomy, that of all known animal beings, man alone cxeepted, none will prove more interesting in a struetural point of view ; and further, none will furnish more striking and incontrovertible evidences of the trutliful doctrine of final causes, and the consummate wisdom of creative skill. It is well known these creatures enjoy a subterrancous mode of existence, and it cannot but delight the high-sonled teleologist when he perceives that their entire organization is beautifully adapted to, and eminently qualifies them for, such a habit of life. These adaptations are well seen in the skeleton, and selecting that of the common mole (Plate 33, fig. 10t), the first peculiarity which meets the eye is the apparent length of the osscous frame-work-a resnlt which arises rather from the shortness of the limbs and clongation of the liead than from attenuation of the body itself. The bones of the neek, A, have very strong transverse processes, for the attachment of muscles ; but the sccond cervical vertebra only is provided with a superior spinous process, to the extremity of which there is artieulated a long slender osseous style, which is called the nuchal bone. Altogether there are forty-threc vertebre, that is, seven cervieal, fifteen dorsal, B, six lumbar, C, three sacral, D , and twelve caudal, e. The several bones of the head are very early consolidatcd together, while the nasal cartilage extends forward in front to support the long projecting muzzle. The ribs have a tolerably uniform length, a eircumstance which helps to impart a cylindrical aspect to the skeleton. The long narrow bones of the pelvis cxhibit a similar appearance of being drawn out, as it were, from end to end. In regard to the hinder extremitics, perhaps the only points worthy of remark refer to their general shortening, and the union of the tibia and fibula at the lower third of the leg; in the bones of the foot there is a supplementary tarsal segment of considerable size, assuming in the prepared skeleton the character of a sixth toc. It is, however, in the constitution of the anterior extremity that the most extraordinary skeletal deviations are witnessed, these being well calculated to excite astonishment. The sternum, though not usually deseribed in connection with the bones of the fore limb, is here so intimately associated with the prodigious museular developments attached to it and reudered necessary to move the arms, that hitherto we have purposely passed it over. It is a very large bone, and the anterior portion or manubrium, as it is called, is excessively prominent, serving to support the collar bones and the first pair of ribs. The clavicles are remarkably short, thick, aud of a quadrate form; they form a strong point d'appui for muscular action. The scapula or shoulder-blade, on the other hand, is extremely long, and correspondingly narrowed-more resembling, in fact, one of the ordinary eylindrical bones of the limb than its normal characteristic flatness. The humerus or arm-bone proper is, however, the most strangely altered of all, having not only lost the usual elongated character so constant in quadrupeds generally, but presenting an oddly-contorted and jagged outline, utterly incomparable to that seen in any other family. Yet,
in all its typical constituent parts, it is a veritable humerus, and by its very abnormality demonstrates how strictly nature adheres to a given archetypal plan, even when the exigencies of the individual seem to require the introduction of a supernumerary element of strengtl. Observe the remarkable conformity to type. This bone presents an irregularly square-shaped form, and is somewhat compressed laterally. Unlike any other humeri with which we are acquainted, it has two widely separated and distinet articular facets at the superior end; one being articulated to the clavicle, the other to the bladebone. A still more manifest reversion of the ordinary state of things is seen in the situation of the elbow-joint, which, instead of occnpying its relatively inferior position, is actually placed on a higher level than the shoukler-joint; and as the limb is turned and fixed in a semi-prone attitude, the palm of the hand is consequently directed outwards and backwards. The boncs of the forearm, or radius and ulıa, also take part in these alnormal dispositions; the head or upper end of the former assuming a hooked character, while that of the latter is also greatly enlarged. By these arrangements strength is imparted, and all rotation of the limb prevented. There are no less than eleven bones belonging to the carpus or wrist; they are placed in two rows, five in each, while the eleventh is attached to the lower extremity of the radius; this latter is sabre-shaped, and converges outwards towards the lower end of the metacarpal bone of the thumb, giving increased breadth to the spadelike hand. The digital phalanges of the first two rows are particularly short and broad, the terminal scries being clongated, pointed, and curved inwards towards the palm. In addition to these skeletal characters, there are others of equal importance, when considered in the light of a family definition. In the typical forms the tecth are forty-four in number, of which there are fourteen incisives, six above and eight below, no true canines, and thirty molars, seven on cither side of the lower jaw and eight similarly disposed in the upper; the anterior pair functionally representing the absent canines. The genera Chrysochloris and Cundylura cxhibit a slight departure from this dental formula. The moles have no external auricles; the eyes are very small, the feet being pendactylous and armed with strong claws; the tail is usually short. Speaking generally, they have a stout thickset appearance; but this is chiefly due to their large fleshy muscles and fatty accumulations, which are also covered by a dense, smooth, furry coat of close-set laair.
the common mole (Talpa Europeca)-Plate 6, fig. 22.-Every rustic is familiar with the habits and oblong form of this little mammal, which measures five inches in length, not includiug the tail. Destined to pursue its prey bencath the surface of the earth, it is surprising, consilering the dense nature of the meclim, that it should be able to swim, as it were, through the very soil with a rapidity perfectly astounding. We have already partially unravelled the nature of the mechanism by which these morements are accomplished in our description of the skeleton; but there still remains to be noticed in particular, the scoop-like coufiguration of the hands, which are convex
on the baek, and shallowed out at the palm (fig. 15). Every finger is armed with a strong pointed nail, grooved on the under surface, while all of them eonverge together at the tips, forming a powerful kind of digger or


Front and back view of the hand or fore-foot of the Mole (Talpa Limopaa).
loo. Of our more common animals, few have had their behaviour and manner of living more thoroughly exposed than the mole. Pennant, speaking of its powers of progression, says-" The breadh, strength, and shortness of the fore feet, which are inclined sideways, answer the use as well as the form of hands, to scoop out the earth to form its habitation, or to pursue its prey. Ilad they been longer, the falling in of the earth would have prevented the quick repetition of its strokes in working, or have impeded its course ; the obliqne position of the fore feet has also this advantage, that it flings all the lose soil behind the animal. The form of the body is not less admirably contrived for its way of life; the fore part is thick and very muscular, giving great strength to the action of the fore part, enabling it to dig its way with great force and rapidity, either to pursue its prey or clude the search of the most aetive enemy. The form of its hind parts, which are small and taper, enables it to pass with facility through the earth that the fore fect had flung bohind; for, had each part of the body been of equal thickness, its flight would have been impeded, and its security precarious. The skin is excessively compact, and so tough as not to be cut but by a very sharp knife; the hair is very short and close set, and softer than the finest silk; the usual colour is black, not but there are instanees of these animals being spotted, and a ereamcoloured breed is sometimes found in dry lands near Downing. The smallness of the eyes (which gave occasion to the ancients to deny the sense of sight) is to this animal a peculiar happiness; a small degree of vision is sufficient for an animal ever destined to live under ground. Had these organs been larger, they would have been perpetually liable to injuries by the earth falling into them; but nature, to prevent that inconvenienee, hath not only made them very small, but also covered them very elosely with fur. To make amends for the dimness of its sight, the mole is amply recompensed by the great perfection of two other senses, those of hearing and smelling; the first gives it notice of the most distant approach of danger; the other, which is equally exquisite, directs it in the midst of darkness to its food ; the nose also, being very long and slender, is well formed for thrusting into small holes in search of the worms and insects that inhabit them. These gifts may with reason be said to compensate the defeet of sight, as they supply in this
animal all its wants, and all the purposes of that sense." But the most interesting researches coneerning this extraordinary ereature, are undoubtedly those of the Freneh writer-IIemri le Court. This indefatigable observer pointed out that the mole pushes its way through the soil, not at mere random, in any ehance direction; but laving selected certain loealities or liunting grounds, as thicy have been ealled, construets a habitation or fortress. This is sometimes formed "under a considerable hillock raised in some secure place, often at the root of a tree, under a bank, or any shelter that offers protection. The fortress is domed by a cement, so to speak, of earth, which has been beaten and compressed by the architect into a compact and solid state. Within, a eircular gallery is formed at the base, and communicates with an upper smaller gallery by five passages, which are nearly at equal distances (fig. 16). Within the lower and under the upper of these galleries is the chamber or durmitory, which has aceess to the upper gallery by three similar passages. From this habitation, we should here observe, the high road, by which the proprietor reaches


> Fortress or habitation of the common Mole.
the opposite end of the eneampment, is prolonged, while the various galleries or excavations open into this road, which the mole is continually carrying out and extending in its search for food, and which has been termed its hunting ground. But to return to the chamber: from it another road extends, the direction of which is downwards at first, and that for several inches, when it again rises to open into the high road of the terri tory. Some eight or nine other passages open out from the external circular gallery, but the orifices of these never come opposite to the passages which connect the external gallery with the internal and upper gallery. The extent of these passages is greater or less aecording to circumstances, and they each return by an irregular and semicircular route, opening at various distances from the habitation into the high road, which differs considerably from all the other passages and excarations, both in construction and with regard to the use to which it is applied. From the habitation this road is carried out nearly in a straight line, and forms the main passage of communication between the habitation, the different portions of the encampment, and the alleys learling to the hunting ground, which open into it on each side. In diameter it excceds the body of the mole, but its sides will not admit of two moles passing each other. The walls, from the reiterated pressure of the mole's sides against them, beeome smooth and compaet, and its course is remarkable for the comparative absence of molehills, which are frequent in comection with the alleys and
quarries, as they have been termed, in constructing whieh the earth is removed out of the way to the surface. Sometimes a mole will lay out a second or even a third road, in order to the extension of its operations. Sometimes several individuals use one road in common, though they never trespass on each other's lhunting grounds. In the event of common usage, if two moles should happen to meet, one must retreat into the nearest alley, unless both should be pugnacious; in whieh ease the weakest is often slain. In forming this tumel, the mole's instinet supplies the place of seienee, for he drives it at a greater or less depth, aeeording to the quality of the soil or eoneurrent circumstances. When there is nothing superineumbent threatening a disturbance of its security, it is often exeavated at a depth of some four or five inehes; but if it is earried under a road or a stream, a foot and a half of earth, sometimes more, is left above it. Thus does the little animal earry on the subterraneous works neeessary for his support, travelling, and comfort; and his tunncls never fill in. The alleys opening out from the sides of the ligh road have generally a somewhat downward inclination, from their eommeneement towards their end. It has been observed, that when on opening one of these alleys, a plentiful supply of food is found, the mole proceeds to work out branchalleys from its termination, upheaving new molehills as it advanees in quest of prey. Should, however, the soil be barren of the means of existenee, the animal eommenees another alley at a different part of the high road. The quality and humidity of the soil, which regulate the abundanee of earthworms, determine the greater or less depth of the alleys. The mainroad being the highway of eommmneation to its different hunting grounds, it is neeessarily passed through regularly in the eourse of the day, and it is in this road that the molceateher sets his traps, or practises his devices to intereept the animal between its labitation and the alley where it is earrying on its labours. Some moleeatehers will tell you that the hours when the moles move are influeneed by the tides; to whieh statement the reader is at liberty to give as mueh eredence as he ehooses. Besides the various traps which are set for them, there is, or very lately was, a man who travelled the eountry with a dog, and destroyed them without any trap at all, by the following process:Taking his station at the proper time and place, attended by his dog, and armed with a spear or spud, he waits till the dog indientes the presenee of the mole, and then spears or spuds the animal out as it moves in its run. Pointers will stop at moles as steadily as at game, when the former are straying on the surface." So much for the observations of Le Court, quoted by Ogillby, whose deseription appears to have been borrowed from Geoffioy St. Hilaire's abridged aeeount of the original discoverics, as reeorded in his "Cours d' Histoire Naturelle des Mammiferes." The mole is an extremely voracious animal, and it would further appear from Le Court's investigations, that its appetite is exalted into a regular passion, whieln oecasionally rises to such a pitch that the desire is aecompanied with violent exeitement. A speeies of madness seems to take possession of the entire frame, as it furionsly
rushes upon its prey. Its food is exelusively animal. It is true, and worthy of remark, that this point has been a subject of dispute, but the united testimony of several distinguished naturalists, has conclusively shown that the vegetable debris sometimes found in its stomaeh, must be regarded as mere aecidental aceumulations, consisting of fragments of roots and other vegetable matters, which have been swallowed along with its appropriate inseet food. After advaneing some very acute reasonings on this suljeet, Mr. Bell remarks, that "the primeipal object of its seareh is the carthworm. In pursuit of this, its favourite food, it occasionally follows it towards the surface with such cagerness, that it aetually throws itself out of its burrow upon the ground. It has been stated that the mole will not eat the larve of the Searabride and other eoleopterous inseets that live under the ground; but this is certainly a mistake, as these larve lave been found in their stomael. It is not, however, to these and similar kinds of food that the mole is necessarily restricted; a mouse or a bird, a lizard or a frog, if placed within its reaeh, beeomes a speedy victim to its voracity. Toads, however, it rejects even when famishing with hinger, probably on aecount of the acrid secretion of the skin, first noticed by Dr. Dary. Gcoffroy gives a eurious picture of the manmer in which it will approach, seize, and derour a small bird-exhibiting, in the first place, a considerable exercise of stratagem to get within reaeh of its vietim, and ehanging on an instant this mode of approaeh for the most sudden and impetuous attack; seizing the hapless 1 ird by the belly, tearing it open, thrusting its muzzle amongst the entrails, where it appears to luxuriate on its bloody repast. Even the weaker of its own species, under particular eircumstanees, are not exempted fiom this promiscuous ferocity; for if two moles be placed together in a box without a very plentiful supply of food, the weaker eertainly falls a prey to the stronger. No thorough-hred bulldog keeps a firmer hold of the oljeet of its attack than the mole. Mr. Jackson, a very intelligent molceateher, says that, when a boy, "his hand was so severely and firmly laid hold of by one, that he was obliged to use his teeth in order to locsen its hold. It is not only in the warm and temperate seasons of the year, when the food of the mole is of eomparatively easy aceess and exists in great plenty, that its labours are steadily and regularly followed; in the winter, when the frost has penetrated deeply into the soil, and the ordinary hunting grominds are rendered useless and impraetieable, it deseends to a considerable depth by a perpendienlar shaft, till it arrives at the part to which the earthworms have been driven by the eold. Here its labours must be even more toilsome and less prodnetive than ordinary ; but the voracity of this indefatigable gourmand minst still be appeased: and as it lays up no store for the winter, and cannot fast with impunity for more than a few homrs, it may well be imagined how ineessantly and laborionsly it must work in suel a season, and at so great a depth, to obtain a sufficient supply of worms to satisfy its insatiable eraving. This rage of hunger alternates with the most profomed repose, which the animal enjoys either within its fortress, during the sea-
son in which that domicile is occupied, or in a simple molehill devoted to this purpose, during the summer. Its bed is formed of various vegetable matters, such as grass, leaves, or similar soft substances. It sleeps for about four or six hours at a time in warm weather, and principally during the day-its usual working time being very early in the morning and at night. In the spring the mole laves the fortress, and does not return to this shelter until the autumn, when it does not generally reoccupy the same edifice, but constructs another, leaving the old one to the occupation of the fieldmouse, or other small animal of similar habits. During the month of June, or longer, it is in the habit of leaving its runs, and wandering during great part of the night on the surface of the land in search of its food." There is also another mode which the mole adopts in capturing his prey, when the soil is light, and when showers of rain have enticed the worms to the surfaee. This is accomplished by boring shallow trenches immediately under the surface, surprising and catching these unfortunate anuelids at the most unsuspeeted moments. Every one must have observed these mole-runs in fields which have been only recently sown with grain. The mole is a hard drinker, and his appetite in this respect is in perfect harmony with his flesh-eating propensities. He is also a firstrate swimmer, and, as we have seen, his form is singularly adapted for easy propulsion through any firmly-resisting medium. He will not only take the water when inundations or a desire to change his hunting grounds compel him to migrate, but Mr. Bell avers that he sometimes takes a swim "mercly for the purpose of enjoying the luxury of a bath." The male mole is exceeding fierce during the love season, and readily resents any individual of the same sex who should unhappily be paying his addresses to the same female as himself. Formidable pitched battles are fought, and much blood shed on such occasions, while the unfortunate object of affection is also somewhat roughly handled. The nest is generally situated at a considerable distance from the habitation; it is well constructed and compact, but its place of location is not always to be found indicated by a hillock. When the latter is present it exceeds in size that of an ordinary molehill. The nest is built "by enlarging and excavating the point where three or four passages meet and intersect each other." In one instance no less than two hundred and four wheatblades were counted by Geoffroy St Hilaire, and Le Court. From this circu.astance alone, therefore, we can well comprehend the weight of those accusations which have from time immemorial been levelled against the mole. Some distinguished naturalists, and most prominently among them Mr. Bell, have endeavoured to advocate its cause, and to contend that after all the mole is not such a thievish villain as some have supposed. Without entering at any great length into this instructive controversy, we are inclined, all things considered, to take the view and state the case, as Professor Owen has succinctly put it, in the following words-"The farmer views the operations of the mole as destructive to his crops, by exposing and destroying their roots, or by overthrowing the plants in the construction of the molehills; his burrows, moreover, become the haunts
of the fieldmouse and other noxious animals. The mole is also accused of carrying off quantities of young com to form its uest ; hence every means are de vised to capture and destroy it, and men gain a livelihood exclusively by this occupation. Some naturalists, however, plead that the injury which it perpetrates is slight, and that it is more than counterbalanced by the benefit which it produces by turning up and lightening the soil, and especially by its immense destruction of earthworms and many other noxious animals, which inhabit the superficial layer of the ground, and occasion great injury to the roots of grass, corn, and many other plants. The soundest practical conclusion lies probably in the mean of these opinions, and the eulightened agriculturist, while he takes prompt measures to prevent the undue increase of the mole, would do well to reflect on the disadvantages which might follow its total extermination." The common mole is found in nearly all parts of Europe, but in Greece it is said to be scarce, while in the more northern counties of Scotland, and in the contiguous isles of Orkney and Shetland, it is stated to be altogether unknown.

THE THICK-TAILED STAR-NOSE (Condylura macroura). - The individuals of which this genus is composed, are closely allied to the true moles, not only in their general form, but also in their labit of life. Their dental arrangement is peculiar. Of the ten cutting teeth, six occupy the upper and four the lower jaw. The two central teeth of the supcrior row are remarkably broad, also somewhat triangular and curved anteriorly. The lower series slope forwards in an almost horizontal direction. There are no true canines, as usual; but the deficiency is sufficiently compensated by the presence of thirty grinding teetll, seven on either side of the upper, and eight on those of the lower. The anterior three of the superior serics, or upper false molars as they are called, are small, conical, and more or less widely separated from each other, while the inferior false molars, five in number on either side, are irregularly scrrated and trenchant. Several species have been described; but


Snout of the Star-nose, or Condylura.
their differentiating characters do not appear to be very strongly marked. In all of them the muzzle is prolonged into a narrow proboscis, the naked extremity of which is furnished with a number of moreable cartilaginoid, styliform processes or caruncles, radiately disposed like the spokes of a wheel (fig. 17). All have
very minute eyes. The cars are destitute of conspicuous auricles; the fect are pentadactylous or five-toed; the tail is of moderate length, varying, howerer, in this respect with different species, and only loosely clothed with hair. In the Thick-tailed Star-nose "the head is remarkably large; the body is stout and short, and becomes narrower towards the tail, and the lind legs are consequently nearer to each other than the fore ones. The nose is rather thick, and projeets beyond the mouth. It is maked towards its end, is marked with a furrow above, and terminates in a flat surface, which is surrounded by seventeen cartilaginous processes, with two more anterior ones situated above the nostrils, and a pair of forked ones immediately below the nostrils. The surfaces of these processes are minutely granulated. Some white whiskers spring from the sile of the nose, and reach about half the lengtly of the head. There are others not so long on the upper and under lips. The fur on the body is very soft aud fine, and has considerable lustre. It is longer than the fur of the other two known speeies. Its colour on the dorsal aspect is dark amber brown, approaching to blackish-brown. On the belly it is pale liver brown. When the fur is blown aside it exhibits a slining blackish-grey colour towards its roots. It is longer behind the head and on the neek, than on the belly. The tail is narrow at its origin; but it suddenly swells to an inch and a half in circumference. It then tapers gradually until it ends in a fine point, formed by a pencil of hairs about half an inch long. It is round, or very slightly compressed, and is covered with seales about as large as those on the feet, and with short, tapering, acute hairs which do not conceal the scales. The hairs covering the upper surface of the tail are nearly black; those beneath are of a browner hue. The extremities are shaped almost precisely like those of C. longieaudata, only the palms and toes of the fore feet project beyond the body. The palms are nearly circular, and are proteeted by a granulated skin, like shagreen. 'The sides of the feet are furnished with long white hairs which curve in over the palins. The five toes are very short, equal to each other in length, and, together with the back of the hands, are covered with hexagonal seales. The fore claws are white, nearly straight, broadly linear and acute, convex above and flat beneath. The palms turn obliquely outwards, which causes thic fonrth claw to project rather farthest; but the third one measures as much, the second is shorter, and the first and fifth are equal to each other, and a little shorter than the rest. The hind feet are also turned obliquely outwards, and are scaly, with a few interposed hairs above, and gramilated muderneath. The sides are narrow, and present a conspicuous callous tubercle posterior to the origin of the inner toc. The hind legs are very short, and are elothed with soft brown hairs, a tuft of which curves over the heel. There are no hairs on the sides of the hind feet, like those
which form a margin to the fore ones. The hind toes are louger than the fore ones, and are armed with more slender claws, which are white, awl-shaped, curved, and acutc. They have a narrow groove towards


The Common Star-nose (Condylura cristata).
their point underneath." The length of the body, not ineluding the tail, is four inehes and a quarter. 'This minute and accurate account is taken from Sir John Richardson's description of a specimen captured on the banks of the river Columbia, and all the examples hitherto received have been brought from North American districts. Fig. 18. represents a very closelyallied form. The generic name Cundylura was originally given to these moles by the naturalist Illiger, who was misled by a figure which had been executed from a dried specimen, and consequently showed a knotted appearance of the tail. This irregularity of the tail unfortunately suggested to him the generic title now generally adopted; but the term Ihinaster proposed by Wagler, would have been, scientifically speaking, more correct.

THE LUSTROUS CAPE MOLE (Chrysochloris capensis). -The members of this small gemns are also pretty elosely alliod to the true moles. They differ, however, in some respects, and among the most important distinctions are those which eoncern the skeleton and teeth. Following the authority of De Blainville, there appear to be twelve cutting teeth, six above and six below, the two central teeth of the lower jaw being very minute. Of the grinding series there are probally twenty-eight, six of which come under the category of false grinders or premolars, two of them being superior and four inferior. The true molars have the form of triangnlar prisms with transverse crowns, which in the lower set are divided by corresponding srooves. All the species have the eres covered by the integument, while there is no appearance of an external ear. The mizzle is short and broad, terminating in a slightly pointed and projecting nose. The fore foot or hand is apparently tetradactylous; but there are in reality five toes or fingers, the phalanges of the third and fourth fingers laaving coaleseed to form a single gigantic digit. The latter is amed with a prodigionsly strong claw, which is broad and arcuated, forming a powerful weapon for digging and burrowing in the eartll; the fifth digit is particularly small and rudimentary. The hind feet are obvionsly pentadactylons, the several toes presenting the ordinary dimensions. The body is short and stont, and unprovided with a tail. The skeleton offers numerons points of
iutcrest. The skull cxlibits a more conical form than (u)tains in the true moles. There are no less than nineteen pairs of ribs, whilst in one species as many as twenty have been counted. The sternum is provided witlo small concave lateral appendages ; the first rib is umsually broad; the clavieles and the scapulx are long and thin. 'Ihe humerus is comparatively longer than that of the common mole, and at the lower part it is not only articulated to the radius and ulna, but also to a third bone, specially developed to strengthen the arm during the action of burrowing. This strange supplementary osscous appendage is supposed to represent one of the carpal elcments of the wrist ; be that as it may, the circumstance of these creatures' possessing a fore-arm consisting of three long bones, indicates an anatomical and morphological change altogether without precedcht in this region of the mammiferous skeleton. The Lastrous Cape Mole or Chrysochlore-Fig. 19-is not quite so long as the

common Europcan mole. The fur is of a brownish colour, capable of reflecting irrideseent hues of green and purple, which change to a copper or bronze tint; and thus we have brought before us, in the language of Cuvier, " the only known quadruped which cxhibits any appearance of that splendid metallic lustre which adorns so many birds, fisbes, and inseets." The species under consideration is found at the Cape of Good Hope, but other kinds are obtained from the same locality, as well as from the neighbourhood of Mozambique.

## Family II.-SORICIDE.

From a consideration of the moles we pass by a very natural transition to the Soricide, which are more commonly known as the shrews, or shrew-mice. They have a very general resemblance to oritinary mice; but while the latter have their front teeth formed for gnawing vegetable structures, the former are entirely insect-fceders, as in the case of the moles. The typical Soricide exhibit eonspicuous eyes and ears, and the feet are not formed for burrowing in the soil, Yol. I.
or, in other words, are non-fossorial. In some of the aberrant types we still recognize the peculiar talpine features, and so much so is this the case in the gemes we shall here first elucidate, that it becomes almost a matter of indifference whether we class them as moles or shrews, or, on the other hand, altogether recognize them as a separate osculant group.
THE SHREW MOLE (Scalops aquaticus). -This species, in common with others of the genus Scalops, prescuts a stout, thickset, eylindrical body, the limbs being remarkably short. The pentadactylous fect and hands very closely resemble thosc of the common mole, especially the latter, which are also situated close to the auditory opening. The head terminates anteriorly in a movable snout, which is naked at the tip. The teeth are probably forty-four in mmber, but a considerable difference of opinion exists on this point. Aecording to l'rofessor Owen there are twelve incisors, four canincs, sixteen false grinders, and twelve true molars; half of these severally belonging to either jaw. The eyes are extremely small and concealed by the fur. The colour of the hair is, generally speaking, of a greyish-black, approaching to brown in some regions, especially on the forehead, where it assumes a chestnut tinge. The length of the body is rather more than seven and a half inches, not including the tail, which is short, ammulated, and rery thinly clothed with hair. The shrew-moles are inhabitants of the low grounds and marshy districts bordering on the river Columbia, and the adjacenit coasts of the Pacific. Sir John Richardson speaking of their habits says, that they resemble our common European mole, "in leading a subterranean life, forming galleries, throwing up little mounds of earth, and in feeding principally on earthworms and gruls. Dr. Godman has given a detailed and interesting account of their manners, particularly of one which was domesticated by Mr. 'Titian Peale. He mentions that they are most active, early in the morning, at mid-day, and in the evening, and that they are well known in the country to have the remarkable custom of coming daily to the surface exactly at noon. They may be taken alive by thrusting a spade beneath them and throwing then on the surface, but can scarcely be canglit at any other period of the day: They burrow in a variety of soils, and in wet seasons are observed to retreat to the higher grounds. The captive one in possession of Mr. Peale ate considerable quantities of fresh meat, either cooked or ram, drank freely, and was remarkably lively and jlayful, following the hand of its feeder by the scent, burrowing for a short distance in the loose earth, and, after making a small circle, returning for more food. When engaged in cating he employed his flexible snont in a singnlar
manner to thrust the food into his mouth, doubling it so as to forec it directly backwards."

THE MUSK RAT (Mygule moschala).-This rather ugly-looking animal las few charaters in common with the moles, unless we make exeeption in favour of the form of the body, the sloortness of the limbs, and some other non-cssential features. It possesses a long snout or proboseis whieh is very mohile, and usually more or less curved downwards. The eyes, though small, are comparatively distinet, while the short ears searcely project beyond the fur. The arrangement of the tectlo is somewhat peenliar, there being six incisors, fonr of which, that is, two above and two below, are very largely developed, and look like canines; of these, however, there are none. There are no less than thirty-eight grinders, twenty in the upper and eighteen in the lower jaw. The feet are pentadactylous, the digits being severally comeeted together by a membrane to facilitate locomotion in the water. The tail is about one-fourth shorter than the body, and compressed from side to side tliroughout, especially at the tip; it is thinly laired, but very sealy, being also provided with numerons glandular follicles, arranged in double series along the under surface. These organs scerete a fatty matter or kind of pomatum giving out a peculiar musky odour. The firr presents a duskybrown colour. The musk rat is very common in the rivers and lakes of southern Russia, and more partieularly on the banks of the Volga. Aecording to Mr. Ogilby, "it does not appear to have been secn on dry land, and, indeed, it is broadly asserted that it never goes there, but wanders from lake to lake in fortuitons floods only. It is often seen swimming or walking under the water, and coming for air to the surface, where, in clear weather, it is apt to sport. Stagnant waters, shut in by high banks, are its favourite localities, and in such places it makes burrows some twenty feet in length. Its prineipal food is alleged to consist of fish, leeches, and the larve of water insects; but fragments of roots have been found in its stomach. Its pace is slow; but it does not seem to be torpid in winter, at which season it is often taken in nets. The holes which it makes in eliffs and banks have the entrance far beneath the lowest level of the water, and the animal works upwards, never, however, nearing the surface more than suffieiently ligh to secure itself from the farthest rise of the river. Fish, as we have seen, form part of its food; but the quadrmped in its turn falls a vietion to the pikes and siluri, whose flesh becomes so impregnated with the flavour of musk in eonsequenee, as not to be eatable." Formerly a very considerable trade was carried on at Orenberg for the sale of these animals' skins and tails, which, from their extraordinary abmudanee, only realized a sale at the rate of twenty copecs per himudred--a sum equivalent to eightpenee-three farthings, of Euglish money.
THE ELEPHANT MOUSE (Macroscelides typicus). -This is perlaps the best known of the seven or eight species which constitute the members of the genns. Its name almost suggests a combination of the sublime and the ridiculous, for the only feature by which this tiny creature in any measure rescmbles the luge pachyderm, lies in the eircumstance of its possessing
an clongated proboscis-like suout, at the extremity of whieh there are two oblique perforations representing the nostrils. 'The base of the snout supports numerous long stiff hairs or whiskers. In regard to the teeth, there are ten incisors, six above and four below, no true eanines, and thirty-two molars, that is, fourteen in the upper and eighteen in the lower jaw. The ears are large and thimly haired. The feet are pentadactylous and plantigrade, the digits corresponding to the thumbs in the fore-feet, and the great toes in the hindfeet being very short; the claws are thin and strongly incurved. The fur has a tawny-brown colour, gradually becoming whitish on the limbs. The length of the body is rather less than five inches, the tail being likewise three and a quarter inches long, a little swollen immediately beyond the root, and provided, in the males at least, with minute glandular follicles. This and some other speeies of so-ealled elephant miee live in south Africa. Their labits are diurnal, and they are frequently seen hunting for their prey amongst the roots of brushwond and bushes. On being discovered, however, their timidity soon shows itself, and they seamper off in loot haste; retreating either into their natural binrows, or beneath stones and similar places of sceurity.

THE SOLENODON (Solcnodon paradocres). The distingnished maturalist Braudt has employed this title to designate a remarkable animal forming a sort of gigantic shrew. It is an inhabitant of the island of St . Domingo, is covered with eoarse fur, and possesses very long whiskers. Each jaw is armed with six ineisor teeth, the two central ones of the upper series being very large and triangular, while the pair next outside the central ones of the lower jaw are elongated, conieal, and hollowed out at the inner surface by a deep groove. These two pair assume the aspeet of very powerful eanines, but the latter have in reality no true representatives. The molars are twentr-eight in number, that is, seven on either side of each jaw. This singular creature is larger than our common brown rat, being upwards of twenty inches in length, ineluding the naked or sealy tail, which measures nine inches. The eyes are small, the nose slightly proboscidiform, the ears also being only moderately developed. The sides of the head and neek, as well as the aldomen and feet, exhibit a faint yellow-brown colour, with an occasional misture of a greyish tint.

THE COMMON SHREW (Sorex arancus). - Plate G, fig. 21. The genus Sorex comprehends an extremely numerous scries of individuals, and it has therefore been variously subdivided by different naturalists. Withont, however, expressing any opinion as to the propricty of their arrangements, our object is to impart a definite and aceurate knowledge of the more important forms, under whatever names they may be clearly reeognized. Exen the species meder consideration has eaused muel controversy, but it is now very generally understood that the common shrew-monse of the British isles is correctly indicated by the abore combined gencric and specifie title. Among the characteristics which distinguish this form we may especially refer to the teeth, of which there are probably ten incisors, thongh on this point there seems to be
considerable difference of opinion. They are "much prodnced; the upper ones curved and notehed at the base, the lower ones almost horizontal." There are in all twenty-four molars or grinding teeth, but no true canines. The length of the body, not ineluding the tail, is about two and a half inches. The fur exhibits a reddish tint on the back, which passes from the ordinary mouse-colour to a light-grey on the under surface of the belly. The snout is conical and pointed; the eyes and ears are small-the latter being searcely visible-and furnished with two lobes internally. With regard to its habits Mr. Bell observes, that "the common shrew frequents dry situations, feeding upon insects and worms, in the pursuit of which its attenuated snout cnables it to grub amongst the closest herbage, or under the surface of the soil; for which habits it is also adapted ly its soft, short, velvety coat, and its extensible form. Like the mole and other insectivorous tribes, it is very impatient of lunger during summer; like that animal too it is excessively pugnacious, so that it is rare to see two of them together excepting in the aet of fighting. If two shrews be confined in a box together, a very short time elapses before the weaker is killed and partly devoured. They not only destroy cach other, but there is reason to believe that many of them are victims to the voracity of the mole." A friend also informed him "that, in a field which had always before been abundantly inhabited by shrews, scareely one had been seen during the then present season; but that a colony of moles had occupied the district, to whose voracity he, with much probability, attributed the disappearance of the shrews." Touching the early history of this creature many curious superstitions were formerly held in this country respecting them; but though, as we have recently taken occasion to show, these follies do still exist in regard to certain animals, we are inclined to believe that, so far at least as the shrews are concerned, they have almost entirely passed away. The cliildish notion that lameness of the foot or some grave disease could result from the mere accidental passage of a shrew over that part of the body of another animal was really credited, and, absurdly enough, induced our intellectual peasantry to prepare a ridiculous charm, which they swore to be an unfailing antidote against these imaginary injuries. This preparation was called shrew-ash, and a twig or fragment of it constituted the remedy. The modus operandi in the manufacture of this ash is thus described by Mr. Gilbert White:"At the south corner of the plestor or area, near the church, there stood about twenty years ago a very old, grotesque, hollow pollard-ash which, for years had been looked upon with no small veneration as a shrewash. Now a shrew-ash is an ash whose twigs or branches, when applied to the limbs of cattle, will immediately relieve the pains which a beast suffers from the running of a slrew-mouse over the part affected; for it is supposed that the shrew-mouse is of so bancful and deleterious a nature that, whenever it creeps over a beast, be it horse, cow, or sheep, the sufficing animal is afflicted with eruel anguish, and threatened with the loss of the use of the limb. Against this accident, to which they were eontinually
liable, our provident forefathers always kept a shrewash at hand, which, when once medicated, would maintain its virtue for ever. $A$ shrew-ash was made thus:-Into the body of the tree a deep hole was bored with an anger, and a poor devoted shrew-mouse was thrust in alive, and plugged in, no donbt with several quaint incantations long since forgotten." Some other methods of cure were likewise had recourse to, but of these it is unnecessary to speak further. The shrewmouse propagates very rapidly, the female lringing forth six or seven young ones at a birth. The nest is rudely eonstructed of grass and other vegetable materials, and is plaeed in superficial holes in the earth, espeeially amongst hedgebauks, the debris and sulg recesses of which afford abundant security. An excess of these animals is wisely prevented by the agency of owls, moles, and weasels, and also, it would appear from the statements of several writers, by a special mortality which cuts them off by hundreds diring the autumnal months. The immodiate cause of this phenomenon yet remains to be expluined.

THE WATER SHREW (Sorex fodiens).-This form is darker than the common shrew upon the back, and also, on the other hand, of a lighter colour beneath the belly, being in point of fact, quite white. The feet and tail are provided with conspicnous, but thinly sct hairs. The ears and eyes are very small, the auricles being furnished with three interual lobes. It is also a somewhat stouter species, while, at the same time, it measures three and a quarter inches in length. The fur is very close, smooth, and downy-a circmmstance which, together with an increased lureadth of the fect, favours the development of its swimming propensities. Perhaps the best account of the habits of this pretty little animal, is that long ago recorded by Mr. Doraston in the second volume of Loudon's Magazine of Natural History. Speaking of the behaviour of one of these shrews, he says-" It swam with great agility and frcedom, repeatedly gliding from the bank under water, and disappearing below the mass of leaves at the bottom, doubtless in search of its insect food. It rery shortly returned and entered the bank, occasionally putting its long sharp nose out of the water, and paddling close to the edge. This it repeated at frcquent intervals from place to place, seldom going more than two yards from the side, and always returning in about half a minute. Sometimes it would run a little on the surface, and sometimes timidly and liastily come ashore, but with the greatest caution, and instantly rlunge in again." This species has a pretty wide distribution throughout the British isles, being found in Devonshire, and also as far north as Scotland. The female brings forth six or seren young at a birth.

THE OARED SHREW (Sorex remifer).-This is a comparatively large species, and, like the two proceding, indigenous to the islands of Great Britain. Its body is rather more than three inches long, the tail also being two-thirds of the entire length of the animal. The last-named organ has a quadrilateral shape. It is flattened towards the tip, being also provided with stontish hairs along the minder surfaee. The fur is of a rich black colour, except at the lower part of the belly, whore, in some speeimens at least, it is greyish-
black, and also of a yellow tinge towards the region of the throat. The snout is compressed, the eyes and ears are small, the latter being bordered by a fringe of whitish-coloured lairs. The teeth exhilit a rusty or chestnut hue at their tips-a peculiarity, however, not confined to any particular species. Like the water shrew, its habits are essentially aquatic.

THE INDIAN SHREW (Sorex indicus).-Thongh in general appearance this species closely resembles the common shrew, the size at once distinguishes it, being in this respect equal to our common brown rat. In virtue of a very strong musky odour, it imparts a peeuliarly nauseous smell to every thing with which it may liappen to come in contaet. Some of the stories told of its powers of communicating odoriferous properties to particular ubjeets, appear to be rather exaggerated. For example, we are informed that wine in a properly-closed bottle will become impreguated with a musky flavour, merely by the circmmstance of this animal's passing over the exterior surface of the glass! Surely this savours a little of the inaginative. At all events, the little beast enjoys an menviable credit on this score. It is better known by the name of the Indian musk rat.
THE AMERICAN MARSH SHREW (Sorex palustris). -This species is principally marked by the possession of an unusnally long tail, combined with very short hairy ears which lie entirely concealed beneath the fur. The hairy covering exhibits a hoary black colour, except on the belly, where it is lighter and of an ashgrey tint, the texture throughout being dense, soft, and lustrous. The teeth are thirty in number; that is, four incisors and twenty-six molars. Sir John Richardson was the first to describe this shrew, and he obtained several specimens in British America during his explorations with the expedition under Sir John Franklin. With regard to its habits, he says that it "lives in the summer on similar food with the water shrew, but," he adds, "I am at a loss to imagine how it procures a sulsistence during the six months of the year in which the commtries it inhabits are covered with snow. It frequents the borders of lakes, and Hearne tells us that it often takes up its aborle in beaver houses." The length of the body, not including the tail, is preeisely three and a half inches.
forster's shrew (Sorex Forsteri).-The shrew thus named appears to have been first noticed by Forster, and deseribed by him in the sixty-second volume of the Philosophical Transactions. It resembles the oared shrew in respect of the quadrangular form of the tail, and in some other minor particulars. The length of the body is about two and a quarter inches. It is armed with thirty-two teeth, four being incisors and the remainder true and false molars. The snout is much attenuated; the whiskers are conspicuons, and the ears completely enveloped by the fur. The anthor of the "Fanna Boreali Americani," speaks of it as fol-lows:-" This little animal is common throughout the whole of the fur countries to the sixty-seventh degree of latitude, and its minute foot-prints are seen everywhere in the winter when the snow is sufficiently fine to retain the impression. I have often traced its pathway to a stalk of grass by which it appears to
descend from the surface of the snow ; but a search for its labitation by removing the snow was invariably fiuitless. I was unable to procure a recent specimen." And further on he says-"It is the smallest quadruped the Indians are acquainted with, and they preserve skins of it in their conjuring bags. The power of generating heat must be very great in this diminutive creature, to preserve its tender limbs from freezing when the temperature sinks furty or fifty degrees below zero."
SAVI'S SHREW (Sorex ctruseus).-To the general observer of nature, the distinctions established between the mumerous specics of slurew may not at first sight appear very satisfactory, and it is partly on this account that we find it necessary to confine our attention to the more striking or better known forms. There is a little North American form, emplatically called the small shrew-mouse-the Sorex pareres of Say and Lithard. son-which is ouly two inches and three-quarters in length; but this specific title might perhaps with greater propriety be applied to the species under consideration; for Savi's shrew is not only believed to be the smallest in existence, but it is probably the tiniest of all living quadrupeds, excepting, of course, those which have not attained their adult or fully developed state. The body of Say's small shrew measures two inches and three-quarters, without reckoning the tail; whereas the little Sorex clruseus searcely exceeds two inches and a laalf, two entire fifths of which measurement belong to the caudal appendage. It is an inhabitant of Italy and the northern coasts of Africa. Notwith1standing what we have here adranced, it will doubtless occur to our readers that some of the bats scarcely excced this animal in length ; although, if placed side by side with the pipistrelle, this bat would appear in all likelihood comparatively bulky.

THE BULAU (Gymmera Rafflesii).-The members of this and the two following genera offer such peenliarities as scarcely to entitle us to classify them with the Soricidæ, properly so called; and on the one hand, they neither sufficiently agree in their respective characters, so as to enable our associating them together under a separate family titc, nor, on the other, are they clearly referable to the Tupainder ; yet, as they exhibit characters of a very mixed kind, we camot at present, perliaps, do better than briefly record them in the order here adopted. The head of the bulau is much elongated and compressed from side to side, the muzzle being proboscidiform, obtuse at the tip, and continued forward a considerable distance beyond the lower jaw. The eyes are rather small, and the ears romeded, conspicnons, and naked. The body' is stoutish posteriorly, and terminates in a long, smooth, scaly tail which supports a fow thinly seattered hairs. The mass of the fur is soft; but from beneath this downy corering there projects a multitnde of long harsh, bristle-like hairs, which are particularly numerous along the back. The limbs are well developed, and terminate in plantigrade pentadactylons feet, having the three middle toes longer than the other digits. The jaws are armed with forty-four teeth, which Professor Owen has divided into twelve incisives, four canines, sixteen false, and twolve true molars. They
are equally distributed above and bolow. It is also worthy of remark, that the skeleton displays fiftecn pairs of ribs and five lumbar vertebræ. In external form this animal approaches the American marsupials; but little or nothing is known of its habits.

THE RHYNCHOCYON (Rhynchocyon cirnci). -The eminent naturalist Peters has given this name to an extremely rare and very curious animal, discovered by him during his travels in the Mozambique. In certain particulars it resembles the bulau; but its snout is very much more prolonged, forming a conspicuous proboscis. The ears are moderatcly developed; but the eyes are comparatively large. The jaws are furnished with thirty-six teeth, somewlat irregularly disposed, there being only two incisors above while there are six below; and of the twenty-eight molars, the anterior pair in the upper series are sufficiently elongated to be at lirst sight mistaken for canines. The feet are plantigrade, tetradactylous, and armed with strong claws, the onter toe of the fore-feet being widely separated from the others. As in the preceding specics, the lind feet are longer than the front ones. The tail is considerably developed, amnulated, and sparingly clothed with hair.

THE HYLOMYS (IIylomys suitlus).-MI. Salomon Miiller employs this name to designate a small and rare animal inhabiting the islands of Sumatra and Java, and living at a height of from twelve liundred to two thousand feet above the level of the sea. In the form of the skull and other cranial peculiarities, it appears to approach the members of the succecding family; but the back of the orbit is not closed in by a bony ring, snelı as is found in that remarkable group. The teeth are forty-four in number ; that is, twelve incisors, and thirty-two molars. The snout is prolonged forwards into a movalle proboseis, which is directed a little downwards at the tip, where the nostrils are laterally disposed. The eyes are not large; but the cars are conspicuous, and thinly provided with hair. As in the bulau, the feet are pentadactylous, the three central digits boing paramount, and the hind feet longer than the fore ones, the claws being sharp and strongly curved. The tail is particularly sloort, and but thinly clothed with hair. Very little is known respecting its habits. The teeth, however, indicate its insectivorous propensities.

## Family III.-TUPAiADE.

The Tupaias are here collected into a separate group, chiefly on account of several well-marked anatomical peculiaritics. The most important of these consists in the presence of an osseous ring completing the posterior part of the orbit, and entirely circumseribing that cavity. In all other sjecies of the order Insectivora, a communication exists between the orbits and the spaces occupied by the temporal museles which act upon the lower jaw. In this, and in some other features, we observe a structural and morphologieal approach towards the inscetivorous monkeys. Throughout the family we have an clungated head, which is very much narrowed towards the pointed muzzle, and at the cxtremity of this snout the semilunar nostrils
are placed sideways. The ears and cycs are largely developed, the latter projecting sufficiently to cnable the animals to sec backwards almost in a straight linc. The body is long and narrow, but provided with tolcrably strong limbs, terminating in plantigrade, five-toed feet, the digits being armed with sharply-enved claws. All the species at present known are inhabitants of the Sunda islands, while some ferv liave beor found in Pegu and on the shores of the Indian peninsula. Thicir habits are diurnal and active, and from this circumstance they have always been associated with the squirrels ly the native Malays.

THE JAVANESE BANGSRING (Tupaia javanicu).This species was first familiarly made known to natnralists by Dr. IIorsfield, who during his travels in Java, in the year 1806, discovered nuncrous examples in the thickly-wooded forests of the province of Blambangan. The body being slender and compact is eminently fitted for active pursuits. The limbs are gracefully formed, imparting to the ereature an easy and attractive appearance. The five-toed feet terminate in compressed and strongly-curved claws, which are firmly implanted into the somewhat swollen tips of the several digits. The tail forms a very conspicuous organ. It is fully as long as the body, having an almost uniform thickness from root to tip, and is clothed with regularly arranged hairs spreading out like those of the squirrel, but in a more limited degree. The fur consists, for the most part, of fine straight hairs elosely applied to the skin; the back, neck, sides, and limbs being provided with a few longer, stonter, and darker-coloured hairs. The colour is of a greyishbrown, varying considerably at different spots, being lighter menderneath the throat, chest, and belly. The head is narrowed anteriorly, and the cycs are particularly prominent. The bangsring and its allies appear to be very easily tamed; for a specimen of this genus which eamc under the notice of Sir Stamford Raftles, behaved itself like a pet spaniel, freely partaking of fruits and milk at the breakfast and dinner table, and scampering through the house with evident satisfaction.

## Family IV.-ERINACEAD E.

The hedgchogs are readily recognized by their peculiar spinons integument and the remarkable power possessed by the more typical forms of rolling themselves up into a ball. This function is accomplished by the agency of a special derelopment of the subentaneous muscular bands, which are more or less developed in all the mammalia, forming in scientifie nomenclature the muscular mass termed the pamiculus carnosus. It is of such strength in these creatures, that in tlicir donbled-up state they are capable of resisting almost any foree which their enemies employ to unroll them, while the points of the setre or spinous lristles infliet severe wounds npon the aggressors. In other respects the hedgehogs exhibit a general conformity to the inscctivorous type. The muzzle is pointed, and prolonged beyond the lower jaw. The cyes and ears are tolerably conspienons; the latter, however, are rather short. The fect arc pentadac-
tylous and armed with powerful elaws; but the anterior pair are not specially modified for the purposes of burrowing like the moles. The tail is either very short or altogether absent.
THE TENREC (Centenes setosus.) - This animal differs from the ordinary hedgehogs both in respect of certain structural modifieations, and also in the eircumstance of its not being able to fold itself up into a ball ; at least, its powers in this particular are extremely limited. The skin along the back is armed with a mixture of slender spines and bristles, and the body terminates abruptly behind without any trace of a tail. Some difference of opinion exists in regard to its dentition, owing, perhaps, to the fact that many of the specimens examined were quite young. In the adult state there are probably twelve incisors, four camines, twelve false and also twelve trae molars-that is, forty teeth in all, equally divided between the two jaws, the eanines being large and of a conieal shape. The muzzle is much attenuated and proboscidiform. The tenrec is a native of the island of Madagascar ; it is possessed of noeturnal habits, and passes three months of the year in a state of hybernation. According to the statements of Brugiere, the torpidity occurs during the period of greatest heat.

THE SOKINAH (Echinops Telfairi).-Under this title Mr. W. C. L. Martin has described, in the second volume of the Transactions of the Zoological Society of London, a kind of hedgehog which, like the foregoing, is an inhabitant of Madagascar. This animal is chiefly distinguished by the peculiarities of its dentition. It possesses ten incisors, four only of these occupying the uppcr jaw, the anterior pair being strongly developed and placed somewhat in front of the others; there appear to be four canines and but twenty-four molars-that is, five on each side of the upper, and seven on either side of the lower jaw; the crowns of the upper molar series are longitudinally grooved. Notwithstanding this dental arrangement, the sokinah camnot be said to differ very materially from the hedgehogs properly so called.

THE COMMON HEDGEHOG (Erinaceus europeus) Plate 6, fig. 20.-Most persons are familiar with this bristly urchin. All who have dwelt amid rural scencs or wandered along grassy hedgerows, have surcly come in contact with our thorny friend. Yes! we shall deign to consider him a friendly individual, notwithstanding that he turns his back upon us and displays a cheveux de frise of little bayonets pointing in every conccivable direction. "Stay!" remarks one of my readers, "he is an enemy! 'To my certain knowledge, he has the credit of pilfering milk direct from the cow; he is a notorious stealer of apples and pears; he is an unsparing egg-poacher; and, moreover-which to my mind is the most eogent argument against him-he is a nasty, dirty little beast. for, as old Pliny observes, he sprinkles himself all over with urine, for the express purpose of disgusting alike his tormentors and admirers, thereby necessitating a respectful distance! What do yon say to that, Sir; will you still call him a friend?" Patience! impetuons reader, and you shall have my answer to your hypercritical censures upon this comparatively harmless animal. In the first place, with
regard to the asseverations of the aneient historian of mature, they may safely be regarded as the gratuitous offispring of a fertilc imagimation, having, in point of fact, no other fomndation than such as I have myself witucssed-namely, an involuntary expulsion of the fluid secretion on the part of the animal itself, when suddenly and violently alarmed. Secondly, in regard to the milking propensities, no one has ever yet witnessed the animal's indulgence of this refreshing experiment. Thirdly, with respect to his alleged earpological thefts, the body is but ill-adapted for climbing fruit-trees, though I admit, in a time of famine, he will not refuse apples and pears which have accidentally fallen to the ground ; but the story to which you allude bears on its face the very stamp of absurdity, seeing it would have ns believe that he not only ascends the tree, but, in the donbled-up state, voluntarily throws himself from the branches with sufficient precision to alight on the fallen fruits; these, in consequence, adhere to his skin, and, laving unrolled himsclf, he hurries off with the desired booty upon his back! Fourthly, while I grant there is strong evidence of his being a poacher, you must bear in mind, before hastily pronouncing lim to be a worthless character, that he only resorts to fowls' and pheasants' eggs when the supply of mice, snails, slugs, worms, and various insects, fail to satisfy his legitimate demands. On the whole, therefore, will you not be disposed to regard the hedgehog as an erring ereature which does more good than harm? Let me direct your attention to its organization. On closely contemplating the structure of the hedgehog, we carmot fail to be struck with the marvellous adaptations provided for its comfort and security. "Deprived," says Mr. Bell, in his admirable history of British quadrupeds, "of all means of attacking its enemies, of defending itself by forec, or of seeking safety in flight, this harmless animal is yet endowed with a safeguard more secure and effectual than the teeth and claws of the wild eat or the fleetness of the bare. Its close covering of sharp spines, which are hard without brittleriess, sufficiently clastic to bear great violence without breaking, and fixed with astonishing firmness in the tough leathery skin, forms not only a solid shiek to protect it from the effects of blows or falls, but a shirt of prickly mail sufficiently sharp and amoying to deter all but a few thoroughbred dogs, or a half-starved fox, from venturing to attack it. Immediately it is touched, or when it sees danger approaching, it rolls itself up into a compact round ball, by the contraction of the powerful museles which cover the body immediately meder the skin, and presents this impenetrable panoply, beset by immomerable spines standing out in every direction; and the more it is irritated or alarmed, the more firmly it contracts, and the more strongly and stifly the spines are set. The strength and elasticity of this corering is such, that I have repeatedly seen a domesticated hedgchog in my own possession run towards the precipitous wall of an area, and, without hesitation, without a moment's pause of preparation, throw itself off; and, contracting at the same instant into a ball, in which condition it reached the ground from a height of twelve or fourten fect, after a few moments it
would unfold itself and run off unhurt." This lastmentioned phenomenon appears to give some clue to the ridiculous story of the hedgehog's voluntary falls from the branches of fruit-trees; at all events, the circumstance illustrates the well-known remark, that all widcly-spread notions, however false and egregions, have their origin in some misinterpreted fact or other element of truth. Hedgchogs are readily tamed, and are, we believe, still kept by a few persons to eat up cockroaches and other noxious insects which infest our houses. Some aver that the flesh is good eating, but others dispute its merits in this respect ; gipsies, at any rate, will cook and eat them. Without entering into a lengthencd description, we may remark that a fullgrown example measurcs about nine and a half inches,
not including the rudimentary tail, which is only threequarters of an inch long. The jaws are armed with thirty-six teeth-that is, cight incisors, six above and two below, and twenty-cight molars. The ears are short and oval, the eyes being bright and distinct. At the lower part of the body the spines degenerate, as it were, into mere bristles and stont hairs. The amimal's habits are cssentially nocturnal, and during the winter it remains in a torpid state, hybernating in the hollows of decayed trees and similar secure retreats. The nest is carefully constructed and rain-proof. In the carly part of the summer the female produces from two to four young oncs at a birth, their skin being covered with soft white clastic bristles, which in a very fcw days assume the ordinary hard spinous character.

## Order V.-CARNIVORA.

In the arrangement of Cuvier, this eminently carnivorous group of animals constitutes the third family of those unguiculated mammals, which he associated together under the common title of Carnassiers. It is in these Carnivora, properly so called, that we observe the highest development of physical force combincd with a purely zoophagous appetite. If, for example, we examine the skeleton of a lion, we shall find its mechanism specially adapted for the purposes of active pursuit, and for the employment of overbearing strength (Plate 33, fig. 105). The skull is short, broad, and massive, the hind part supporting at the vertcx a longitudinal ridge or crest. The object of this median elcuation is to afford attachment to the powerful temporal muscles which act upon and are inserted into the lase of the lower jaw. The several bones of the face, and consequently those of the jaw, bear a remarkable contrast to the same osseous elements in the order previously considered; for, whercas in the latter we invariably notice a more or less marked attenuation towards the snout, in the lion and other typical Carnivora we find the facial bones terminating abruptly in a broad and short muzzle. The orbital fosse are spacions, in order to accommodate the largely-developed eycs. That part of the temporal bone immediately connected with the function of hearing, is remarkably developed for the purpose of exaggerating the power of appreciating the most delicate sonorous vibrationsa circumstance obviously connected with the animal's nocturnal habits. From the internal surface of the occipital and parictal bones a peculiar shelf-like osseous plate projects, so as to divide the cerebral cavity into two or more parts; in the living state these osseous laminæ occupy the narrow interspaces between the priucipal divisions of the brain, and they are evidently intended to protect the great nervous contre from injury, during the violent and oft-repeated shocks to which the animal's habits necessarily expose it. The prodigiously strong jaws are armed with thirty teeth, twelve of these being well-developed incisors, six above and the same number below; the four canincs arc long and stont, having almost the appearance of
tusks, while the majority of the molars are trenchant or cutting, two only being tuberculated, and these belonging to the upper series. In other Carnivora we find a larger number of tuberculated molars; and so uniformly is the balance of structure and function marked by this peculiarity, that the degree of tuberculation on the one hand, and of sharpness on the other, affords a very accurate indication as to the amount of carnivority possessed by any one particular species. According to Professor Owen, only four of the fourteen molars are true, the other ten being what are termed spurious, false, or pre-molars. The rertebral column of the lion is amazingly strong, yet, at the same time, very flexible; this combination of strength and elasticity being particularly well scen in the bones of the neck, where the first two scgments, termed the atlas and dentata, are remarkably enlarged, the transvere processes of the former and the spinons process of the latter also affording admirable support and attachment to those muscles which act upon the occiput. There are thirteen ribs, but the number varies in different genera. The skeletal elements of the fore-limbs display evidence of great power. The scapula or shoulder-blade, is particularly broad; the upper end of the humerus, or arm-bone, R , is specially enlarged to give insertion to the strong muscles of the shoulder; the radius, S , and the ulna, T , together with the bones of the carpus, U , and metacarpus, V , are likewise corrcspondingly stout and powerful. In the lion and other digitigrade Carnivora-that is, those which walk on the tips of their toes-the ultimate digital phalanges, W, are curiously modified for the support and protection of their terrible claws. The extremity of each phalanx is invested by the hooked nail, the base being also deeply grooved and hollowed out for the lodgement and fixation of its root. With regard to the posterior pair of limbs, the femora, H, tibio, I, and fibulæ, $\kappa$, do not exhibit any more remarkable features than those referable to an increased power; the calcaneum or heel-bone, $\mathrm{L}_{\mathrm{L}}$, is bulky, and with the metatarsals, M, directed vertically upwards. This arrangement facilitates the actions of springing and leaping. The
digital phalanges, N , closcly resemble those of the fore-fect. Such is a brief sketch of the more striking peculiarities secn in the skelcton of the lion, these characters being for the most part shared by all the more typical members of the order. The variations that occur in aberrant forms will be alluded to in the gencral remarks given at the head of each separate family.

## Family I.—URSIDe

The bears differ from the more typical Carnivora in several very important particulars. In the first place, they arc plantigrade, applying the entire sole of the foot to the ground during progression; and in this respect, as well as in the circumstance of their nocturnal labits, associated with a comparative slowness of pace, we perecive a close alliance with the Insectivora. In the construetion of the skelcton also, we find the bones less robust, while their mode of inter-articulation does not admit of the same degrec of easy mobility which obtains in the cats. The clongation of the sknll contrasts strongly with the short, massive cranium of the lion and tiger. The bears, properly so-called, usually carry forty-two tecth, twelve being incisive, four caninc, sixtecn spurious, and ten true molars; cight of the lattcr-that is, two on cither side of each
jaw-are tuberculated. The snout is prolonged and abrupt at the tip; it contains internally a movable cartilage. The cars are short, rounded, and crect. The tail is inconspicuous or fecbly develoled. Differcut incmbers of the family are severally found inlabiting various parts of the globe. Thcir food is of a mixed character, scarcely anything being refused, whether animal or vegctable; this corresponds with the dentition, which, as we have seen, is cven more frugivorous than carnivorous. The majority of the species are stout, thickset animals, and when attaeked or excited, they frequently assume an upright attitude, fighting and striking with their powerful hands. They pass the winter in a scmi-torpid half-starving condition, retreating for this purpose into dens and holes which they have cxcavated among the rocks. Fossil remains of bears have becn found in the newest tertiary or plcistocene deposits, and in caverns refcrable to the subsequent glacial period. Among the scveral extinct forms at prescut known, the Great Cavern Bear (Ursus spelous) appears to have becn the largest, being probably about onc-fifth more bulky than any specics now living. Caverns containing these remains occur in England, at Kent's Hole near 'Torquay, in Devon-' shirc; also in Essex, Norfolk, Yorkshire, andCambridgcshirc; as well as in various parts of Germany, Italy, and the south of France.

Fig. 20.


The Fiatel (Mellivora capensis).

THE RATEL (Mellivora capensis). -Following out
Cuvier's arrangement as far as possible, we place this interesting animal among the bears; yct, at the same time, we are fully aware that not only the ratel, but also scveral of the succecding forms, cxhibit, in a structural point of vicw, many important features in common with the Mustclide. On scicutific grounds a distinct group might be formed, osculant between the two families; these refinements, however, as well as the more complicated classifications of some recent natural history authorities, would ill serve our present
purpose. The ratcl (fig. 20) is an inhabitant of the Cape of Good Itope and the region of the Mozambique. The body is about threc fect in length, including the tail, which measures at least six iuches; its height from the gromid is scarecly one foot. The skin is very dense, the fur consisting of long, stiff, wiry hairs, which are greyish abore, inclining to white on the head, but very dark or black on the belly; a white line or stripe separates these two colours. The hearl is smooth, short, and stont, with an abrupt muzzle; the auricles are small or rudimentary, being repre-
sented only by a slight elevation of the integunent round the auditory opening. The teeth are thirty-two in number-tlat is, twelve incisive, four canine, a dozen spurious molars, and four true ones; none of these so-ealled grinding teeth are tubereulated, and this peculiarity alone constitutes a distinetive character. The limbs are slort, terminating in semi-plantigrade pentadactylous feet, the digits of which are furnished with very powerful elaws, and are admirably adapted for the purposes of burrowing. The ratel by this means grnbs up the nests of wild bees, and is led to their haunts by watehing the behaviour and return of these insects at evening-time. He is said also, like the native IOttentots, to listen to the note of the Honey Guide Cuckoo, which indieates the spot where the desired treasure is to be foumd. According to Peters, it also feeds on birds, rats, and snakes, a statement Which entirely coincides with the opinion formed by a distinguished naturalist who, from a eareful examination of the dentition, was led to express the following sentiments:-"It requires," observes Mr. Bemnett, "the most positive evidence to convince us that an animal, the number and disposition of whose teeth correspond more closely with those of the eat than any other animal with which we are aequainted, and exhibit a carnivorous character searecly, if at all, inferior to that which is evidenced by the same organ in the hyrenas, should subsist entirely, as from these accounts we are led to believe, upon the petty rapine of a hive of bees and the honied produce of their comb. Still there exist such decisive marks of a diminished eapacity for preying on animal food, in the thickset and elumsy form of its body, the shortness of its limbs, its partially-plantigrade walk, the structure of its muzzle, and even in the form of the teeth themselves, as to induce ns to pause before we determine to reject the popular testimony as unworthy of ercelit, although we must regard it as doubtful on some particnlar points, and insufficient and imperfeet on the whole." Messr's. Shaw and Hardwieke have described, in the Transactions of the Limmean Society, another species of ratel (Mellivoru inclicu) inhaliting the uper regions of the Iudian peninsula. The tail of this form is shorter, and there is no appearance of the characteristic white band above mentioned.

THE GLUTTON OR WOLVERENE (Gulo !uscus). As liefore remarked, we do not now diseuss the nicelybalaneed dnestion as to whether the genera here allied together would be more appropriately placed among the weasels or eats. No injury is done to the harmony of zoological sequenee by placing these animals side by side with the typical forms of the great ursine group, provided it is understood that we only employ the family title in its most comprehensive signification. The wolverene (Plate 2, fig. 36) is about the size of the common badger, and measures two and a half fect in length, not including the thick bushy tail, which is rather more than half a foot in length, the terminal hairs reaching four or five inches further. The borly is strongly arched, especially along the back. The head is broad and pointed at the muzzle, the cars being short, romeded, and partly eonecaled by the fur. The jaws are provided with thirty-eight teeth-there being

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twelve incisors, four eanines, sixteen false and six true molars, fonr of the latter belonging to the lower jaw. The limbs are short, and terminate in semi-plantigrade five-toed feet, the digits of which are furnished with powerful sharp elaws. 'the fur exhibits a dark maroon or reddish-brown colour, becoming alnost black as winter sets in ; on either side a light reddish band, inclining to white, extends from the shoulder to the hip, but it is more conspicuous in some individuals than in others. The hair of the tail is blaek, the under part of the throat and chest being more or less marked with pale whitish streaks. In regard to the glnttonous habits of this animal, perhaps no ereature has had its digestive capacities more wantonly exargerated; and in these days it is well that our records of the instincts and habits of various ereatures should be marked by the enunciatious of sober truth, and the distinctions between faet and mere fietion sedulonsly maintained. The legendary tales of Yisbrandt, Olans Magnus, Buffou, and many others, in which the ferocity, cunning, and voracity of the glinton are duly set forth, have too often been aceepted as emborlying actual truths. But by far the best aceonnt yet given of this animal is that by Sir Joln Richardson, who thus fairly estimates his stomachal powers and cuming propensities:-" The wolverene is a earnivorous animal, which feeds chicfly upon the eareasses of beasts that lave been killed by aceident. It has great strength, and amoys the natives ly destroying their hoards of provisions and demolishing their marten traps. It is so suspicious that it will rarely enter a trap itself, but, beginning behind, seatters the logs of which it is built, and then earries off the bait. It feeds also on meadow-mice, marmots, and other Rodentia, and oceasionally on other disabled quadrupeds of a larger size. I have seen one chasing an American hare, which was at the same time harassed by a snowy owl. It rescmbles the bear in its gait, and is not flect; but it is very industrious, and no doubt feeds well, as it is generally fat. It is much abroad in the winter, and the track of its journey in a siugle night may be traced for many miles. From the shortness of its legs, it makes its way through loose snow with difienlty; but when it falls upon the beaten track of a martentrapper it will pursue it for a long way. Mr. Graham observes that the 'wolverenes are extremely misehierons, and do more damage to the small fur trade than all the other rapacious animals conjointly. They will follow the marten-huuter's path round a line of traps cxtending forty, fifty, or sixty miles, and render the whole unserviceable, merely to come at the baits, which are gencrally the head of a partridge or a bit of dried venison. They are not fond of the martens themselves, but never fail of tearing them in pieces or of burying them in the snow by the side of the path, at a consideralle distance from the trap. Drifts of snow often conceal the repositories thus made of the martens from the hunter, in which ease they furnish a regale to the hungry fox, whose sagacious nostril unerringly guides him to the spot. Two or three foxes are often seen following the wolverene for this purpose.' The wolverene is said to be a great destroyer of beavers, but it must be only in the summer when those
industrious animals are at work on land, that it can surprise them. An attempt to break open their house in the winter, cven surposing it possible for the claws of a wolverenc to penetrate the thick mud walls when frozen as hard as stone, would only have the effect of driving the heavers into the water to seek for shelter in their vaults on the borders of the dam. The wolverene, although it is reported to defend itself with boldness and success against the attack of other quadrupeds, flies from the face of man, and makes but a poor fight with a hunter, who requires no other arms than a stick to kill it." The grographical distribution of the wolverene is co-extensive with the length and breadth of the colder regions of the great North American continent, indications of its presence having been found as far north as Melville Island. The female produces from two to four young ones at a birth, which are clothed with a soft light cream-coloured fur.

THE ANERICAN BADGER (Mcles labradoria).This animal is also recoguized by the names of the Brairo and Taxel. Mr. Waterhouse and others separate it from the badgers, properly so called; but, as it is closely allied to them in all essential particulars, we prefer to retain the above title. The dental clements correspond numerieally with those of the common badger, but their carnivorous character is more marked, although the grinding smrfaces of the molars are remarkabiy flat and even. The length and bulk of the body is similar to that of the glutton. The head is broad, and truncated posteriorly. The cars are short and round, the internal auditory bullee being largely developed. The fur is coarse and short on the head and limbs, bnt everywhere else it is beautifully fine and silky, the individual hairs measuring several inches in length. Near the skin, the hair exhibits a purplish-brown colour; the free ends, however, are white, producing a pretty mottled grey appearance. A white band extends from the muzzle over the head along the middle line, gradually disappearing toward the shoulders. The limbs are stoutish, the fore-fect being furnished with strong light-coloured claws, which are longer than those of the common badger. In regard to its habits and geographical distribution, Sir John Richardson states that it "frequents the sandy plains or prairies which skirt the Rocky Mountains as far north as the banks of the Peace river, and sources of the liver of the Mountains in latitude $58^{\circ}$. It abounds on the plains watered by the Missomi, but its exact sonthern range has not, as far as I know, been defined by any traveller. The sandy prairies in the neighbourliood of Carlton IIouse, on the banks of the Sasketchewan, and also on the Red river that flows into Lake Winipeg, are perforated by innumerable badger-holes, which are a great annoyance to horsemen, particularly when the ground is covered with show. These holes are partly dug by the badgers for habitations, but the greater number of them are merely culargements of the burrows of the Aretomys Hoodii and Richardsonii, which the badgers dig up and prey $u_{1}$ on. Whilst the ground is covered with snow, the badger rarely or never comes from its lole, and I sulppose that in that climate it passes the winter from the bergiuning of Norember to $A$ pril in a torpid state.

Indeed, as it obtains the small amimals on which it feeds by surprising them in their burrows, it has little chance of digging them out at a time when the ground is frozon into a solid rock. Like the bears, the badgers do not lose much flesh during their long lyybernation; for, on coming abroad in the spring, they are observed to be very fat. As they pair, however, at that season, they soon become lean. This badger is a slow and timid animal, taking to the first earth it comes to when pursued; and as it makes its way through the sandy soil with the rapidity of a mole, it soon places itsolf ont of the reach of danger. 'The strength of its forefeet and claws is so great, that one which had insinnated only its head and shoulders into a hole, resisted the utmost efforts of two stout young men who endeavoured to drag it out by the hind legs and tail, until one of them fired the contents of his fowling-piece into its body. Lirly in the spring, however, when they first begin to stir abroad, they may be easily canght hy ponring water into their holes; for, the ground being frozen at that peried, the water does not escape throngh the sand, but soon fills the hole, and its tenant is obliged to come out. The American badger appears to be a more carnivorous animal than the European one. A female which I killed had a small marmot, nearly entire, together with some field-mice, in its stomach. It had also been eating some vegetable matters."

THE INDIAN BADGER (Ncles collaris). - Some naturalists also regard this species as an aberrant form of badger, and they go so far as to place it with the digitigrade teledus! It is an inhabitant of IIndustan, and is commonly called by the natives the Bhalloo-soor", or Bear-pig. This title is by $n o$ means inappropriate, for, if we are to accept the description of Frederick Cuvier, the combination of swinish and ursine characters is very evident. It is similar to the European form in respect of bulk, but the tail is considerably longer, measuring nine inches. Mr. Johnson, in his "Indian Field Sports," says they "are marked exactly like those in England, but they are larger and taller, are exccedingly fierce, and will attack a number of dogs." The tame specimens kept in the menagerie of the governor-general at Barrackpoor, when irritated, gave out a peculiar kind of grunt, and stood up on their hind limbs to show fight precisely in the same manner as ordinary bears. The female appeared more docile than the male. Their movements were sluggish, aud they always preferred regetable to animal food, being particularly fond of bread and fruits. In the wild state, the Indinu badger appears to be exceedingly sarage. It occurs chietly in the hilly distriets, but is not very abundint anywhere.

THE EUROPEAN BADGER (1Tcles ta:cus), fig. 21.Before noticing this creature's habits, we offer a few remarks on the principal ebaracters which distiuguish it, especially as we have desigucdly omitted entering upon minate details in onr description of the two preceding aberrant forms. The body is broad and depressed, and is furnished with short powerful limbs, terminating in plantigrade, pentadactylons feet, whose digits are armed with long, powerful, fossorial claws. The fur consists of shaggy, coarse, bristly hairs, those on
the belly tonching the ground during progression. The liead is remarkably long and attemated in front. The ears are short, almost concealed, and placed well baek. The mouth is provided with thirty-six teeth, of which there are twelve incisors, four eanines, sixteen spurious, and four true molars, a moiety being appropriated by either jaw. The back is feebly curved, the tail being particularly short and only reaching down to the middle of the limbs. One of this animal's most remarkable peculiaritics eonsists in the presence of a

Fig. 21.


The European Badger (Meles taxus).
glandular pouch situated under the tail. This organ, which also exists in many other carnivorons animals, sueh as the skunks aud weasels, secretes an unctnous oily material having a disgusting fetid odour. It is this circumstance which has suggested the common proverb, by which ill-savoured matters are said to "stink like badger." With regard to the varied colour of the fur, Mr. Ogilly gives the following minute description:-"The head of the badger is white, except the region beneath the chin, which is black, and two bands of the same colour, which rise on each side, a little bchind the corners of the mouth, and after passing backwards and enveloping the eye and ear, terminate at the junction of the head and neck. The hairs of the upper part of the body, considered separately, are of three different colours-yellowishwhite at the bottom, black in the middle, and ashygrey at the point; the last colour alone, however, appears externally, and gives the uniform sandy-grey slade which covers all the upper parts of the body. The tail is furnished with long, coarse hair of the same colomr and quality, and the throat, breast, belly, and limbs are covered with shorter hair of a uniform deep black." The European badger can scarcely be considered a common animal. It is by no means abundant on the continent, while in this country it appears to be rapidly approaching extinction. It has lost its ursine companion of former days, and in a few centuries more our perscented friend will probably be better known by his fossil remains than by the smell of his greasy fur. At, or inmedi ttely succeeding, the elose of the glacial period, he associated himself with several species of bears and hyenas, whose specific eharacters and latits are only known to us by the bony relies they have left in caverns and among the
sands of time. A master liand has thens portrayed the habits of a living badger :-"Heavy, sleepy, and slothful, endowed with but a moderate degree of intelleet, and with instincts dull and obtuse, it yet possesses a character and qualities which, if not peculiarly interesting and intelligent, are far from being disgusting and feroeions ; and, if it do not boast the admirable sagacity and lively attachment of the dog, it is yet free from the euming and rapine of the fox, and the fiereeness and treaehery of the cat. Its favourite haunts are obseure and gloomy. It retires to the deepest recesses of woods, or to thick coppices cuvering the sides of hills; and there with its long and powerful elaws, digs for itself a deep and well-formed domicile, consisting of more than one apartment, the single entrance to which is by a deep, oblique, and even tortuous excavation. The general form of the clongated but rolust borly, the long taper muzzle terminating in a morable snout, the hard coarse hair, the loose and leathery skin, the low and plantigrade limbs, and the fossorial character of the claws-combine to fit the badger for a sulterraneous abode, and to enable it to form that abode by its own labour. There it sleeps during the greater part of the day, coming abroad only for a short period in the evening or night to seek its sustenance, in the choice of which it exhibits as completely an omnivorous character as perliaps any animal with which we are acquainted. Its food, in fact, consists indiferently of various roots, earth-nuts, beech-mast, fruits, the eggs of birds, some of the smaller quadrmpeds, frogs, and insects. Buffon states that it digs up wasps' nests for the sake of the loney-a fact which lias received an interesting eonfirmation from the observation of a correspondent of Loudon's Magazine of Natural Mistory, who seems, however, to attribute the destruction of these nests to the fondness of the badger for the larve of the wasp, as he says that the combs were found scattered about, but none were left that contained the maggots." Mr. Bell also observes, further on, in regard to the methods of taking this animal-" The farourite mode, and that which is perhaps the most successfnl, is by catching him in a sack placed at the entrance of his hole. The haunt of a badger being ascertained, a moon-light night is chosen when he is ont feeding, and a small sack is placed within the mouth of the hole, fastened at the outside, with the mouth of the bag outwards, and having a rumning string round it. Two or three comples of hounds are then thrown off at some distance, and as soon as the badger hears their ery, le makes for his home with all speed, and rmus into the sack, which closes behind him by the tightening of the running string at its mouth. Another method is by digging him out. This, however, is laborious and not always successfnl, particularly in sandy soils, in which the badger will easily foil the dogs which pursue him in his subterraneous passnges, by throwing the earth back upon them, and hocking up their way, whilst he takes adrantage of their loss of time, and makes lis way to the surface." The nest of the badger is made of soft herbage, especially moss and grass. The female produees three or four young ones at a birth, the cubs being suckled for about five or six weeks, after which
they are permitted to help themselves. If eaptured while still young, they are readily tamed, and become very playful and agrecable companions. Notwithstanding, however, all that has been recorded in their favour, we do not ourselves either propose or recommend the rearing of a family of badgers. We heartily rejoiee that the barbarons enstom of batger-baiting has now completely passed away; but we still recollect an exhibition of this kind some twenty years ago, in a village in the comnty of Suffolk, since whieh time varions societies have been established throughout the kinglom for the limmane purpose of suppressing eruelty to noxious as well as inoflensive animals.

THE KINKAJOU (Cercoleptes caudivolvula).-By some anthors the kinkajon is plaeed among the Viverride. Although its general aspect would at first naturally lead us to coincide with such an arrangement, yet its structural characters are evidently more intimately associated with the Urside, and consequently we have introduced it in this place. Unlike the badgers, its head is slort, rounded, and more resembling the apes, the mizzle being only very slightly prodneed. 'The jaws are furnished with thirtysix tectl, there being twelve incisors, four canines, twelve spmrious, and eight trine molars. The two anterior grinders on either side, above and below, are eonieal, the remainder being tubereulated. Their erowns are also flattened, those of the lower jaw having an oblong form, while the upper series are a little widened transversely. The tongue is slender and extensile. The body is cylindrical, a good deal cmred posteriorly, and terminates in a long prehensile tail. According to Mr. Blyth, its capacity of employing the tail as a fifth limb is very limited; for he says-" One which I had an opportunity of studying as it ran abont loose in a room, possessed the prehensile power of the tail in an extremely moderate degree, merely resting slightly on this organ, which it stiffened throughout its length, and never coiled in the manner of the Sapajous." Frederick Cuvier's figure represents the tail several times coiled upon itself. The feet are five-toed and plantigrade. The fur is thick and woolly, and of a golden-yellow brownish colour. The kinkajou is an inliabitant of the tropical parts of America, and of the prineipal West India islands. It is strictly arboreal and noctmonal in its habits, cautiously moving to and fro, and feeding on frints, honey, milk, insects, eggss, small birds, and quadrupeds. Its disposition appears to be peeuliarly mild and gentle.

THF BROWN COATIMONDI (Nusua narica)-Plate 11, fig. 38.-The genus Nasua ineludes two or more species of coati, of which this is probably the best known form. It is distinguished by the presence of white patehes over the eye and muzzle. In the red eoati, on the other land, the snout is quite brown, the fur, generally, being of a rnfo-fulvons lue. Withont, however, insisting very strongly on these specific distinctions, we may observe that the coatis are characterized by the possession of an elongated head, the muzzle being extended into a movable prohoscis. The superior border is partienlarly narrow, while the tip is slightly turned upwards. The ears are short, broad, and oval. The jaws are provided with forty
teetl; that is to say, twelve incisives, four eamines, sixteen premolars, and eiglit true molars. The canines are somerlat eompressed, and have sharp points. The molars are comparatively small, three of the lower series loeing narrower than those of the upper. These animals are eminently arboreal in their habits, and consequently we find their plantigrade, pentadactylous feet admirably adapted for the purposes of climbing. The hinder feet are semi-palmate, and so freely do the tarsal bones move upon the leg, that when deseendiug head-foremost they almost hang by them; their ordinary position, as maintained in walking, being nearly reversed. The toes are comected by an extension of the skin, and are provided with long, compressed, inenrved claws. These they employ in digging up earthworms and various subterranean insects. They also feed upon slugs, snails, small quadrmpeds, and more particnlarly upon egrs, birds, and varions kinds of fruit, and vegetables. In short, nothing seems to come amiss, and their appetite is extremely vigorons. Before they actually devour the flesh of amimats, they are careful to tear it in picees and detach it. Withont entering at any great leugth into the structure of the skeleton, a drawiug of which is given in Plate 34, fig. 113, we may remark a general slimmess of the several osseons elements of which it is composed. It may also be observed that the elongater head slopes very much backwards, while the dergree of this numal's carnivority is shown by the aspeet of the tecth already described, and more partienlarly by the sharp, prominent, occipital crest and ridge, which afford attachment to the powerfinl museles of the neek -an arrangement enabling the animal to raise its head rapidly with great force, so as to impart to the jaws the necessary aid in tearing away the soft flesh from off the bones of its vietims. We may likewise notice one other more remarkahle peenliarity in the skeleton. It is seen in the eurious fact that only a single bone or vertebral segment is found to represent what is termed the sacrum, while in the typical bears and camivors, properly so called, there are always three or fom eonjoined osscous elements, and in the polar bear as many as seven. This phenomenon probahly bears some relation to the arboreal liabits of the coati, and this power of elimbing requires, as we have seen, the ntmost freedom of motion in the linder parts of the body, while it forms an interesting contrast with the consolidated chain of bony elements witnessed in the slow-moving bears. The tail of the eoatimondi is very long, and is marked externally by numerous ammlations, depentling mpon the alternating dark and lightbrown hairs which extend from the root to the tip. In other parts of the body the colours are more or less uniform, and, from the observations of the Prince of Neuwied, it wonld appear that the slight differences of colonr occurring in the fur of ravious individuals, are entircly insufficient tc indicate the correctness of those specifie definitions whieh have hitherto been regarded as establishect.

THE BINTURONG (Ictides allifroms) approximates very closely to the racoons, especially in the form of the sknll. It is an inhabitant of the isles of Borneo, Malacea, Smmatria, and the western parts of Java,
where it is also known as the Palm-civet or Musang. The head is short and pointed anteriorly. The borly is clothed with long hair, which is generally of a grey colour, the tail and sides of the muzzle being black. The whiskers are extensively developed, forming a very conspichous feature. The eyes are cat-like, with the pupil elongated from abore downwards, the small and rounded ears being covered with a tuft of peneilled hairs. The jaws are armed with thirty-cight teeth; that is, twelve incisors, fomr canines, sixteen spurious, and six true molars, only two of the latter occurring in the lower jaw. The feet are entirely plantigrade and pentalactylous. The tail is remarkably long, stoutish throughout, more particularly at the root; it is also prehensile. According to Sir Stamford Raftes, the Binturong is slow and heavy in its movements, slecping for the most part during the day, and at night wandering about in search of food. It appears to enjoy both an animal and vegetable diet, having however, a decided preference fior the former. It climbs trees with tolerable facility, being greatly assisted by the strong prehensile tail.

THE PANDA (Ailurus refulyens) comes still nearer to the racoons, and consequently to the bears proper. It is an inhalitant of the Himalayas, between the snowy mountains and Nepaul. The body is stout, and covered with a soft thickly set fur. It is of a rich cinmamon colour on the back, fulvons posteriorly, and of a deep black hue beneath. The tail is as long as the body, tolerably thick thronghout, especially at the root, and is ammlated with dark brown bands. The head is short, broad, rounded, and elothed with whitish hair. The ears are small, arched, and pointed. The eyes are placed well forward. The jaws support thirty-six teeth; that is, twelve incisive, four canines, sixteen spurions, and four true molars. The limbs are short, the soles of the plantigrade five-toed feet being furnished with fine downy hairs. The elaws are compressecl, curved, retractile, and very sharp. Altogether, this animal is a handsome species. Respecting its affinities with certain allied forms, General IIardwicke states, that the peculiaritics "on which its rank as a genus depends are striking and prominent; but its disposition in a natmal series is still obscure, as it resembles in several characters the individuals of that subdivision of digitigrade Carnassiers, from which it differs essentially both in its tecth and in its plantigrade walk. Among the peculiarities of our animal are to be noticed, the great breadth of the rostrmm and the singular structure of the teeth; but the most remarkable character, and that on which its distinction principally depends, is the form of the projecting points of the posterior grinders. This character, as far as our observation extends, is pecnliar. It does not exist, except in a small degrec, in any other genus of carnivorous quadrupeds." Comparing it with the genera Nasua and Procyon, he adds -"These differ essentially in the lengthened form of the head and in the extended rostrum, which is terminated by a flexible rhinarium. They also differ in the number, character, and distribntion of the grinders. Nasma and Procyon have in both jaws six grinders, of which the three anterior are false; and of
those which fullow, none of the points even in the adult state exhibit the truncation above deseribed." The habits of the landa are strietly arboreal, the animal being particularly abmendent in the neighbourhood of running streams and momtain torrents. It utters a peculiar ery resembling the syllable whe, and is consequently sometimes called by the natives the Chituca. Its food consists chiefly of small quadrupeds and lirels.

THE RACOON (Procyon lotor)-I'late 11, fig. 37is characterized by the possession of an acnte fox-like muzzle, associated with an attitnde thoronghly ursine and phantigrade. During progression, however, the heel is slightly elevated. The posterior part of the head is more or less rounded. The ears are oval and a little pointed. The eyes are large and penetrating, having spherical pmpils. The nose is soft, naked, tapering, and projecting consilerably beyond the month. The jaws carry furty teeth; that is, twelve incisors, four eanines, sixteen spurious, and as many as cight true molars. The body measures about two feet in length, exclusive of the tail; but it stands low, the back being scarcely a foot from the gromed. The limbs are short and narrow, when compared with the preceding genera. The feet are pentalactylous, the digits being clothed and armed with strong falciform claws. Its tail is about ten inches long, and ammulated by alternating bands of dark, black, and whitish hair, the latter being thick and much elongated. The fur is for the most part of a greyish-brown colour. On the head a brownish-black streak rmus down the central line from between the ears to the tip of the nose, and on either side, below the eyes, there is an obliqne patch of a similar coluur. Over the cycbrows, and towards the muzzle, the hair is whitish. This is also the case with the ears. The whiskers are well developed. Under the belly the fur is much lighter than on the back. The Racoon has an extensive range over the upper parts of the North American continent. In regard to its habits, Sir John Richardson thus speaks of it :- "In the wild state it sleeps by day, comes from its retreat in the evening, and prowls in the night in search of roots, fruits, green com, birds, and inscets. It is said to cat merely the brain, or suck the blood of such birds as it kills. At low water it frequents the sea-shore to feed on crabs and oysters. It is fond of dipping its food into water before it cats, which oceasioned Limnens to give to it the specific name of lotor. It climbs trees with facility. The fine of the Racoon is used in the manufacture of hats, and its flesh, when it has been fed on regetables, is reported to be good."

THE BROWN BEAR ( ( 7 -sus arctos).-Almost every one is familiar with this common species, which has a very wide geographical distribution over the northern half of the eastern hemisphere, extending from Spain and the west of Firope, to the extreme castern parts of Asia and the islands of Japan. It is also now generally believed that the Barren-ground bear is only a variety of this species-an opinion in which we are disposed to aequiesee; and if this persuasion be correct, Uisus arctos must be considered an American as well as Eimropean species, wideh would give it a range coex-
tensive with the eircuit of the glube. As the name indicates, the general colour of the fur is brown; but it is sulject to a great variation of tint, partly depending upon age and partly also on locality-circumstances which have given origin to several well-marked varieties. In the young state the texture of the hair is woolly; but it becomes firm and even in the adult condition. The whitish hands seen on the neck and sides of the head in the Siberian varicty of this bear, are, it would seem, merely the permanent indications of the pale collar which is commonly more or less marked in young specimens of the European form. Like all the true ursine types of structure, the common brown bear possesses a stont bulky frame and powerful thick limbs (fig. 22). The forchead is slightly con-
vex, while the ears are short. Its habits are solitary. The flesh is very good eating, especially when the animal is young. The fur is valued everywhere, and more particularly by the Laplanders and the Kamtehatkans, to whom, Mr. Ogillby remarks, "it gives the necessaries and even the comforts of life. The skin, we are told, forms their beds and their coverlets, bonnets for their heads, gloves for their hands, and collars for their dogs, while an over-all made of it, and drawn over the soles of their shoes, prevents them from slipping on the ice. The flesh and fat are their daintios. Of the intestines they make masks or covers for their faces to protect them from the glare of the sun in the spring, and use them as a substitute for glass by extending them over their windows. Even

Fit. 22.


The Brown Bear (Urisus arctos).
the shoulder-blades are said to be put in requisition for cutting grass." As a source of sport, it was in early times the custom for English sovereigns and nobility to assemble together to witness the baiting of this unfortumate animal. We rejoice to know that those barbarons customs have long since passed away, and those who wish to indulge in a fairer and more legitimate amusement must betake themselves to the monntains and well-wooded districts of Europe and Asia, where they will find ample opportmities for developing their skill and courage, and, at the same time, confer a positive boon upon the inhabitants of many an outlying, lonesome, hill-begirt village. Although the belaviour of these animals is far less alarming than that of lions, tigers, and their congeners, yet their pursuit is by no means unattended with danger, and it requires great courage to attack them. Among the many interesting stories which have from time to time appeared respecting enconnters with this animal, we are not aequainted with any more daring or des-
perate than those which lave been recorded by Mr. Atkinson in his attractive work entitled "Oriental and Western Siberia." While in the neighbonrlood of the celebrated 'Tsaravo-Nicholiovsly gold mine, two men, one of them being a skilled hunter, succeeded in springing a bear. "The hanter fired, and the ball struck, but not in a vital part. In an instant the wounded anmal charged. The other man, who was less experienced, reserved his shot until within twenty paces. The rifle missed. At once the brute raised himself on his hind legs, and tearing the earth beneath him, rushed on his first assailant, striking him down with a blow that stripped his sealp, and twned it over his face. Then seizing his arm, he began to gnaw and ernsh it to the bone, gradually ascending to the shoulder. The man called to his companion to load and fire; lout the fellow, when he saw his friend so fearfinly mangled, ran away and left him to his fate. Late in the evening he reached the gold mine and reported what had happened; but it was too late to
make any effort in behalf of the mangled hunter. The officer ordered a large party out at day-light the next morning with the coward for a guide. He took them through the forest to the spot where the encounter had taken place, of which there still remained ample evidence; but no remains of the victim were met with, except some torn clothing and his rifle. By the state of the grass it was evident that the man had been carried off into the thick forest. A most diligent pursuit was therefore made. Sometimes the track was lost; but the pursmers of the bear were too well skilled in wood-craft to be foiled, and at length diseovered his larder. Ite had dragged the hunter into a dense mass of wood and bushes, and, to render the place still more secure, had broken off a quantity of branches and heaped them over his boly. These were quickly stripped off, when, to their great surprise, they found the man, though frightfully mutilated and quite insensible, still living! Two long poles were immediately cut, to which saddle-cloths were secured in the middle. One horse was placed in front, another at the back, and the cuds of the pole secured to the stirrups, thins forming a very easy conveyance. The sulfierer was placed upon the saddle-cloths, and carcfully propped up, and then began the painful march back as fast as possible. On their arrival at the gold mine he was taken direct to the hospital. The doetor dressed his womuds, and administered all that medical skill and kindness prompterl. His patient survived, but long remained unconscious of everything around him. After more than two months had clapsed a slight improvement took place, and his reason appeared to be restored. His first question was about the bear, and then he referred to his own defeat. He spoke of nothing clse, and was constantly asking for his rifle to go and kill 'Michael Ivanitch' (the bear). The medical men thonght his mind scriously affected. is he gained strength there arose in him so great a desire to have another combat with his nowerful and ferocious enemy, that it was considered necessary to place him under some restraint. Summer had passed over, and autumn had arrived; the sun had scorched the foliage, changing it into golden and crimson hues, and as it was now thought the poor lunatic lad forgotten his adventure, less vigilance was exerecised towards him. The opportunity was not lost; for he secretly left the hospital, and started off for his cottage. All the fanily being absent, except some young children, he was enabled to secure his rife and ammunition, and provided himself with an axe and a loaf of black bread, which he stowed in his wallet. Thus armerl and provisioned, he left the village in the evening without having been seen, except by the children, and was soon lost to them in the forest. When it was discovered that he had escaped, people were sent out in various directions to seck him; but they returned without success. More than a week passed over, during which nothing had been heard of him, when one day he walked into the hospital, carrying the skin of a huge bear on his shonlders, and throwing it down exclaimed, 'I told you I would have him.' This man wats a fine old hunter. It was not a spirit of revenge which prompted him to this daring aet.

The fact was lie could not brook the idea of a defeat. Now his reputation was re-established, he was happy. His health was again restored; nor was this the last bear that fell before his deadly rifle." Not only do the men of these regions courageonsly attack bears, but women also take to hunting, one of them having obtained an extraordinary reputation for her skill and daring. Thoughout Siberia, Bruin is said to have no more intrepid enemy than the damsel, Anna Petrovnaia! The closing scene of onc of her expeditions is thus described by Mr. Atkinson:-" As she was crecping eautiously forward, out rushed the bear with a loud growl, about twenty yards in front. (Quickly she threw forward the prongs of her rifle, dropped on one knee, and got a good sight of the animal staring at her, almost motionless. She now tonched the trigger; there followed a flash, a savage growl succeeded, then a struggle for a minute or two and her wish was accomplished-the bear lay dead." Since this event, we are informed that she has destroyed no less than sixtecn bears! Here we wonld willingly quit the subject, but camot do so without also recording the most desperate encounter probably ever placed on record. This took place not far from the district in which the poor hunter above mentioned was so terribly mangled. One afternoon, says Mr. Aikinson, a Cossack offieer "was quietly strolling through the forest, alone and marmed, botaniziug by the way, when, at a distance of about eight versts from the gold mine, he came ont of the forest into an open glanle, on which stood some single trees. Almost immediately on entering this spot, he observerl at a distance of two hundred paces a she-bear and her two cubs playing together. The moment she became aware of his presence, she uttered a savage growl, drove her young ones into a tree for shelter, and mounted guarl at the foot of it to defend them. The Cossack retreated into the wood to provide himself with a weapon, having determined to carry of the cubs. The woodmen had been cutting timber, and from the stems of several young birch trees lying on the ground, he selected part of a strong one, nearly four feet in length, tricd its quality against a tree in a succession of smart blows, and then club in hand, retraced his steps. As soon as the old bear observed his approach she began to growl furiously, moving to and fro with an nneasy motion at the foot of the tree. He slowly and steadily advaneed, when within abont a hundred paces her growl bceame more savage, and her actions showed that she intendec mischief. Nevertheless he quietly mored on, his lieen eye steadfastly fixed upon her. The ground was a fine grassy turf, with no slirubs or bushes to impede lis movements or entangle his feet. When within about fifty paces, she made a savage rush that would hare dannted most men; but he firmly stood his ground, waiting her nearer approach. At this moment the cubs began to whine, and she trotted back towards the tree in increased fury. The Cossack followed, and when she turned round, they were face to face, within twenty paces of each other. There was now no retreat. The brute eyed him keenly for two or three minutes, as if calculating his strenytly ; he returning her gaze with as searehing serutiny: Presently
she made a second rush, her eyes glaring like balls of fire. At a few paecs from her enemy she rose on her lind legs, intending to give him a settler with her powerful paws, or to clasp him in her savage embrace; but on the instant, he made a sweep with his club, and dealt a blow that toppled her over. She was up again in a second, and ready for action, but another blow laid her prostrate. This added to her ferocity, and it at onee beeame a elose encounter of the most deadly and savage claracter. Many rounds were fought, her antagonist keeping elear of her paws. At last the blows bugan to tell on her comrage. She endeavoured to get behind him; but his eudgel met her at every turn, and was so well wielded that whenever within reach she reecived a stroke which drove her back step ly step, till both eame under the tree. Here the fight was renewed with inereased fury, and every time the eubs whined she made her attack with redoubled violence. The battle eontinued to rage furiously; but the blows from the stafl fell so fast, and were applied with so much foree, that at last she began a retreat towards the forest, the skirts of which she entered; but the moment her brave assailant moved a step towards the tree, she would rush out, taking especial eare, however, not to come within his reach. The cubs remained in the branches the sole spectators of this extraordinary seene; nor could the Cossack oflicer devise any plan by which he could get them down. At their respective posts the combatants stoorl, he grarding the eubs, and the mother standing at the edge of the forest. At this time a woodman returning to the gold mine, rode into the glade. IIe was instantly hailed, and rode towards the tree; but when he heard the growls, and beheld the bear, then in her most savage mood, his natural impulse to bolt was only checked by the fear of a birching promised by his superior. He was ordered to dismonnt, and talse from his saddle the zumba (large leathern bags), and open them; then to climb the tree, and bring down the cubs. The man was soon up among the brancles, securad a cub, brought it down, and then tied it safe in the bag. 'lhe other was also quickly placed beside it in the other bag. During these operations the mother rushed at the Cossack, and was screral times knocked duwn by his weapon. The peasant was now ordered to place the bags on his horse, and lead the way to the gold mine, the Cossack covering the retreat, and beating off the enemy at every charge. After a walk of nearly two hours, they reached the village, the bear keeping close up with them. As they went throngh the forest, she made many charges, but each time was laid prostrate, and finally would not approach within striking distance. When they reached the village the Cossack officer hoped to secure the dam ; but after following them to the cottages, she returned to the forest, anl was never seen again. The eubs were kept, and became great pets witl the people. Even the hardy hunters of Sileria consider this a most daring feat, wondering at the power, and admiring the cool comrage of the man who accomplished it." Mr. Aikinson records many other pleasing adventures and interesting facts conneeted with the Siberian bear. Sike most other
quadrupeds, this animal has a great fear of fire ; bnt when pressed with huuger he will, in order to scize any person who may be reposing loy a fire in fancied security, deliberately enter some strean, and laving saturated his fur with water, put out the fire by rolling over it, and then secure his victim. Bears have been known, cren in the wild state, to show attachment to young people; and the same author mentions an instance where two young children, two and four years of age respectively, lad wandered from a hayfield where their parents were at work, and when the father and mother went to look for them, lo and behold! one was sitting on a linge bear's back, whilst the other was feeding the least with wild fruit! The eliildren readily came away at their parents' alarming calls, and Bruin seemed vexed to part with his joyous little companions.

THE SYRIAN BEAR (Ursus syriucus). - This appears to be a well-marked species; the fur is of a fulvous or light-brown colour, whilst on the upper part of the neck there is a mane of thick rigid hairs, which increase in lengtly towards the shonders, terminating posteriorly about the centre of the back. The Syrian bear, though often feasting ippon animals, is said to be particularly partial to eertain kinds of vegetable food, and more especially to the chick-pea, Cicer arictinus, entire erops being laid waste hy its ravages.

HORSFIELD's BEAR (Ursus isulllinus) is an inhabitant of the entire Ilimalayan chain of hills, and, like the foregoing species, is of a pale fulvons colour ; it is, however; quite a distinct form. According to Dr. Horsfield, it resembles "the European bears in its strueture, as far at least as can be determined from the parts which have been preserved in the specimen (procured from Nepaul). Among these, the claws atlord the best means of comparison; they are small, obtuse, and straight; while those of the Asiatic bears ( $U$. thibctinus, U. labiatus, and UT. malayamus) are large, strongly-curved, acute, and fitted for climbing."

THE SLOTH BEAR (L'sus lubiulus) exhihits so striking a resemblance to a sloth, that when it was first made known to Enropeans, it was aetnally deseribed as a species of Bradypus. Some confusion has arisen respecting it, partly perhaps on account of the varied nomenelature ly which it las been indicated; thus it is called the Ursine sloth, the Labiated bear, the Jmighe bear, and one author denominates it the Bengal bear. It is an awkward, unwieldy animal. The body is elothed with thickly-set, black, shaggy hair, which becomes much longer when the animal is old. 'the head is depressed and attenuated in front, the nasal cartilage being movalle and extensile. The lips are eaprable of protrusion, this being especially the case with the lower one. Captain Thomas Williamson, in his "Oriental Fieh Sports," remarks that "the Bengal bear is distinguished ly the deep black colour of his hair, and by a cresecnt of white hair, like a gorget, on his breast. The hind legs are shorter, and the paws thatter and longer than those of the European breed; his pace is more shufling, awkward, and laboured, thongh quick enongh to orertake a man on foot ; and his lair is long and thinly seattered over his body. Ite is remarkably active in climbing; frequently, when net
more than a month old, a eub will aseend to the shoulder of his keeper with great ease, and deseend again, stern foremost, with equal adroitness." Its food eonsists chiefly of fruits, honey, and white ants, of which latter it appears to be particularly fond. When the Bengal bear "finds a nest of any kind of ants, but especially white ants, he is in his glory! he tears the whole burrow, licking up all the elusters he can get at, and lying with his tongue out to entice the little prey into his mouth. By this means, lie no donbt often obtains an ample neal; for I think I may with propriety assert that frequently a bushel of white ants may be found in the same nest. The presence of bears in the vicinity of a village is generally pretty well known by the nature of the covers, and their having been, perhaps time out of mind, regular visitors; sometimes, however, they change their hamins, on which their neighbourhond is commonly first discovered by the anthills and burrows near the sides of roads being found in a state of destruction." Their food, however, does not appear to be confined to insects and fruit, for the same naturalist observes that they will attack and devour quadrupeds, and even man himself. He gives the following sad account of their behaviour:-"It has often been in my way to see the operations of bears; and I am confident that no animals exist more crucl, more fieree, nor more implacable than they are! Such as have suffered under their brutality have in all instances within my knowledge borne the proofs of having undergone the most dilatory torments. Some have had the bones macerated, with little breaking of the skin; others have had the flesh sucked away into long fibrous remnants, and, in one instance, the most horrid brutality was displayed. While stationed at Dacea, I went with a party several times to the great house at T'ergong, distant about five miles from the town. I had on several occasions seen bears among the wild mango topes, and did not eonsider them as leing so dangerous, until one day as I was returning with a friend from hunting some hog-deer, we heard a most lamentable ontcry in the cover through which we had to pass. Having our spears, and being provided with guns, we alighted, not doubting but a leopard had attacked some poor woolcutter. We met a woman whose fears lad deprived her of speech, and whose senses were just flitting. She, however, collected herself suffieiently to pronounce the word bauloo, which signifies a bear. She led us with caulion to a spot not more than fifty yards distant, where we found her husband extended on the ground, his hands and feet, as I before observed, sucked and chewed into a perfeet pulp, the teguments of the limb in general drawn from mader the skin, and the skull mostly laid bare, the skin of it langing down in long stripes, obviously effected by their talons. What was most wonderful was, that the unhappy man retained his senses suffieiently to describe that he had been attacked by several bears, one of whieh had embraced him about the head and bit at his arms and lerss, seemingly in competition for the booty. We eonveyed the wretched oljeet to the loouse, where, in a few hours, death reliesed him from a state in which no human being could afford the smallest assistance !" The Bengal bears appear to be Vol. I.
abundant on the eastern side of the Ganges, bint of late years their number has been very considerably reduced by the skill of our Indian officers, who are notoriously fond of the sport of hunting.

THE MALAYAN SUN-BEAR (Ifclarctos malayanus) is also characterized by the possession of a deep jetblack fur, the lairs of which are, however, comparatively shorter than obtains in the foregoing species, the breast being marked by a white patch of a leartshaped colour. In the Bornean bear, which we take to be a mere variety of this species, this patch is of a fulvous colour, and likewise deeply notched in front. The Malayan bear feeds chiefly on vegetables and honey, and is said to evince a special predilection for the young shoots of eocoa-nut trees, to which it proves very destructive. The length of the body is about four and a half feet. This animal appears to be easily tamed, if taken whilst still young. Sir Stamford Raffles' account of one in his possession might almost induce us to desire a similar companion. He says, it "was brought inp in the nursery with the children, and when admitted to my table, as was frequently the ease, gave a proof of his taste by refusing to eat any fruit but mangostcens, or to drink any wine bit champagne. The only time I ever knew him to be out of humour was on an oecasion when no ehampagne was forthcoming. It was naturally of an aflectionate disposition, and it was never found neeessary to chain or chastise him. It was usual for this bear, the cat, the dog, and a small blue mountain bird or lory of New Holland, to mess together and eat out of the same dish. His favourite playfellow was the dog, whose teasing and worrying was always borne and returned with the utmost good humour and playfulness. As lie grew up he became a very powerful animal, and in his rambles in the garden he would lay hold of the largest plantains, the stems of whieh he could searcely embrace, and tear them up by the roots." Of a tame specimen of the Bornean variety; Dr. Horsfield also gave the following interesting account:"The Helarctos readily distinguishes the keeper, and evinees an attachment to him. On his approach it employs all its efforts to obtain food, seconding them by emitting a coarse but not mpleasant whining sound. This it centinues while it consumes its food, alternately with a low grunting noise; but if teased at this time, it sindenly raises its voice and emits at intervals harsh and grating sounds. Our animal is exeessively roracious, and appears to be disposed to eat almost without cessation. When in a good humonr, it often amuses the spectators in a different manmer. Calmly seated in its apartment, it expands the jaws and protrudes its long and slender tongue as abore deseribed. It displays on many occasions not only much gentleness of disposition, but likewise a considerable degree of sagacity. It appears eonscious of the kind treatment it receives from its keeper. $n_{11}$ seeing lim, it often places itself in a variety of attitudes to court his attention and earesses; extending its nose and anterior feet, or suddenly turning round exposing the hack, and waiting for sereral minutes in this attitude with the head placed on the ground. It delights in being patted and rubbed,
and even allows strangers to do so ; but it violently resents abuse and ill-treatment, and, having been irritated, refuses to be courted while the offending person remains in sight." This unfortunate animal died suddenly one summer's morning, after having gorged itsclf with a too hearty meal.

THE BLACK BEAR (Ursus americamus) is a wellknown species, inhabiting the American continent from the shores of the Atlantic to the Pacilic, and from the Aretic regions to the Isthmus of Panama. The form termed the Speetacled bear, which inlabits the wooted slopes of the Andes and Cordilleras in Chili, is likewise by many naturalists regarded as a mere variety of this species. The American black bear differs only in the non-displayment of certain pale fulvous marks situated on the throat and cheeks, and similar light bands round the eyes from which the Spectacled bear las derived its name. Other varictics of the American llack bear have also been described. This species is occasionally as much as five feet in length, but it seldom exceeds that measure. The fur is of a soft eveu texture, and of a shining black colour. The head is comparatively narrow ; the muzzle elongated and pointed. The elaws are sharp, strongly eurvel, and in great part concealed by the laair. Like its congeners, it is partial to wellwooded and rocky grounds. Here it feeds principally upon vegetable matters, but often succeeds in capturing quadrupeds and birds, which it readily devours, as well as fish. When winter approaches, it retires either into the hollow of some tree, or more commonly into a kind of den amongst fallen trees or brushwood, where it digs up the soil in such a way as to scoop out a tolerably secure and snug retreat. A small opening in its snowclad tenement allows fresh air to enter. The American black bear is naturally timid, nevertheless it is regarded by the natives with considerable dread, chiefly it would appear on superstitious grounds. In proof of this, we produce the following interesting account by Mr. Henry, an early traveller, who was in the neighbourhood of Lake Michigan when the incident which he here describes took place:-"In the course of the month of January, I happened to observe that the trunk of a very large pine trec was much torn by the claws of a bear, made botlı in going up and down. On further examination, I saw that there was a large opening in the upper part, near which the smaller branches were broken. From these marks, and from the additional circumstance that there were no tracks in the snow, there was reason to believe that a bear lay concealed in the tree. On returning to the lodge, I communicated my discovery, and it was agreed that all the family should go together in the morning to assist in entting down the tree, the girth of which was was not less than three fathoms. The women at first opposed the undertaking, because our axes, being only of a pound and a half in weight, were not well-adapted to so heary a labour; but the hope of finding a large bear, and obtaining from its fat a great quantity of oil, an article at the time muels wanted, at length prevailed. Accordingly in the morning we surromed the tree, both men and women, as many at a time as could conveniently work at it ; and there we toiled like beavers till the sun went down. This day's work earried ns
about laalf-way through the trunk, and the next morning we renewed the attack, continuing it till about two o'elock in the afternoon, when the tree fell to the ground. For a few minutes everything remained quiet, and I feared that all our expectations would be disappointed; but as I advanced to the opening there came out, to the great satisfaction of all our party, a bear of extraordinary size, which I shot. The bear being dearl, all my assistants approached, and all, Lut particularly my old mother (as 1 was wont to call her), took the head in their hands, stroking and kissing it several times, begging a thousand pardons for taking away her life, calling her their relation and grandmother, and requesting her not to lay the fault upon them, since it was truly an Englishman that had put leer to death. This ceremony was not of long duration, and if it was I that killed their grandmother they were not themselves behind-hand in what remained to be done. Theskin being taken off, we found the fat in several places six inches deep. This being divided into two parts, loaded two persons; the flesh parts were as much as four persons could earry. In all, the careass must hare exceeded five hundredweight. As soon as we reached the lodge the bear's head was adomed with all the trinkets in the possession of the family, such as silver arm-bands and wrist-bands, and belts of wampum, and then laid upon a scaffold set up for its reception within the lodge. Near the nose was placed a large quantity of tobaceo. The next morning no sooner appeared than preparations were made for a feast to the manos. The lodge was cleaned and swept, and the head of the hear lifted up, and a new Stroud blanket which had never beon used before laid under it. The pipes were now lit, and Wawatam blew tobacco smoke into the nostrils of the bear, telling me to do the same, and thus appease the anger of the bear on account of my liaving killed her. I endeavoured to persuade my benefactor and friendly adviser that she no longer had any life, and assured him that I was under no apprehension from her displeasure; but the first proposition obtained no credit, and the second gave but little satisfaction. At length, the feast being ready, Warratam made a speceh rescmbling in many respects his address to the manes of his relations and departed companions, but having this peculiarity that he here deplored the necessity under which men laboured thus to destroy their friends. He represented, however, that the misfortune was unavoidable, since without doing so they could by no means subsist, The speech ended, we all ate heartily of the bear's flesh; and even the head itself, after remaining three days on the scaffold, was put into the kettle." Independent of these statements, we have plenty of eridence that the flesh of the American black bear is excellent eating; and recently Mr. Oliphant, who has enjoyed considerable experience of different linds of food both in the eastern and western quarters of the northern hemisphere, declares for himself and his companions that it is a "royal feast" In the winter time the female produees from one to five cubs, and in order to scoure her progeny from the attack of other animals, such as wolves and the like, she makes her lodging, as we have secn, high up among the branches of thicklywooded trees.

THE GRISLY BEAR (L'rsus ferow) is also an American species. Its disposition is exceedingly fierce, and it is endowed with prodigious strength. Its muscular power may be estimated by the circumstance of a specimen of this animal having been seen to carry the carcass of an American buffalo, weighing about one thonsand pounds, to a considerable distance. 'The travellers Messrs. Lewis and Clark measured a speeimen which had attained a length of nine feet, and some persons pretend to have met with individuals several feet longer. The liead is broad and flattish on the crown, and nearly even from the occiput to the nose, except in old specimens; the ears are short and conical; the muzzle being wide, and of a pale colour. 'The fur is long and of a decp-brown tint ; commercially speaking, it is of inferior quality. Its limbs are powerful, the feet being armed with very long, compressed, white, strongly-curved claws; the inferior border of the latter is particularly narrow. Its rudimentary tail is entirely conccaled by the hair. With regard to its habits, the grisly bear is more carnivorous than the preceding species, althongh it docs not refuse to subsist on a vegretable diet if anmal food be not forthcoming. Sir John Richardson has given us the following interesting harrative, which he states to be derived from anthentic sources:-"A party of voyagers who had been employed all day in tracking a canoc up the Sasketchewan, had seated themselves in the twilight by a tire, and were busy in preparing their supper, when a large grisly bear sprung over their eanoe that was tilted behind them, and seizing one of the party by the shoulder, carried him off. 'The rest fled in terror, with the exception of a Metif named Bourasso, who, grasping his gun, followed the bear as it was retreating leisurely with its prey. He called to his unfortunate comrade that he was afraid of hitting him if he fired at the bear, but the latter entreated him to fire immediately, without hesitation, as the bear was squeezing him to death. On this he took a deliberate aim, and discharged his piece into the body of the bear, which instantly dropped its prey to pursue Bourasso. He escaped with difficulty, and the bear ultimately retreated to a thicket, where it was supposed to have died; but the curiosity of the party not being a mateh for their fears, the fact of its decease was not aseertained. 'Ihe man who was rescued had his arm fractured, and was otherwise severely bitten by the bear, but finally recovered. I have seen Bourasso, and can add that the account whieh he gives is fully credited by the tritders resident in that part of the country, who are best qualified to judge of its truth from the linowledge of the parties. I have been told that there is a man now living in the neighbourhood of Edmonston Jousc who was attacked lyy a grisly bear, which sprung ont of a thicket, and with one stroke of its paw completely scalped him, laying bare the sknll, and bringing the skin of the forchead down over the eyes. Assistance coming np, the bear made off without doing lim further injniy, but, the scalp not being replaecd, the poor man has lost his sight, although he thinks that his eyes are uminjured. Mr. Drummond, in his excursions over the Rocky Momntains, had frequent opportunitics of observing the manners of grisly
bears, and it often happencd that in turning the point of a rock or sharp angle of a ralley he came suddenly upon one or more of them. On such occasions they reared on their hind legs and made a loud noise like a person breathing quick, but much harsher. He kept his ground without attempting to molest them, and they on their part, after attentively regarding him for some time, generally whecled round and galloped off; though, from their known disposition, there is little doubt he would have been torn in pieces had he lost his presence of mind and attempted to fly. When he discorered them from a distance, he gencrally frightened then away by beating on a large tin box in which he carried his specimens of plants. He never saw more tlan four together, and two of these he supposes to have been cubs; he more often met them singly or in pairs. IIc was only once attacked, and then by a female, for the purpose of allowing her eubs time to escape. His gun on this occasion missed firc, but he kept her at bay with the stock of it, until some gentlemen of the Ifudson's Bay Company, with whom he was trayelling at the time, came up and drove her off. In the latter end of June, 1826, he obscrved a male caressing a female, and soon afterwards they both eame towards him, but whether accidentally, or for the purpose of attacking him, lie was unecrtain. He ascended a tree, and as the female drew near, fired at and inortally wounded her. She uttered a few lond screams, which threw the male into a furious rage, and he reared up against the trunk of the tree in which Mr. Drummond was seated, but never attempted to ascend it. The female; in the meanwhile retiring to a short distance, lay down, and as the male was proceeding to join leer, Mr. Drimmond shot him also. From the size of their teetlı and claws, he judged them to be about forty years old. The culus of the grisly bear can elimb trees, but when the animal is fully grown it is unable to do so, as the Indians report, from the form of its claws. Two instances are related by Lewis and Clarke, and I have heard of several others, where a hnnter having sought shelter in a tree from the pursuit of a grisly bear, has been held a elose prisoner for many hours, by the infuriated animal keeping watel below." The flesh of the grisly hear is of very inferior" quality; so much so. indced, that the native Indians reject it, maless other food cannot be procured. Althongh these animals invariably hybernate during the winter months, the old males sometimes steal forth from their snug abodes to seek for food. The grisly bear has a pretty wide geographical distribution on the North American continent, extending from a latitude of uprrards of sixty degrees north, to Mexico in the south. It is most abundant on the eastern slopes of the Liocky Mountains.

THE POLAR BEAR (Thalarcios memimus), Plate 12 , fig. 39.-This is the most carnivorous of all the bears, probably however, more by necessity than by choice. It is essentially a marine animal, destined to wander to and fro on blocks of ice, in dreary solitudes and wastes, seldom risited, save by the Esquimaux and a few of the more enterprising spirits of human kind. Here the polir bear makes haroc among seals, whales, walruses, and other denizens of
the polar seas. Dead or alive, nothing comes amiss, while his skill enables him to secure not only fish, but even birds. The general appearance of the polar bear is too well known to require a lengthened description; yet, it is necessary to notice a few of the prineipal characters. The body is more cylindrieal than that of the land varieties of bear; the head is likewise rather more elongated; the ears are short. The muzzle is somewhat curved, the mouth being comparatively small, while the neek is long and thick The fur, generally speaking, is white, long, loose, woolly in texture, and has a silvery lustre; on the legs and under the surface of the belly the hairs are much more lengthened. The claws are short, only slightitly chrved, and nearly concealed by the fur. The size attained by the polar bear is very considerable. Captain Lyons met with a specimen measuring rather more than eight and a half feet in length, and weighing sixteen hundred pounds avoirdupois. The same gentleman obtained from an intelligent Esquimanx the following account of the mamer in which this animal hyber-nates:-"At the commeneement of winter the pregnant bears are very fat and always solitary. When a heavy fall of snow sets in, the animal seeks some hollow place in which she can lie down, and remains quict while the snow covers her. Sometimes she will wait until a quantity of suow has fallen, and then digs herself a cave; at all events, it seems necessary that she should be covered by, and lie amongst the snow. She now gocs to sleep, and does not wake until the spring sun is pretty high, when she brings forth two cubs. The cave by this time has become much larger, by the effect of the animal's warmth and breath, so that the cubs have room enough to more, and they aequire considerable strength by continually sucking. The dam at length becomes so thin and weak, that it is with great difficulty that she extricates herself, when the sun is powerful enough to throw a strong glare throngh the snow which roofs the den." We have already allnded to this animal's cuming and activity. IIere is the method it adopts to eatch a seal, for the account of whieh we are also indebted to the "Private Journal" of Cuptain Lyon :-"The bear, on seeing his intended prey, gets quietly into the water, and swims to leeward of him, from whence, by frequent short dives, he silently makes his approaches, and so arranges his distanee that, at the last dive, he comes to the spot where the seal is lying. If the poor animal attempts to escape by rolling into the water, he falls into the bear's clatches ; if, on the contrary, he lies still, his destroyer makes a powerful spring, kills him on the ice, and devours him at leisure." Captain Sir Edward Beleher, in lis interesting work entitled "The Last of the Aretic Voyages," also gives an amusing description of the performanees of a female polar bear, whose antics seemed to lave for their olject the capture of a seal by another shrewd expedient. On the first day of Jme, 1853, he writes:-"We pushed on for Tongne Point, and there pitched. More bears! I was busy on the Puint with the instrument, watehing for an object, when I notieed a lady and her cub, amusing themselves, as I imagined, at a game of romps, but the old lady was evidently the more excited. Possibly no such
opportunity has before been afforled to any naturalist of witnessing quietly the humours or habits of these animals. At first the motions of the muther appeared to me as ridiculously absurd, or as if she was teaching: her enb to perform a summerset, or sumething nearly approaching it; but the cub evinced no interest, no participation in the sport, indeed moved off and lay down, apparently to sleep. The antics, too, of the mother were too distant from the cub to prove instruetive. I will endearour to convey my impression of the exhibition, as viewed through the teleseope at a distance of a quarter of a mile, as well as the object on which she appeared intent. It must first be bome in mind, that a bear of such dimensions as that before me would weigh abont six and a half or seven hundrentweight. The object apparently in view was to break a hole in the ice. In order to effect this the claws were first put in requisition, and as nimbly and gracefully as a dug did the huge ereature tear up and seatter snow and ice to the winds; having removed as she imagined sufficient, she then appeared to estimate her distance, ealculate on her leap, and in the effort came down perpendicularly on her fore-paws over the spot which she had scratehect. Something, she imagined, had been effected. She continued to repeat this scratehing and amusing mode of pomding until at length she appeared satisfied, when she assumed an attitude of 'dead point,' with fore-paw laised, and remained for some time immovable. The question oecurred to me, 'Is this a mode, by concussion and making a hole, of seducing a seal within gripe?' for I have repeatedly noticed that when we cut for tide-hole, fire-hole, \&c., that these iuquisitive animals will show themselves. This, however, 1 leave for others to verify:" After this, an msuceessful attempt was made to get within shot, but both mother and cub made their escape. Sir E. Belcher does not state whether he minutely examined the spot thus signalized, to ascertain if any injury lad been done to the ice; nerertheless, his observations have very great interest, and the correctness of his conjecture is placed almost beyond a doubt. The female bear, as we have just scen, is very carefnl over her cubs; these, if taken while still very young, may be suceessfully tamed. The fullowing incident, however, shows the neecssity of caution :-An English officer, while stationed at one of the more remote and lonely fortresses of Canada, amused limself by taming a young polar bear. He sueceeded in teaching the little cul to fetch and carry, and its behaviour was so unexceptionable that the animal was allowed to share his master's meals, and to follow at his heels when out for a walk. On returning to this country, the ursine pet aecompanied the officer on board slip, and soon aequired the mireserved contidence of the passengers and crew, and by his facetious anties afforded them much pleasure and diversion. In a very short time, as is frequently the habit with domesticated animals, he showal a particular liking for children of the female sex, and singled one ont as an espectial favourite; the little girl, who was a daughter of one of the lady passengers, reciprocated the hear's attentions, and the loving pair daily romped abont the deck with ecstatic delight. This fun, however, was after a time restined
to be suddenly elanged into sorrow, for on one occasion during their gambols, the animal, without giving any previons indication of his purpose, suddenly seized the young lady by the waist, and before the astonished crew and half-distracted parrent could do aught to arrest his progress he was half way up the rigging; neither did he rest till he had gained the maintop! Doubtless, many of our readers have heard of an elopement down, but, perhaps, never up a ladder of ropes! But the matter is too serious for a joke! What is to be done? The mother cries!-the child sereams!and the bear recommenecs its antics! A moment's delay may render all chance of eseape hopeless ! Alarm and consternation fill every breast! Shall the sailors ascend the rigging: and by mited force tear the frail eaptive from its arms? If the bear should at any moment relinquish its hold, the poor child must be dashed in pieces! Bravo!-a bright idea has struck the captain! See with what alacrity his orders are obeyed! Mattrasses and pillows are placed around the mast, in case the ehild should fall, while numerous limps of sugar are piled together on the deck! IInrrah! the saccharine dainty cannot be resisted! Down comes Bruin, carefully bringing the eaptive with him! Once more, hurral! ! Mother and bear are satisfied! The child is relcased-the sugar devoured! It is almost needless to add, that during the rest of the voyage, the animal was entirely deprived of lis sadly-abused liberty. In regard to the capture and destruction of full-grown polar bears in the wild state, early writers have always described such attempts as extremely dangerous; these accounts have probably been exaggerated, but there ean be no doubt that in recent times the danger has been materially lessened by the introduction of longer-ranged and more destructive fire-arms. The polar bear seldom quits the regions of eternal ice and snow; nevertheless he is sometimes observed drifting out to sea on floating icebergs ; by this means he makes excursions to very considerable distances, and has been observed ly Captain Seoresby upwards of two hundred miles from the shore. As many as a dozen have come over from West Greenland and landed on the coast of Iecland during a single winter season. Captain Parry, when passing through Barrow's Strait, encountered a polar bear swimming vigorously in the open sea, although at the time the animal was fully forty miles from any coast, and there were no traces of floatiug ice in any direction. Specimens oif this animal have always constituted an attraetive feature in our menageries, and, notwithstanding the unsuitable character of this climate, they seem to live pretty comfortably. A few years since one of the very fine specimens kept in the Zoologieal Gardens at Edinlurgh gave birth to a solitary cub, but it very soon perished.

## FAMILY II.—MUSTELID 天.

Not only are the weasels, properly so called, placed under this head, but also numerous genera, whose relations are so closely allied to the furegoing family that they are grouped ly some naturalists with the Ursidx, and by others with the present family. On this point
we purposely adherc to the Cuvierian arrangement, as far as eircumstances permit. The Mustelide, as we have retained the genus, are either semi-plantigrade or to a greater or less extent digitigrade-that is to say, they are supported on the tips of their toes during progression. The feet are five-toed or pentadactylous, the claws being fixed or non-retractile. They have elongated, slim, and cylindrieal bodies; it is on account of this long vermiform or worm-like character that the majurity of them are called vermin, though to the popular inind that term rather expresses the idea of certain noxious qualities, altogether independent of its etymological signification. The limbs of Mustclide are short. The heal is rounded and narrowed anteriorly, out that part of the skinll containing the brain is considerally extended; so that the space between the sockets and the posterior margin of the cranium, is much greater than that which obtains in the higher digitigrade Carnivora. The jaws support the usual complement of twelve incisors and four canines, whilst there are generally four or five molars on either side belonging to the upper series, and five or six similarly disposed in each division of the lower gromp. Four of these tecth are tuberculated-that is, one to each of the forr divisions of the grinding series above indicated. The condyles or articulating extremities of the rami of the lower jaw are broad transversely, and completely lodged in the corresponding socket called the glenoid eavity. The Mustelidæ, like the bears, have no blind or ceecal appendage to the intestine. They do not pass the winter in a state of hybernation. Their destructive and sanguinary propensities are well known; and members of the family are fonnd in all quarters of the globe. Musteline fussil remains nceur in the bone-eaves and osseous breceias of the tertiany period.
the Javanese teledu (Mydaus meliceps.s).Purposely commencing our weasels with this aberrant type, more particularly on aecount of its close relations to ecrtain ursine and insectivorous genera, we remark, in the first plaee, that the muzzle is prolonged in the form of a proboseis. The grinding teeth are eighteen in number, there being twelve spurious and six true ones. The laniary, cutting, or carmassial tooth-that is, the fourth or last premolar tooth, reckoning from before backwards-supports an aceessory central cusp. The head is hog-like; the ears being rudimentary, and surrounded by a tuft of long fur. The fur consists of delicate lairs, whieh are more or less blackish-brown throughout, except on the central line of the baek, on the top of the head, and at the end of the tail, which latter is only half an inch in length, not taking into consideration the long hairs projeeting beyond the skin. The body measures about fifteen inches. The limbs are short, thick, and semi-plantigrade, the compressel and rather straight claws being united at the base by a sheathing membrane. The teledu emits a most horrible odonr, as the author of this article can abundantly confirm, from having had a specimen placed in his lands fur dissection and preservation. The intolerable stench arises from the secretion of a peculiar matter by two oral glands situated at the posterior part of the body, and opening into the intestine near
the vent. The animal has the power of ejecting this secretion to a distance of about two feet. "The fetid matter itself is of a viscid nature ; its effects depend on its great volatility, and they spread through a great extent ; the entire neighbourhood of a village is infected by the odour of an irritated teledu, and in the immediate vicinity of the discharge it is so violent as in some persons to produce syncope." Dr. Horsfield gives the following admirable account of its habits and singular geographical distribution:-" 'The teledu is confined exclusively to those momtains which have an elevation of more than seren thonsand feet above the level of the ocean; on these it occurs with the same regularity as many plants. The long-cxtended smface of Java, abounding with conical points which exceed this elevation, afford many places favourable for its resort. On ascending these mountains, the traveller scarcely fails to meet will our animal, which, from its peculiarities, is universally known to the inhabitants of these elevated tracts; while to those of the plains, it is as strange as an animal from a forcign country. A traveller would inquire in vain for the teledu at Batavia, Scmarang, or Surabaya. In my visits to the mountainous districts, I uniformly met with it; and, as far as the infomation of the matives can be relied on, it is fomm on all the mountains.

Most of these mountaius and ridges furnish tracts of considerable extent fitted for the cultivation of wheat and other European grains.
'These grounds and plantations are laid out in the deep vegetable mould, where the teledu holds its range as the most ancient inhabitant of the soil. In its rambles in search of food, this animal frequently enters the plantations, and destroys the roots of young plants ; in this mamer it causes extensive injury, and on the Tengger Hills partieularly, where these plantations are more extensive than in other elevated tracts, its visits are much dreaded by the inlabitants. It burrows in the earth with its nose in the same manner as hogs, and in traversing the hills its nocturmal toils are observed in the morning in small ridges of mould recently turned up. The mydaus forms its dwelling at a slight depth beneath the surface, in the black mould, with considerable ingenuity. Having selected a spot, defonded above by the roots of a large tree, it constriets a cell or chamber of a globular form, having a diameter of several feet, the sides of which it makes perfectly smooth and regnlar; this it provides with a subterrancous eonduit or areme about six feet in length, the external entrance to which it conceals with twigs and dry leaves. During the day it remains concealed, like a badger in its hole ; at night it proceeds in seareh of its food, which consists of insects and their larve, and of worms of c very kind. It is particularly fond of the lumbrici, or earthworms, which abound in the fertile moulds. These animals, agrecably to the information of the natives, live in pairs, and the female produces two or three yomg at a birth. The motions of the mydaus are slow, and it is easily taken hy the natives, who by no means fear it. During my abode on the mountain Prahn, I engaged them to procure me individuals for preparation ; and, as they received a desirable reward, they brought them to me daily in greater
numbers than I could employ. Whenever the natives surprise them suddenly, they prepare them for food; the flosh is then scarcely impregnated with the offensive odour, and is described as rery delicate. The animals are gencrally in excellent condition, as their food abounds in the fertile moulds. The mydaus is not ferocious in its manners; and taken young, like the badger, it might be easily tamed. An individual which I liept some time in confinement affurded me an opportunity of obscrving its disposition ; it soon became gentle and reconciled to its situation, and did not at any time cmit the offensive fluid. I carried it with me from Mountain Prahu to l3lederan, a village on the declivity of that mountain where the temperature was more moderate. While a drawing was made, the animal was tied to a small stake ; it moved about quietly, burrowing the ground with its snout and fect, as if in searel of food, without taking notice of the bystanders, or making violent efforts to disengage itself. On earthworms being brought, it ate roraciously; holding one extremity of a worm with its claws, its teeth were employed in tearing the other. Having consumed about ten or twelve, it became drowsy, and making a small groove in the earth, in which it placed its snout, it composed itself deliberately, and was soon sound asleep."

THE NYENTEK (IIcliclis moschutus) is a rarer animal than the teledu, and more circumscribed in its geographical area of distribution. It is about sixteen inches in length, not including the tail, which measmes six inches more; this organ is bushy, terminating in long thick hairs. The head is small, gradnally narrowing into an obtusely-pointed muzzle. The jaws are furnished with twenty-two molars, the tuberculated pair above being small and widened transversely: The nostrils are notched at the side. The moustaches are few in number, long, and bristly. The ears are comparatively large; the eyes being rather prominent. The limbs are thin, terminating in five-toed plantigrade feet. The claws are shorter than those of the toledu, and are more strongly curved. This animal, say's Dr. IIorsficld, who described it as a species of Gulo, "is somewhat smaller than the English pole-cat. The form of its body, in comparison with other ghuttons, is rather slender; it is thickly eovered with fur, consisting of long hairs closely arranged, silky at the base, of a brown colour and somewhat glossy, with a slight tint of roddish-brown ; in certain lights it appears diversified, greyish, and tawny. 'This fur covers the greatest part of the body and head, and the whole of the tail and extremities ; the colour of these parts is consequently brown, with oceasional shades of rufous and tawny; the sides of the head, the noek, the throat, breast, and a broad spot on the top of the head, which passes, gradually decreasing in breadth, to the middle of the back, are white, with an obscure tint of isabella yellow of different degrees of intensity. This colonr also exists, less distinct, in a longitudinal band along the lowest part of the aldomen." Little or nothing is known of this animal's habits, which are thonght by Dr. Horsfield to be similar to those of the ratcl.

THE SKUNK (Mephitis amcricana), Plate 10, fig. 33. - Varions species of skunk have been described,
but most of them appear reforable to this species. The true slunks are confined to the American continent. Accepting Sir John Richardson's description, the skunk very closely resembles the wolverene. The body is stoutish, and stands low; the eyes being small, and the ears short and rounded. "A narrow white mesial line runs from the tip of the nose to the occiput, where it dilates into a broad white mark. It is again narrowed, and continues so until it passes the shoulders, when it forks, the branches running along the sides, and becoming much broader as they recede from each other. They approach posteriorly and unite on the rump, beenming at the same time narrower. In some few specimens the white stripes do not unite behind, but disappear on the flanks. The black dorsal space included by the stripes is egg-shaped, the narrow end of which is towards the shoulders. The sides of the head and all the under parts are black. The hair on the body is long. The tail is covered with very long hairs, and has generally two broad longitudinal white stripes above on a black ground. Sometimes the black and white colours of the tail are regularly mixed. Its under surface is black. The claws on the fore-fcet are very strong and loug, being fitted for digging, and very unlike those of the martens." The jaws are provided with eighteen molar teeth, the upper laniary grinder being remarkably large. Respecting the habits of the skunk, which has obtained such notoriety on accomnt of the nauseating smell emitted from the glands previously alluded to, the same distinguished naturalist writes:-"It exists in the rocky and woody parts of the country, but is still more frequent in the clumps of wood which sketch the sandy plains of Seskatchewan. I have not been able to ascertain the southern range of this variety of skunk [from IIudson's Bay]; and, judging from Kahn's description, there appears to be a different one in Canada. The skunk passes its winter in a hole, seldom stirring abroad, and then only for a short distance. It preys on mice, and in summer has been observed to feed much on frogs. It has a slow gait, and can be overtaken without difficulty, for it makes but a poor attempt to escape, putting its trust apparently in its power of discomfiling its pursuers by the discharge of a noisome fluid. This fluid, which is of a deep yellow colour, and is contained in a small lag placed at the root of the tail, emits one of the most powerful stenches in nature, and so durable that the spot where a skimk has been killed will retain the taint for many days. Mr. Graham says that he knew several Indians who lost their eyesight in consequence of inflammation produced ly this fluid having been thrown into them by the animal, which has the power of ejectiug it to a distance of upwards of four feet. I have known a dead skink thrown over the stockades of a trading port, which produced instant nausea in several women, in a house with closed doors upwards of a hundred yards distant. The odour had some resemblance to that of garlic, although much more disagrecable. One may, however, soon become familiarized with it; for, notwithstanding the disglist it produces at first, I have managed to skin a couple of reeent specimens by recurring to the task at intervals. When eare is taken not to soil the carease with any of
the strong smelling fluid, the meat is considered by the natives to be excellent food." These olsservations agree for the most part with those of Catesby, who says:-"When one of them is attacked by a dog, to appear formidable it so changes its usual form, by bristling up its hairs and contracting its length into a round form, that it makes a very terrible appearance. This menacing behavionr, however insufficient to deter its enemy, is seconded by a repulse far more prevailing; for from some seeret duct it emits such fetid efiluvia that the atmosphere, for a large space around, slall be so infected with it that men and other animals are impatient till they are quit of it. The stench is insupportable to some dogs, and necessitates them to let their game escape; others, by thrusting their noses into the earth, renew their attacks till they have killed it ; but rarely care to have more to do with such noisome game, which for four or five hours distracts them. The Indians, notwithstanding, esteem their flesh a dainty, of which I have eaten and found it well tasted. I have known them brought up young, made domestic, and prove tame and very active, without exercising that faculty which fear and self-preservation perhaps only prompt them to." Like its congeners, the skunk does not entirely confine itself to an animal diet, vegetable matters, especially fruit, being sought in the absence of small quadrupeds, frogs, and insects. The female produces from six to ten young at a birth. In the Catalogue of Mammalia preserved in the British Museum, this species is called by Dr. Gray Mephtitis varians.

THE GRISON (Galictis rittata).-The members of the genus Galictis originally established by Mr. Bell, are characterized by the possession of cighteen molar teeth: of which ten are spurious, four of them belonging to the upper series and six to the lower. The body is much elongated, terminating in sub-plantigrade pentadactylous feet, their palms and soles being naked. The tail is of moderate length. In the species under consideration "the colonrs are very remarkable, and the markings distinct and decided (fig. 23). The whole of the upper part of the head, the neck, the back, the flank, and the tail, are yellowish-light or brownish-grey, produced by the mixture of a dirty yellowish-white with brownish-black for about two-thirds of their length; the tip, dirty or yellomish-white. The muzzle, the cheeks, the throat, the under part of the neek, the belly, the anterior legs, and the hinder feet, are black, with a bromnish tinge lighter towards the back part, and on the belly interspersed with a few whitish hairs. The grey of the upper, and the black of the under parts, are separated by a rather broad fascia (or band), cxtending on each side from the centre of the forehend above the eye, hackwards as far as the shoulder, incholing the ears; this fascia is of a buff or yellowishwhite colour." Respecting its habits, Mr. Bell also records the following interesting particulars. In his "History of British Quadmpeds," he says:-" $\Lambda$ tame grison (Galictis rittatu) which I possessed for sereral years, was very fond of frogs, but these were not the only reptiles which were obnoxious to its voracity. On one occasion, in the winter, I had placed it in its cage, in a room with a fire, where I had also two young
alligators, which in gencral were stupidly tame. On going into the room in the morning, I found the grison at large, and one of the alligators dead, with a hole eaten under the fore-log, where the great nerves and bloodvessels were torn through ; and the other alligator began snapping furionsly at every one who attempted to aproach it." The same eminent naturalist clsewhere remarks that this grison "was as tame and
affeetionate as a dog; and she followed me," he adds, "wherever I went about the house, was extremely frolicsome and playful, and was delighted at boing caressed. She would throw herself on her back, and seize the hand that fondled her with all four of her paws and her month at the same moment, pressing it with her teeth, but never sufficioutly hard to eause the slightest degree of pain. She was extremely fond of

Fis. 23.


The Grison (Galictis vittata)
cggs, which she ate in a very singular manncr. On one being given her, she first played with it for some time, rumning backwards and at the same time pushing it under her belly with her fore-fect. At leugth she would fix one of her sharp canine tecth through the shell, and lick or suck as much of the contents as would flow through the orifice. Then, again inserting her tooth, a piece of the shell was broken out so as to enable her to insert her tongue ; and, finally, the egsshell was broken to pieces and each fragment carefully licked clean." The grison is an inhabitant of the northern regions of Brazil, the specimens hitherto seen in this country having been brought from Guiana and Paraguay. A brief, but very accurate description of a fine example captured by Mr. Edmonston at Demerara, is described by Dr. Traill in the third volume of the Wernerian Society's Transactions. It measured nearly three fect in length, including the tail which gave nine inches. In the list of Mustelidic preserved in the British Musenm, this species is deneminated Grissonia vittata.
allamand's GRISON (Gulictis Allamandi), appears to be a well-marked form. Mr. Bell has given a heautiful figure of it, accompanied with another of the above, in the second volume of the Transactions of the Zoological Society. According to his description, "this species. though evidently distinct from the former, exhibits the same gencral character of colour and marking, with some remarkable differences, however, which, though not easily expressed in a spceific phrase, are tangille and important. The whole of those parts
which in the former species are yellowish, are here perfectly white; and those which are blackish-brown in the former, are in this pure black. The basal portion of the hairs on the back, therefore, is black, and the apical quite white, forming a pure blackish-grey or black, with white points and lines, whilst all the under parts of the throat and part of the belly are black. The fascia extending from the forehend to the sides of the neek is also white. This fascia does not extend in the specimen described so far back as in the former species. The hairs of the whole body are very short in comparison, and much stitter and more closely set. The animal is considerably larger, and the tail, as far as can be ascertained from a stuffed specimen, short in proportion." As in the forcgoing, its labits eorrespond with those of the weasels generally.

THE ZORILLA (Zorilla striata). -Several forms described under the generic title of Zorilla, are probably merely varicties of one and the same species. Perhaps two or three of them may fairly be regarded as distinct. Their differentiation obtains chiefly in respect of colour and other superficial characters, which, howerer, are in too many instances the only distinctions the zoologist ean rely on, as he may have none other to gruide him. The zorilla, known to the colonists at the Cape of Good Hope by the name of muishond, possesses cightecn molar teeth, four being placed on either side above, and five correspondingly opposed on eaeh side below. The prepared skeleton exhibits five rertebral segments in the lumbar region of the spine, while there are no less than fiftecn pair of rils. The fur is of a
blaek colour generally; but there are four whitish bands, which, eommencing at the neck, pass in a backward direetion, gradually diverging from one another. This charaeter las suggested the specific name above given. There is also a white spot on the upper part of the head. The zorilla is not eonfined to the Cape of Mozambique, but is still found in Nubia, Abyssinia, and other parts of the Afriean continent. Its habits are similar to those of the skunk. It is also known under the title of Meplatis africana.

THE SABLE (Martes lcucopus.) -The varions members of the genus Martes, differ from the true weasels generally, by the possession of "an additional false molar above and below," whilst they liave also a small tubercle on the inner side of their seetorial tooth. 'Ihese two eharaeters tend to diminish the ferocity of their nature ; or, rather, they indieate by analogical and eorrelative evidence, that such a subearnivorons disposition exists in accordance with their modified dental arrangements. Their habits and general appearance entirely correspond with these structural peculiarities. They are pretty and attractive little animals, having large lushy tails. The martens lave larger ears than the weasels, and their habits are more arboreal, while the odour emitted by them is not offeusive. Much eontroversy has arisen as to the specific distinctions of various kinds of marten. Thus, loy some the sable, the pine marten, and the beech marten have been considered as mere varieties of a single speeies; that is to say, they are supposed to have originated from the same stoek, and that stock, in all probability, being represented by a single pair. This view, however, does not appear tenable, and after lengthened investigation, the more general opinion now reecived is, that they are different animals $a b$ origine. The sable is eelebrated for its beautiful fur, which is of a yellowish-brown colour, inclining to black. The throat is pale yellow; but it varies somewhat in different individuals. We have here placed the sable as a distinet species, in aecordanee with the opinion of some of our lighest authorities.

THE PINE MARTEN (Marles abictum)-Plate 10, fig. 34-if not specifically identieal, very closely resembles the foregoing. The fur is of a comparatively inferior quality; yet it is much superior to that of the beech or stone marten. It exists in northern Europe and North America, being also indigenous in our own eountry. According to Sir John Richardson's description, "the pine marten inhabits the woody districts in the northern parts of Ameriea, from the Atlantie to the Pacific, in great numbers, and has been observed to be particularly abundant where the trees have been killed by fire, but are still standing. It is very rare, as Hearne las remarked, in the distriet lying north of Churehill River and east of Great Slave Lake, known by the name of Chepewyan or Barren Lands. A similar district on the Asiatie side of Behring's Straits, twenty-five degrees of longitude in breadth, and inlabited by the Tchutski, is deseribed by Pemmant as equally unfrequented by the marten, and for the same reason-the want of trees. The limit of its northern range in America is, like that of the woods, about the sixty-eighth degree of latitude, and it is said to be
found as far south as New England. Partieular races of martens, distinguished by the fineness and dark colour of their fur, appear to inhabit certain rocky districts. The rocky and mountainous, but woody distriets of the Nipigon, on the north side of Lake Superior, has long leen noted for its black and valuable marten skins. The marten preys on mice, lares, and partridges, and in summer on small birds' eggss, \&e. A partridge's head with the feathers, is the best bait for the $\log$ trajs in which this animal is taken. It does not reject earrion, and often destroys the hoards of meat and fish laid up by the natives, when they have aecidentally left a creviee by which it ean enter. The marten, when its retreat is eut off, shows its teeth, sets up its lair, arcles its back, and makes a hissing noise, like a eat. It will seize a dug by the nose, ancl bite so hard, that unless the latter is accustomed to the combat, it suffers the little animal to eseape. It may ve easily tamed, and it soon acquires an attachment to its master ; but it never becomes ducile. Its flesh1 is oeeasionally eaten, though it is not prized by the Indians. The females are smaller than the males. They burrow in the ground, carry their young about six weeks, and bring forth from four to seven in a litter about the latter end of April." The darkcoloured furs are deemed the most valuable, and they are in the best condition during the winter sason. Respeeting the distinctions observable between this species and the beech marten, Mr. Bell observes, that "the most striking and obvious differences are those of colour ; but as these appear, in some eases at least, to be associated with certain slight diversities in size and proportion, and as the labits of the two animals also offer a trilling variation, there appears to be some, though far from satisfactory ground, for eonsiderints them as specifically distinet. The pine marten is so called from its supposed preference for the fruits of those trees, as the other is called by some the beceh marten, from a similar pretended prefurence for beech woods. There is, however, no ground for this appropriation of the two species to these different localities." The nest is made of moss, leaves, and other regetalle matters. A full-grown individual of the male sex measures about twenty inehes, the females being rather smaller.

THE BEECH MARTEN (Martcs foina), is also ealled the common marten, and by traders it is more usually designated the stone marten. Its fur is inferior to that of the preceding species, and it is sometimes passed off unfairly for the skin of the true sable. An experieneed cye, however: readily deteets the fraud, notieing the absence of lustre, softness, and other essential qualities. The beech marten is about eighteen inehes lons, not including the tail, whieh alone measures upwards of nine inches. The head is rounded and broad posteriorly, narrowing in front into an acute and slightly projecting muzzle. The ears are comparatively large, oval, and a little pointed. The body is thin, eylindrical, and rery mobile, terminating in a thiek bushy tail. The fur is for the most part brown, being darker in some parts than in others. It is deeper-colomred on the back, limbs, and tail. On the throat or muder part of the neck it is white. The beech marten is a
native of the British isles, as well as of Europe generally. It occurs abundantly in rocky mountainous districts, and is perhaps less strictly arboreal in its habits than the pine marten. Aecording to Mr. Bell, "the female makes her nest generally in a hollow tree, but not unfrequently in holes in rocks, sometimes in ruined buildings, or even in granaries and barns. It is formed of straw or grass. She has at least two litters in a ycarsome assert, four-and the number of young ones at each birth varies from two to seven, the usual number being four or five. The aspect and attitudes of the marten are perhaps more elegant than those of any other of our native quadrupeds. Endowed with great liveliness and activity, its movements are at onee rapid and gracile. Its limbs are clastic, and its body lithe and flexible, and it bounds and springs over the gromed with equal speed and grace. It is, however, wild and untameable to a great degree, if captured when full grown or after a very early age." The food of the beech marten, in common with its allied forms, consists of birds, squirrels, and other small quadrupeds.
the pekan (Martes Canadiensis) of the Canadians, is known by the title of the Fisher or fishing marten, and it has likewise several other names. It presents a more canine look about the face than the sable or other martens. The head is rounded posteriorly, contracting suddenly in front to terminate in a rather slarply-pointed muzzle. The ears are comparatively small. It is a stouter-built animal than the pine marten. The fore-limbs are remarkably strong and short, the claws of the feet being sharp and much curvel. As in the pine marten, the soles of the feet are completely enveloped in closely-set hairs, the several digits being connected together at their common base by a short, web-like expansion of the skin. The fur is rather coarse, and of a dark-brown colour, lighter at the fore part of the body, but almost black behind, as well as on the throat, belly, and limbs. White: spots are occasionally seen between the fore and hind legs. The fur has a strong musky odour, and its quality is inferior to that of the sable. Although less souglt after by the American fur-dealers, several thousand pekans are destroyed ammally for the sake of their skins. Sir John Richarlson states that it feeds principally on mice. He adds-"It lives in the woods, preferring damp places in the vicinity of water, in which respect it differs from the marten, which is generally found in the driest spots of the pine forests. The fisher is said to prey much on frogs in the summer season; but I have been informed that its favourite food is the Canada porcupine, which it kills by biting on the belly. It does not seek its food in the water, although, like the pine marten, it will foed on the hoards of frozen fishlaid up by the residents." The pekan is widely distributed over the upper half of the North Ameriean continent. The female produces from two to four young at a single litter.

THE POLECAT (ITustcla putorius) or foumart is a most ferocious creature (fig. 24). "Its appetite for slaughter, which seems never to be satiated as long as Fig. 24.

any living thing remains within its reach, rendering it a most ruinons neighbour to those who rear fowls or keep up a head of game. Not only the young birds fall vietims to it, but the parents also; nor are even geese or turkeys safe. We remember an instance of a hen and a whole brood of chickens being killed by one of these destroyers in a single night; and upon another oceasion, seven or eight nearly full-grown turkeys. The brain and the blood seem to be its choieest portions. The bodies of the dead are carried off to its haunts, which are generally in some copse or wood near a farm or in the heart of a preserve, whenee it issues on its deadly crrand in the evening, generally soon after sunset, or when it grows dusk. No vermin is placed with more satisfaction upon the kecper's tree; for none commits more havoe, if so much, among the game. Beginning with the egge, it persecutes all the game birds through every period of life, and is a far more determined enemy than the stoat itself to the hare and rabbit warren. The fox, as is well known, will do much to kecp down the pheasants, and espeeially the rabbits and hares; but even this wily and powerful invader is not so misehierous as the speceies of which we are treating. Where a fox will kill one, a polecat will immolate ten, to say nothing of egges. No vertebrated animal scems to come amiss to its murderous nature. Bewiek relates that during a severe storm, a fonmart was traced in the snow from the side of a rivnlet to its hole at some distance from it. As it was observed to have made frequent trips, and as other marks were to be seen in the snow which could not easily be accounted for, it was thought a matter worthy of great attention. Its hole was accordingly examined, and five fine eels were diseovered to be the fruit ot its nocturnal excursions. The marks in the snow were made by the motion of the eels in the quadruped's month. In Loudon's Magazine is an accoment of a polecat that was lhunted to her nest, which held five young ones in a comfortable bed of withered grass. From a side hole the narrator pieked out forty large frors and two toads alive, but capable of sprawling only; for the old polecat lad stricken them all with palsy by a bite throngh the brain of
each." Such is Mr. Ogilby's account of its depredations; and there are few of us who have resided in the country that cannot testify to its accuracy. The polecat is a larger and stouter-built animal than the marten. Its body rather exceeds two fect in length, not inchuding the tail, which measurcs only six inches. The head and neck are comparatively stout and thick. The fur is of a dark-brown colour, approaching black. There is, however, a considerable difficence of shade, depending upon the greater or less abnndance of short woolly hairs, having a pale brown colour. The lips and cheeks are more or less whitish. The odour given out by the polecat has a very disagreeable smell. It is produced by a fatty substance secreted by a gland sitnated beneath the tail. The fur, though of comparatively small value, is sold under the name of fitch; hence the term fitehet weasel, another name by which this animal is known. The female produces towards the close of the spring, or in early summer, a litter of five or six young. The nest is made either in a rabbit burrow or in some similar snng retreat, among stones and rocks covered over with long grass, tangled herbage, or low brushwood.
The common ferret is considered by most naturalists to be a mere domesticated variety of the polecat. It exhibits every shade of hue from that of a pale yellowish-white up to a dark fulvous brown, and it is most frequently somewhat variegated. Its habits are similar to those of the wild animal, and they will freely breed together. The ferret, however, can hardly be considered a tame creature, in the strict meaniug of the term ; for, as most of us have observed, its disposition is excecdingly capricious, and in handling ferrets, as every rat-catcher knows, a certain degree of boldness and caution are necessary. The following sad story, taken from Mr. Jesse's "Gleanings in Natural History," illustrates its truly carnivorous and sanguivorous propensities. "Some few years ago, a poor woman, holding a mangled infant in her arms, rushed screaming with agony and fright into my friend's house, who is a surgeon, imploring him to save the child's life, who, she said, had been almost killed by a ferret. The face, neek, and arms were dreadfully lacerated, the jugular vein had been opened, as also the temporal artery. The eyes were greatly injured, and indeed the clrild, who is still living, has lost the entire sight of one of them, and has very imperfect vision in the other. IIaving stopped the still bleeding vessels, my friend accompanied the mother to her cottage, on entering which the child, in some degree recovering from its state of apparent death, hegan to cry, when the ferret was in an instant seen rushing from behind some basins where he had taken shelter, and with his head erect, boldly came forward and met the infuriated parent in the midille of the room, still holding the infant in her arms. On my friend's kicking the ferret, as the first impulse of protection, the animal endearomred to seize his leg, and not until his (the ferret's) back was broken by repeated kicks, did he give over his carnest and reiterated attempts to renew his sangninary feast ; and indeed, whilst in the agonies of death, the piteous screams of the child seemed to rouse him to vain efforts to regain his prey.

The ferret was of large growth and much distended with the infant's blood; and though formerly of peenliar shyness, yet he lost sight of fear and became bold in the pursuit of the unfortunate infant. It appears the poor woman had left her child (about six months old) in a cradle, whilst she went to market, when it is supposed the infant's cry had arrested the attention of the ferret, who managed to make his escape, and thus effected his purpose. There is good reason to believe he must have passed more than half an hour in the indulgence of his appetite, from the circumstance of the neighbours having heard the piercing shrieks of the child a long time withont the slightest suspicion of the mother's absence." Finally, we have only to remark, that the method of employing ferrets for the capture of rablits, rats, and other vermin is too well known to require more than a passing allnsion. In the majority of cases it is advisable to use a muzzle ; otherwise the ferret is very apt, after having feasted on its prey, to lay up in the burrow, and disappoint the sportsman. This remark applies more particularly in the case of rabbit hunting.

THE ERMINE OR STOAT (Nustela crminea) is a much smaller species. The body is scarcely ten inches; long, exclusive of the tail; this organ is four and a half inches in length, slightly bushy towards the tip, the hairs of which are invariably black. In the summer the fur is rufous-brown on the back, and white underncath from the chin to the root of the tail. In the winter the entire fur becomes white, with the exception of the tail ; and this change is brought abont, not by an alteration of the colour of the summer hairs, as some have supposed, but by the development of new and white hairs in the autumn to supply the place of the falling coloured ones. It is this metamorphosis of the fur which renders the ermine so valuable in commerce. From the North of Europe and Siberia several hundred thousand skins are exported annually to varions parts of the world-a large proportion of them being transmitted to this country. Every one is familiar with the pure, white, glossy texture of crmine tippets, boas, and other robes, whose pure snow-white ground-work is beset and adomed with a regularlydisposed series of quincunxially-arranged tails, forming a striking contrast ly their rich jet-black colour. Such are the leading characteristics of the fur. With regard to this animal's habits, Mr. Bell observes that they vary "from those of the weasel, principally with relation to the difference of size. Although much more destructive than that animal to poultry and to game, the favourite object of its pursuit is the common rat and the water-vole, as that of the weasel is the different species of mice. Prevented from following the latter little pests into their runs, which are often not much larger than their own bodies, the staat leaves such small game to its little congener, and betakes itself to prey more suited to its own bilk. It occasionally attacks hares even half or two-thirds grown, pursuing them with the utmost pertinacity, and hunting them down by dint of its indefatigable perseverance. The Rev. F. W. Hope informs me, that on one occasion, when shooting in Shropshire, he heard at a short distance the shrill loud scream of a hare, which he
concluded was just eaught in a poacher's springe. On running towards the spot from whence the sound proceded, he saw a hare limping off greatly distressed, with something attached to the side of the throat, which a nearer approach showed to be a stoat. 'I'he hare made its way into the brushwood with its enemy still elinging on. It is a curious fact, that the hare, when pursmed by the stoat, does not betake itself to its natural means of escape-its fleetness of foot-which wonld in a few seconds carry it out of all danger from its little enemy, and which it always employs when eseaping from the clase of dogs or of the fox. On the contrary, it hops languidly along, evidently aware of the stoat's approach, yet as if incapable of exerting its powers to avoid the impending destruction. Whether this arises from a stupid indifference, or from not appreciating its danger, or, on the other hand, from intense terror, produeing an effect similar to that misealled fascination, which the small bright eye of the rattlesuake excites in its helpless vietims, it is perhapis difficult to decide. The stoat is eertainly one of the boldest animals of its size. It pursues its prey with the greatest intrepidity even into circumstanees of considerable danger, and, like the weasel, will follow it into the water. It will also cross the water for the purpose of besieging the haunts of the water-vole, Avicola amphilius, of which it destroys great numbers. In swimming it lifts the head and neek well out of the water, like a dog. It hunts its prey by scent." The ermine is comparatively searcer' than the weasel in England; but in Scotland, as Mr. Macgillivray remarks, "it is certainly of more frequent occurrence than that species; and for one weasel, I have seen at least five or six ermines. It frequents stony places and thickets, among which it finds a secure retreat, as its agility cnables it to outstrip even a dog in a short race, and the slimness of its body allows it to enter a very small aperture. Patches of furze in partieular afford it perfect security, and it sometimes takes possession of a rabbit's burrow. With regard to this little animal's boldness and fcrocity of disposition, we have not only the testimony of the gentlemen above named, but that of many others, including Sir John Richardson and Captain Lyon. The author of the section of this work at present under consideration, can also testify to its combativeness, having onee been improdent enough to attempt the eapture of a specimen withont any weapon. The little beast immediately fastenced itself on his armslecve, but was fortunately dislodged by a violent jerk before its teeth had done more than graze the skin. On faling to the ground it scampered off to the nearest heilgehank, and was soon out of sight. The ermine is usually eanght by very simple means, namely, by a trap in the form of a heavy stone or slah, which, being delicately supported by a thin stick baited with flesh, at the first or second niblle sudilenly falls and crushes the intronter. Sentimental individuals may be disposed to pity the poor little crmines, who are thus mereilessly destroyed to serve for the external adomment of the wealthy; but we beg to remind sneh persons that it were hetter, without warning, to perish like a stoat beneath the squash of a brickbat, than to sit romed a well-served table with a D.moclesian sword suspended over one's
head. In respect of geographical distribution, the ermine is not confined to the eastern hemisphere; for it is also formd abundant in North America. It is, however, not much sought after by the furriers of the Hudson's Bay Company, on account of the large supply imported into Britain from Russia and the north of Europe, which renders it too cheap for a profitable competition. In England the female is said to produce only four or five young at a single lirth; but, according to the Canadian aborigines, it produces in Ameriea ten or twelve at a litter. The nest is made of grass, leaves, and other regetable matters, and is placed in a rat-hole or other forsaken burrow.

THE WEASEL (Mustela vulyaris).-Having dwelt at considerable length on the charaeter aud habits of the stoat, which is so closely related to the present species, onv observations respecting the weasel will be neeessarily more restricted. It is a smaller animal, the body being about eifht and a quarter inehes in length, not including the tail, which would give us at least another two inches. The frn is of a reddisll-brown colour on the back, head, and tail ; lout underneath the belly and throat it is quite white. The limbs are short and hairy up to the extremities of the digits. As we have before remarked, its habits are very similar to those of the stoat; but, althongh generally regarded as a highly noxious animal under some cireumstances, would appear to be extremely uscful. Mr. Bell, with lis usual tact in defendirg the persecuted of animal kind, thus advocates its cause:-"It is not meant to be asserted that the weasel will not, when driven ly hunger, boldy attack the stock of the poultry yarel, or occasionally make free with a young rablit or a slecping partridge; but that its usmal prey is of a much more ignoble character, is proved by daily observation. Mice of every description, the field and the water-role, rats, moles, and small birds, are its ordinary food ; aml from the report of unprejudiced observers, it would appear that this pretty animal ought rather to be fostered as a destroyer of vermin, than extirpated as a noxious depredator. Abore all, it shonld not be molested in barns, ricks, or granaries, in which sitnations it is of great service in destroying the colonies of mice which infest them. Those only who have witnessed the multitndinons numbers in which these litite pests are found, in wheat ricks especially, and have seen the manner in which the interior is sometimes drilled, as it were, in every direction by their runs, can at all appreciate the amount of their clepredations; and surely the oceasional abduction of a chicken or a duckling, supposing it to be even much more frequently chargeable against the weasel than it really is, wouk be but a trilling set-off against the benefit produced by the destruction of those swarms of little thieres." Like other creatures preying upon animals, the weasel itself falls a prey to cuemies of superior strength; ancl instances have also heen recorded where its sharp bite has emabled it to ilestroy its more powerful persecutor. The flexibility of the body in such cases is shown to be of essential service. Mr. Bell gives the following story :-" $A$ s a gentleman of the mame of Pinder, then residing at Bloxworth in Dorsetshire, was riding over his gromnds, he saw at a short distance from lim a kite
pounce on some object on the ground, and rise with it in his talons. In a few moments, however, the kite began to show signs of great uneasiness, rising rapiclly in the air, or as quickly falling, and wheeling irregularly round, whilst it was evidently endeavouring to force some obnoxions thing from it with its feet. After a short but sharp contest, the kite fell suddenly to the earth, not far from where Mr. Pinder was intently watching the mancouvre. He instantly rode up to the spot, when a weasel ran away from the kite apparently muhurt, leaving the bird dead, with a hole eaten through the skin under the wing, and the large bloodvessels of the part torn through." Respecting the geographical distribution of the weascl, it has a range almost coextensive with that of the ermine. Even in this country the fur of the weasel has been observed to grow whitish on the approach of winter, while in the higher American latitudes it usually becomes as white as the crmine after the cold season has fairly set in. In these cases the tail retains its normal light reddishbrown colonr: In the spring the female produces either four or five young ones at a single birth.

THE VISON (Vison lutreola).-This species has been described under a variety of names, such as the vison-weasel, the mink, the minx-otter, and the jackash. It is a very common animal throughout Canada and the United States, as far sonth as Carolina. The body is nearly a foot and a half in length, exclusive of the tail, which would add seven or eight inches more. The head is small, terminating anteriorly in a short, flat, and abrupt muzzle. The ears are small and oral, the eyes being placed well forward. The cheeks are furnished with very strong, short, brown-coloured whiskers. The jaws are provided with thirty-four teeth, of which there are eighteen molars, four on either side above, and five correspondingly opposed below. The limbs are short, the toes being connected together by a membrane and entirely covered with hair; the claws are almost straight, and project very slightly. The fur is of a rich chocolate brown colomr, paler on the head and underneath the body, but approaching to black on the back towards the tail. Near the root of this latter organ there are to be found the usual pair of anal glands, which give out a lighlly fetid secretion. Iespecting its habits, Sir John Richardson remarks that "the vison passes much of its time in the water, and when pursued seeks shelter in that element in preference to endeavouring to escape to land, on which it travels slowly. It swims and dives well, and can remain a considerable time under water. Its short fur furming a smooth glossy coat, its tail exactly like that of an otter, and the shortness of its legs, denote its aquatic habits. It preys upon small fish, fish-spawn, fresh-water mussels, \&ec., in the summer; but in the winter, when its watery hamits are frozen over, it will hunt mice on land, or travel to a considerable distance through the snow in searcl of a rapil or fall, where there is still some open water." The same authority further observes that the vison "is not rery timid when in the water, and will approach near to a canoe out of curiosity, diving, lowever, instantly on perceiving the flash of a gun, or any movement from whence it appreliends duger. It is easily tamed, and is capable of strong
attachment. In a domestic state it is ouserved to sleep much in the day, and to be fond of warmth. One which I saw in the possession of a Canadian woman, passed the day in her pocket, looking out occasionally when its attention was roused by any unusual noise. Like a cat, a tame vison is easily offented, and will, on a sudden provocation, bite those who are most kind to it." The female produces from four to seven young at, a birth. The fur is not much ralued by traders, nevertheless it appears to be of good quality, being soft, fine, and downy; the principal defect is, that it is very short.
THE OTTER (Lutra rulgaris), Plate 10, fig. 35.The genus of which this well-known animal forms a type is partly characterized by the possession of thirtysix teeth, and of these there are twenty molars, the sectorial or laniary grinder of the upper series being enormonsly developed, white the corresponding carnassials of the lower jaw are tuberculated at the posterior half; there are, in all, six true molars-one on either side of the npper jaw, and two to each divisional serics below. In all the members of the genus the body is much lengthened, and in the species under consideration it is upwards of two feet long, exclusive of the tail, which would add nearly a foot and a half more. A full-sized otter will weigh about twenty-four pounds, but the naturalist Pemmant has recorded one captured in the river Lea which weighed as much as forty pounds. The head of the common otter is broad and compact, and it terminates anteriorly in an abrupt wide muzzle, the upper lip being particularly thick and overlapping the lower. The ears are small, short, rounded, and widely separated; the eyes are remarkably prominent and placed far forward, abont an inch from the tip of the nose. The limbs are short, and end in palmated pentadactylous feet, the several digits being connected together by a strong thick membrane, and they are also armed at the tip with short, non-retractile, bunt slightly elevated claws. The tail is flattened from above downwards, being immensely strong and broad at the root, in which latter situation, below, there occur the two usual anal glands similar to those described in other musteline genera. The fur is made up of two qualities of hair; the one lind is soft, fine, short, compact, of a whitish colour, save at the tips, where it is brown; the other is long, course, stifl, smooth, and somewlat darker externally at the point. This combination, therefore, is such that, while offering little or no resistance to the water during the forward progress of the animal, it, at the same time, preserves the body from sudden changes of temperature. In every part of the amimal the muscular system is very highly developed, and to those who, like ourselves, affect to see much that is attractive even in the so-called dry details of myological anatemy, we could not point out a more beautiful display of muscles than such as may be witnessed by a careful dissection of the neek of the common otter. In point of fact, this creathre is exquisitely organized both for rapidity of motion through the lambent waters of a rolling stream, and for overtaking and seizing the swiftest of its finny prey. The spindle-shaped body, elastic to a high degree, and bounded by harmonious curres-the projecting eye-
balls-the smooth, close, glossy fur-the broad rudderforming tail-and the short, web-footed, fin-like limbs, -all combine to show its singular adaptiveness to the fluviatilc and lacustrine haunts, where in ceaselcss activity it despoils the waters of their abounding piscine treasures! Noiselessly it glides through the liquid medium, rivalling, surpassing, and overcoming the fimny tribes; and one by one the latter fall victims to his trenclant grasp! In succession each captive is hurried to the bank, forthwith torn asmoler, and the head severed in a moment's time! All this is common testimony which none will dispute. The common otter is, indeed, extremely voracious, and will destroy an incredible quantity of fish; for, when the latter are abundant, he has no sooner detached and devomed the head, and it may be a small adlitional portion of the body, than ofl lie starts again, as if for the mere pleasme of the chasc. Speaking of this animal's habits, Mr. Bell also observes that " the otter avails itself of any convenicnt excaration, particnlarly of the hollows beneath the ovcrhanging roots of trees which grow on the banks of rivers, or any other sceure and concealed hole near its fishing liament though in some cases it fixes its retreat at some distance from the water, and, when driven by a scanty supply of fish, it has been known to resort far inland to the neighbourhood of the farmyard, and attack lambs, sucking-pigs, and poultry-thus assuming for a time the labists of its more terrestrial congeners. It is asserted by some that the otter confines its haunts to the rivers and lakes, never descending to the sca. This, however, is a mistake. In the northern parts of Scotland they certainly frequent the sea, and cxtend their rambles to a considerable distance from the shore ; and Mr. Couch of Polperro, states that "in the summer, and when the weather will permit, it occupies a retired and quict station where the land stretches into the ocean. It swims low in the watcr, and will go a mile or more after its prey. The ncighbourhood of a popnlous harbour is a frequent station. Fishes," contimes Mr. Couch, "seem to have an instinctive dread of the otter; for I am eredibly informed that it has been seen to collect into a shoal a vast number of trouts in a river, and to drive them before until the greater part have thrown themselves on shore." The otter has likewise its enemies. In former times the sport of otter lumting was muel songlit after in this country, as indeed it probably would also be at the present day, if those animals were only more abundant. In certain parts of Scotland, Wales, and Ireland, otters are still tolcrably numerous; but if they were allowed to increasc without any check, the more delicate sport of the fly-fisher would be serionsly compromised. One of the most interesting facts connected with this persceuted animal is, that with eare it may, when taken young, be completely domesticated, and not only become an agrecable companion, but even lend a hand to its master, should he lie a fisherman in the ordinary sense of the term. In Swerlen, the employment of this animal in the capture of fisl appears to be no uncommon ciremmstance ; and an instance has been recorded of an otter which captured eight or ten salmon in a single day. According to Mr. Bell, the following is a method of training recommended:-"Ithey should be procured as young
as possible, and they are at first fed with small fish and water. 'Ilien bread and milk is to be alternated with the fisl, and the proportion of the former gradually increased till they are led to live entirely on bread and milk. They are then taught to fetch and earry, cxactly as dogs are trained to the same triek; and when they are brought to do this with ease and docility, a leather fish stufferd with wool is employed for the purpose. They are afterwards exercised with a dead fish, and chastiscd if they disobcy or attempt to tear it; and finally, they are sent into the water after living ones. In this way, although the process is somewhat tedious, it is believed that the ottcr may be certainly domesticated, and rendered subservient to our usc." Independent, moreover, of their value as purveyors of fish, sevcral accounts go to prove that, in the tame state, they become tractable, docile, and cenen amusing creatures. In the early spring of the year the female produces from three to five young at a birth. The flesh has a coarse fishy flavour, and is not considered good cating.
THE AMERICAN OTTER (Lutra americana) is a muel larger species than the above. The borly is three fect and a laalf in length, cxclusive of the tail, for which we must reckon other cighteen inches. The fur is of a rich brown colour, not only on the back, bnt also underneath the belly; ditfering in this latter particular from the European species, which is lighter below. According to Hearnc, the fur is nearly black in the summer, but in the winter it assumes the characteristic chocolate brown, a greyish spot being placed under the chin. This form of otter is widely distributed throughout the North American continent. Sir John Riclardson states that it closely resembles the common otter in its habits and foorl. "In the winter season it frequents rapids and falls, to lave the advantage of open water; and when its usnal haunts are frozen over, it will travel to a great distance through the snow in scarch of a rapid that has resisted the severity of the weather. If secn and pursued by humters on these journeys, it will throw itsclf forward on its belly, and slide through the snow for several yards, laving a deep furrow behind it. This movement is repeated with so much rapidity, that cven a swift rmmer on snow shoes has much trouble in overtaking it. It also doubles on its track with much cumning, and dives under the snow to clude its pursuers. When closely pressed, it will turn and defend itself with great ohstinacy. In the spring of 1826 , at Great Bear Lakc, the otters frequently robbed our nets, which were set under the ice, at a distance of a few yards from a picee of open water. They generally carricd off the heads of the fish, and left the bodies stieking in the uct." This last-named lahit strikingly accords with what we have abore remarked in regard to the common species, and it cxplains the extraordinary amount of destruction whieh these animals are known to create among fishes. The female American otter produces from one to three young at a single birth. The fur is of an excellent textme and quality, but its valne is deteriorated by the circumstance of its being rather short; nevertheless, several thousand skins are aumually imported into this country. In the list of Mustelida contained in the

British Museum, this speeies is denominated Lataxina mollis.

The Brazilian otter (Lutra Braziliensis) is, in point of mere size, very similar to the foregoing; the female examples, however, proeured by the naturalist D'Azara, did not exceed four feet in length, including the tail, which measured twelve inches in the largest specimen. The fur has a fulvous yellow colour, generally, approaching to a chestnut lue on the limbs and tail. According to D'Azara, as quoted by Mr. Ogilby, this "species lives in troops, which sometimes, rising to the surface of the water, lift their heads and bark like dogs, with a hoarse voice in a menacing and snapping manner, without, however, injuring voyagers or swimmers. Each family scems to possess a separate domain. It spends nearly as much time upon the water as it does upon the land, where it devours the fish which it has taken, and rears its young in holes which it excavates in the banks. The same author was informed by the Payaguas Indians, who sail continually up and down the river, and are better acquainted with this animal than others, that the female brings forth two at a birth, covered with hair, and that many females bring forth and rear their young at the same time and in the same place-their usual resort throughout the year. The motions of this otter are generally slow, and it drags, as it ware, its belly and muzzle along the ground; when it runs, it is not at all swift." By the Portuguese colonists of South America, the Brazilian otter is calleel Loto de Rio, or River-wolf. In the British Museum Catalogue, it is termed the 'Lutra.'
the Javanese OTter (Aomyx Leptomyx) is also known by the names of the simung and the wergul. It is a small species comparatively, the body measuring vcry little more than two feet, exclusive of the tail, which is about half that length. The character and texture of the fur is very similar to that of our common European species, but the brown colour has a much less rich tint, approaching more to a tawny aspect ; the lower part of the face, throat, ncek, and breast, being of a light dusky yellow. The whiskers are strongly developed in a double series on either side, one set of bristly hairs arising immediately below the nose, and the other from the posterior region of the chcek. Dr. Horsfield states that "the Javanese otter agrees in its manners with the common otter. It inhabits the banks of rivers, and lives on fishes. Its disposition, when found at large, is extremely ferocious; if attacked, it defends itself with courage. It is with great difficulty taken in its adult state; but, if obtained when young, it is mild and tractable. In this state it is occasionally seen in dwellings, but I never observed it to continue long in confinement. The natives distinguish two varieties of the Javanese otter, to one of which the name of wergul, to the other that of welingsang, is applied. The former is of a grey colour, and is said to be solitary, while the latter lives gregariously ; but these statements require confirmation." The species under consideration is found in parts of the Iudian Peninsula, Sumatra, Java, their adjacent isles, and the Continent of Siam. Its roicc is said to bear some resemblance to that of a person crying. The female exhibits much solicitude and affection for her offspring.

THE SEA OTTER (Enhydra marina), or kalan of the Kamtschatkadales, is a very remarkable animal, approximating elosely to the pimigrade seals in its habits and haunts. The length of the body is rather more than three feet, exclusive of the tail, which gives an additional seven or eight inches in a full-grown speeimen. The head is rounded posteriorly, the outline, in a profile view, seen passing insensibly, as it were, into that of the strong, thick, muscular neck. The ears are remarkably small, and placed on a muel lower level than the eyes. The whiskers are strongly developed. The limbs are short, more especially the anterior pair, and the hinder feet are comparatively more bulky than the fore ones, being also situated very far back. The tocs are covered with hair, almost eoncealing the claws, and the outermost digit of the posterior fect is longer than any of the others. The fur varies in colour at different seasons of the year, and likewise according to the animal's age. Ordinarily, it is of a deep, sooty brown, or sometimes of a rich jetblack colour; but in young specimens it is lighter. There are two kinds of hair as usual; the longer are whitisl, and overlap the more numerous soft, downy hairs, which lic partly concealed beneath. The fur lias a beautiful, glossy, velvety texture; and, according to Captain Cook's account, is softer and fincr than that of any other species. In early times, the skins appear to have fetched an extraordinary price; for Pallas states that single skins were sold at Kiachta, by the Russian furriers, at the rate of one hundred roubles-a sum of moncy equivalent to twenty pounds sterling. Even now, the sea otter's fur is highly prized, especially as its numbers have been so considerably reduced by the competition of Russian, Anglo-Indian, and American traders. This animal was formerly abmendant on the islands skirting the north-eastern shores of Asia, Kamtschatka, the Kurile, and the Aleutian isles, but it is now almost limited to the western coasts of North America, extending as far south as California. The fur is purchased principally by the inhabitants of China and Japan. In a morphological point of view, the sea otter may be looked upon as an intermediate form between the fresl-water otters and the true maritime seals; and we also find that in its capacity for capturing fish, it appears to combine the special facilitics of either species. It is essentially a marine animal, living very constantly in the open sea, and only frequenting the rocks for repose, and for the occasional purpose of rearing its young. The Russian traveller, Yon Kotzebue, has given the following interesting account of the habits and mode of hunting the sea otter:-"They are often seen on the surface of the water, many milcs from land, lying asleep on their backs, with their young, of which two are produced at a birth, resting upon them and sucking. The young cannot swim until they are several months old; but the mother, when she goes out to sea in search of food, carries them on her back, and brings them home to her hole in the rocks when she has duly satisfied her hunger. If seen by the lunters during these excursions, the female falls a sure prey to them; for she never forsales her offspring howerer much they embarrass her swimming, but, in common with the male, defends them
courageously against every attack. The lungs are so constructed that they cannot subsist for more than a fcw minutes under water, but are neeessitated to reascend to the surface for breath. These opportunitics are seized by the hunters, who would seldom suceeed if the otter could remain long under water, whecre it swims with great rapidity and skill. The hunters row in the little Alcutian baidars or boats round the coast, and for some miles out to sea, being provided with bows, arrows, and short javelins, which they diselarge as soon as they observe an otter. The animal is seldom struck at first; it immediately dives, and as it swims very rapidly, the skill of the hunter is displayed in giving the canoc the same dircetion as that taken by the animal. As soon as the otter reappears on the water, it is once more fired at, when down it dives again; and the pursuit is thus continued until the creature beeomes so weary that it is at length easily struck. Sometimes the otters succeed in tearing out with their teeth the arrows which have wounded them, and often, especially if their young are with them, boldly rush upon the canoes, and attaek their perseentors-employing for this purpose their powerful tecth and claws. These conflicts, however, uniformly terminate in the defeat and death of the otter. The hunt is safer when the canoes are numerous, but, with experieneed hunters, two boats are suffieient."

## Family III.-VIVERRID RE.

This family cmbraces a large section of the Carnivora, but the interest attaeling to them being probably less than that accorded to any other subdivision of the Mammalia, we shall consequently devote a smaller space to their consideration. By many naturalists the hyenas are included in this group; yet, as they are clearly osculant between the civets and the cats, it is our intention to consider them as a separate family. The civets, properly so called, have usually forty teeth, their dental formula displaying the ordinary number of incisors and canines seen in the typieal Carnivora, but almost invariably presenting twenty-four molars-that is to say, six above and below on either side; and of these, the anterior sixteen are spurions, while, of the remaining eight, six only are tubereulated-a pair of the inferior true molars being earnassial in their character. The tongue is furnished with numerous sharp, rongh, horny papille, which are directed backwards. The feet are more or less digitigrade, being generally pentadactylous, but in some cases tetradactylous--the claws boiug slightly raised during progression. Selaceous glandular follicles exist in the anal region, eapable of seereting a more or less disagreeable fortid matter. The various kinds of viverrine carnivors are widely distributed over the eastern hemisphere. A solitary speeies of civet, with long hair, large ears, and a small pointed head, is known to inhal)it Mexico. The naturalist Lichtenstein has described and figured it under the combined generie and speeific title of Bassaris astuta.

THE GALET (Cryptoprocta ferox). -This creature is about the size of our common stoat. 'The body is very slcuder, terminating posteriorly in a long lairy
tail, having throughout an almost uniform thickness. The head is narrow ; the muzzle being short, with the nostrils decply notelied laterally. The mouth and eyes are comparatively small, more particularly the former. The ears are remarkably large, conspicuous, and hairy; they lave an oval ontline, the margin being folded upon itself posteriorly; the internal surface is also marked by simnosities. The whiskers are numerons and strongly developed. The limbs are stoutish, and of moderate length, the antenior pair being rather shorter than the hind ones. The feet are plantigrade and pentadactylous, the soles being maked, and the digits furnished with compressel, retractile, inenred claws; those of the anterior feet being more sharply pointed than the posterior series. The galet is a mative of the island of Madagasear. Althongh plantigrade in its walk, most of the charaeters above recorled, as well as those of the dentition, serve to indieate a close alliance with the more highly carnivorous cats and dogs. It is to Mr. Bemett that naturalists are indebted for having early described this species in the first volume of the Zoological Society's 'Transactions.
THE DELUNDUNG (Prionadon gracilis) comes so near to the cats in certain particulars, that Dr. Horsfield originally described it as a species of Felis in his valuable "Zoological Researches in Java." It was discovered by him in the distriet of Blambangan at the eastern extremity of the island in the year 1806. The lengtl of the body is about fifteen and a half inehes, not ineluding the tail, which would give us rather more than another foot. A glanee at the exeellent figure presented in the work above quoted, is sufficient to prove its distinetiveness as a separate species-the body being singularly elongated, vermiform, and rather slimly built. The tail is also rery long, cylindrical, and particularly thick at the base, the outline of the rump being prolonged, as it were, into that of the cxtended eaudal development. The head is tapering, and sharply pointed in front. The nose is elongated, naked, and fumished with laterally-plaeed nostrils. The jaws are provided with thirty-cight tecth. of which there are twenty-two molars, five on cither side above, and six correspondingly opposed in each series below. The eyes are placed far forward, and have a circular pupil. The ears are rather small, short, rounded, and somewhat irregular at the margin. Long whiskers proceed from the upper lip, projecting backwards beyond the head; others also rise from the angles of the month, and from the interspaces between the eyes and ears. The feet are five-toed and digitigrade, being clothed with hair above and below. The digits are provided with minute, sharply-pintel, retractile claws. The delmong is an attractive and elegant speeies. "On a ground of palc, yellowishwhite, which covers the throat, breast, belly, sides, and part of the back and tail, the distinguishing marks of a deep brown colow, inclining to blaek, are arranged in the following manner:-Four transverse bands, gradually inereasing in breadth, corer the baek at intervals hetween the limbs. On the rump are two narrow bands; two longitudinal stripes take their origin, one between the ears, the other near the posterior angle of the cye on each side, and pass, with
interruptions at the transverse bands, to the thighs, when they are eontinued by numerous large spots whieh cover these parts. From the shoulders and thighs, several obscure stripes pass to the feet, which have a dusky-grey colour. Between the origin of the longitudinal stripes of the body, and the transverse bands of the back, two smaller stripes are plaeed, which unite on the lower part of the neek from the opposite sides." Little or nothing is known of the habits of the Delungdung beyond such as may be legitimately inferred from its earnivorous strueture, and from the circumstanee of its being usually found in extensive forests.

THE MEERRAT (Cynictis Stcedmannii).-Mr. Ogilby first aecurately described this species in the Zoological Society's Transactions. It is an inhabitant of the district of Uytenhaye on the borders of Kaffraria. The term meerkat is applied by the South Afriean colonists to signify almost any kind of small quadruped having burrowing habits. The body of the meerkat is about a foot and a lalf in length, exclusive of the tail which would give another twelve inches. The jaws are furnished with thirty-eight teeth, of which twenty-two are molars, twelve above and ten below; the last two on either side of the upper series, as well as one correspondingly opposed on each side below, being tuberculated. The limbs are slender and comparatively long. The feet are completely digitigrade, and provided with claws adapted to grubbing up the soil. The fore-feet are five-toed; but the hindfeet are tetradaetylous. The fur has a bright reddish or chestnut tinge generally, being deeper coloured on the back. The tail is bushy like that of a fox, and shaded with dark-brown lairs, execpl at the tip, where it is of a uniform dull white. The texture of the fur is smooth, close, and fine. This animal appears to be tolerably abundant in the locality above mentioned, as several travellers have been careful to notice its occurrence. At a time when the meerkats were perhaps totally unknown to Europeans, the African traveller, Barrow, records the following little incident:-"An eagle," he says, " making a stoop at one of these, close to where we were passing, missed his prey, and both fell a sacrifice, one to the gun, the other to the dogs."

THE EGYPTIAN ICHNEUMON (Herpestes Ichneu-mon)-Plate 9, fig. 32. The varions members of the genus Herpestes, are, amongst other things, characterized by the possession of forty teeth, of which twenty-four belong to the molar series, the last two on either side above, and the ultimate tooth of cach corresponding group below, being tuberculated. The hear is furnished with short and rounded ears, and the circumferential osseous ring of the orbital space is in most cases complete. The limbs are short, the fect being pentadactylous and ammed with huge, eompressed, incurved, and slightly retraetile claws. The oval glandular pouelt is remarkally eapacious. The fur consists of long, rigid hairs, more or less amulated with alternating slades of dark and light tints. The Egyptian ichnemmon is the best known of all the species, and is celebrated by Herodotus, Aristotle, and many other ancient writers. All sorts of fabulous stories, mixed with a certain degree of truth, have

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been told respecting it; but the sober seience of modern times very properly rejects such silly reeords as totally unworthy of belief. By European residents in Egypt the iclneumon is known by the name of Pharaoh's rat ; but the native Arabs call it nems or nims. The traveller Sonnini, whose observations on this animal were made towards the close of the eighteenth eentury, was one of the first to give an accurate aecount of these ereatures. Speaking of their habits he says that "they feed upon rats, birds, and reptiles. They ramble about the habitations of men; they even steal into them in order to surprise the poultry and devour their eggs. It is this natural fondness for egrs that prompts them frequently to seratch up the sand with the intention of discovering those that the crocodiles deposit there, and it is in this manner that they prevent, in reality, the exeessive propagation of these detestable animals." The Egyptian ielneumon is readily domesticated, and specimens of it are always to be seen in living collections in this eountry. The fur has a peculiar dark tawny-grey aspect, resulting from the circumstance that the iudividual lairs are coloured with alternating rings of chestnut-brown and yellow. The muzzle and feet have a leep, reddishbrown tinge. The tail is long, thick, and bushy at the root. A full-grown ichueumon is about the size of an ordinary cat. When mueh excited it is said to growl and even bark.

THE MOONGUS (Herpestes griseus).-This animal is also known as the Indian ichneumon in contradistinction to the above-described species; but as there are several other allied forms inhabiting the great Asiatic peninsula and the adjacent islands, it is better to retain the more distinetive appellation here given. The moongus is celebrated for attacking venomous serpents, and it is said to have recourse to the plant called Hampadder-tanah or Mungo-root (Ophorhiza mungos) as an antidote to their renom. The plant is still employed as an antidote by the natives; but we do not place much faith in the above-mentioned statement, which was originally recorded and concocted by Rumphius. This animal's astonishing power of destroying vermin, however, has been satisfactorily demonstrated in our own country. Mr. Bennett, in his account of a specimen kept in the tower of London, relates that the beast actually destroyed, on one oecasion, no fewer than a dozen full-grown rats which were loosed to it in a room sixteen feet square, accomplishing the slaughter in a minute and a half! The moongus may be readily tamed and taught to accompany its master anywhere, both in and out of doors.
the garangan (Herpestes Javanicus) is a native of Java, and is especially abundant in the large teak forests of that island. Like the last-described species, it is exceedingly destructive to serpents, which it attacks with great fury. Rats appear to be its favourite food; but it is also terribly destructive to chiekens. In pursuing its prey it exercises much cunning and ingenuity. It is very casily domesticated; but its propensities for poultry deter the Javanese from showing it much regard. Moreover, it is said to be of a capricious disposition, occasionally indulging in fits of anger and violenee. The fur of the garangan or

Javanese ichneumon, as it is sometimes called, is ratlier darker than that of the moongus and its allies.
THE RATLAMUCHI (Herpestes buclius) inlabits the Cape of Good Hope and neighbouring parts of southern Africa. According to Dr. J. E. Gray, the fur is of a "red bay, the hairs being of a uniform colvur, execp,t a few just over the shoulder nape, which have a black sub-apical ring." The ratlammelii, in common with its congeners, is very shy in the wild state, so that only very feeble glimpses can be obtained of it while it hurrically escapes from one wood to another. There is every reason to believe that it feeds upon rats, mice, snakes, and lizards; but the stomachs of those examples obtained by Dr. Smith, who originally deseribed the species, contianed the remains of insects only. In the catalogne of Mammalia preserved in the British Muscum, this species is denominated Smith's ichneumon or Herpestes Smithii.

THE SURICATE OR ZENIC (Rhyzena tetradactyla) is also a mative of southern Africa, and is rather smaller than the Indian moongns, being about four feet long, incheding the tail, which is rather more than half the length of the borly. The suricate possesses thirty-six teeth, twenty being molars, of which the anterior twelve are spmions. The fonr true grimers of the upper series and the two ultimate ones below are tuberenlated. The orbital cavity is surrounded by a complete osseous ring. The ears are small, the muzzle much prodnced, the tongue being furnished with horny papille. The limbs are comparatively long, terminating in tetradactylous feet, whose digits are armed with strongly-developed, compressed, incurved claws. The tail is slender and pointed, and the anal region is supplied with the usual pair of glandular follicles. The fur of the zenic very closely resembles that of the ichneumon in respect of its
ammlations and peculiar tinting. The colour is a mixture of yellow, white, brown, and black. The iuncr sides of the legs are yellowish-brown, and the hairs on the back are also darker, while the tail is marked with blackish tufts, especially at the tip. The labits of the suricate are similar to those of its congeners, fecding, as it does, upon rats, micc, \&c. It is also reported to be exccedingly destructive to cockroaches.

THE MANGUE (Crossarchus obscurus). -This animal was first described by M. Friedrick Cuvier. It is an inhabitant of the district of Sierra Leone, on the west coast of Africa. In respect of size and general appearance it resembles the suricate. The head is more rounded posteriorly than in the ichneumons; but the bony orbital ring is incomplete behind. 'Ihe muzzle is very much prodnced or proboscidifurm ; and the jaws are furnished with twenty molars, the laniaries or carnassials being surmounted with acute conical tubercles. The ears are small, round, and bilobulated. The central papillse of the tongue are horny. The feet are plantigrade and pentadactylous, while the tail is flattenerl, of moderate lengtlr, but considerably thicker than that of the suricate. In the anal region there is a solitary glandular ponch. 'The body is only sixtecn inches in length, not including the tail, which measures some eight inches. The fur presents a tolerably uniform brownish colour, except on the sides of the head, where it is much paler. The mangue feeds on small quadrupeds, insects, and fruits; and in the domesticated state it is a cleanly ducile creature.

THE POUGONNE (Paradoxurus typus).-As this animal, in common with several of its allies, is called the musang, we purposely retain the subjoined distinctive title. The term laradoxure, by which it is

Fig. 27.


The Pougume (Paradoxurns typus).
likewise well known, is also applicable to other species of the same genus ; while to employ the name of palmmarten given to it lyy the French, would involve the sarne uncertainty, being open to precisely similar oldections. The Pongonne (fig. 27), is a native of India, and is quite distinct from the genets, with which,
however, it has been frequently confounded. 'L'he hoad exhibits a thoroughly canine aspect, and the muzzle is much pointed. 'The jaws are supplied with forty teeth, twenty-fonr of them being molars. The pupil of the eye is slit longitudinally, the cars being rather large and rounded. The body is stoutish, and
provided with short limbs, the feet being semi-palmate, plantigrade, and pentadactylous. The claws are slightly retractile. The odoriferous secreting ponch is represented by a superficial grandular space, placed a little below the anal opening. The tail is as long as the body, cylindrical, slightly flattened from above downwards, and non-prehensile; in the example described by F. Cuvier it was found spirally folded upon itself, as in the figure here given. The fur of the pougome has a more or less brownish tint generally, being marked on the back and sides with clarker patches of the same colour, somewhat irregnlarly disposed. Its labits correspond with those of the species of this family whose food is of a mixed character.

THE COMMON GENET (Genetta vulgaris), is an inhabitant of the south of France, of Spain, and of the African continent thronghout its entire length and brealth. It is generally found in the low grounds, near the edges of rivers, or in the immediate neighbourhood of springs. The Genct very much resembles an ordinary cat, and in the domesticated condition forms a very good substitute, catching and killing mice with equal skill. The various members of the genus Genetta are distinguished by their vertically slit pupils, and by their completely retractile claws, in which respect they approximate very closely to the Felide. The odoriferous anal ponches are reduced to a mere depression in the skin, the amount of the secretion being correspondingly deficient; nevertheless quite enough to produce a very perceptible odour. The Genets are smaller than the true civets, and less frugivorous in their habits. The fur of the species under consideration is more or less: greyish and spotted, witl: conspicuous oval, oblong, or rounded patches of a brown-ish-black colour, the checks and sides of the muzzle being covered with white markings. The tail is beautifully annulated witu upwards of twenty alternating white and black bands. It is as long as the body, and tapers very gently towards the tip, where it is also clothed with long coarse hair. Its dental arrangement is precisely similar to that of the civets, properly so called.

THE LUWAK (Viverra musanga), is a well-marked form, although it resembles the genet in size and many other particulars. The head is broad belnind, cnding anteriorly in a sharply pointed muzzle. The jaws are furnished with twenty molar teeth, which are comparatively short and broad. The body is about twenty-two inches long, exclusive of the tail, which would give us another foot and a laalf. The general colour of the fur is that of a deep tawny-brown; the head, central line of the back, tail, and outer sides of
the limbs being almost black. A whitish-grey band passes backwards from the eye, gradually increasing in breadth until it arrives at the centre of the neck. The pupils of the eyes are rounded. The limbs are robust, terminating in pentadactylous fect, armed with large, strong, semi-retractile claws. In regard to the habits of the Luwak, Dr. Horsfield states that they are "very similar to those of the genct. If taken while young, it becomes patient and gentle during confinement, and receives readily animal and vegetable food. It requires little attcntion, and even contents itself with the scanty remains of the meals of the natives, with fish, eggs, rice, potatocs, \&c., the structure of its teeth being particularly adapted to a veretable dict. It prefers, however, delieate and pulpy fruits, but when pressed by limger, also attacks fowls and birds." The Luwak, we are told, causes terrible damage to the coffee plantations, devouring the berries with excessive greedincss. On this account some have called it the "eottee rat." Only the arillus and external coverings of the berry are consumed, the seed itself passing throngh the animal unaffected by the digestive powers of the animal's stomach. The Luwak is pretty widely dis-


The Hasse (Viverra liasse).
tributed, being found in Sumatra, Java, the Malayan peninsula, and in most of the adjacent islands of the Indian archipelago.

THE RASSE (Virerva Rasse), is a remarkably handsome creature, and is readily distinguished from its congeners by its elongated form, delicate build, and elegant colonring (fig. 28). It is also a native of Java and the adjoining isles. The length of the body is nearly two feet, not including the tail, which would give ns another twelve inches. The hearl is cunciform, compressed sideways, terminating anteriorly in a tory attenuated minzzle. The ears are particnlarly broad at the base, closely approximating to each other on the crown of the head. The eyes are dark-coloured. The whiskers are few in mmber, but of considerable length. The limbs are of moricrate size, and terminate in digitigrade
pentadactylous feet, armed with acute semi-retractile claws. A solitary glandular ponch exists in the anal region. The general aspect of the fur is tawny grey, prettily marked with dark-browu or blackish spots, in addition to which there are eight dark-colomred parallel bands passing from the shoulders to the posterior cxtremity of the rump, four of them being situated on cither side, and immediately below the central line of the back. The dark spots above mentioned lave also a tendency to arrange themselves in linear scries. The tail is striped with sixteen circular alternating bands of a black and whitish-grey colonr. The lasse "preys on small birds and animals of every description. It possesses the sanguinary appetite of animals of this family in a high degree, and the structure of the tecth strictly correspouds with its habits. In confinement it will devour a mixed dict, and is fed 011 eggs, tish, flcsh, and rice. Salt is reported by the natives to be a poison to it." The odoriferous secretion from the anal glands is termed decles by the Javanese and jibet by the Malays, and Dr. Horsfield further informs us that it is quite a "favourite perfume amoug the Javanese, and applied both to their dresses, and, by means of various unguents and mixtures of flowers, to their persons. Even the apartments and the furniture of natives of rank are gencrally scented with it to such a degree as to be offensive to Europeans, and at their feasts and public processions the air is widely filled with this orlour."
the tanggalung (Viverra zibetha) is a very widely distributed species thronghout the more southern portions of the great Asiatic continent, extending from Arabia on the west to the coast of Malabar on the east, and also occupying Sumatra, Java, Borneo, and other islands of the Indian archipelago. The term Tanggalung is of Malayau origin; but this species is also called the Indian civet, and by the native IIindoos is known by the name of the Kutauss. It is a comparatively strong and bulky species, having a short thick neck and somewhat rounded head. The ears are very much wider apart than obtains in the Rasse, leaving an interspace of about two inches width. The tail is cylindrical, nearly uniform in thickness, and shorter than the body; it is somewhat indistinctly striped with alternating black and lightbrown rings. The fur has a light-brownish ashy-grey colour, being marked with small black spots arranged in a transversely undulating manner. The throat and lower parts of the belly are whitish. Dr. Horsfield says that this animal has a comparatively mild disposition ; but his remarks evidently apply to it when in a semi-domesticated condition. Captain Thomas Williamson's account of the wild Indian civet affords a clearer estimate of its naturally fcrocions character. "This animal," he says, "is perhaps the most obnoxions of all the wild tribes known in India. It is seldom, if ever, seen on a plain, except at night, when it leaves its haunt in quest of prey. The Kutauss is remarkably bold, sparing nothing which it can overcome, and frequently killing, as it were, mercly for sport. Its principal devastations are among sheep and swine, from which it purloins the young, and commits dreadful havoc among poultry. 'Io the rapacity of the wolf it
joins the agility of the cat and the cunning of the fox." The same excellent observer tells us that it "is generally fonnd in short underwood covers, mixed more or less with long grass, and especially where the palmyra or cocon tree is to be seen. Although it is sometimes met with in various detached jungles, yet, for the most part, its residence is confined to such as border old tanks or jeels. The banks being formed by the excavation, are often very high and broad; with time they settle and become flatter, and are gencrally overrun with very strong brambles, through which even an elephant could not make his way without extreme difficnity. Of such covers the Kutanss is a regular inhabitant, seldom stiring in the day, during which time he appears to lide limself in the most opaque recesses." The Kutauss ascends trees with facility, and when chased by hunters makes a very powerful resistance. The odour which it emits is similar to that of the liasse, and, like the jibet, is duly extolled by the natives as a delightful perfume. It is, however, lighly offensive to Europeans, and Captain Williams states that the lhunters' dogs in Bengal become perfectly sick with the stench; nevertheless there is no animal which they will so readily attack, and after they have worried a Kutauss nothing will induce them to pursue any other kind of game-until at least the smell of the beast has cutirely quitted their nostrils. Kutansses only frequent the neighbourhood of such villages as are inhabited by Mussuluans, simply because no poultry can be stolen from those populated by Hindoos, whose religion forbids the rearing of chickens and fowls. Unclean animals all!

THE AFRICAN CIVET (Viverra ciretta)-Plate 3, fig. 31-is the species most commonly known, and it is from this animal that the unctuous brown substance termed "civet" is chiefly procured. The fatty matter in question is obtained from the two anal glandular pouches, so frequently alluded to in other viverrine genera. In the fresh state its odom is extremely disagreeable ; but when very copionsly diluted and mixed with other perfumes--the energy of which it appears to have the power of angmenting-the combination is considered pleasant. The Civet is most abmendant in North Africa; but it is also found on the coast of Guinea and at other parts of the continent as far south as the Mozambique. In the domesticated condition this animal exhibits a very capricious tomper; but large numbers of Civets are kept for the sake of procuring the oily perfume. We are told that the unfortumate captives have their dignity insulted about twice a week. Thus, the tails being raised, and the hinder parts fixed to the bars of their cages in situ, a sort of iron scoop is unceremonionsly introduced into the before-mentioned ponches, and the glands are relieved of their odoriferous contents. 'The African civet is larger than the Tanggalung, the body being nearly three fect long, not including the tail, which measines about eighteen inches. 'The fur has a light brownishgrey colour, with spots and bands of a darker brown or blackish tint. The hairs along the central line of the back and neck are sufficiently elongated to form a kind of manc, which can be raised or depressed at will. The hairs of the tail are also long, and being whitish
with black ends, they impart to the organ a more or less ringed appearance. The habits of the African civet are by preference nocturnal. It is a good climber, and although particularly fond of birds and small quadrupeds, it does not reject fruits, roots, and other vegetable matters.

## Family IV.-HY AENID A.

In a zoological point of view, this family cannot be considered as equivalent to any of the three foregoing carnivorous groups. It is clearly osculant between the Viverridæ and Felidæ, resembling the cats in its dental formula, and the civets in nearly all other respects. In addition to the usual six ineisives and four canines, the Ifyenas have eightcen molars, of which the auterior fourteen, that is, eight above and six below, are, according to the view of Professor Owen, spurious ; whilst, of the four remaining true molars, the upper pair are tuberculated, those of the lower series remaining sectorial in their character. The Hyæuas are further distinguished by their peculiar gait, depending upon the paramount lengthening of the anterior limbs as compared with the hind legs. This elongation is perhaps, on the whole, more apparent than real; nevertheless, taken separately, the tibia and fibula of the posterior extremity are shorter than the corresponding radius and ulna of the fore-limb. The feet are all tetradactylons. The ears are large, the eyes prominent, and the tongue covered with horny papille. The body gradually declines from the shoulder towards the tail, supporting a bushy mane on the neck and central line of the back. There are fifteen or sixteen pair of ribs. The tail is rather short, the anal glandular pouches being deep and capacious. So far as at present known, this family is exclusively confined to the eastern hemisphere. Numerous fossil remains of Hyænas occur in the pliocene dcposits, and more partieularly in the ossiferous caverns of Great Britain and central Europe.

THE AARD-WOLF (Proteles Lalandii)-fig. 29.This is a very interesting animal, inasmuch as it constitutes one of those transitional or aberrant forms which serve to demonstrate the unity of plan pervading all organized beings. The various species which inhabit this planet, whether animal or vegetable, are not to be rcgarded as creations representing so many totally different designs, but they are rather to be looked upon as special modifications of one common arehetypal plan. Speaking of secondary causes, we may say that nature developes progressively, and in accordance with the motto, "Nihit per saltum." Such a view is act the same time quite consistent with the notion that each animal-the Aard-wolf, for example -is an independent entity, a distinct species, a separate creation, an expression of the Divine will.

Observe how closely this creature resembles sevcral other allied forms. In general appearance and atlitude it is like the true liywenas, and this apparent identity is perhaps even more obrious in the dentition and in the structure of the skeleton. In respect of its size, the form of the head, and in the circumstance of its excavating burrows for diurnal retreat, we notice its fox-like qualities, while in several other particulars it approaches the civets. The molars are small, and vary in number from sisteen to twenty. The forefeet are pentadactylous, having the digit of the thumb

Fig 29.


The Aard-Wolf (Proteles Lalandii).
slightly raised. The hind-feet have only four toes. The tail is comparatively short. The texture of the fur is soft and woolly, except along the central line of the back and neck, where it is long and rigid, and forms an erectile mane, the individual hairs being upwards of six inches long. The body displays a yellowish ashy-hrown colour, the sides being irrcgularly banded with eight or ten dark-brown stripes, whilst the legs are also lined with similar transverse markings. Like its congeners, the habits of the Aardwolf are nocturnal, and it feeds on various kinds of animal and vegetable food, and from the observations of Sparman, appears to be very partial to ants, thus reminding us also of the insectivorons labits of the bears. On the approach of daylight he retires to his self-constructed subterraneous burrow, and there lies concealed during the day. Aard-wolves are remarkably timid and shy; and, as if to increase their security, they not only make their burrows near each other, but many are frequently found occupying the same hole, which, however, may have several outlets, so that they can all escape if disturbed. They are thus gregarious in their habits, and are also swift runners, notwithstanding the disproportion whieh exists between the anterior and posterior extremities.

THE STRIPED HY庣NA (Hyana striata)—Plate 9, fig. 30.-Whis is the most widely distributed species, being found in abundarice in the greater part of central Asia, Hindoostan, Asiatic Turkey, Persia, Syria, and northern Africa. It is recognized by its brownish-
grey colour, which is darker along the central line of the back and neck, where the hairs are prolonged to form an ercetile mane, the sides of the body being also marked by scveral dark-brown bands. All the hyænas display remarkable strength and voracity, their jaws being eminently fitted for tearing and crushing the hardest substances. At night they prowl about in large numbers, devouring alike living and dead animals, whether the latter be fresh or semiputrid. Graves are torn open without ceremony-a circumstance which lans given rise to various superstitions and silly tales, which aucient writers ignorantly delighted to record. The Striped hyena is not very particular as to the character or size of his victim. Colonel Denham, when at Kouka, informs us that a legion of this species literally stormed a large village in that neighbourhond one night, and, notwithstanding that the place was surrounded by a barricade, consisting of branches of the prickly tulip nearly six fect in height, they succeeded in throwing it down and taking away two donkeys. IIe adds-"We constantly heard them close to the walls of our own town at nights, and on a gate being left partly open, they would enter and carry off any unfortunate animal that they could find in the streets." It has often been stated that hymas cannot be tamed -a notion which is entirely erroncous. Among the very many proofs which have been adduced to show that the species under consideration is quite capable of domestication, we may refer to Mr. Bennett's accomnt of a Striped hyena kent in the tower of London, which manifested remarkable docility and attachment to its keeper. It may also be mentioned, on the authority of Colonel Sykes, that in central India, where the species is numerous, they are found to be as susceptible of domestication as ordinary dogs.
THE SPOTTED HYENA (Hycena crocut( $t$ ). - This is called the "Tiger-wolf" by the colonists at the Cape of Good IIope, and it is often spoken of simply as the Wolf, in contradistinction to the next species, which is termed the Strand-wolf. Thongh most aboudant in Southern Africa, the Spotted hymena is found as far north and west as the coast of Guinea and Senegal, and even Barbary, if the statements of Lesson are correct. It is rather smaller than the last-described species, and is further distiuguished by the absence of any well-marked mane, as well as by the circumstance that the fur is covered with roundish black spots, instead of stripes, which, nevertheless, exlibit a tendency to arrange themselves in linear series. The general colour of the fur is yellowish-brown, the hairs being comparatively short. Thle tail is bushy, and of a brownishblack tinge. The habits of the Spotted hymena appear to loe even more destructive than those of the striped species. Numerous accounts have been placed on record respecting its extraordinary rapacity, but of these we sliall refer only to the more interesting. The traveller Steedman gives the following account of its depredations, as communicated to him by a trustworthy correspondent, who writes from Mamboland as follows: -"'I'o show clearly the preference of the wolf (i.c., Spotted hyiema) for human flesh, it will be necessary to notice, that when the Mambookies bnild their houses, which are in form like beehives, and tolerably large-
often eighteen or twenty feet in diameter-the floor is raised at the higher or back part of the house, until within three or four feet of the front, where it suddenly terminates, leaving an area from thence to the wall, in which every midnight the calves are tied, to protect them from the storms or from wild beasts. Now it would be natural to suppose, that should the woll (hy:ena) enter, he would seize the first olject for his prey, especially as the natives always lie with the fire at their feet; but notwithstanding this, the constant practice of this animal has been in every instance to pass by the calves in the area, and even by the fire, and to take the children from under the mother's kaross; and this in such a gentle and cautions mamer, that the poor parent has been unconscious of her loss, until the cries of her little innocent have reached her from without, when a close prisoner in the jaws of the monster." The same writer avers, that there had come to his knowlerlge no less than forty instances where these beasts had thus committed serious havoc within the space of only a few months. The Spotted hyxua is a great coward, for he will usually only attack his intended victim after he has succeeded in intimidating lim, and in making him run for his life. To bring about this result, he utters hideous howls, and puts on every kind of sharl and grimace which his villanous physiognomy can conjure up. This propensity to howl, however, seems to be rather disadvantageous than otherwise, seeing that it scrves as a warning to the occupants of farm-yards and villages. Its design is probably to inspire terror, and not to call together other hyenas of the same species, as some have supposed. Various mothods are adopted to destroy this pest, the best of which seems to be that of a spring-gun trap, set in the following manner:-"Two young trees are selected, and divested of their lower branches, or, in lieu of such, a couple of stout posts, firmly driven into the ground, will answer the purpose equally well. To these trees or posts, as the case may be, the gun is firmly lashed in a horizontal position, and with the muzzle pointing slightly upwards. A piece of wood abont six inches in length-the lever, in short-is tied to the side of the gun-stock, in such a manner as to move slightly forwards and backwards. A stout piece of string comects the trigger with the lower part of the lever. 'To the upper extremity of the latter is attached a long piece of cord, to the outer end of which, after it has been passed throngh one of the empty ramrod tubes, is tied a hump of flesh, which is pushed over the muzzle of the gim." By this contrivance Mr. Anderson and his friends succeeded in destroying several lygronas. The same sportsman and author records in his "Lake Ngami" the following curious incident. While stationed at Great Namaqna-land, he says-" Almost the first animal I saw at this place was a gigantie 'tiger-wolf,' or Spottel hyanna, which, to my surprise, instead of seeking safety in flight, remained stationary, grinning in the most ghastly manner. Having approached within twenty paces I perceived to my horror, that his fore-paws, and the skin and flesh of his front legs, had been gnawed away, and that he could scarcely more from the spot. 'To shorten the sufferings of the poor beast, I seized my opportunity, and knocked him on the head with a stone;
and, catching him by the tail, drove my hunting-knife deep into his side. But $\dot{I}$ had to repeat the operation more than once before I could put an end to his existence. I am at a loss how to account for his mangled condition. It certainly could not lave been from age, for his teeth were good. Could it be possible that from want of food he had become too weak for further exertions, and that as a last resource he harl attacked his own body? Or was he an example of that extraordinary species of cruclty said to be practised by the lion on the lyyana, when the latter has the insolence to interfere with the monarch's prey?" We are inclined to believe neither of these ingenious views are correct, but that the poor beast had gnawed its limbs on accomint of some local disease. We noticed, a few years ago, an unfortunate hyæena in the Dublin Zoological Gardens, which, from some local irritation at the part, had, by constant liting and sucking, so reduced its caudal appendage, that scarcely any trace of the tail remained. We sugrested to Dr. Ball that it should be destroyed, but that distinguishen maturalist did not seem inclined to adopt Mr. Andersson's judicious method of consoling the afflicted; expressing his belicf that the animal would get better !

THE WOOLLY HYENA (ITyena villosa). - This species was first described by Dr. Andrew Smith in the 15 th volume of the Linnean Society's Transactions. It is called the "Strand-wolf" by the Cape colonists, and, when young, bears a very close resemblance to the striped hyæna, from which circumstance some lave stated that the latter is also found in South Africa. This is not the case, unless, indeed, the persuasion that the Woolly hyena is nothing more than a well-marked variety of the specics under consideration, should gain universal acceptance. The distinguished author of the "Catalogue of Mammalia," preserved in the British Museum, entertains this view. In the meantime we may observe, that a fourth kind has been described-the Brown hyrena (Hyena rufa)-which is also a South African species. The fur of the Woolly hyæna is long and coarse, but it does not form an erectile mane along the central line of the back. The hody has a greyish-brown colour, with indistinct markings of a darker hue, transversely arranged on the sides and hips, and other more conspicuous ones on the legs. The tail has a deep-brown tinge, and is longer than in the ordinary striped hyæna. The head is lined with dark patches beneath the eyes, on the chin, and at the point of junction of the cheeks and neck. The ears are comparatively large, straight, and pointed. Its habits are similar to those of other hyenas, but it frcquently resorts to the sea-coast, where it greedily devours carcases of whales, and the semiputrid remains of any other animals which by chance may have been washed ashore. It is not so common a species as the spotted hyæna.

## Family V.-CANIDE.

The Dogs form a small natural group, although the individual members of the family are extremely numerous, owing to the circumstance that a solitary species has giren origin to a multitude of well-marked and more
or less permanent varieties, furming a series of domesticated races. Besides the ordinary complement of twelve incisive and four canine teeth, the dogs are usually furnished with twenty-six molars, but in some instances as many as thirty-two have been present. Ordinarily, there are six molars on cither side above, and seven correspondingly opposed below. Of these, the last pair on either side, above and beneath, are generally tuberculated; sometimes the latter three of each series are thus characterized. The tongue is soft, and not armed with lorny papillæ. The feet are digitigrade, and furnished with five toes in front, but the hind limbs are, in most cases, only tetradactylous. Doys have no anal glandular pouch. The coecum is well developed, and of a spiral form. These animals are found in all parts of the habitable globe. Fossil remains of dogs and wolves have been found in the bone-caverns of Liége, and also in Eughand, at Overton near Plymoutl, and at Paviland in Glamorganshire. A careful examination of these fossils has led Professor Owen to advocate the view, that all the varieties of dogs are specifically identical with the common Wolf.

THE MARBLED LYCAON (Lycaon venatica).-This is the wild dog or Wilde Hond of the Cape colunists. In external appearance it very closely resembles a lyyena, and it was originally described by Burchell as a member of that genus, under the title of Hyanu pictu. It is, however, a nearer approacls to the true dogs. This is more especially seen in the character of the dentition, and in the structure of the skeleton. Its height at the shoulder is rather under two fect from the ground, but it looks somewhat taller at first sight on account of its slight, gaunt figure. The limbs are long and narrow, all of them terminating in tetradactylous feet. The fur has a yellowish-brown colomr, and is irregularly marlled with black and variegated spots of an exceedingly irregular shape. The head is like that of a hyæna; the muzzle is pointed, and of a black colour. The ears are remarkably large. The tail is moderately long, bushy like that of a fox, and divided near the middle by a black ring, abore which the colour is sandy, and white below. According to Mr. Burchell, from whose description these characters are partly derived, the Lycaon hunts in large organized packs, by preference at night, but occasionally also by day. It appears to be a bolder animal than the hyiena, rery swift of foot, attacking sloep openly, but employing more caution in the case of horses and large cattle.

THE LALANDE (Otocyon Lalandii).-This animal is rather smaller than an ordinary fox, and is also an inlabitant of Southern Africa. The fur is greyish. The tail is moderately long, bushy, black at the upper part, and also at the extremity. The body stands comparatively liigh, the limbs being lengthy and slender. The heal is furnished with remarkably large, long, and straight ears. The teeth are forty-eight in number, there being no less than thirty-two molars. One of the most distinctive peculiarities of the Lalande has reference to the character of these molar tecth, fifteen of which are tuberculated-all the true grinders, in short, four of them belonging to each lateral division abore, and three correspondingly opposed in each series below: The food of the Lalande is principally frugivorous.

THE FENNEC (Vulpes Zerda)-Plate 7, fig. 25is more closely allied to the foxes and true dogs, with which, indeed, its dentition entirely coincides. It resembles the foregoing species chiefly in respect of its cars, whieh are extremely long, and in the cirecumstance of its slight build and small body. The tail is well developed, and dark-coloured at the root and tip; but in other respeets it partakes of the general colour and character of the fur, which is of a whitish, fulvous, or light isabel tint throughout, being almost white beneath the belly. Its texture is fine and woolly. The Femee is an inhabitant of the sandly plains of Nubia, where it exeavates burrows. It also aseends trees with facility. A specimen in possession of Mr. Brande, the Swedish consul at Algiers, was particularly partial to clates and other sweet fruits, and also to eggs. The sight of a bird, however, was suffieient to produce violent exeitement. The Fennee does not nestle in trees as the traveller Bruee supposed.
THE COMMON FOX (Vulpes vulgaris) - Plate 7, fig. 26.-If the "Museum of Natural History" were exelusively devoted to the consideration of those animals which afford sport, in the ordinary aceeptation of the term, our readers would in this place probably expect a brilliant record of daring leaps and other adventures, which are the ordinary accompaniments of the chase after a fox. Due regard, however, being paid to the habits of the more rare and important quadrupeds of foreign countries, we must necessarily limit our details respecting such natural history and sporting data as the records of the fox-hunter furnish; moreover, special works are devoted to this subject, as well as to other matters of interest conneeted with it. Who is not familiar with the common fox, with its rufous brown fur and bushy tail-or "brush," as it is termed by hunters-tipped with white? The sharp muzzle, the shrewd look, the penetrating eye with its elliptically contracted pupil, the triangular pointed ears, the fetid odour, and the cunning step-these, and many other well-known features, are characters by whieh Reynard may be easily distinguished. Associated with this aspeet and attitude, we may also be reminded of its burrowing propensities, its power of eluding pursuit, its skill as a poacher, its swiftness of flight, its sagacity in deteeting traps, its wily instinet in securing food, \&e.peenliarities which have over and over again been ectebrated in story-books from the earliest times; neither need any doubt be entertained of the general correctness of those serious charges which have from time to time been laid at its door, or, as a lunter would say, at the entrance of its "earth." Notwithstanding all this, Reynard has many friends among English gentry, although it cannot be urged that this friendship is in any degree disinterested. On the contrary, lieynard is esteemed only for the sport he creates. Howcerer destructive he may prove among the occupants of a farmyard, woe betide the tenant-farmer who ventures to destroy him, and so possibly abridge his landlord's pastime. Let Reynard devour hares, rablits, pheasants, partridges, chucks, geese, chickens, and whatever else he may please to lay his elaws upon; but kill him not, lest the tread of the molle fox-limnter's steed be obliterated from the uptumed soil! Through this barrier
of liunting etiquette, however, a breach is sometimes made; and not long ago the author of the present section of this work was visiting a gentleman at Attleborough in Norfolk, who, when out shooting on a nohleman's estate in the same county, deliberatelywith his lost's consent and approbation-rolled orer a pair of foxes, one with the right-hand barrel, and the other with the left! As may be supposed, such a elever feat of arms gave considerable offence to the fox-hunting gentry of the district, while the farmers and lovers of partridge-shooting only offered their congratulations. The common fox is widely distributed over Enrope, and is also found, according to several authorities, in Egypt and other parts of Northern Aifliea.

THE AMERICAN RED FOX (Tulpes fulcus) has been considered by many as a merc varicty of the common species alove deseribed; there is, however, good ground for believing this view to be crroncous. According to Mr. Sabine's description, this animal exhibits "a general bright ferruginous colour on the head, back, and sides, less brilliant towards the tail; under the chin white; the throat and neek a darkgrey; and this colour is continued along the first part of the belly in a stripe of less width than on the breast; the under parts, towards the tail, are very pale red; the fronts of the fore-legs and the feet are black, and the fronts of the lower part of the hind-legs are also black; the tail is very bushy, but less ferruginous than the body, the hairs mostly terminated with black, and more so towards the extremity than near the root, giving the whole a dark appearance; a few of the hairs at the end are lighter, but it is not tipped with white." We can testify to the accuracy of this deseription of the fur, having ourselves not only earefully examined several examples, but having also dissected a specimen. Speaking of its habits, Sir John Richardson states that the American Red fox is not so swift as its English eongener. It runs rapidly for a short distance, "but its strength is exhausted in the first burst, and it is soon overtaken by a wolf or a mounted huntsman. Its flesh is ill-tasted, and is eaten ouly through necessity." The female produces four young at a birth, the cubs having a soft downy fur of a yellowish-grey colour. The Red fox is very abundant in the wellwooded distriets of North America, many thousand skins being amnually imported into England by the Hudson's Bay Company.

THE KIT-FOX (Trulpes cinereo-argentatus) is also a North Ameriean species, extending from the plains of the Saskatchewan territory to those of Columbia. It is a very small species, measuring about twenty-two inches in length, exelusive of the tail, which would give us nearly another foot. Its face and muzzle are comparatively short and broad. On the upper part of the body the fur presents a peeuliar colour, "produced by an intermixture of hairs tipped with brown, black, and white." Underneath the neek and belly it is of a dull rufous orange colour, the hairs in this situation being also longer. The lower parts of the face about the mouth are whitish, and more or less tinged with blackish-brown at the margins. The whiskers are strongly developed and dark-coloured. The tail is
bushy, of a yellowish-grey colour, gradually tapering towards the extremity, where it is black.
THE ARCIIC FOX (V'ulpes Tagopus) is as commonly known by the desigmation of Blue fox, on account of its peculiar deep ashy, leaden, or bluish-coloured liair. The fur varies much in appearance at different periods of the year, and accorling to the place of aborle; being very commonly of a brownish-grey colour in some distriets, and in uthers sooty or almost black. In the winter the fur usually becomes $p_{\text {mure whe or whitish- }}$ yellow ; lut this is not invariably the case, as the sooty variety is said searcely to alter its colour in any respect; its texture is woolly, the individual hairs being comparatively long. The Aretic fox is considerably less than our European species, the tail being well dereloped and very bushy towards the tip. The ears are short and rounded, laviug a cropped appearance owing to a peculiar arrangement of the hairs ; the latter are partieularly thick and long at the posterior part of the cheeks. According to Captain Iyon, "the Arctic fox is an extremely cleanly animal, being very careful not to dirty those places in which he eats or sleeps. No unpleasant smell is to be perecived, cren in a male, which is a remarkable circumstance. 'To come unawares on one of these creatures is, in my opinion impossible; for eren when in an apparently somed sleep, they open their cyes at the slightest noise which is made near them, although they pay no attention to sounds when at a short distance. The general time of rest is during the daylight, in whiel they appear listless and inactire; but the night no sooner sets in than all their faculties are awakened; they commence their gambols, and continue in unceasing and rapid motion until the morning. While houting for food they are mute; but when in captivity or irritated, they utter a short growl like that of a young puppy. It is a singular fact that their bark is so modulated, as to give an idea that the animal is at a distance, although at the very moment he lies at your feet." The same gentleman observes, that when taken they at first clisplay great anger, but after a few homrs' confinement they gradnally cool down to a state of easy quietude; instances also occur where they have become quite tame. The Aretic fox displays far less cuming than our European species, and is not so suspicious of traps. The female produces from three to five young at a birth. This animal is an inhabitant of the sulb-polar regions of either division of the Northern hemisphere, being found in North Anerica, Lapland, Iccland, Siberia, and Kantschatka. We have also been informed by a Russian gentleman from the neighbourhood of Archangel, that the sport of hunting bhe foxes is particularly excellent in the large islos of Nora Zembla. Ordinarily, Aretic foxes are captured by an clevated pit-fall, the pit consisting of an elerated lant built mp with stones, and arched over, leaving ouly an aperture at the summit, over which blades of whalebone are fixed in such a manner as to insure the certain precipitation of the fox into the interior, should the bait, also placed at the upper part, successfully allure him on to the top of the roof. In the young state, the flosh of the Arctic fox is stated to be excellent eating. The fur is employed as an article of commerce, the bluish or lead-coloured
varicty being most estecmed. In the peculiar dialect of the American Cree Indians, this animal rejoices in the nuntterably cuphonious name of Wappeckecshewmenlikecshew!

THE INDIAN FOX (Vulpes Bengatensis). -This is a small and clegant species, laring a brownish fur, which is much darker along the middle line of the back, forming a longitudinal sooty-coloured band; theo tail is also tipped with black, and the species is further distinguished by the presence of circular patches of white rom the eyes. According to the experienced testimony of Captain Willianson, these foxes are extremely munerons in India. In gencral their earths are placed on rising grounds, to prevent their being inmilated. The holes are "remarkably small, and may be opened in an hour loy any common lalourer. The foxes are rery cumning, at least as mueh so as their brethren in Enrope. I have sereral times known them, when pmshed hard by greyhounds, to conceal themselves in rice fields, or among loulrushes, \&e., with only their noses pecping out of the water. On such occasions, unless there be some questing dog at hand, Reynard will ofton eseape unnoticed. Loth jackals and foxes sham death to admiration. After having been almost pulled to pieces lyy dogs, and left to all appearance lifeless, they sometimes gradually cock their cars, then look askance at the retiring enemy, and, when they think themselves unobserved, steal under a bauk, \&e., and thus skulk along till they find themselves safe, when, setting off at a trot or canter, they make the hest of their way to some place of security." The Indian fox feeds principally on small hirds and quadrupeds, especially rats, mice, and such like vermin; he is likewise partial to fowls, ponltry, and game, but to sccure them lie rarely ventures within the walls of any village or town.

THE JACKAL (Canis aureus)-Plate 8, fig. 27differs from the fox, in presenting a more dog-like appearance. The fur exhibits a ruddy yellowish-grey colonr generally, being darker on the back, where it is almost black. The throat and under parts of the belly are much lighter. The ocular pupils are rounded, as in dogs. The common Jackal is widely distributed thronghont eastern comintres, being found in abmuance in IJiudoostan, Persia, Tartary, the Caucasus, Dalmatia, the Morea, Palestine, Eegyt, and North Africa, as far as the coast of Guinea. In respect of size it is intermediate between the fox and the wolf. Its habits are gregarions; it lumts at night in packs, and, from its piercing yells and destructive habits, is crerywhere regarded with horror. The united cry of a pack produces a most unearthly sound, which has been compared to the distant rolling of thmeder. Captain Williamson records many facts which clearly prove that jackals will combine to defend or rescue one of their number. Among these he mentions the following incidents:"Mr. Kinloch, who was well known as an excellent sportsman, and who, when at Afiduapore, kept a famous pack of hounds, having one morning chased a jackal, which cutered a thick jungle, found himself mider the necessity of calling ofl his dogs, in consequence of an immense herd of jaekals which had suddenly collected on hearing the cries of their lirother, which the homeds
were worrying. They were so mumerous that not only the dogs were defeated, but the jackals allsolutely rushed out of the cover in pursnit of them; and when Mr. Kinloch and his party rode up to whip them off, their horses were bit, and it was not without difficulty a retreat was effected. The pack was found to lave sulfered so severely, as not to be able to take the field for many weeks." 'Tlie same writer speaks of the Jackal as an extremely tronblesome customer. He is exceedingly rigilant, and seldom fails to carry his purpose. In spite of your efforts to seare him away; even with the aid of ficc-arms, he will perseveringly "wait at yom door, nay, will enter your house, and avail limself of the smallest opening for enterprise; he will rob your roost, and steal kids, lambs, pigs, and sometimes even take a pup from its slecpy mother; he will strip a larder, or pick the bones of a careaseall with equal avidity. It is cmions to see them figliting almost within reach of your stick, for proximity to expeeted booty. It may readily be supposed that when any meat or ponltry is purloined by servants, the Jackal bears the blame. An officer in our battalion in one night lost twenty.seren fowls from the hut in which they were kept ; on which one of his servants did not hesitate to declare that, on hearing their uproar during the night, he had run to see what was the matter, aud saw twenty-seven jackals, each bearing away his bird!" Jackals, as we have seen, will devour any kind of oficil, and it is eredibly stated that they will dig up and greedily feed upon the half-buried corpses of a battle-field. The odour of the Jackal is very offensive, but it appears to wear off in the domesticated animal. The matter which gives rise to the disagrecable smell is secreted by a gland at the base of the tail. This dermal or skin gland was at one time supposed to exist only in the foxes, until a distinguished comparative anatomist-Professor Retzius, of Stockholm-showed that this organ oceurs in wolves and jackals also. It is not necessary to place the slightest reliance in the old story about jackals acting as purveyors to the lion, there being 110 suffieient grounds for such a notion.

THE WOLF (Canis lupus), Plate 7, fig. 24.--Probably no wild animal is more dreaded in civilized countries than the common Wolf, its ferocity aud strength having very often proved disastrous to the traveller, and to the residents of ontlying villages. Its gencral appearance is too well known to reguire any lengthened description. The body is about four feet long, exclusive of the tail, which measures from fourtecn to eighteen inches, according to cireurnstances. The straight direction and dependent position of this organ has been considered as a character suffieiently important to distinguish the wolf from the dog; but when those who argue fur the speeific distinctuess of the two animals are thus obliged to resort to such trifling characters, it shows the very slender nature of the grounds on which their arguments are based. Without regarding the point in dispute as entirely decided, we strongly adhere to the view of Professor Owen and others, who regard all kinds of dogs as domesticated varieties of the wolf. 'The fur of the Wolf is long, especially on the throat and below the ears; its texture rough, wiry,
and harsh. Ordinarily it is of a ycllowish-grey colour, being much lighter beneath the neek and belly. Some varieties are dark, almost pure black. In northern regions the fur becomes light-colomed during the winter, and is very frequently quite white; yellow and pied varieties lave also been deseribed. There are indeed tDany wolves differing very markedly in size and colour. and it is quite impussible to determine aceurately how many of them represent distinct species. Even if this were the proper plaee to diseuss the matter, our space would not allow a full and complete discussion of the subject. The black variety is very common in the south of Furope, especially ou the Spanish side of the Pyrences. They are very large, tall, and strong in that quarter, and their habits are excessively crafty. Colonel Hamilton Smith says, that they formerly congregatel "in the passes of the Pyrenees in large troops; and even now the Lobo will accompany strings of mules as soon as it becomes dusky. They are seen bounding from bush to bush by the side of travellers, and kecping parallel with them as they proceed, waiting an opportunity to select a victim, and often succeeding, unless the inuleteers can reach some place of safety before dark, and have no dangerous passes to traverse." These black wolves are likewise to be found in the mo!ntain slopes of Friuli and in the neighbomihood of Cattaro. The common grey variety is very widely distributed, oceurring in various parts of Europe, Asia, Afriea, and North Amcrica. In early listorie times it roamed at large in the forests of Great Britain, as abundantly, perhaps, as it now occurs in some districts of France, Inngary, Russia, Norway, and Sweden. Their rapacity is much increased during the winter months, especially if the cold season prove unusually severe and protracted, when the supply of food necessarily becomes limited. On these occasions their depredations prove most disastrous. Thus, Dr. We eissenborn informs us, that in one severe winter on the continent, they became remarkably bold and violent. About the middle of the month of January large mumbers infested the ncighbomrhood of Stuttgard, where they succeeded in eapturing a poor lad, twelve years of age, only a few miles ontside the city. At night they prowled about in packs; and one batech of them, ten in number, having forced their way into a farmyard near Agram, they committed most serious havoc among the cattle. Many crossed over into Prussia from the Polish frontiers, and a solitary individual deliberately attacked a horse in one of the busiest and principal strects in the city of Königsherg. Many other instances have been given of their daring under the extremities of famine. The most horrible accomt is that recorded by Captain Williamson in Northern India. On this oceasion their want of food was not the result of cold, lout it was owing to the extreme drought of the year 1783, which caused a dreadful scareity of all kinds of food and animals during the ensuing season. This famine was especially felt in the fertile province of Oude. Thousands of the natives, we are told, perished from starvation, "while numbers fell an easy prey to the wolves, which, being heroft of their usual means of subsistence by the general destruction of all eatable animals, were at first compolled, and aiterwards fornd it convenient.
to attack the wretched wanderers. The little resistance they experienced in their depredations on these unfortunate creatures, cmboldened them in an astonishing manner, and taught them to look with contempt and defiance towards a race, of whose powers they had heretofore been in awe. Such nmmbers, however, succeeded in finding their way to the cantomments, that we were to all intents in a state of sicge. The wolves followed, and were to be seen in all directions committing havoc among the dying crowd." Here we have indeed a sad picture; fur the very loss of food these animals experienced by the general scarcity of other creatures, was more than amply compensated to them by the abundance of perishing men, women, and children. For the latter, indeed, the Wolf has a remarkable propensity at all times. The same writer declares that "his favourite object is a child at the breast, which, when opportunity serves, he seizes by the throat, thereby not only preventing it from giving the alanm by its cries, but taking a hold such as enibles him to bear away his prize without impeding his progress." Very few ehildren, even if timely rescued, survive this trenchant grip. On another occasion two wolves gained access to a bungalow near Cawnpore, where they seized a lad thirteen years old, precisely in the same manner; death having ensucd, they were in the act of ingenionsly raising the body over a wall, when the fall of a tile aroused the slecping parents, who hurried to the spot, from whence the brutes scampered off leaving the victim of their cunning a ghastly spectacle. About this time the wolves in the northern districts became so familiarized with man, by what had happened during the famine, that they very frequently attacked adults and even armed persons. Ordinarily, however, as we have before remarked, the Wolf is a great coward. Sir Juhn Richardson testifies to the same behaviour in the ease of the Ameriean wolf, which is probably a mere varicty of the common grey species. He states that if these wolves were not as fearful as they are rapacious, the Americau buffalo-hunters would be unable to preserve their game. "The simple precaution of tying a handkerchief to a branch, or of blowing up a bladder, and langing it so as to wave in the wind, is sufficient to keep herds of wolves at a distance." Sir John Richardson also mentions an instance where a poor Indian woman was killed by a wolf, within sight of her husband, who was coming to rescue her; and it is particularly worthy of notice, that in this instance the neck was the part of the body seized. In the higher northern latitudes many wolves perish during the cold season from inanition; and in some eases, when the winter has been unusually severe and prolonged, they perish by hundreds. Some voyagers tell us that they have both seen and heard the poor animals -for under these circmistances we feel inclined to pity them-howling painfully as they lay stretelied and famishing on blocks of ice. To these they have resorted in the hope of catching seals and other marine animals, and while thus employed, the ice-fields have become detached and have drifted away into the open sea. The Wolf, like the fox, forms Lurrows or earths; into these they retreat during the day, and likewise occupy them for the special purpose of rearing their yomig.

The nuraber of cubs produced at a birth seems liable to vary, there being usually fom or five; but in the ease of the American variety, Sir John Richardson states that eight or nine are sometimes the result of a single litter. A very effectual manner of extirpating wolves is by smoking them out of their earths. This plan, adopted in India, is extremely simple. All that is necessary, is to be provided with a quantity of sticks, straw, and lucifer matches, and a few pounds of brimstone. There are gonerally scveral ontlets to each eartly; but it is not necessary to make a fire before many of these, especially if the party be well provided with fire-arms. Usually it is not considered desirable to give any of them the slightest chance of escape; but, under any circumstances, it is advisable to fire the lower holes, so as to allow of the fumes being drawn in by a strong current of air. The death of the savage tenant is usnally very painful, and long before he comes to the surface, his commencing distress and agony is indicated by a painful moaning. Sometimes they rush out; but being more or less stupified by the fumes, they seldom make their escape. If they aroid the spears and chubs of the natives, who are anxiously watching outside, the gun, rifle, or arrow, more surely effects the purpose of their destruction. In the foregoing remarks we have repeatedly had nceasion to point out instances of the cunning and ingenuity of the Wolf; but we camnot cutirely quit our account of this animal without quoting another interesting illustration of its craftiness. Mr. Lloyd, in his "Scandinavian Adventures," thus writes:-" $\Delta$ t one time, intleed, I had serious thoughts of training a fine female wolf in my possession as a pointer; but I was deterred, owing to the penchant she cxhikited for the neighbours' pigs. She was chained in a little inclosure, just in front of my window, into which those animals, when the gate happened to be left open, ordinarily found their way. The devices the wolf employed to get them in her power were very amnsing. When she saw a pig in the vicinity of her kennel, she, evidently with the purpose of putting him off his guard, would throw herself on her side or back, wag her tail most lovingly, and look imnocence personified. And this amiable demeanour would continue until the grunter was beguiled within the length of her tether, when, in the trvinkling of an cye, the prey was clutched." Whilst she was young she contented herself with the tail; but after she had realized her full powers, the linsuspecting swine were snapped up budily, and, ou such oceasions, Mr. Lloyd found it a difficult matter to rescue them from her jaws.

THE RED WOLF (Canis jubata).-This is a wellmarked form, inhabiting the marshy districts of South America. The fur has a fine cinuamon-red colour, which imparts to the species a vory attractive appearance. The terminal moiety of the tail is white, and there is also a white spot under the head. The Red wolf is further distinguished by a short hack mane, commencing at the occiput, and procecding downwards along the middle line of the back. According to D'Azara, as quoted by Ogilby, these animals "do not commit havoc on the herds or smaller flocks; and as they inhabit only the extensive lowlands and marshes of Paraguay as far as the river Plata, and near its mouth, he has no
doubt that they feed on rats, guinea pigs, small birls, and certain vegetables, if these fall in their way, but chicfly on suails, toads, frogs, and other reptiles, and on the land crabs, which are abondant in the plains and sand-banks. They walk with very long paces, rum moch, and are, D'Azara adds, great plunderers, although they always fly from man, and even from dogs. They are solitary in their habits, are sail to swim well, and in their wild state to utter no somed but gouna, which they often and loudly repeat, so as to be heard at a great distance." The Payagrots Indians call the Red wolf Paraprayu; it is termed Culpeu by the natives of Chili. It is also known as the Aguara, a name likewise applied to a distinet rate of wild dogs.

THE DOG (Cunis lup)us sar. familiuris).-ITe do not specifieally recognize the doy as a distinct animal, and have previonsly expressed onr adhesion to the view that these useful ereatures are neither more nor less than domesticated varieties of the common woll. The natural listory of the Dog is a subject of considurable interest; but it is one so extended that the bare enumeration of the leading characteristics and habits of the principal varieties, wonld require an entire volume for their deseription and elucidation. 'Those, therefore, who wish to follow up this department of the subject, must consult works specially devoted to dugrs. Sume of the numerous canine varieties attain a very great size, with a proportionate degree of strength; such, for
example, as the Bloorlhome the Mastiff, the Newfoundland, and the Thibet $\log$ (Plate 6, fig. 23) ; others are remankably small, as in certain varieties of Spaniel; while a third kind are extremely attenuated both in shape and make, as instanced by the little Italian Greylhound. In many parts of the world, dogs have returned, at least to a certain extent, to their original wild condition. In this way they have formed several quite distinct races or typical varieties, which are found in different parts of Asia, Australia, and the two Americas. From a general consideration of these forms, it may be fililly stated that, both in structure and appearance, they exhibit a much cluser approximation to the common woll than obtains in the case of any of the varieties which have remained domesticatel. (For a full and able exposition of this sulyect, however, we must refer our readers to Mr. Bell's work on "British Quadrupeds," aurl particularly, also, to the early part of Dr. Carnenter's admirahle article entitled "Varicties of Mankind," contained in the 4th volume of D1. Todd's "Cyelopedia of Anatomy and Physiology.") The Anstralian wild dog or Dingo, fig. 30, approaches so closely to the wolf, that it was deseribed by Bewick as the "New South Wales wolf." The Indian Dhole is another interesting example of a return to the wild state. In some respects it comes nearer the jackal. The fur is of a bay or rufous-brown colour; the tail being long and narrow, and not busly at the extremity. It has a remarkably bright cye, and

a keen lively comntenance. Though strictly wild and savage, it will not attack persons uiless first molested. These Dholes live almost entirely upon other animals, especially decr, which they hunt in large packs; authentic instanees are also recorded where they have attacked and overcome tigers. Some liave doubted this, but the evidence is complete; and, besides, there ean be nothing improbable in the eiremmstance of wild dogs attacking tigers, when it is a well-known fact that common spaniels will realily to the same thing; many a life,
indeed, has been spared ber the comrage of the latter. When engaged in the chase or on the scent the Dholes do not howl or bark, but, at times of much excitement in the course, they utter a kind of plaintive whining note. Among other kinds of wild dogs which are more or less closely allied to the wolf, we may perhaps elass the Caygrotte or Coyotl, whose fur las a whitishbrown colour. This animal is an inlahhitant of Sonth America, and feeds mpon small quadrupeds, and also npon maize and otler regetable matiors.

FAMILY VI.-FELID.e.

Having in our introductory observations on the Carnivora selected examples of the present family for the purpose of enunciating the leading characteristics of the order-mainly on accomnt of its forming the most typical subdivision of that great mammalian group-the observations which we have now to ofler must necessarily assume a supplementary character. In the remarks above alluded to, attention was drawn to the general massiveness of all the osseous elements entering into the solid framerwork of the typical carnivorous skeleton -this adaptation to the destructive habits of the ereature being more particularly conspicuous in the structure of the skull. In the accompanying representation of the cranium of a tiger-lig. 31-the remarkable shortcning of the facial bones, associated with the powcrful


Skull of the Tiger.
grasping teeth, and a surprising transverse breadth of the skull below the orbital and temporal fossic, are remarkably significant. The tecth are thirty in number, and of these we find only four true and ten spurious molars, the ultimate grinder on either side of the upper series being tubereulated. This tooth, however, is particularly small, and widened laterally; but, with this exception, all the molars are much compressed from side to side, and the crowns being sharp and pointed, the two series, during the action of the jaws, close in upon each other like the blades of a pair of scissors. Their function is thercfore cssentially cutting, while that of the huge dagrer-like canines, assisted by the incisors, consists in tearing and lacerating-the due performance and integrity of these actions being secured by the strong temporal and nuchal muscles acting upon the oecipnt and the lower jaw; and farther, to prevent any lateral motion, sncl as we find in those animals which grind and triturate their food, the condyles or articulating facets of the last-named bone are firmly lodged in the corresponding transverselyelongated glenoid sockets. Co-ordinating with this prehensile and offensive armature of the jaws, we al:o find the structural modifications of the feet eminently suggestive. Those of the anterior limbs are pentadactylous, while the posterior feet are tetradactylous; but the peculiarities which prineipally distingnish them arise out of the beautiful provision made for the preservation of their formidable retractile claws. 'The meehanieal contrivances here displayed are perfect. Not only are the actions of flexion, extension, pronation, and supination amply provided for by the pectliar
manner in which the bones of the fore limb or arm are articulated together, but the muscles of this member are so prodigiously developed, that, as is well known, a single blow from the sledge-hammer like jaw of a lion or tiger will fracture the skull of a man, and deal death to almost any animal that may happen to come within its ponderons swing. In addition to this, we find the claw's ordinarily maintained in a state of retraction; this concealed position is accomplished ly the agency of three elastic ligaments or bands, which being severally placed above and on cither side of the digit, serve to connect the ultimate phalanx to the penultimate segment of the same toe (iig. 32). All injury to the claw is hereby prevented - il circumstance which, associated with the prescuce of resilicut sule-pads of thickened suhnucons tissue placed under the ball of the toe, also serves to secmre the characteristically gracefuland noiseless tread of the feline animal. Antagonistic to the elastic binding cords above mentioned, the tendon or string of a large muscle called the flexor profundus perfurans is inserted below, into the base of the ultimate claw-supporting phalanx. When, therefore, it becomes necessary to display or employ these fearful instruments of destruction, a violent contraction of the muscle in question-which of course


Lion's Fout dissectid. involves a drawing back of the tendon, and a consequent thrustisg forward of the claw -is the principal agency by which this change is effected. There are likewise other small extensor muscles inserted at the upper part of the digit, serving to steady the movement and regnlate the degree of protrusion, according to the will of the aumal. But, we have further to remark, that, although these constitute the most prominent features in the sereral structural changes adapted to the wants and habits of the feline mammalia, there are others cqually worthy of being mentioned, such as the strong, homy, recurvel papilla of the tongue, formed for rasjing the suft flesh from off the bones of their slanghtered rictims- the comparatively small salivary glands, showing how little mastication is required-the uninterrupted chain of osseous elements extending from the larymx to the head-the flexibility of the vertebral colimn-the small coecmm-the slortness of the intestinal canal, and, more particularly, the simple cylindrical stomach, which explains that the food is more readily reduced to the condition required for nutriment, tlan obtains in the herbivorous quadrupeds. Do not these, and other peculiarities elsewhere noticed, satisfactorily demonstrate that the typical carnivor is intended to oecupy the field in the economy of creation for which his powers are so befittingly adapted? Surely one would suppose that the legitimacy of such a self-erident ennchusion could not be denied! Are we perverting truth to say, that the lion was not formed to eat straw like an ox? Uufortunately, there
are some so-called educated people who would fain persuade us that we are wrong! It is sad to reflect that some persons can be found who will thus resist the evilence of their senses, in order to gratify a childish erotehet, or to support a pre-conecived dogma! Those of our readers who have pernsed the address issued previons to the publication of this part of the "Museum of Natural History," will appreciate the motive which thins leads ns to offer a few reflections on the halits of this highly interesting class of animals. Not many years ago the writer of this artiele lad the misfortune to be present at a lecture given in the northern metropolis, by a gentleman whose mind appeared to be siugullirly ill-adapted for the reception of scientific truth, but whose perverted views, ne vertheless, enjoy a certain credence among individuals capable of indulging extreme opinions. 'thus, he undertook to iuform his audience that the several organs of a carnivorous animal, in which we have been aceustomed to recognize teleologic evilences of beaty, harmony, and design, have all been diverted from their proper development by an evil ageney-that the eliuss, teeth, and stomach, which we have jnst shown to he severally adiapted to the seizure, tearing, and digesting of the flesh of other animals, do not, indeed, exlibit evidences of design, benevolenee, and wisdom in the Creator, but rather, evidences of anotler power, which has caused the anterior extremity to become a hideous weapon of destruction-which has caused those tecth to display their tearing and cutting surfaces-which has caused the stomach to assume a viearious action; all of these organs severally contributing to render the creature ferocious, cruel, and destructive--habits, which, in this anti-zoologist's view, the animal was not intended to have! Such is an illustration of the melaneloly infereuces to whieh unseientific dogmatism inevitably leads -a mere bigoted minicry of medieval times! For the successful cultivation of natural-history seience it is above all things necessary that our minds be imbued with a love of truth, in whatever aspeet it may present itself. If we pereeive that the integrity of organized existences on this planet ean only be maintained by the reeiprocal action of antagonistic forces, and that the balance of this reciprocity involves and guarantees the welfare of every living entity, needing a residenee on the habitable globe; if, we repeat, it is clearly evident that any departure from this divinely-appointed law would, ou the one hand, only bring abont a redmidancy, or, on the other, a deterioration; what, we ask, is to be gained by impertinently eriticising this universal law, this wise method of divine government, fixed on the eterual priuciples of justice, equity, and compensation? In the nicely-adjusted balance of probabilities we recognize abundaut good to all living beings whose immediate wants are thus duly provided for; and we are content to admire and adore the power which regulates the destiny of every species. In conelusion, we lave only to observe that the Feclidec are widely distributed in all quarters of the world, exeept in Australia, the larger speeies being, for the most part, coufined to tropical regions.
the wild Cat (Felis Cutus), is more or loss abundant throughout the well-wooled and hilly districts of

Burope, and was at one time very plentiful in these islands. It is still found in Wales, in the north-west counties of Euglind, and more commonly in Scotland, and certain parts of Ireland. It is not quite two feet long, exclusive of the tail, which measures about twelve inches. The body is stonter than in the common honse eat, the tail presenting an almost uniform thickness from one end to the other, exeept at the tip, where it is slightly swollen. The fur has a yellowish-grey colour generally, but beneath the throat and belly it is nearly white; the sides of the body, the legs, the tail, and summit of the head being striped with browiishblack bands, which becomes lighter as they approach the ventral line. A longitudinal black band runs along the middle of the back, extending from the head to the root of the tail; this last named organ being black at the tip. The wild eat was formerly considered in England a beast of the chase, but, except for mere sport, it does not appear to lave been considered of any great value. It is repiorted, by those who have seen it in its wild haunts, to be extremely ferocious, a cireumstance which has doubtless contributed to bring about its almost total extinction. The female produces four or five cubs at a birth, and selects either a hollow tree, a rocky recess, or, according to Sir William Jardine, a large bird's nest, for the 1 rotection and rearing of the young.
the donestic cat (Felis donestica).-The concurring testimony of the majority of British naturalists favours the notion that our common house eat is a distinet species, or, at least, that it is not a mere domestieated variety of the European wild eat. It is well known that the common cat frequently betakes itself to the woods, and after a time assumes a semisavage condition. This was at first considered sufficient ground for believing it to be identieal with Feclis Catus; but when, on a closer examination, its characters were not found to have reverted to the state of those ordinarily present in the wild species, considerable doubt arose on the question. The colour of the fur is frequently indistinguishable, but a very marked dissimilarity is seen in the tail, whieh, instead of being unifornly thick throughourt, as obtains in the wild eat, is, in the form mader consideration, much narrower and tapering also toward the extremity. Sir William Jardine has made some very interesting remarks on this sullject. He says there is probably "110 animal that so soon loses its cultivation and returns apparently to a state completely wild. A trifling neglect of proper feeding or attention will often eause them to depend npon their own resourees, and the tasting of some wild or living food will tempt them to seek it again, and to leave their eivilized home. 'They then prowl about in the same manner as their congeners, eroucling among cover, and carefunly concealing themselves from all publicity. They breed in the woods or thickets, and support themselves upon birds or young animals. Few extensive rabbit-warrens want two or three depredators of this kind, where they commit great havoc, partienlarly among the young in summer. They sleep and repose in the holes, and are often taken in the snares set for their prey." Sir W. Jardine once stumblerl upon one of these truants which had just kittened, and
by her side there lay two dead leverets! In the ordinary domesticated condition, the cat is certainly of a capricions disposition, but its habits are too well known to demand any lengthened exposition.

THE EGYPTIAN CAT (Felis maniculat(o). - The Frankfort naturalist, Rüppell, who discovered this species during his travels in Nubia, has expressed his opinion that our common domestic cat owes its origin to this species. Temminck and others have supported this persuasion, and authorities are still divided on the subject. After weighing the arguments on either side, all that we can say, is, that there appears more probability of our tame animals having descended from the Egyptian, than from the European wild form ; but the matter is by no means settled. In the Royptian eat the limls are more slender, while the tail is narrower and longer than in Felis Catus. The fur is greyish-yellow generally; the cheek, throat, under part of the throat, and belly being white. A dark stripe runs along the central line of the back, and the limbs are crossed by several faint blackish bands. The length of the body is about twenty inches, exclusive of the tail, which ineasures three-quarters of a foot.
the pampas cat (Felis pajeros).-This species is extensively distributed over the South American plains, from the banks of the La Plata to the Straits of Magellan. It is about the size of the European wild cat, measuring twenty-six inches, exclusive of the tail, which is about a foot from root to tip. The fur is particularly long, the individual hairs being from three to five inches in length; it is of a pale yellowish-grey colour generally, and banded at the sides by numerous irregularly-disposed stripes of a brownish tinge. Along the central line of the back the hairs have a brownishblack colour, which is more or less continued on the tail. The head is comparatively small and rounded, the ears having a moderate development. The tail is short, thick, and rather bushy; but it does not exhibit any circular markings or spots. According to D'Azara, the natives call it Gato Pajero, or jungle cat. It is said to feed chiefly upon guinea-pigs.

THE CHATI (Felis mitis) is somewhat larger than our common domestic cat, measnring three feet including the tail, for which eleven inches may be reckoned. The fur displays a multitude of irregularly arranged dark-brown patches on a general ground colour of pale yellow above, and white below; on the limbs these spots are more rounded, and there are two creseentshaped collar-like bands beneath the throat. The ears are blackish externally; the pupil of the eye is rounded. The tail is slightly ringed towards the tip. Like the foregoing, the Chati is an inhabitant of the plains of South America. The female preserved in the Parisian menageric, was extremely gentle and fond of attention.

THE CHIBIGUAZU (Felis chiligzaza) is also a South American animal, being rather larger than the above, and measuring, according to D'Azara, four feet including the tail, which is abont thirteen inches long. Some regard it as identical with the chati, others refer it to the ocelot; probably it is distinct. It is exceedingly cumning and destructive in its habits; approaching and entering human habitations only in the darkest nights, and then, not content with carrying off as much
poultry as it can manage, it destroys others that have been left behind. If taken young it becomes very tractable and amusing, lut if allowed much liberty it soon displays its fowl-destroying propensities.

THE SERVAL (Felis serval) is a native of southern Africa, and is called the Tiger loschlatti by the Dutch colonists at the Cape. By others it is called the leopard. According to Mr. Andersson some of the African tribes believe the real tiger to exist in that country, but it is evident that they refer to the serval. This animal is remarkably savage. "One night," says Mr. Anlersson, "I was suddenly awoke by a furious barking of our dogs, accompanied by cries of distress. Suspecting that some least of prey had seized upon one of them, I leaped, undressed, out of my bed, and, gun in hand, hurried to the spot whence the cries proceeded. The night was pitchy dark, howerer, and I could distingnish nothing; yet, in the hope of frightening the intruder away, I shouted at the top of my voice. In a few moments a torch was lighted, and we then discovered the tracks of a leopard, and also large patches of blood. On counting the doers, I fomm that 'Summer,' the best and fleetest of our keunel, was missing. As it was in rain that I called and searches] for lim, I concluded that the tiger had carried him away; and, as nothing further could be done that night, I again retired to rest, but the fate of the poor* animal continued to haunt me, and drove sleep away. I had seated myself on the front chest of the wagron, when suddenly the melancholy cries were repeated; and, on reaching the spot, I discovered 'Summer' stretched at full length in the middle of a bush. Though the poor creature had several deep wounds about his throat and chest, he at once recognizerl me, and, wagging his tail, looked wistfully in my face. The sight sickened me as I carried him into the house, where, in time, however, he recovered." It is also satisfactory to learn that the savage animal was found on the day succeeding the encounter. On being discovered the beast took refuge in a tree, and was not dispatehed before it had received sixteen wounds, some of the arrows employed for this purpose haring been poisoned. In Dr. Gray's arrangement of the Felide contained in the British Muscum, this species is denominated Leopardus serval.
the nepaulese cat (Felis Nipaulensis).-In the list of feline mammalia preserved in our National Museum, this species is called the raved cat or Felis inconspicuns, and it is believed by Dr. Gray to be identical with the Bengal cat. Dr. Horsfield considers these forms to be distinct. The hody is scarcely two feet long, exclusive of the tail, for which another ten or eleven inches must he allowed. The general colour of the fur is that of a tamuy-gres; the surface being marked with spots and linear patches of a deep-black colour, somewhat irregularly disposed. The throat and under part of the belly are whitish; the spots on the tail being uniform, rounded, and arranged so as to resemble transrerse bands.

THE KUWUK (Filis Jaranensis) is also a small species, principally distinguished by its comparatively short tail and rather long legs; it is also only provided with three molars on cither side of each jaw. The body
is twenty-three inches in length, not inchuling the tail, which measures between cight and nine inches. The fur has a greyish-brown colour generally, the under part of the throat, neck, and belly being nearly white; it is long, and of a solt ish texture. Four dark lorownishblack bands pass from the crown of the liead to the root of the tail, while the sides of the botly are marked by sparsely-seattered oblong patches of a similar colour; having a tendency to assume a linear arrangement. Similar spots ocenr on the limbs and tail. The eyes are placed well forward, and have a circular pupil. The cars are small and rommed. According to Dr. Horsfieht the "Kinwuk is fomm in large forests in every part of Java. It forms a retreat in hollow trees, where it remains during the day; at night it ranges about in quest of food, and often visits the villages at the skints of the forests, committing depredations among the hen-roosts. The natives ascribe to it an menemmon
sagacity, asserting that in order to approach the forms unsuspected, and to surprise them, it imitates their roice. It feeds chiefly on fowls, birds, and small quadrupeds; but, in case of necessity, it also devomrs carrion." It is, we are furtlier iuformed, a rery fieree and untameable animal. In the British Muscmm list of preserved specimens, it is designated Leopardus Jaranensis.
THE BULU (F'elis Sumatrena).- $\Lambda$ s far as regards size, the comparative shortness of the tail, the length of the limbs, and in the disposition of its spotted markings, this species very closely resembles the foregoing. According to Horsfiekd, the general ground colour of the fur "is fermginons, inclining to yellowish-grey, more intense on the back, the crown of the heal, and the upper part of the tail; paler on the sides, and passing into whitish-grey on the checks, breast, abdomen, and the interior of the thighs and legs." The Bulu (fig. 33) is an inlahitant of Sumatra, Java, and the contignous


The Pulu (Felis Sumatrana).
islands. In the list of specimens preserved in our National Museum, it is also associated with the leopards.

THE OCELOT (Felis pardulis) inlaabits the forests of tropical America, and is an attractive-looking species. The borly is about three feet in length, exclusive of the tail, which measures from twelve to fourteen inches. The general colour of the fur is fullous-grey, the inferior parts of the throat, neck, and belly being nearly white. 'The entire surface is beautifully streaked with irrecrnlarly shaped patelies of a hlack colomr; these spots laving a marked tendency to form longitudinal bands, especially at the upper part of the body. The ears are small and rombed, the limbs comparatively short. Respecting its habits, the Occlot is a good climber, and is said to sham a state of death in order to capture monkey's, whose euriosity leads them to approach and inspect the simulating carcass. It is capable of heing tamed, but, like others of the cat tribe, its disposition is capricions. Mr. Blyth mentions an instance where "a gentleman had succecded in taming an ocelot, which for three years, enjoyed the range of his house
and garden as freely as a domestic cat, appoaring thoronghly reclaimed. One eroning, lowever, at the fireside, when a child of three years old was playing with it, as it had often done before, the animal being irritated, seized the infant ly the throat, and Lilled it. hefore assistance could bo rendered." In the British Muscmm's list, this animal is classed with the Joopards.
the chaus (Felis Cherus) is a kind of Lyinx. It has a wide geograpluical distribution, inhabiting Egypt, Persia, the borders of the Caspian, and also many parts of central and northem India. It is chicfly fonind in low marshy grounds and jungles, whore it preys upon small quadrupeds and birds, and also, according to liiippell, on fishes. The fur is comparatively long, loose, soft, and of a yellowish-grey colonr. The tail is short, thick, and indistinctly marked by four or five altemating black and greyish-white hands. These occur towards the extremity, which terminates somewhat abruptly. In common with other allied forms, the ears are much jointed, being tufted at the summit ly a pencil of finc hlack lairs, half an inch in
length. The Chaus is not very easily tamed. The Booted lynx-Felis caligata of Olivier-appears to be identieal with it. In the eatalogue of speeimens preserved in the British Museum it is designated Chars Lybicus.

THE EUROPEAN LYNX (Felis Lynx).-There are several forms of Lynx, regarded by some as so many distinet speeies, whiell are only varieties of this type. Among these may be mentioned the Felis virgata of Nilsson; the F. cervaria of Temminek, being an Asiatie form; and perhaps also the $F$. pardinu of Oken, found in Spain and southern Europe. The European lynx is abont three feet long, not ineluding the short tail, which measures six inches. The fur is long, roligh, and of a rufous-grey colour above, the under parts of the throat and belly being more or less white. The sides are indistinetly marked with oblong spots, and the free end of the tail is tipped with black. The ears are hairy, and pencilled at the upper part ; the limbs stout, and eomparatively short. During the winter season the general eolour of the fur is much lighter than in summer, while it is also eonsiderably longer. The European lynx is a good elimber, fceding prineipally on small mammalia and birds.

THE CANADA LYNX (Fclis Canadensis) was formerly supposed to be only a varicty of the above, but it is now generally believed to be distinet. In respeet of size, colouring, and other eharacters of the fur, it very elosely resembles the European speeies. The body is rather more than three feet in length, exelusive of the tail, whieh measmres only four and a half inches. For an aceurate account of this animal's habits we are indebted to Sir John Riehardson, who remarks that "it is a timid creature, ineapable of attacking any of the larger quadrupeds; but well armed for the eapture of the Ameriean hare, on whieh it ehiefly preys. Its large paws, slender loins, and loug but thiek lind legs, with large buttocks, scarcely relieved by a short thick tail, give it an awkward, elumsy appearanee. It makes a poor fight when it is surprised by a hunter in a tree; for though it spits like a eat, and sets its hair up, it is easily destroyed by a blow on the baek with a slender stick, and it never attacks a man. Its gait is by bounds, straightforward, with the baek a little arehed, and lighting on all the feet at once. It swims well, and will eross the arm of a lake two miles wide; but it is not swift on land. It breeds onee a year, and has two young at a time." We are further informed that the natives eat its flesh, and that from seren to nine thonsand skins are annually exported by the IIndson's Bay Company. In Dr. Gray's catalogue this speeies is designated Lyncus Canadensis.

THE CARACAL (Felis Caracal) is also a kind of lynx, having a wide goographical range, and extending not only over Afriea, but, aceording to Mr. Bennett and others, over southern Asia, as far eastward as the Ganges. The body is about thirty-four inehes in length, exeluding the tail, whieh measures other nine ineles. The fur exhibits a uniform rufous-brown eolour generally, growing paler from above downwards, and beeoming white immediately miderneath the throat, neek, and belly. On each half of the face are placed two pure white spots, one being situated above and to
yol. I.
the inside of the cye, the other oceurring beneath the outer angle of this organ. The ears are eomparatively long, "tapcring gradually to a fine tip, surmounted by a pencil of long black hairs," which are dark externally, and whitisl within. Like other speeies of lynx, the Caraeal is a good elimber, and feeds ehiefly on small mammalia and birds. It is said also to feed on the careasses of larger quadrupeds, whiel have been forsaken by lions. The Caraeal is proportionably strong, savage, and only tamed with difficulty. Aceording to Mr. Andersson, the fur is mueh esteemed by the natives of sonthern Afriea for making earosses, \&e., while the Dutch settlers employ it as a local applieation in rhenmatism. In 1)r. Giray's list this species is termed Caracal metanutis.

THE OUNCE (Felis Unciu).-Since the naturalist Buffon gave an accurate description of this animal, some authorities have disputed its claims to be regarded as a separate specics. It is, however, quite distinet, and in the language of Dr. Gray, "easily known by the thickness of its fur, the paleness of its eolour, the irregular form of the spots, and especially lyy the great length and thickness of the tail." In the form of this last-named organ, we observe a wide departure from the pceuliarly short stumpy condition of the tail in the lynxes ; justifying perhaps, when taken into eonsideration with other minor elaracters, their generic sejara-tion-a view which several naturalists have praetically adopted. The Ounee is abont the size of the eommon leopard, and has similar halits. It is a native of the mountainons districts of eentral Asia. In the list of feline mammals presented in oun national eollection, it is denominated Leopardus Uncia.
THE LEOPARD (Felis Leoprardus).-Most naturalists have arrived at the eonclusion, that the Leopard and Panther are one and the same animal; we say arrived, but it would be more just to state, that they liare fmally aeknowledged the opinion of Linnsus on this point to be eorreet, after laring over and over again disputed his authority. The Leopard is truly a beautiful species (fig. 34). The gromid colour of the fur has a pale yellow tint, the surface being marked at tolcrably regular intervals by dark patches made up of numerous small round spots, blended together in the form of ammlations surrounding a eentral clear space, the general tint within being deeper than the ground colour without. The Leopard is widely distributed in Africa, Asia, and the Indian Arehipelago. Its habits are essentially cat-like, and, being an expert elimber, the Indian natives call it the Tree-tiger or Lacliree bang. Unlike the tiger, it is said that nothing will induee it to take to the water. Leopards are remarkably deceitful, shy, and ravenons, the ntmost eaution being neeessary in any attempt to domestieate them. Their treacherous disposition has been illustrated in various ways, espeeially by Captain Williamson, who, amongst other things, relates the following ineident:-"The adjutant of our regiment, wishing to send a leopard as a present to a friend in England. procured a very fine eub, whieh had seareely openal its eres, and took every pains to rear it in such a manner as might obriate all apprehension. For some months the animal appeared as innoeent as a kitten, was playful, and seemed to be peculiarly traet-
able. I will not say how far its disposition might have continned mexeeptionable under any other eircumstances, but, mhappily, several of the privates of the artillery having aceess to the place where the leopard
was kept, and of course now and then imprudently worrying lim, the leopard became suappish and petulant. One day a soldier proroked him rather too far, when the leopard, now grown to the size of a stont


The Lenpard (Felis Leopardus).
pointer, suldenly reared, and fixing his claw in the nape of the man's neck, tore his shoulder in such a manner as to oecasion the soldier's death in the course of a few hours. The leopard from that time became so ferocious as to render it absolutely necessary to shoot him-a measure which gave universal satisfaction."
the cheetah (Felis jubata). -This is a species of very great importance in a zoological point of riew, inasmuch as it has been represented as forming an aberrant transitional type between the dogs and eats ; and but for the marked disparity in size, its general appearanec, and the noble lion-like attitude which it assumes, we might perhaps have more reasonably considered it at the beginning of the feline series. Much las been written eoncerning its true zoologieal position, especially by Mr. Bennett, who is quite eloquent upon the subject; yet Professor Owen's detailed researeles into the anatomy of this animal, clearly demonstrate that the so-called eanine characters are more apparent than real. The body is much elongated, and stands high on the legs, which are correspondingly slim (fig. 35). The firr has a pale fulvous colour generally, being almost white beneath the neek and belly; and exeept in these situations, the entire surface is marked with numerous uniform and closely-set spots of a decp-hlack colour. The tail is long, and somewhat linsly at the tip, the ecutral line beneath it, and the extremity, heing white; but at the upper part and sides thronghont the remainder of its extent, it is more or less ammulated, the spots haring a tendency to form ineomplete transuerse rings, which become more and more consprinous as they approach the free extremity. The mane is very slightly
developed; the ears are short and romnled; the pupil of the cye is cireular; the tip of the nose being black. The feet are provided with retractile claws, as in other Felidae ; but, according to Professor Owen, their action is somewhat restricted on account of the length of the unequal phalanges and their elastic ligaments. Some authors have erroneonsly' stated that the claws are nonretractile. The Chectah enjoys a wide geographical range over the open grounds of Africa and southern Asin. It is a singnlarly gracefnl and elegant species, and is very commonly known by the name of the Iunting leopard. In Persia it is called the Iouze, and Mr. Ogilly tells us that "in the East, where these beautiful animals are employed in the chase, they are carried to the field in low ears, whereon they are chained. Each leopard is hooded. When the lunters come within view of a herd of antelopes, the leopard is melaned, his hood is removerl, and the game is pointed out to him; for he is direeted in the pursuit by his sight. Then he steals along cautiously and crouchingly, taking alvantage of every means of masking his attack, till he has approached the herd mensen within killing distance, when he suddenly launches himself upon his quary with five or six rigorous and rapid bounds, strangles it instantanconsly, and drinks its bloord. The huntsman now approaches the leopard, earesses him, wins him from lis prey by placing the blood which lie collects in a woorlen ladle under the nose of the animal, or by throwing to him picces of meat; and whilst he is thus kept quiet hoods him, leads him back to his car, and there chains him. If the leopard fails, in consequence of the herd laving taken timely alarm, he attempts no pursuit, but returns to his car with a
dejeeted and mortified air." The Cheetah seems, therefore, quite eapable of domestication. It exhibits a frankness of look, and an openness of mamer, totally different from the sneaking distrustfulness of ordinary cats. Any one who has carefully watched the bchav-
iour of the two beautiful speeimens at prescnt contained in the Zoologieal Society's Gardens, Regent's Park, eannot but have been struck with their playful freedom, gentle manners, and elegant attitudes; their habits entircly according with the favouralle account given

Fig 35.


The Cheetah or llunting Lcopard (Fclis jubata).
by Mr. Bennett of a similar pair formerly preserved in the Tower menagerie. In Dr. Gray's list this speeies is designated Gueparda jubata.

THE JAGUAR (Felis Onca) is a broad-ehested, powerfully-built animal, inhahiting Central and South Ameriea (fig. 36). By some it is called the "great panther " or leopard. The body oeeasionally measures nearly five feet, exclusive of the tail. The fur is beautifully spotted, with amulations resembling those of the eommon leopard, their general appearance being, in the language of Mr. Bennett, at first sight "the same in both; but the open roses of the loopard are seareely more than half the size of those of the jaguar, and they all inelose a space of one uniform colour, in which, unless in some rare and aecidental instanees, no central spots exist ; while in the latter animal most of those which are arranged along the upper surfaee, near the middle line of the baek, are distinguished by one or two small blaek spots inclosed within their cireuit. The middle line itself is occupied in the loopard by open roses, intermixed with a few black spots of small size and romndish form ; that of the jagnar, on the contrary. is marked by one or two regular longitudinal lines of broad, clongated, deep blaek patehes, sometimes extending several inches in length, and oeeasionally forming an almost eontinuous band from between the shoulders to the tail. The black rings towards the tip of the latter are also more completely eircular than in the leopard." Respecting the habits of the Jaguar, its ferocious and destruetive character is well known;
devouring, as it docs, with equal avidity, all kinds of cattle, horses, and other quadrupeds, monkeys, birds, fishes, and even reptiles, having, it is said, a true aldermanic relish for savoury turtle. Notwithstanding its fiereeness, it is a cowardly anmal, instanees having been recorded where a loud shout has been suffieient to seare it away. The Spanish naturalist, D'Azara, gives an apt illustration of its great strength:-"A jaguar had struck down a horse, and D'Azara gave instructions that the latter slould be drawn within musket shot of a tree wherein he intended to pass the night, in expectation that the jaguar would return for his prey. While D'Azara was gone to prepare himself, the jaguar returned from the oplosite side of a broad and deep river, seized the horse in its mouth, drew it to the water some sixty paees, swam aeross the river with it, and drew it into a wood hard by." Both in form and colouring the Jaguar is prone to considerable variation, one of the kinds being of a deep brownish-black hue generally; so that the dark spots are scarcely rendered visible.
THE RIMAU-DYAN (Felis macroscelis) or Gigantie Tiger-eat of Sumatra, is a magnifieent animal, and one of the handsomest of all the feline mammalia. The body is about three and a half feet long, exelusive of the tail, whieh would give us some three feet more. The fur has a brownish-grey eolour, and is marked with marbled, interrupted, and angular patehes of a deep relvet-black eolour. In the 1st volume of the Zoological Journal, Sir Stamford Rafles gives the
following account of the habits of two lalf-tamed examples :- " Both speeimens, while in a state of confinement, were remarkable for their good temper and playfulness; no domestic kitten could be more so; they were always courting intercourse with persons passing by, and in the expression of their countenance, which was always open and smiling, showed the greatest delight when noticerl, throwing themselves on their backs, and delighting in being tiekled and mibbed. On board the ship there was a small musie dog, who used to play romd the eage with the animal, and it was amnsing to observe the playfuluess and tenderness with which the latter came in contact with his inferior-
sized companion. When fod with a fowl that died, he scizel the prey, and after sucking the blood and tearing it a little, he amused himself for hours in throwing it about, and jumping after it in the mamer that a cat plays with a mouse before it is quite dead. He never scemed to look on man or children as prey, but as companions; and the natives assert that when wild, they live principally on poultry, birds, and the smatler kinds of deer. They are not found in numbers, and may be considered rather rare anmals, even in the southern part of Sumatra. Both specimens were procured from the interior of Bencoolen, on the banks of the river of that name. They are generally found

Fig 26.
in the vicinity of villages, and are not dreaded by the natives, exeept as far as they may destroy the poultry. The natives assert that they sleep and often lay wait for their prey on trees; and from this circumstance they derive the name of Dahan, whieh sigrifics the fork formed by the brauch of a tree, across which they are said to rest and oceasionally streteh themselves." The Rimau-dyau is identical with, and also known by the name of, the Clonded tiger. A fine living example exists in the Zoologieal Socicty's collection, Regent's Park.

THE TIGER (Felis Tigris)--Plate 8, fig. 29-is readily distinguislod from all other foline mammalia by its large bulk, associated with the cliaracteristic transverse bands whieh occupy all parts of the body. The stripes form rings on the tail, the tip being always black. On the inside of the limbs and under part of the belly the fur is white. In some examples there is more splitting of the banls than in others, forming what are
termed the donble stripes. In all the tigers we have seen, this tendency was more or less marked. In the specimen called "Jungla," now exlibiting in this conutry, and formerly the property of the king of Oude, this variation is remakkably developed; but in other respects the much raunted "fighting tiger" is not to be eompared with the examples preserved in the Zoological Society's Gardens, Tegent's Park. The Tiger is not firmislied with a mane, and he stands less crect than the lion; his entire shape and make being more slender and graceful than that of his noble-looking congener. In regard to its gengraphical distribution, it is almost entirely confined to the great Indian peninsula aud its adjacent islands, although it is also fomed in central and eastem Asia-in the latter region as far as Clinese Tartary. Early writers have celebrated in strong terms the ferocions and amazingly destructive habits of this animal; while its enormous strength, prodigious specel, and tremendons leaping powers, have over and
over again been only too faithfully illustrated by the disastrous records of its ravages, which have ever and anon appearcd on the page of history. Cruel, insidious, bloodthirsty, and malevolent-such is the character it bears; but therc are some who would fain modify the force of this charge, and defond the character, if not protect the life, of this fcarful scourge of man and beast. The tiger is certainly a very cowardly animal, although the naturalist Pennant has been sadly taken to task for having recorded and belicved the fact, that one of these beasts had been frightencd by the mere unfolding of an umbrella. Whilst a party of ladies and gentlemen were seated under the shade of some trees on the banks of a river in Bengal, they obscrved a tiger preparing to spring; "one of the ladies, with amazing presence of mind, laid hold of an umbrella, and furled it full in the animal's face, which instantly retired, and gave the company an opportunity of removing from so terrible a neighbour." Such is Pennant's account, and although rather badly expressed, there can be no just reason for doubting its truthfulness. Confirmatory of this story, we have recently, through the columns of the Times, been made acquainted with the circumstance and results of a frightful attack, where a light umbrella proved, for the time at least, a most valuable instrument of defence. An English person, whose letter dates from Penang, February 10, 1859, writes:-"My escape from the tiger was truly miraculous, but that of Padre Cuellon was still more so, as the following details of the attack upon that worthy priest will clearly prove. The padre was on his way to church, and was immersed in the study of his sermon, when a tiger, to his utter surprise, suddenly rushed out of the jungle or tall grass; but as the beast had not measured its distance to a nicety, the padre, walking very quickly, was more frightened than hurt. The tiger, however, brushed so close to him, that his trowsers were torn, the snap of the beast being almost within a hair'sbreadth of his leg. The brute, not contented with a single spring, made another charge upon the poor padre, and as he had nothing wherewith to defend himself but his large paper umbrella, he suddenly opened it out in the animal's face, which had the effect of cowing it for a time. The tiger, however, evidently gamer or more pertinacious in his attacks than is wont with his tribe, charged the padre at least a dozen times, which occupied nearly twenty minutes. In the meantime the padre gradually edged towards a tree in an open space of ground, and as there was a large white ant's nest between him and the tiger, round which the latter had to make, this enabled the padre to climb the tree and get out of his way. The tiger, on getting round the nest, was at first puzzled at not seeing his intended victim; but in a few minutes he had his nose to the ground, and so scented the whereabouts of the padre. The tiger quietly sat down under the tree, and gave a wistful look upwards, but it was of no avail. The natives at length hearing the cries of the worthy padre, hastened to the spot, and renderal the assistance required. The tiger fled the instant it heard their shouts. The poor pricst burst into tears, and sang the 'Te Dcum,' in token of gratitude for his
delivery. Padre Cuellon, however, did not rally long; the fright had too serious an effect upon his system, and in about ten days he sank to rise no more." We might furnish many other proofs of the cowardly conduct of the tiger. Captain Thomas Williamson-no mean authority, and no mere closet naturalist-deliberately gives it as his opinion, that the tiger is more of a coward than any other beast of prey; "its treacherous nature induccs it, almost without exception, to conceal itself until its prey may arrive within reach of its spring-be its victim either bulky or diminutive. Size seems to occasion no deviation in the tiger's system of attack, which is founded on the art of surprising. We find, accordingly, that such as happen to keep the opposite side of a road by which they are somewhat beyond the first spring, often escape injury; the tiger being unwilling to be seen before he is felt. Hence it is rarely that a tiger pursues; but, if the situatiou permit, his cunning will not fail to eflect his purpose ; he will steal along the road's side among the bushes parallel with the traveller's course, until one of the many chances which present themselves, of finding him within reach, induces to the attack. Often where the country is rather too open to allow his procceding in this manner, the tiger will take a sweep among underwood or through ravines, in order to meet the traveller again, at a spot whence he may take his spring. Tigers are extremely partial to such sitcs as command a road, selecting one rather less frequented, in preference to one that is much in use. In the former they are certain of finding as much as will answer their daily wants." On one occasion, observes the same author, "I was travelling past in my palankeen, through the Ramghme district, which is mountainous and little cultivated, being for the most part in a state of nature and everywhere abounding in jungles, when a bangywollah, who conveyed two baskets of linen and refreshments, and who preceded the palankcen about an hundred and fifty yards, set down his load and seated himself on the side of the road to rest awhile. About two yards behind him was a small bush, not much larger than a good-sized currant tree, round which a small quantity; of jungle grass was growing to the height of about three feet. There was not another twig to be seen for at least half a mile on that side of the road. No sooner had the poor fellow seated himself, than a tiger sprang from behind, or rather from within the bush, and, after giving the fatal blow with his paw, scized the man by the shoulder, and dragged him off with the utmost ease at a round pace, into a thick cover which had as formerly skirted the road, but which had by order of goverrment been cut away to the distance of about a hundred yards, for the safety of travellers." Some such deceitful plan is, in point of fact, the ordinary method adopted by the tiger for overcoming its prey. The melancholy death of Sir Hector Munro's son took place in a similar manner. Several writers have rccorded the incident, which, according to Mr. Wood, took place under the following circumstances:-"This merturiatc gentleman, accompanied by three of his friends, went on shore, December 22, 1792, on Sawgar Island, to shoot decr. They contimed their sport till the afternoon, when they
retired to the edge of a jungle to refresh themselves, where they had not remained long before one of the party, who was leaving the rest to slioot a deer, heard a dreadful roar, and saw a large tiger spring on poor Munro, and rush with him into the jungle with the greatest ease, dragging him through everything that obstructed his course, as if all were made to yield to his amazing strength. All that lis companions could do to rescue their friend from this shocking situation, was to fire at the tiger; and it is evident that their shots took effect, since in a few minutes after, Mr. Munro staggered up to them and fell. Lvery medical assistance that the ship afforded was procured for him immediately, but in vain; he expired in the course of twenty-four hours, in the greatest agonies. His head was tom, his skull fractured, and his neck and shoulders covered with womds made by the claws of the savage beast. It is worthy of observation, that neither the large fire that was blazing elose to them, nor the noise and laughter which, it scems, they were making at the time, could divert this determined animal from his purpose." This, however, is $n 0$ proof of the tiger's bravery, since it fell upon them una wares, and their noise was that of unsuspicious mirth, and not of the kind to scare away such a cowardly enemy, but rather to attract lim. 'Diger-hunting in India is considered the noblest and most dangerous of sports; and from the mass of interesting details which have appeared in various works devoted to the sulbect, it is dillicult to decide which are the most meritorious records of the chase. Captain Mundy tells us of a lunting party who sprung a tiger, when the following scene ensucd:-This beast "took to the open country, which would have more become a fox than a tiger, who is expected by his pursuers to fight, and not to rum; and as he was flushed on the flank of the line, only one bullet was fired at him ere he cleared the thick grass. He was unhurt, and we pursued him at full speed. Twice he threw us out by stopping short in small strips of jungle, and then heading back after we had passed; and he had given us a very fast trot of abont two miles, when Colonel Arnold, who led the field, at last reached him by a capital shot, his clephant being in full carect. As soon as he felt himself wounded, the tiger crept into a close thicket of trees and bushes, and crouched. The two leading sportsmen overran the spot where he lay, and as I came up I saw lim through an aperture rising to attempt a charge. My mathout had just before, in the lieat of the chase, dropped his ankors, or goad, which I had refused to allow him to recover; and the elephant being noteriously savage, and further irritated by the goading he had undergone, became consequently inmanageable; he appeared to see the tiger as soon as myself, and I laad only time to fire one shot, when he suddenly rushed with the greatest fury into the thicket, and falling upon his knees, nailed the tiger with lis tusks to the ground. Such was the violence of the slook, that my servant, who sat behind, was thrown out, and one of my guns went overboard, The struggles of my elephant to crush his still resisting foc, who had fixed one parv on his eye, were so energetic, that I was obliged to hold on with all my strength to kecp myself
in the houdah. The second barrel, too, of the gun, which I still retained in my hand, went off in the scuffle, the ball passing close to the maliout's ear, whose situation, poor fellow, was anything but enviable. As soon as my elephant was prevailed upon to leave the killiug part of the business to the sportsmen, they gave the roughly-used tiger the coup-de-grace." Sometimes, when the elephant rushes mon the tiger in the manner just mentioned, it is absolutely impossible for the riders to keep their seats. The author of the "Oriental Ficld Sports" gives an amusing illustration of an accident of this kind which happened to Captain John Rotton:-" He was one of a very numerous party assembled for the purpose of tiger-hunting, and was mounted on a very fine male elephant, that, firr from being timid, was very remarkable for a courage scarcely to be kept within the bounds of prudence. This singularly fine animal having, after much beating a thick grass, hit upon the tiger's situiltion, uttered his rour of vengeance, which roused the lurking anmal, occasioning him to rise so as to be seen distinctly. No sooner did the tiger show himself, than Captain Rotton, with great readiness, bending his body a little to the left, took aim at him as he stood up, crosswise, almost close to the elehlant's head. The elephant no sooner espied his enemy, than he knelt down, as is common on such occasions, with the riew to strike the tiger through with his tusks. At the same time the tiger, sensible of the device, as suldenly threw himself on his baek, therely erading the intended mischief, and ready to claw the elcphant's face with all four fect, which were thus turned upwards. Now, whether Captain Rotton had not been in the habit of joining in such rapid evolutions, or that the elcphant forgot to warn him to hold fast, we know not; but, so it happened, that the delicate situation in which he was placed, while taking his aim, added to the quickness of the elephant's clange of height forward, combined to project him, without the least olstruction, from his seat, landing him plump on the tiger's belly! This was a species of warfare to which all parties were apparently strangers. The elephant, however fearless in other respects, was remarkably alarmed at the strange round mass-the captain being remarkally fat-which had shot like a sack over his shoulder; while the tiger, judging it to be very ungentlemanly-like usage, lost no time in regaining lis legs, trotting off at a round pace, and abandoning the field to the victorious captain!" With regard to other modes of destroying tigers, it may be observed generally that these animals are not very easily secured by traps. According to Williamson, they adopt a very ingerious method in Persia. "This device consists of a large semi-spherical cage, made of strong lamboos or other efficient materials, woven together, but leaving intervals throughout of about three or four inches broad. Under this corer, which is fastened to the ground by means of pickets, in some placos where tigers abomed, a man, provided with two or three slort strong spears, takes post at night. Being accompanied by a dog, which gives the alarm, or by a goat, which by its agitation answers the same purpose, the adventurer wraps himself up in his quilt, and very composedly gocs to slecp, in full confidence of his
safety. When a tiger comes, and, perlaps after smelling all around, begins to rear against the cage, the man stabs him with one of the spears through the interstices of the wiekcr-work, and rarely fails of destroying the tiger, which is ordinarily found dead at no great distanee in the morning." Another plan, stated by the same authority to be employed in Oude, is too amnsing to pass unnoticed:-"The track of a tiger being ascertained, whieh, though not invariably the same, may yet be known sufficiently for the purpose, the peasants collect a quantity of the leaves of the prauss, which are like those of the sycamore, and are common in most underwoods, as they form the larger portion of nost jungles in the north of India. These leaves are smeared with a species of bird-lime, made by bruising the berries of an indigenous tree; they are then strewed with the gluten uppermost, near to that opaque spot to which, it is understond, the tiger usually resorts during the noon-tide heats. If by chanee the animal should tread on one of the smeared leaves, his fate may be considered as decided. He eommenees by shaking his paw, with the view to remove the adhesive incumbrance; but finding no relief from that cxpedient, he rubs the nuisance against his face with the same intention, by whielı means his eyes, ears, \&e., become agglutinated, and oecasion such uneasiness as eanses him to roll, perhaps among many more of the smeared leaves, till at length he beeomes completely enveloped, and is deprived of sight. In this situation he may be eompared to a man who has been tarred and feathered. The anxiety produced by this strange and novel predicament soon discovers itself in dreadful howlings, which serve to call the watchful peasants, who, in this state, find no difficulty in slooting the mottled object of detestation." A more common method of destroying tigers is that of shooting them from a moychaun or platform. This temporary elevation is ereeted only when a tiger has earried off some animal, and the haunt of lis concealment has been duly aseertained by finding the half-mangled carcase. The platform is then rapidly constructed of bamboo or other poles, and raised about twenty feet from the ground. On the tiger's return, the native sheearrie, or sportsman, seldom fails to kill or mortally wound the beast, for which, on his return home, he is amply rewarded by money, gifts, and congratulations. In eonelusion, we may remark that the tiger is capable of being tamed, but its disposition is irascible and uncertain. The female usually produces from two to four cubs at a birth.
the puma (Felis concolor), Cougar, or American lion, as it is erroneously called, is easily reeognized by its nearly uniform fawn-coloured fur, which in the young state, however, is faintly marked at the sides with spots of a rather deep tinge of the same hue. The inner sides of the legs, as well as the under parts of the throat and belly, are lighter, inelining to white ; but the posterior aspect of the ears, especially at the base, the sides of the muzzle, and the tip of the tail, are black. The body is about four feet six inches, not including the tail, which measures some six and twenty inches. With regard to its labits, early writers have represented the Puma to be an extremely savage species. This is indeed quite true, in so far as it
relates to its depredations among eattle; but it las scldom been known to attack any human being. Mr. Lawson, in his "History of Carolina," states that his prey consists of "swine's flesh, deer, or anything he can take. No ereature is so nice and clean as this in his food. When he has got his prey, he fills his belly with the slauglter, and carefully lays up the remainder, covering it very neatly with leaves, which, if anything touches, he never eats any more of it." The Puma is an excellent climber ; but, as a rule, it appears to prefer the low, swampy, and more open grounds, where it may eommit terrible havoc among herds of cattle pasturing in these situations. It las been known to destroy as many as fifty sheep in a single niglit. The Puma formerly occupied an extensive geographieal range, extending from Canada to Patagonia; but the progress of civilization las made terrible inroads upon its haunts, it being now confined to limited areas chiefly in the prairies of the north and the marshy lowlands of the south. In the Pampas it is hunted and taken with the lasso, while in Canada and the States it falls to the more surely destruetive rifle. When taken young the Puma is easily tamed, and in the domestieated state, exhibits all the playfulness of a kitten; while on being caressed it utters the eharaeteristie purring sound. In the British Museum's list of Felida it is associated with the leopards.
TRAILL'S PUMA (Felis unicolor), or Spotless cat, appears to be quite distinct, being little more than half the size of the true Puma. The body measures thirtytwo inches, exclusive of the tail, which would give us another twenty inches. "The general hue of this speeies is a beautiful glossy reddish-brown. The colour of the whole upper part of the body, including the head and tail, has a considerable resemblance to that of a dark bay horse. The tint becomes gradually paler on the sides and under part of the neek, and passes by imperceptible shades into an ochry brown on the belly. When elosely examined, the darker colour of the back is partly owing to an intermixture of blackish-brown hairs with the rest of the fur. The hair over the body is rather short, like that usually seen on a smooth Spanish pointer." Dr. Traill further observes, by way of eomparison, that "the head of the Spotless eat is much more pointed, its nose more elevated, and its limbs are much more slender in proportion to its size, than in the puma. The strength of the jaws and size of the teeth are likewise proportionally less. In the puma the baeks of the ears are blaek; in our animal they are of the same colomr as the adjacent parts. The tail of the puma is elaviform, or appears thiekened towards the tip, which is black; but the tail of the Spotless eat is nearly of one thickness throughout, and it wants the conspieuous black tip." All that our authority has recurded of its habits may be summed up in a few words, namely, that it occupies the interior of large forests, preying upon monkeys, quadrupeds, and birds.

THE LION (Fclis Lco)-Plate 8, fig. 28-occupies a much wider geographieal range than the tiger, especially if we regard the Gambian and maneless forms as mere varieties of a single species. The latter kind are fornd in the Indian territory of Guzerat, and in the adjacent
peninsula of Cutclı. In all probability there is but one true species of lion, and this in general is characterized by the possession of a uniformly tawny or yellowish-ruddy fur, the tail presenting a bushy tuft of long black hairs at the tip. The male is also furnished with a large flowing mane, which covers the back part of the head, as well as the entire neck, extending over the shoulders to a greater or less extent. The young are frequently marked with roundish spots and dark stripes along the back. Curiously banded hybrids have also been occasionally produced by associating the lion with the tigress. In our introductory observations on the Carnivora, we have already dwelt on the structure of the skelcton of this most lighly developed type of the order, and in our remarks on the Felidx proper, we have been careful to ilhustrate the distinguishing characteristics common to the lion and its allies ; but there still remains an apparently trifling matter which has given rise to much controversy, and cannot therefore be passed unnoticed. We allude to the occasional presence of a corneous thorn-like prickle developed at the extremity of the lion's tail. For a long period we remained sceptical as to the genuine character of this peculiar dermal process, conceiving it to be a mercly accidental thickening or induration of the caudal integnment, and serving no particular purpose in the economy of this animal's habits. The question has, however, becn fiirly set at rest by Messrs. Bemnett and Woods; the former gentleman having, at a meeting of the Zoological Society of London in 1832, exhibited one of these claw-like appendages which had been previously removed from the tail of a lion then living in the society's menageric, Regent' Park. This claw is about the third of an inch long, solid throughout the greater part of its cxtent, sharp at the apex, and slightly hollowed out at the base. Its function has been supposed to be connected with a lashing of the tail for the purpose of stimulating anger ; but in our view it is more probably concerned in the action of scratching out or combing hair where portions of the fur have been accidentally matted together. Be that as it may, its cxistence is a rcmarkable fact; and what perhaps is still more strange, is, that its presence has receutly received confrmation from a source of anthority far more ancient than the oft-quoted statements of Didymus of Alexandria, who flourished forty years prior to the Christian era. The Assyrian sculptures plainly aver that the lion-hunting people of that early period, some seven lundred years before Christ, were well acquainted with this horny development, secing that their artists have faithfully depicted it on the imperishable monuments of their ancient might! Strange, we repeat, that the clucidation of a long-disputed point in natural history and science, should at length receive assistance and confirmation from the disinterred memorials of a by-past race-of a people who bred and reared lions expressly for the clase and other kinds of sports! "Let the spectator," says M. Bonomi, in his attractive volume entitled, "Nineveh and its Palaces," "now examine these interesting sculptures, and consider for himself the various attitudes of the dead and dying lions, what a familiarity with the result of the various wounds
each separate example displays! How this lioness, wounded in the spinal cord, drags her paralyzed hinder quarters after her! How that lion, wounded in the cye, puts up his paw with agony to the spot! How another, pierced with four arrows, is staggering in the last convulsion! How yet another, wounded in the brain, has fallen over on his back! How this one, wounded in the lungs, stops to pour out the life-stream! And lastly, how certain it is that the king and his court, and the inhabitants of Nineveh in general, must have been familiar with such cxlibitions to have required so many cruel details at the hand of the artist!" These and other records also testify that in carly times lions were extremely mmerous in the castern parts of $\Lambda$ sia; and we also learn from Herodotus that they formerly cxisted in Europe, the baggage camels of Xerxes' army being, we are told, attacked in their march from Acanthus towards that part of Turkey now called Salonica. But in modern times it is to Africa that the lion-hmuter directs lis steps. Accordingly we have of late years, especially, received important additions to our knowledge of the instincts and habits of the lion; and it is now pretty well understood that the noble qualities ascribed to this beast by Buffon and his copyists, have existed only in their imaginations, since, on the contrary, it has been continually shown, that the lion, like the tiger, is ever ready to take advantage of a comparatively weak and unguarded prey, and by the execution of a momentary dash, to bring it to the ground. A fullgrown lion weighs from thirty-five to nearly forty stone ; consequently few animals can resist the fearful crash of such a weight falling upon them miawares. Except when pressed for food, the lion is certainly a rather lazy and indolent beast; but this unwillingness to commit havoc for the merc pleasure of the sport, does not entitle it to receive the character of being brave, noble, or magnanimous - qualities which it assuredly does not possess. If we turn our attention to the testimony of eminent and distinguished travellers, what do we find? Sparman mentions the case of a farmer, named Jacob Kok, who, "when walking over his lands with his loaded gun, unexpectedly met a lion. Being an excellent shot, he thought himself pretty certain, from the position in which he was, of killing it, and, therefore, fired his picec. Unfortmately he did not recollect that the charge lad been in it for some time, and consequently was damp; so that his piece hung fire, and the ball, falling short, cutered the ground close to the lion. In consequence of this he was seized with a panic, and took directly to his heels; but, being soon out of breath, and closely pursued by the lion, he jumped on a little heap of stones, and there made a stand, presenting the but-end of his gun to his adversary, fully resolved to defend his life as well as he could to the utmost. This deportment had sueh an efiect on lis pursuer, that he also made a stand, and lay down at a distance of a few paces from the heap of stones, seemingly quite unconcerned. Jacob, in the meantime, did not stir from the spot; besides, he had in his flight untortunately dropped his powderhorn. At length, after waiting a good half hour, the lion rose up, and at first went very slowly, and step by
step only, as if he had a mind to steal off; but as soon as lie got to a greater distance, he begran to bound awiay at a great rate." Here, at all events, our lion did not exhibit much courage or bravery; and, as another instance of cowardice on the part of this socalled noble animal, we quote the statements of Captain Harris, who remarks that, early one rainy morning, when he and his companions were peeping out of their canvas-covered waggon, in order to ascertain if there was any prospect of its clearing up, they "perceived three lions squatted within a hundred yards, in the open plain, attentively watching the oxen. Our rifles," lie adds, "were hastily seized, but the dampness of the atmosphere prevented their explosion. One after another, too, the Ilottentots sprang out of the pack waggon, and suapped their guns at the unwelcome intruders as they trotted sulkily away, and took up their position on a stony eminence at no great distance. Fresh caps and priming were applied, and a broadside was followed by the instantaneous demise of the largest, whose cranium was perforated by two bullets at the same instant. Swinging their tails over their backs, the survivors took warning by the fate of their companion, and dashed into the thicket with a roar. In another lialf hour the voice of Leo was again heard at the foot of the mountains, about a quarter of a mile from the camp; and from the waggon-top we could perceive a savage monster rampant, with his tail hoisted and whirling in a circle, charging furiously along the base of the range, and in desperate wrath making towards John A pril, who was tending the sheep. Every one instinctively grasped his weapon and rushed to the rescue, calling loudly to warn the expected victim of his danger. Without taking the smallest notice of lim, however, the infuriated monster dashed past, roaring and lashing his sides, until concealed in the mist." So mucli for the lion's courage. Another false appellation by which he is known, is that of the dignified title of "monarch of the forest ;" but, as Mr. Burchell remarks, this name is not very applicable, seeing that he is seldom seen except amongst low thickets and brushwood, or in the open plains. Captain Harris, who employs the misnomer without comment, is very careful to tell us, that the fine specimens seen in onr, menageries are, as it were, "but the shadow of that animal which clears the desert with his rolling eye." No doubt our semi-domesticated examples lose something of that lustre of the eye, a ard breadth of limb, which characterize the wild and unfettered beast; nevertheless, our conceptions of a lion's strength are perhaps as accurately realized by an examination and dissection of such examples as are bronght over, or even bred in this country, as by the description and poetical language above adopted. In the sad story given ly Mr. Gordon Cumming, of the seizure and death of a Iottentot named Hendrick, the lion's attack was of the most cowardly character. "It appeared that when the unfortmatc ITendrick rose to drive in the ox, the lion had watched him to his fireside; and he hatd scarcely lain down when the brute sprang upon him and Ruyter (for both lay under one hlanket) with his appalling murderons roar, and, roaring as le lay, grappled him with his fearful claws, and kept biting
him on the breast and sloonlder, all the while feeling for his neck; having got hold of which, he at once dragged him away backwards round the bush into tho dense slade. As the lion lay on the unfortunate man, he faintly cried-'Help me, help me, O Ciod! men, help me!' after which the fearful beast got hold of his neck, and then all was still, except that his comrades heard the bones of his neck cracking between the teeth of the lion." With regard to the death-dealing strength of the lion's paw, Mr. Burchell relates the following incident:-Whilc he and his fricuds were out hunting, they sprung a lion and lioness. The latter soon disappeared, but the former made a slight advance, as if to show fight. "At this instant the dogs boldly flew in between us and the lion, and, surrounding lim, kept hinn at bay by their violent and resolute barking. The courage of those faithful animals was most admirable. They advanced up to the side of the luge beast, and stood making the greatest clamour in his face, without the least appearance of fear. The lion, conscious of his strength, remained momoved at their noisy attempts, and kept his head turned towards us. At one moment the dogs, perceiving his eye thus engaged, had advanced close to his feet, and seemed as if they would actually seize hold of him; but they paid dearly for their imprudence: for, without discomposing the majestic and steady attitude in which he stood fixed, he merely moved his paw, and at the next instant I beheld two lying dead. In doing this he made so little exertion, that it was scarcely perceptible by what means they lad been killed. Of the time which we gained by the interference of the dogs, not a moment was lost. We fired upon him ; one of the balls went throngh his side, just between the short ribs, and the blood began to flow; but the animal still remained standing in the same position. We had now no doubt that he would spring upon us. Every gun was instantly reloaded; but happily we were mistaken, and were not sorry to see him more quietly away, thongh I had hoped in a few minutes to have been enabled to take hold of his paw without danger."
As to the destructive habits of the lion, Mr. Andersson tells us of one powerful heast slain by Messis. Galton and Bam, which only a slort time previous had killed upwards of fifty oxen, cows, and horses! In its stomach, when shot, was a small dog bitten into five pieces, the little animal having incautiously approached the lion during the hunt. Many other interesting details regarding the habits of the lion are given by this most successful hmenter. On one occasion Mr. Anderssou had a marvellously lucky escape. When eating his dimer, a number of native damaras and mamaqnes came to tell him that an ongeama, as they call it, had destroyed one of their goats, and that they hoped he would help them to kill it. IIe consented. The lion had taken refnge in a dense tamarisk brake, and Mr. Andersson says:-"I had procceded for some time, when suddenly, and within a few paces of where I stood, I heard a low, angry growl, which caused the dogn, with hair erect in the mamer of logs' bristle, and with their tails between their legs, to slink behind my hecls. Immediately afterwards a tremendous shout of "ongeama! ongeama!" was raised ly the natives
on the bank above, followed by a discharge of fire-arms. Presently, however, all was still again; for the lion, as I subsequently learnt, after showing himself on the outskirts of the brake, lad retreated into it. Once more I attempted to dislodge the beast; but finding the cnemy awaiting him in the more open country, he was very loath to leave his stronghold. Again, however, I succeeded in driving him to the edge of the brake, where, as in the first instanee, lie was received with a volley; but a broomstick would have been cqually efficacious as a gun in the hands of these people, for out of a great number of shots that were fired, not one seemed to have taken effect. Worn out at length with my exertions, and disgusted beyond measure at the way in which the natives bungled the affair, I left the tamarisk brake, and, rejoining them on the bank above, offered to change place with them; but my proposal, as I expected, was forthwith declined. As the day, however, was now fast drawing to a close, I determined to make one other effort to destroy the lion, and, sloould that prove unsuccessful, to give up the ehase. Accordingly, accompanied by a single native, I again cutered the brake in question, which I examined for some time without seeing anything; but on arriving at that part of the cover we had first searched, and when in a spot comparatively free from bushes, up suddenly sprung the beast within a few paces of me. It was a black-maned lion, and one of the largest I ever remember to have encountered in Africa. But his movements were so rapicl, so silent and smooth withal, that it was not until he had partially entered the thick cover-at whieh time he might have been about thirty prees distant-that I could fire. On receiving the ball he wheeled short about, and, with a terrific roar, bounded towards me. When within a few paces, he couched as if abont to spring, having his head imbedded, so to say, between his fore-paws. Drawing a large hunting-knife and slipping it over the wrist of my right hand, I dropped on one knee, and, thens preparcd, awaited his onset. It was an awful moment of suspense, and my situation was critical in the extreme. Still my presence of mind never for a moment forsook me-indeed, I felt that nothing but the most perfect coolness and absolute self-command would be of any avail. I would now liave become the assailant; but as-owing to the intervening bushes, and clouds of dust raised by the lion's lashing his tail against the ground-I was mable to see his head, while to aim at any other part would have been madness, I refrained from firing. Whilst intently watching his every motion, he suddenly bounded towards me; but-whether it was owing to his not perceiving me, partially concealed as I was in the long grass, or to my instinctively throwing my body on one side, or to his misealeulating the distance-in making his last spring, he went elear over me, and alighted on the ground three or four paces beyond. Instantly, and without rising, I wheeled round on my knee, and diseharged my second barrel, and, as his broadside was then towards ine, lodged a ball in his shoulder, which it completely smashed. On receiving my second fire, he made another and more determined rush at me; but, owing to his disabled state, 1 happily avoided him. It
was, however, only by a hair's breadth, for he passed me within arm's lengtlh. He afterwards serambled into the thick eover, beyond where, as night was then approaching, I did not decm it prudent to pursue him." Next morning they fomm the spot where the poor brute had passed the night in slecpless agony; but it was not until the expiration of several days that lis carcase was found, then in a state of decomposition; and thus ends the story. Many other narrow eseapes are recorded by Mr. Audersson, some of which are even more astonishing. In most instances it wonld appear that these escapes depend upon the cowardice of the lion, which also does not seem to be able to recognize the proper moment when an intended vietim is entirely within its power. 'Thus, for example, what can be more extraordinary than the following incident, given by the same gentleman? - An old waggon-driver, Piet by name, "riding along one morning in a very weak state, having just recovered from a severe fever, a lion suddenly rushed on him. The ox became frightened, and threw the old man. One of his feet was caught in the stirrup; but, fortumately, the 'weld' shoe slipped off. 'I know,' said the old veteran hunter, 'I was thrown, and that I got on my legs again, but in what mamer is quite a mystery to me to this day. I ealled, as lond as my feeble voice permitted, to my people to bring a grun, the lion always getting nearer and nearer, until he stood within arm's lengtlı. I once or twice tried to pull out my pistol or my sword-knife, which, as you know, I usually carry about with me, but in my anxicty I missed them. My jacket was lying just in front of me on the ground, but the brute had one of his paws on it. I felt desperate, however, and, pulling it forcibly away, struck the lion on the head, when he grimed and growled terribly, and I expected every moment he wonld tear me to pieces. At this juncture my damara, who fortnnately had heard my cries of distress, cance running up with my gun. Taking the piece from the man, I fired at the lion, who had retreated a few paces, where he sat quietly looking at me. I dont know whether I hit him, for what with the sudden fright and my weak constitution, I felt very minteady. Be that as it may, it had at all events the effect of searing him away, for at the report of the gim he instantly betook himself to cover.'" In such cases as the above, one camnot but recognize a providentially-implanted fearfulness in the the lion, which frequently gives to the hmman victim an opportminty of escape; and perhaps, therefore, those instances of deliverance, where the amimal has already partially succeeded in overcoming his intended prey; onght to be considered the more remarkable-such, for example, as that of the escape of Dr. Livingstone, which is deseribed by the distinguished missionary himself as follows:-" Being abont thirty yards off, I took a good aim at his body through the bush, and fired both barrels into it. The men then called out, 'Ile is shot, he is shot!' Others cried, 'Ile has been shot by another man too; let us go to him!' I dicl not sce any one else shoot at him, but I saw the lion's tail erected in anger behind the bush, and, tuming to the people, said, 'Stop a little till I load again.' When in the aet of ramming down the bul!ets I heard a shont.

Starting, and looking half round, I saw the lion just in the act of springing upon me. I was upon a little height; he caught my shoulder as he sprang, and we both came to the ground below together. Growling horribly close to my ear, he shook me as a tcrrier dog does a rat. The shock produced a stupor similar to that which seems to be felt by a mouse after the first shake of the cat. It caused a sort of dreaminess, in which there was no sense of pain nor feeling of terror, though quite conscious of all that was happening. It was like what patients partially under the influence of chloroform describe, who see all the opcration, but feel not the knife. This singular condition was not the result of any mental process. The shake annihilated fear, and allowed no sense of horror in looking round at the beast. This peculiar state is probably produced in all animals killed by the Carnivora; and if so, is a inerciful provision by our benevolent Creator for lessening the pain of death. Turning round to relieve myself of the weight, as lie had one paw on the baek of my head, I saw his eyes directed to Melalwe, who was trying to shoot him at a distance of ten or fifteen yards. His gun, a flint one, missed fire in both barrels; the lion immediately left me, and, attacking Mebalwe, bit his thigh. Another man, whose life I had saved before, after he had been tossed by a buffalo, attempted to spear the lion while he was biting Mebalwe. He left Mebalwe and caught this man by the shoulder; but at that moment the buliets he had received took efficet, and he fell down dead. The whole was the work of a few moments, and must have been his paroxysm of dying rage. In order to take out the charm from lim, the Bakatla on the following day made a huge bonfire over the carcase, which was declared to be that of the largest lion they had ever scen. Besides crunching the bonc into splinters, he left eleven teeth wounds in the upper part of my arm."

In attacks on the more powerful quadrupeds, the lion seldom approaches them singly. Thus, Messrs. Oswell and Vardon witnessed three male lions pulling down a buffalo, and they were enabled to shoot two of the plunderers on the spot. Again, Mr. Andersson saw no less than five lions, two of which were in the act of similarly destroying "a splendid giraffe, the other three watching close at hand," ready to take part in the deadly strife. The last-named sportsman also mentions two instances where the lion had been guilty of cannibalism. In one case a male had devoured a lioness, having apparently quarrelled over an insufficient meal, consisting of a spring-bok, on which they had evidently been feasting together! In the other case, after Mr. Andersson and his friends had severely wounded a male, a whole troop of lions immediately rushed upon their disabled brother and tore him to pieces. In all these incidents the true cowardly character of the species
is very conspicuous, and it camnot therefore be affirmed, we repeat, that the lion is either brave or magnanimous. In regard to the power of the lion's roar, Dr. Livingstone's observations are too important to pass un-noticed-"The samc feeling," says this eminent traveller, "which has induced the modern painter to caricature the lion, has led the sentimentalist to consider the lion's roar the most terrific of all earthly sounds. We hear of the 'majestic roar of the king of beasts.' It is indeed well calculated to inspire fear if you hear it in combination with the tremendously loud thunder of that country, on a night so pitchy dark that every flash of the intensely rivid lightning leaves you with the impression of stone-blindness, while the rain pours down so fast that your fire goes out, leaving you without the protection of even a tree, or the chance of your gun going off. But when you are in a comfortable house or waggon the case is very different, and you hear the roar of the lion without any awe or alarm. The silly ostrieh makes a noise as loud, yet he never was feared by man. To talk of the majestic roar of the lion is mere majestic twaddle. On my mentioning this fact some years ago, the assertion was doubted, so I have been careful evcr since to inquire the opinions of Europeans, who have heard both, if they could detect any difference between the roar of a lion and that of an ostrich; the invariable answer was, that they could not when the animal was at any distance. The natives assert that they can detect a variation between the commencement of the noise of each. There is, it must be admitted, a considerable difference between the singing noise of a lion when full, and his deep, gruff' voice when hungry. In general the lion's voice seems to come deeper from the chest than that of the ostrich; but to this day I can distinguish between them with certainty only by knowing that the ostrich roars by day and the lion by night." The lion, as we have seen, is rather timid than courageous; the testimony of Burchell, Harris, Cumming, Andersson, Livingstone, and many others, clearly showing that it entertains great fear of man. Whilst this mighty beast is actually cnjoying a hearty meal, by mercly walking up, Captain Harris causes it to march off forthwith. Many similar incidents are also recorded by these distinguished travellers; Dr. Livingstone going so far as to assure us, that there is "more danger of being run over when walking in the streets of London than of being devoured by lions in Africa, unless engaged in hunting the animal." Lions are still very abundant in the interior of that country, but, with an extending civilization, and a more constant supply of fire-arms to the natives, it may be fairly predicted that the regions of the south will ere long become as completely cmptied of this huge beast of prey, as have been the-once infested districts of Grcece and $\Lambda$ sia Minor.

## Order Vi.-PINNIPEDIA.

Tiris order of amphibious mammals, thouglt, for eonvenience, here treated as a distinet gronp, camot be regarded as zoologically equivalent to any of the foregoing ordinal divisions, inasmuch as it ouly represents a peculiar section of the Carnivora, properly so ealled. In accordance, therefore, with the system indieated at the commencement of this work, the Pimipeds or Seals are here eonsidered separately. The most marked and obvious peculiarity in their organization, consists in the conversion of the fimbs into paddles or swimming feet-the modifications of structure by which this change is brought about being best understood by an cxamination of the skeleton (l'iate 34, fig. 114). Bearing in mind what we have ahready pointed out respecting the osteology of the typieal earnivor, it will be notieed that the several skeletal elements of the seal are more or less attennated, compressed, and shortened, aceording to cireumstances. Thms, instead of the broad massive sknll, we have a rather congated cranium, associated with a movable spine, which is even more flexible than that of ordinary eats. The bones of the pelvis are partieularly slender, and but fecbly developed, while the shoulder-blades are, on the other hand, remarkably broad. There are no clavieles. The homologous arm and thigh bones, that is, the humeri and femora, are much shortened. The bones of the forc-arm are considerably flattened; and, in the conformation of the hand, the adaptation of the limb for matatory purposes is eminently significant. It will be observed that the phalanges are drawn out, as it were; and, diverging from one another, like the spokes of a wheel, they form mutually-resisting supports for the interdigital webs. The hind paddles, with their membranous expansions, are similarly constructed, stretching out posteriorly in a horizontal direction. All the fect are pentadactylous, the toes of the anterior extremity becoming, one after another, shorter from the thumb outwards. The outer and imermost toes of the hind feet are the most extensively developed. The forward movements of the body upon land are produced by a rapid succession of short shuffing or wriggling leaps, entirely due to the contraction of the museles of the trunk, and altogether independent of the limbs, the latter only being employed in elambering up the sides of projecting roeks. Generally speaking, the bones are light and spongy in texture; and this cirenmstanec-when taken in connection with the boatlike form of the body, whieh terminates posteriorly in a short and conieal tail, the oar-like limbs, the smooth adpressed fur, together with the flexible spine and powerful museles - satisfactorily demonstrates how much eare has been taken to render these ercatures swift, easy, and vigorous swimmers.

## Family I.-IIIOCIDA

The truc Seals have been divided into four subfamilies or minor groups, but their differentiating characters are searcely sufficient to warrant such an
arrangement. The tectle are usually thirty-fur in number, of which there may be reekoned six or only four ineisors above, and four or two below, together with four canines, and twenty or twenty-two molars; all having the crowns armed with trenchant conieal points. The tongue is smooth and bifid at the tip; the stomach is simple, the intestinal canal being comparatively long. In conncetion with the liver, the posterior vena cava has a saeculated expansion, the use of which is to prevent the neeessity of rapid respiration, thereby prolonging the animal's power of remaining under water. The venous blood is thus retarded in its course baek to the lungs, until the animal rises for a fresh supply of air. During the aetion of diving, the nostrils are clusedl by a muscular sphineter. Under ordinary cireumstances seals ean remain submerged from fifteen to twenty minutes; and it is stated that, during sleep, they will remain in this condition for as much as an hour, without coming to the surface to breathe. The shining, glossy, adpressed hairs are protceted from an injurious action of the water, by an oily seeretion which exudes from the skin. Their margins are sinuous, hut the long, stout, homy whiskers are uniformly smooth. Seals are for the most part marine, but a fow of them pass up the mouths of rivers to fresh-water streams, and even lakes. While at rest, they are usually seen reposing on the ledges of rocks, and basking in the sun; and on being alarmed, they suddeuly plunge into the water for security. These animals, as is well known, subsist prineipally on various kinds of fish; hut they will also devour erabs, molluses, and other occanie products. Fossil remains of seals oceur in the miocene and pliocene deposits.

THE COMMON SEAL (Ploca vitulina)-Plate 1?, fig. 40 -is an inhabitant of the northern seas generally: and was formerly very abundant all along the westurn coasts of the British islands, as well as those of Franee; now, however, it is comparatively searee, except on the shores of Seotland, and its adjacent northern and westeru isles. The body of the seal is between four and five feet long, having an ashy or yellowish-grey ground colvur, whiel is indistinetly spotted with light brownish-black patehes; it exhibits a eylindro-conieal form, gradually diminishing in bulk from the region of the ehest towards the short broad muzzle in front, and towards the rudimentary tail behind. The eyes are rather large, and protected by a few stiff hairs, forming small eyebrows; the ears being fully-developed, and seareely visible. One of the most interesting peenliarities by whieh this species is distinguished, consists in the oblique disposition of the molar teeth, producing a slight overlapping of the ends; this remarkable charaeter having been tirst pointed out ly l'rofessor Nilsson. The brain is largely dereloped-a fact which in some measure explains that high degree of intellectual manifestation, which the seal is eapable of displaying. Though very timid in the wild state, and very difficult to approach with a gun, it is, nevertheless, extremely docile in a semi-domesticated condition. From the
earliest times it has been tanced and tanght to perform a number of tricks, and to utter ecrtain responsive sounds, when spoken to by its master. A seal thus instructed has been exlibiting in London, under the title of the "talking and performing fish;" its so-eallcd wonderful performances, however, as might be expected, do not equal the absurdities of a puffing and exaggerating advertisement. Mr. Low, in his "Fauna Orcadensis," observes, that in the wild state, "seals seem to have a great deal of euriosity ; if people are passing in boats, they often come quite elose up to the boat, and stare at them, following for a long time together; if people are speaking loud, they seem to wonder what may be the matter. The church of Hoy, in Orkney, is situated in a small sandy bay, much frequented by these creatures; and I observed, when the bell rang for divine service, all the seals within hearing swam directly to the shore, and kept looking about them, as if surprised rather than frightened, and in this manner continued to wonder as long as the bell rung." Their powers of hearing are remarkably acute, as we have recently verified by speaking softly to the active little seal at present living in the Zoological Society's Gardens, Regent's Park; cven while the animal is under water, the very faintest whisper of its name-"Jenny"-does not fail to elicit immeliate attention and expectancy. In high northern latitudes the seal is of the greatest coonomic value. To the Greenlanders it affords an almost exclusive means of subsistencesupplying, as it does, food for the inner man, clothing for the outer man, and light for their ill-furnished dwellings. The seal is also an important article of commerce. A full-grown specimen of this speeies, if taken in spring, will yield from fonr to five gallons of oil, while some of the larger kinds will supply considerably more than double that quantity. If extracted while fresh, the oil is beautifully clear and transparent, inodorous, and of a rather pleasant taste. The skin is either prepared with the fur, or tanned to make leather; in either case it is in great demand for making shoes, caps, and other articles of clothing.
the harp seal (Phoca Grcenlandica) is, as its specifie name implies, found very abundant on the icebound shores of Greenland, being also an inhabitant of Iceland, and the northern coasts generally, from Newfoundland along the borders of the Frozen Occan, as far as the sea of Kamtschatka It is also occasionally transported southward to the western shores of our own sea-girt islands. The fur presents a greyish-white colour, the back being marked by a blackish horseshoeshaped band, arehing backwards from the region of the shoulder to within a few inches of the root of its stumpy tail. This band is broad at the sides, while its ontline is very irregular ; the anterior half of the head exhibits the same deep brownish-black colour, imparting to the physiognomy a very peeuliar look. The molar teeth do not overlap eael other, but they leave slight interspaces between their several ends. In regard to the liabits of this species, Fabrieius states that they leave the coasts of Greenland twiee a-year, namely, in March and July, revisiting their lhaunts in May and September. Their food consists of molluses and fisl, especially salmon. Being stupid and ineautious, they fall an easy
prey to the seal-hunters; their fur is mueh valued, and is less woolly than that of the eommon species. The female produces onc, or rarely two, euls at a birth; the skins being either white or cream-coloured. These seals have a tendency to congregate and herd together on floating masses of ice at a eonsiderable distanee from the shore, under the leadership of one of their number.

THE MARBLED SEAL (Phoca ammlata) inhahits the coasts of France, and was supposed by Frederick Cuvier to be only a variety of the common specics. Professor Nilsson of Copenhagen, however, has determined otherwise. At one time it was believed that this species had been taken on our own eoasts, but the impression appears to have been erroneous; it is certainly not improbable that it should find its way thus far northward. The boly is about as large as that of Phoca vitulina, but it is at once distingnished from it, by the peculiar marbled colour of the fur. A very lively specimen of the Marbled seal, formerly kept in the Jardin des Plantes, aflorded the Parisian and other visitors much amusernent. Two little dogs were houserd with it, and the trio lived on excellent terms ; the seal allowing them to take fish out of its month while eating, and submitting to many other indignities.

THE GREAT SEAL (I'loca Larlata) is occasionally found on the northern shores of Scotland; and, according to Mr. Selby, it is an inlabitant of the Farn anel Staple islands, off the eoast of Northumberland. The body of a full-grown species measures as much as ten, twelve, or even fourtecn feet in length, and weighs upwards of forty-five stone. The head is comparatively long, and much arched in front; the cyes are large, the auditory opening being also capacious. The fore-feet have the central toe longest, the outermost on cither side being comparatively short. In the adult animal the fur presents a deep brownish-black colour, but in the young state it is of light-greenish hue. The female is providel with four teats, and Mr. Selly states that it "calves in the montly of November upon several of the outer rocks, where the young are suckled every tide for the space of fourteen or fifteen days, when the long woolly fur which at first clothed them is cast, and a new covering of close short hair supersedes it; they are then conducted by the dam to the water, from whence they only emerge at intervals."

THE GREY SEAL (IUclicharus gryphus) is also an inhabitant of the British coasts, being especially abuudant on the Irish shores. Professor Nilsson-an excellent authority-states that those living in the Baltic have solitary habits; but, in the neighbourhood of Cork and Waterford, Dr. Ball found them gregarious in small numbers. The Grey seal is also a native of the northern coasts of Europe, and is called the Ltselur by the Icelanders. Zoologically spealing, it is a species of very great interest, because its structural charaeters, in some particulars at least, approaelı very closely those of the walrus; Dr. Gray, indeed, eonsiders it entitled to be regarded as a member of the family which that peculiar form represents. Be that as it may, the canines are present in the lower jaw, while those of the upper aro not prolonged into tusksfeatures which suffieiently distinguish the Phocidæ
from the Tricheeidie. According to Reinhardt, the upper jaw is frequently furnished with a sixth molar on either side, which would make the total number of grinders to be twenty-two. The superior scries are simple, displaying only a single pointed crown, but those of the lower jaw are slightly tubereulated. The head is remarkably flat, terminating anteriorly in a broad, trmeated muzzle. One of the most striking peculiarities of this suecies - and one in which it very clusely resembles the walrus-consists in the disproportionate size of the brain, as compared with that of the common seal; white the bones of the fate are, on the other hand, more cogently developed. The late Dr. Ball of Dublin, in a commmication to Professor Bell-after allnding to the fruitless attemp ts made by his father to rear and tame specimens-has very forcibly remarked that this seal "appears scarcely snsceptible of domestication, and the development of the skull seems to indicate as much; for the size of the brain of a sjecimen nearly cight feet lung, did not exceed that of one of Phoca variegata (i.e., $P$. vitulina), of less than four fuet."

THE SEA-LEOPARD (Leptomy. Weddellii). - M. Frederiek Cuvier formerly associated the various
species of Leptonyx, under the generic title of Stenorhynchus. 'They are characterized by the possession of twenty-two teeth, of which eight are incisors, besides the usnal number of eanines, and twenty molars-eacl of the latter being provided with three sharp, conical, prong-like tubereles. All of these are slightly compressed, and point more or less upwards and backwards; the eentral cusp being the longest, and separated from the lateral pair by a deep notel on either side. The lindermost molars are furnished with double fangs. The skull is narrow, elongated, and rather depressed at the centre of the vertex. The claws of the feet are comparatively small, especially those of the hind pair. This species inhabits the shores of the southern liemisphere.

THE CRESTED SEAL (Stcmmatopus cristatus), or Hoodcap, differs from the ordinary seals, inasmuch as it possesses a remarkable organ, situated at the anterior part of the head. 'This structure consists of a membranous and museular pouch, which is divided internally into two compartments by the prolongation of the cartilaginons septum of the nose (fig. 37). By closing its nostrils, the animal has the power of inflating this sac, which then stretehes back over the cranium, and Fiz. 37.

in the distended coudition rises six or seven inches above the vertex. The molar teeth are irregularly tuberculated. The Hoodeap lives chiefly on large floating fields of ice off the eoasts of Greculand and the north-eastern shores of America, being seldom seen on land, except in the months of April, May, and Jume. It is a large species, measuring seven or cight feet in length; and great numbers are amually destroyed by the seal-hunters.

THE SEA-BEAR (Arctocenteclus unsimus)-Plate 13, fig. 41-is a native of the north-western shores of America, as well as the coasts of Kamtschatka and the Kurile islands. It is a large, bulky species, upwards of seven feet long. The fur is thiek, of a woolly texture, of a greyish-brown tiut in the adult, lont quite
black in the young mimal. The ears are comparatively well-developed, being an inch and a half in leugth, and clothed with hair. There are ton incisor tecth, six above and four below, the four central ones of the upper scries having flat and transversely-grooved crowns; the molars are twenty-two in number. The first toe of the fure-foot is the longest, the remainder gradually shortening in succession, ontwards. The interdigital membrames of the hind feet are prolonged considerably beyond the toes in the form of bands. The Sca-bears are polygamous in their habits, a single male jealonsly gmarding upwards of fifty or sixty females. The males are very fieree, as are also the dams when their young are hunted; if wounded, they utter a loud whining cry. The fur is lighly valued.

THE SEA-LION (Otaria jubata). -Much diserepaney of opinion has all along existed in regard to the distinctions of these aberrant forms of seals, and even now much confusion remains respecting them. Several
species lave been included under the above title by different voyagers. 'Ihe true Sea-lion is a huge animal, the males measuring from ten to fifteen feet in length (figr. 38). 'The fur has a yellowish-brown colour, the Fig. 38.


The Sea-Lion (Otaria jubata).
neek of the male being provided with a well-developed mane. The cars are only half an inch in length, or rather more, the muzzle being armed with numerous stout long whiskers. This species is also polygamous, a single male tending from twenty to thirty fomales. They are very fierce and powerful animals, waging destruetive wars upon the sea-bears. The Sea-lion is
principally found off the coasts of Terra-del-Fuego and the Falkland Islands.

THE SEA-ELEPHANT (Morunga proboscidea) is a gigantic and extraordinary-looking animal. In Professor Nilsson's arrangement it is described as a species of Cystophora, a genus which is equivalent to the Macrortimus of F. Cuvier. The title here employed

is that given in the list of Phocidx contained in the British Museum. The body of an adult Sca-clephant attains the enormous length of four-and-twenty feet, some specimens, it is said, considerably execeding this measurement; the young at the time of birth being
about the size of a fuill-grown Phoca ritulina! The most singular feature in this species, however, consists in the presence of a strongly-developed proboscidiform muzzle in the male, capable of being extended to a disdistance of twelve inclies beyond the mouth, and conse-
quently imparting a very peculiar, if not hidcous aspect (fig. 39). In the female there is no trace of this singular apparatus. The eanine tecth are large, thick, rather slarply pointed, and curved upwards; the molars being furnished with simple, conical, and irregularly constricted conical crowns. The Elephant-seal chijoys a wide geographieal distribution in the southern liemisphere, being found on the eoasts of Australia, Kergueland's Land, the Falklands, and other islands both of the South Pacific and Atlantic occans. It is greatly valued on account of the large quantity of oil which it yields; and, although powerful, it is a comparatively harmless animal, and casily destroyed. Its skin is very thick, and, from its durability when preparecl, is much employed in making earriage harness. The habits of the Sea-clephant are somewhat peculiar, inasmuch as it frequents the mouths of rivers, resorting betimes to fresh-water swamps and inland lakes. The male is said to utter when attacked a strange, hoarse, gurgling, wild sound; the voice of the femate liaving some resemblatee to the bellowing of an ox. A sailor once lost his life from the violence of an enraged female, in whose presence he lad the eruel folly to skin her young one. The dam generally produces two cubs at a birth, the growth of which is so astonishingly rapird, that in cight days they have doubled their natal dimensions. The period of gestation is believed to be between nine and tell months.

## Family II.-TRICHECIDAE.

Externally, the members of this family, as originally established, have a general resemblance to the ordinary seals; but in the form and arrangement of the tecth there are differences of the most marked kind. The eranium is also very unlike that of the typical Phocide;

Fig. 40.


Skull and section of the lower jaw of the Walrus.
but in certain of the abcrrant genera, this variation is less conspicnous. We have slown this to le the case, especially, in the genus Halichmrns, which is even associate! with the present family in the systematic classification of Dr. J. R. Gray. On carefully examin-
ing the skull of a walrus (fig. 40), the first thing that strikes one is the massive character of all the bones, more particularly those of the anterior part of the face. All the facial modifications here witnessed have reference to the enormonsly developed tusks; and, consequently, it is in the superior maxillary bone that the more striking morphological changes have taken place. The extension mpwards and downwards, as well as the great breadth of this osseous mass, has become necessary, in order to insure the reception and fixation of the base of this rootless and linge canine tooth-the socket, of course, heing extremely capacious. This curious osteological change of form has also had the effect of producing an unusually broad muzzle, tilting up, as it were, the aperture of the nostrils. Scarcely less remarkable is the correlative effeet produced by these huge canines on the slape of the lower jaw; but here, instead of increasing the width, we find the anterior part of the bone much narrowed and compressed, so as to pass securely forward, hetween and beyond the not very widely separated turks-an arrangement which las likewise involved corresponding peculiarities in the dental formula of the adult animal. According to the investigations of Macgillivray, lapp, Wicgman, and others, there are either ten or twelve ineisors, four canines, and eighteen or twenty molars in the young animal; out of these, two grinders, the lower pair of canines, and all the incisors are deciduons, their sockets at length becoming entirely obliterated. We have thus left behind in the full-grown animal only sisteen permanent molars, besides the two tusks developed from the upper jaw; the former are depressed, obliquely truncated, and flat on the crowns; while the tusks, which are directed downwards with a slight curving inwards, measure from fifteen to twenty or twenty-five inches in length, weighing between cight and ten pounds cach; they are also proportionately thick. The eranial cavity is small when compared with that of the trpieal Phocile.
the walrus (Trichechus Rosmarus), or MonsePlate 13, fig. 42-is the only representative of the present family, if we are content to alliere to the arrangement above given. It is a large, bulky animal, the body usually measuring from ten to fifteen feet in length, and, in the case of the males, as much sometimes as twenty fect. The fur is of a deep brownishblack colour, becoming lighter as age advanees. The head is comparatively small, termimating anteriorly in an abrupt snout, which is tumid at the sides and clothed with long and very stout whiskers. The lips are particnlarly thick, while the nostrils are rounded and placed high up on the summit of the mnzzle. The auditory apertures are placed well back, but there is no trace of an external auriche; the eyes are comparatively small. The limbs are short, terminating in broad pentadactylous paddles or flippers, having strong interdigital webs. Sir Everard Ilome's notion that they possessed the power of producing a vacum to aid the action of climbing, is entirely erroncons. The Walrus is an inhabitant of the shores of the Aretie occan, being especially abundant on the coasts of Spitzbergen, Nova Zemhla, ant Behring's straits. These animals congregate logether in herds, varying in
number from fifty to one hundred or more; nevertheless their habits are strictly monogamous. Before going to sleep on the floating ice-fields they take the preeaution of appointing sentinels, who, when any danger threatens, forthwith rouse the entire troop, by uttering loud bellowing cries, and instantly all are seen tumbling over into the sea, where they are tolerably secure. If any are wounded the remainder display much sympathy, the mothers defending and earrying off their young with the greatest ardour. On several occasions they have been known to attack a boat's crew, as happened, for example, to two officers who went walrus-hunting by themselves, near Waggat's Straits, in the year 1773. They lad suceceded in wounding a solitary one, which immediately dived under water, and after a short time returned with several others, attacked the offieers, wrested from them an oar, and very nearly suceeeded in capsizing the boat; fortunately another boat came to their assistance, and the infuriated animals were driven off. At
all times the capture of the Walrus is attended with considerable difficulty, for, although not naturally a shy animal, it has learned to dread its human adversary, and therefore takes to the water on the slightest alarm ; moreover, the skin is sufficiently hard to resist the harpoon, unless it has been driven home with great force. The tusks are much prized; their ivory being, bulk for bulk, far more valuable than that of the elephant; the texture of the dentine is denser, and the colour of a purer white. The Walrus is omnivorous, and in its stomach there have been found remains of young seals, fish, shrimps, and other crustacea; also various kinds of molluses and sea-weeds, especially of the common kind-Fucus digitatus.

Those who desire further information respeeting the habits and mode of eapturing the Walrus, we beg especially to refer to the thirteenth and thirtieth chapters of the first volume of Dr. INanc's "Aretic Explorations," where they will find most interesting details, for which we have here no space.

## Order Vif.-RODENTiA.

Thes Rodents constitute a well-defined natural group, comprehending a great multitude of comparatively small species, all of which are characterized by the possession of peculiar incisor teeth. These organs are usually four in number, two occupying the upper, and two the lower jaw; they are also placed prominently forward below the muzzle, and are scparated from the molar teeth by a considerable interspace (fig. 41). Their office is essentially that of gnawing; hence the Rodents are sometimes ealled gnawrers, or rongours by the French. The form of each incisor tooth resembles a chisel, the anterior and superior edge being remarkably sharp and trenchant; the tooth is likewise so constructed that its tissue, and therefore function also, is in no way damaged by continuous use; on the contrary, every time it is put in action, the weapon ehisels down the hard substances required for food or other purposes, while, at the same time, it sharpens


Skull of the Rabbit.
itself, and is thus always fit for use. This interesting result depends, for its integrity, on the following structural arrangement: The anterior and convex surface of the organ is coated with a thin layer of hard enamel, the central mass consisting of the somewhat less dense, but still tolerably strong ivory; and from this disposition of the two structures, it will readily be perceived that, during attrition, the ivory must wear away more
quickly than the enamel, which is consequently left standing prominently forward in the form of a clisellike process. The molar tecth are few in number,

Fig. 42.


Molar Teeth of the Beaver.
seldom exceeding four on each side of either jaw; they are flat, and have the enamel arranged in the form of transverse plates, which, during the backward and forward movements of the jaw, act autagonistically with the corresponding ridges of the opposed teeth (fig. 42). In order to insurc and facilitate this antero-posterior movennent, and the converse action, the condyle of the lower jaw is articulated to the skull by a longitudinallyformed socket, which admits of scarcely any lateral motion. There are no canine teeth in the Rodentia; and from the several dental peculiarities here mentioned, it may readily be perceived that the food of these animals must be chiefly of a frugivorous nature, and that it will comprise substances of the hardest character, such as roots, the bark of trees, and eren wood itself. Some of the species, howerer, are omnivorous, feeding on other animals, as well as on various regetable matters; and in these we find the molar teeth more or less tuberculated. The alimentary canal is of great length, the ecceum being often remarkably large, in some cases exceeding the stomach in size, and filling up the larger portion of the abdominal earity. A eurious exception is seen in the dormonse, where the cœeum is entirely wanting. The form of the stomach in Rodents is sim-

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ple. These animals are very prolific, and enjoy a wide geographical distribution, being especially abundant in North Amcrica. They are not found in Australia. Fossil remains occur in the tertiary formation.

## Family I.-SCIURIDAE.

The Squirrels have simple tuberculated molar tectl, provided with distinct fangs. These molars are usually eighteen in number, but in some instances there are only fourteen. The incisor teeth are smooth, the lower being much compressed. The feet are generally pentadactylous; exceptions, however, occur in the forefeet of certain species, where the thumb is merely represented by a warty tubercle. The limbs are cither free, or partially invested by alaform nembranous expansions of the skin, which materially increase the leaping power of these animals. The tail is well developed, and more or less tufted with long lairs. The species are numerous-so much so, that we can devote only a very short space to their individual consideration.

THE COMMON SQUIRREL (Sciurus vulgaris) is a singularly graceful and attractive little animal (fig. 43). Who has not seen it leaping from branch to branch, and clambering up the sides of many a lofty tree? In
our woodland distriets it is everywhere abundant, and its pretty movements may be most advantageously watched in carly spring, when the female, with extreme activity, is pretendingly secking to evade the pursuit of her attentive lovers, several of which may be giving her chase at one and the same time. "Dwelling principally," observes Mr. Bell, "upon trees, and rarely descending to the ground, it leaps from bough to bough with astonishing agility. It lives upon nuts, acorns, bcech-mast, the bark of young trees, leaf-buds, and tender shoots. In eating nuts, it gnaws with considerable rapidity through the hard shell, and then carefully removes every particle of the dry brown skin from each morsel of the kernel before it is eaten. It sits upon its launches, holding its food in the fore-paws, which serve the office of hands. In taking leaps, when onee thrown off by an eflort of its long and powerful hinder legs, it is in a measure sustained by the horizontal spreading of its limbs and bushy tail; which latter organ is also extremely useful in covering and protecting the back, over which it is often turned, and in enveloping the whole lateral and dorsal parts of the body when coiled up during slecp or in its libernation. It lays up stores of food for its winter provision, which is not usually deposited in a single place of safety, but distributed in several different holes of trees, in the inme-

## Fig. 43.


diate neighbourhood of its own retreat. It remains during the greater part of the winter in a state of almost complete torpidity, coming abroad, however, on the occurrence of a fine day, fceding oll a part of its treasured hoards, and then retiring again to its slumbers." The general appearance of the squirrel is well known; the length of the body being about fifteen inches,
including the tail, which measures six and a half or seven inches. The head is broad, flattened above and at the sides. The eyes are comparatively large, darkcoloured, and prominent. The ears are well developed, and beautifully pencilled at the tip with long delicate hairs. The fur las a rich brownish-red colour generally, being white under the throat and belly. During
the winter the fur becomes somewhat lighter, or of a greyish tint. The female produces four or five young at a birth, and rears them. in a carefully constructed nest. This is formed of vegetable fibres, moss, leaves, \&c., and is usually lodged between the fork of two or more branches, so as to be concealed from view; in some instances the nest is made in the hollow of a trce.

THE HODSON'S BAY SQUIRREL (Sciurus Ifudsonius) is found in the white spruce forests of Canada, and the northern parts of the United States. In the latter comntry it goes by the name of the Chickarce, on account of the peculiar loud noise which it makes when disturbed in its favourite haunts. It lives upon the seeds and young buds of the spruce, and makes burrows beneath the roots of this tree, where, during the summer, it lays in a large store of fir-cones as provision for the winter; but it remains active throughout the cold season. The flesh is said to be good eating. The fur has a yellowish-brown hue, the central line of the baek having a chestnut tinge; but the colouring varies considerably at different periods of the year.

THE BLACK SQUIRREL (Sciurus niger) is a large species measuring upwards of two feet when the tail is taken into account. It is also a North American form, being more particularly abundant on the northern shores of Lake Huron and Lake Superior. According to Sir John Richardson, it is likewise tolerably plentiful in the United States. The fur is short, coarse, and of a deep black colour; the ears have an elliptical form, and are devoid of tufts.

THE GREY SQUIRREL (Sciurus cincreus) is an inhabitant of the United States, being common in Pennsylvania and Carolina. Like our English species, it lays up a provision of nuts and acorns against the season of scarcity. This species is particularly destructive to
the maize crops, and large numbers are therefore annually destroyed. The grey squirrel is about one-third longer than our form. Its ears are not tufted, and the fur is of an asly-grey colour generally; underneath the belly, and on the inside of the limbs it is whitc. The tail is nearly as long as the body.
THE WHITE-STRIPED SQUIRREL (Sciurus getulus) is a native of the northern parts of Africa, and more particularly of Barbary. The fur exhibits a reddishgrey colour, the sides of the body being banded with two white stripes. It is about the size of our British species, the tail bcing well developed, and, according to the description given by Penmant, regularly marked with sliades of black, one beneath the other. It lives chiefly among palm-trees.

THE MALABAR SQUIRREL (Sciurus maximus) is an Indian species, measuring about thirty-three inches, ineluding the tail, which is rather longer than the body. Like the above, it is mostly found among palm-trees, being partieularly fond of the cocoa-nut, and the milk which it contains. The fur presents a rieh chocolatebrown colour, which subsides into a pale yellowishbrown on the inner sides of the limbs and underneath the belly. The ears are short, and provided with long brush-like tufts.

SMITH'S SQUIRREL (Sciurus Cepapi) is a native of Southern Africa, and was originally discovered by Dr. Smith on the banks of the Limpopo river. The fur has an ochreous yellow tint, and is marbled with blaekish brown patehes. The ears are sharp and blunt above, being also slightly notched near the tip. This species is remarkably shy and agile.

SPARRMANN'S SQUIRREL (Sciurus bicolor) is also found in Java, and is, in common with several other species, termed by the natives the Jelerang. It is also a native of India and Cochin China. This animal was


Sparrmann's Squirrel, or Jelerang (Sciurus bicolor).
first described in the Transactions of the Gotheburg Society for the year 1778 . The looly is three feet long, including the tail, for which about nineteen inches have to be reckoned (fig. 44). The ears are pointed, but not tufted. The fur varies much in colour, being,
in some cases, uniformly black abore and of a golden hue beneath; in other instances it is more or less tawny throughout, with patches of a darker tint on the shoulders and hips. It is neither so abundant nor so prolific as the above.

THE BOKKUL (Sciurus insignis). - This squirrel inhabits Sumatra and Java, where, from the obscrvations of Dr. Horsfield, it would appear to be a very rare specics. The fur has a tawny greyish-brown colour gencrally, beeoming ferruginous at the sides, and white beneath the belly; its most charaeteristic feature consists in the presence of blaek bands, which pass from the region of the shoulder to the root of the tail. The body, including the last-named organ, is about thirteen inches long. This species, in eommon with other allied forms found in India and the adjacent islands, possesses a eylindrical tail; the cars are also short and rounded.
THE BAJING (Sciurus Plantani) is likewise a Javanese form, and is extremely abmudant everywhere in the island. It was first described by Ljung in the twentysecond volume of the Swedish Transactions. The body is seven inches in length, exelusive of the tail, which rather exceeds this measurement. The fur has a beautifully variegated tawny-hrown colour ; the imer parts of the limbs and the belly being of a lighter yellow. 'The tail is banded near its root by several dark rings. The Bajing lives principally among the tamarind and eocoa-nut trees. It is readily tamed.

THE PALM SQUIRREL (Sciurus palmarum).-This title is applied to several small species which are abundant in India and Africa, and are found most commonly on pahm-trees. They commit terrible ravages amongst the fruit, and though much hunted, do not appear to be at all shy. The general ground colour of their fur is reddish-brown, the surface being generally marked with a varying number of bands; the inferior parts of the belly and the inside of the limbs are pale yellow; dark-coloured rings also occur on the tail. The body is about a foot in length from the tip of the nose to the extremity of the last-named appendage.

THE FOUR-BANDED SQUIRREL (Sciurus quadrivittatus) is thus named from the circumstance of its displaying four white lines on the back, these being separated from one another by intervening bars of a blackish colour. The sides of the borly are reddishbrown, the under parts being lighter coloured. This species inhabits the wooded districts of North America. It is a remarkably lively creature, and when alarmed utters a chirping note, whieh often proves troublesome to the hunter when in quest of other animals dwelling in the same localitics.
THE GROUND SQUIRREL (Sciurus Lystcii), or Hackee, is an clegant little species, characterized by the possession of check pouches. It has a brownishgrey fur, subsiding into orange, and becoming white leneath the belly. The sides are also marked by a white band bordered with black, extending from the shoulder to the rump. The tail is comparatively short. The Iatace is a native of North America, being abundant on the shores of Lakes IIuron and Superior.
THE ALPINE MARMOT (Avclomys marmotta) Plate 14, fig. 44-is a stout-built animal, about the size of a rablit, measuring sixteen inches long, excluding the thick-set tail, which gives ns six inches more. It inhabits the loftiest slopes of the Alps and Pyrences, immediatcly bencath the snow line. The fur has a yellowish-grey colour, becoming brownish-grey about the head. Its food eonsists of inseets, as well as veget-
able matters. Its burrows in the earth have three chambers and two outlets, several retreating into the same hole. When alarmed they utter shrill crics, and also on the approach of storms. The female produces three or four young at a birth.

THE POLISH MARMOT (Arctomys Bobac), or Bobac, is an inhabitant of the smaller lills of castern Europe and Siberia, extending all the way from Poland to Kamtschatka. The fur exhibits a yollowish-grey eolour, the hairs about the head having a russet tint. This speeies corresponds very closely with the preecding in size and general appearance.

THE SOUSLIK (Spermophitus citcllus) is a native of Austria, Ifungary, Bohemia, and Siberia. It is an attractive-looking species, its greyish-brown fur being prettily marked with small white spots. It belongs to the group of marmots possessing cheek pouches. It is said to have a decided liking for animal food, and will occasionally devour its own species.

THE QUEBEC MARMOT (Arctomys empetra) is, as the title implies, a native of Canada. In appearanee it closely resembles the bobac, whilst its halits are similar to those of its congeners generally. The fur exhibits a hoary aspect, with shades of brown and black intermised, passing into reddish orange beneath. The tail is about half the length of the body, and black at the extremity.

THE SHORT-TALLED MARMOT (Arctomys brachyurus) is an inhabitant of the plains of Columbia, and is characterized by a brownish-grey fur, variegated with red, this colour becoming more conspicnous muderneath the belly. The tail is not shorter than that of screral allied species. This animal lives in large companies, a single burrow containing ten or twelve occupants. On being disturbed they utter a shrill whistling ery.

PENNANTS' MARMOT (Arctomys pruinosus) is dcscribed under the title of the Whistler by Harmon and Sir John Richardson. It is a large species; a specimen taken on the banks of the Mackenzie Piver measuring twenty-seven inches in length. The fur is long, coarse, and of a yellowish-brown colour, the tail being darker and bushy. The Whistler is fomnd occupying the slopes of the Rocky Mountains. The female produces two young at a birth.

THE MARYLAND MARMOT (Arctomys monax), or Wood-ciluck, is a well-known native of the central distriets of the United States, where it is regarded by farmers as a pest, since it proves very destructive to the crops of red clover. The habits of these animals are social and diumal; for laving placed sentincls before their burrows, they wander forth in mid-day to commit their havoc. They are very prolific, the female producing six young at a birth. The fur of the adult has a grey ferruginous colour generally.
THE PRAIRIE MARMOT (Arctomys latrans), or Wistonwish, is another Amcrican species, abounding on the banks of the Missouri and its tributaries. The fur is of a reddish-brown colour, the inferior parts leing whitish. The tail is short and banded near the tip. When alarmed this creature utters a peeuliar barking somid, whence it is often called the prairie dog. Its liabits are gregarions, hundreds of them foming a colony, where they construct deep burrows; the entranee to each hole being surrounded by an elevated moind.

Limitation of space prevents our giving full details of the Marmots. Those of our readers, thereforc, who desire further information on this head should consult Sir John Richardson's "Fauna Boreali Amcricana," where they will find a detailed account of the following specics of American marmots, unavoidably omittcd in this work:-The American Souslik (Spermophitus guttatus) ; the Tawny Marmot (Arctomys Richardsonii) ; the Leopard Marmot (A. Hoodii); Say's Marmot (A. lateralis) ; Douglas's Marmot (A. Douglasii) ; Becchey's Marmot (A. Beecheyi); Franklin's Marmot (A. Franklinii) ; Parry's Marmot (A. Parryi).

In regard to the Squirrels possessing flying membrancs, we can only offer the following particulars:-

THE EUROPEAN FLYING SQUIRREL (Seiuropterus volans) is only found in the north-castern parts of our continent, being more abrundant in the forests and wild wastes of Sikeria. Its habits are similar to those of the common squirrel, fecding, as it docs, on the buds of leech-trees and on the seeds contained in fir-cones. During its flying leaps-so much increased in power by membranous expansions of the skin between the fore and hind limbs-the tail is strctched out to aid in steering the body. In a state of repose, this organ is, as usual, graccfully curved over the back.
NIEUHOFF'S FLYING SQUIRREL (Sciuropterus sagitta).-This very rare animal-concerning the specific distinctness of which there can be no reasonable doubt-has been earefully deseribed by Pennant. It is a native of Java and other Indian islands, and measures eightcen inches in length, exclusive of the tail, which would give us other fifteen inches. The fur is of a bright bay colour, inclining to orange. During its flying leaps, it is said to employ the tail as a prehensile organ.
THE KECHUBU (Sciuropterus genibarbis) is another form of Javanese flying squirrel, mcasuring, with the tail, about fourtecn inches. According to Horsfield it is comparatively rare, and infests the forests of Pugar, one of the most sequestered districts of the eastern portion of Java. Its habits are nocturnal. The fur has a tawny-grey colour generally, the inferior parts being lighter; the texture of the liair is particularly soft and downy.

HORSFIELD'S FLYING SQUIRREL (Sciuropterus lepidus) very elosely resembles the above, and the distinctions given by IIorsfield scarcely scem to warrant its being regarded as a separate spccies. "It is only found in the closest forcsts of Java, where the height of the trecs and the luxuriance of the foliage effectually conceal it. It is with great difficulty pursued or seizcd."

THE GREATER FLYING SQUIRREL (Sciuropterus Sabrinus)-Plate 14, fig. 43-of Nortl Ameriea, is about a foot long, including the tail. The fur has a pale reddish-brown colour generally, being also of very delicate texture. The Roeky Mountain variety so closely resembles it, that, in the opinion of Sir John Riehardson, the two kinds ought to be regarded as identical.

THE ASSAPAN (Pteromys rolucella) is a comparatively small species of flying squirrel. It is very abundant in the United Statcs, infesting the prairies
in large troops. Its tail is about one-fourth shorter than the body, and, as in other allied forms, is flat and distichous.

## Family II.-MYOXID.E.

The Dormice represent a group intermediate between the squirrels and the mice. The molars are sixtcen in number, furnished with fangs, and have thcir crowns marked with transverse ridges of enamel. The feet are pentadactylous, but the fifth toe of the fore-foot is merely represented by a rudimentary tubercle or warty excrescence. The ears are rounded and oval, and the whiskers well developed. The fur is particularly soft and fine. The tail is very long, hairy, and more or less tufted at the extremity. The food of the Dormice consists prineipally of vegetable matters; but tliey also devour beetles, and have been known, in a state of confinement, to cat bats, and even their own young.
THE COMMON DORMOUSE (Myoxus avellanarius) -Plate 15, fig. 47.-This well-known little animal, with its ruddy yellow fur, is a great favourite with those who delight in domesticated animals - in which condition it is partieularly gentle and docile. It is tolcrably common throughout Europe, and dwells in the sequestered parts of dense thickets and plantations. During the summer it lays up a store against the winter, when it falls into a drowsy and torpid state; but on warm sun-shiny days it sometimes cmerges from its snug retreat or dormitory. Its habits are nocturnal. In the spring the female usually produces four young, which are blind at the time of birth. According to Mr. Bell, a second brood is occasionally brought forth in the early part of autumn.

THE GREAT DORMOUSE (Myoxus Glis) is an inhabitant of Southern Europe, being also found in Georgia and on the borders of the Wolga. It is about the size of our common rat, and has a palc ash-coloured fur, which is white underneath the belly, and at the inner sides of the limbs; the cyes being surrounded by a dark-brown cirele. This animal was, in early times, highly prized as a dainty, and was kept by the ancients and fattened in separate hutches expressly for the table. It is still eaten by the Italians. It nestles in holes of trees and roeks, and sometimes attaeks small birds.

## Family III.-DIPODID AE.

The Jerboas are at once recognized by their remarkably developed hinder extremities, although this pcculiarity is also seen in a less striking degree in the marsupial kangaroos. The elongation of the hind limbs eminently fits the members of this family for dwelling amongst wild wastes and open plains; and it is therefore in such localities that they are found. Their molar teeth are complex, and in some instances destitute of roots. The hind feet are tridactylous in the true Jerboas, and tetradactylous in aberrant forms. The clavicles are well developed. The eyes arc large; the tail is very long, hairy, and frequently tufted at the tip.
the egyptian Jerboa (Dipus Eigyptias)Plate 14, fig. 45-is extremely common in the country from whenee its name is derived. According to Swain-
son, it is a sly and timid animal, living in societies, and construeting burrows underground; and is with diffieulty preserved in a state of domestication. Some
naturalists consider this species as identical with the variety found inhabiting the waste country between the Dou and Wolga rivers. and in the southern steppes at.

Fig. 45.


The Abyptian Jerboa (Dipus Aggytius).
the Irtitsch; but the limits of our space prevent our discussing this question or giving further details. The accompanying drawing (fig. 45) represents the Jerboa about to take a leap.
mitchell's Jerboa (Dipus Mitchellii) has been so named by Mr. Ogilby after the original discoverer, Sir Thomas Mitchell, who found this species on the marshy grounds near the junction of the Murray and the Murumbidgee, on the northern boundaries of Australia Felix. In size it scarcely exceeds our common field mouse. The tail is particularly long, and ends in a hairy tuft, two inches in extent.

HARDWICKE'S JERBOA (Dipus Indicus), is a native of Mindostan, frequenting the cultivated districts, and proving lighly destructive to the wheat and barlcy crops. It feeds principally on grain, but will in times of scarcity consume other kinds of vegetable food. During its leaps, which extend over a space of four or five yards at a single jump, the tail is stretched out horizontally. At evening time hundreds issue forth from their sulug retreats, but they disappear on the slightest alarm.
the cape jerboa (Helamys Capensis)-Plate 14, fig. 46 -is a native of South Africa. The hind feet are tetradactylous, and armed with very long, sharplypointed claws. The ears are largely developed ; so is also the tail. The molar tecth have no roots; their crowns also are divided into two equal, oval-shaped portions, by a fold from the outer side in the upper series, and from the imer side below. The fur is of a bright jellow-brown colour generally. The Cape Jerboa is a very powerful animal, leaping as much as thirty feet at a single bound. During sleep it assumes a sitting posture.
THE ALAK-DAARGHA (Scirtetcs jaculus) is the name given by the Mongols to a species of jerboa inhaliting the steppes between the Donan and the Don; this animal is also formd in the Crimea. The feet are pentadactylous, but the three central toes of the hinder extremity are very cogently developed. The molar
teeth are rooted, and have their crowns surmounted by contorted ridges of enamel. The cars are fully as long as the head.

## Family IV.-MURIDE.

The Rats and Mice, pronerly so called, have largelydeveloped ears. The clavicies are distinct. There are usually twelve molar teeth, uniformly covered with enamel ; and the inferior incisors are compressed and sharply pointed. The fore-fect are tetradactylous, the several digits wide-spread, and the thumb represented by a warty tubercle, which in some eases is clawed; the hind feet are pentadactylous. The skeletonPlate 33, fig. 106-is comparatively slim throughout. The tail is mostly very long, naked, or only thinly haired. The species are extremely numerous, and abound everywhere.

THE COMMON MOUSE (NTus musculus) is almost too well known to require more than a passing notice. The fur exhibits an ashy-brown colour, which becomes lighter underneath the belly. Its ears are about half as long as the head; the tail being rather shorter than the body. This clegant little animal is extraordinarily prolific, the female breeding at all seasons of the ycar, and usually producing five or six young at a birth. White varieties are very common.

Speaking of the methods adopted for destroying these pests, Mr. Bell remarks as follows:-" In addition to the usual means employed for their extermination, such as traps of various linds, and the carnivorous instinct of the cat, the ferret, and the weasel, there still exists in Wales a custom so disgustingly cruel that the very mention of it would be scarcely pardonable but for the possibility of thus producing some degree of shame in the perpetrators of it, and consequently saring some poor little mice from being the victims of suel barbarity. It is customary in some parts of Wales to roast a mouse alive, hanging it before the fire by its tail tied to a string, that its screams may seare the rest from the house."

As this statement was originally penned some twenty years ago, we indulge the hope that sounder principles of humanity have at length reached the western borders of our isle ; and if they have, we shall hail with pleasure any information on this head.

THE HARVEST MOUSE (Mus messorius) has a red-dish-brown fur above, being white underneath. The ears are comparatively slort. The body is only two and a half inches long. The tail is prehensile. This speeies constructs its nest in the form of a ball, which is suspended amongst rushes, or placed amongst the leaves of some strong wild plant, such as the common thistle. It has been known to devour flies with avidity. Eight or nine young are produced at a single litter.

THE LONG-TAILED FIELD MOUSE (Mus sylraticus) rescmbles the foregoing in the colouring of the fur, but is distinguished by a brownish spot on the breast, while the ears are much longer, and the tail about the length of the lody, including the head. This species proves terribly destructive in our corn-fields; but its diet is not exclusively granivorons, as it has been known to eat young birds, and even its own species. It is rather more than three and a half inehes in length, exclusive of the tail.
the barbary mouse (Mus Barbarus) is an inlabitant of northern Africa. The fur has a darkbrown colour, the sides being prettily marked with five or six yellowish longitudinal bands, which run parallel, and extend from the neek to the rump. Two of the toes on the fore-foot are rudimentary. This species is also known as the Palmetto mouse.

DARWIN'S MOUSE (Mus Darwinii) is a native of Coquimbo. It measures rather more than five inches in length, not including the tail. The colour of the fur is a mixture of cinnamon and black, the under parts of the borly and the feet being white. The ears are very large and nearly naked. The tail is brownish-black superiorly.
the black rat (Mus Rattus)—Plate 15, fig. 48 is indigenous in Europe. In this country it is not so abundant as formerly, in consequence of the introduction of the brown species, which persecutes and destroys it. It is chiefly distinguished by the greyishblack fur, and by the tail, which is a little longer than the body. The ears are half as large as the head. Its habits are omnivorous. It increases rapidly, the female producing from seven to nine young at a birth.

THE BROWN RAT (Mus decumanus) is also termed the Norway Rat, from an old and erroneons notion that it was indigenous in that country. This is now the common species here, and its destructive habits are only equalled by its boldness and fcrocity. It is even more prolific than the above, the female producing as many as twelve or fourteen young at a litter.
THE BANDICOOT RAT (Mus giganteus) is a huge species inhabiting India, and measuring thirteen or fourteen inches in length, exclusive of the tail. It is a very mischicrous beast, undermining houses and places where stores of grain are kept, and also commits great havoc in gardens, besides sometimes attacking poultry. The low east Hindoos are very partial to its flesh.
THE TIKUS-WIROK (Mus setifer) is a species of rat inhabiting Java. The fur is of a brownish-black colour,
and is distinguished by " numerous rigid hairs, which are scattered over the upper parts of the body, and project widely from the general covering." According to Dr. Horsfield, it rarely approaches the dwellings of the natives, and is generally found at the confines of woods and forests.
THE AMERICAN FIELD MOUSE (Mus leucopus) may be considered as the representative of our longtailed Mus sylvaticus. Sir John Richardson states that this monse does considerable mischief in gardens, and will destroy an entire plantation of maize in a few nights. The fur exhibits a bluish-brown colour, being white underneath the belly. Specimens, talien from the Columbia river distriet, measured four and a quarter inches.
THE LABRADOR JUMPING MOUSE (Meriones Labradorius) is very abundant throughout the fur countries. The finr has a liver-brown colour above, becoming yellowish at the sides and underneath. The hind legs are very long, and stouter than those in front. The body is about four and a half inches in length, exclusive of the tail, which measures five and a quarter inches.
the rocky mountain rat (Ncotoma Drummondii) has a yellowish-brown fur, which is white beneath the belly; but it is principally distinguished by a bushy, hairy tail, in which respect we perceive an approach to the squirrel. It lives in crevices of the higher rocks, its food consisting prineipally of herlage and the twigs of pine trees. The borly measures nine inches, exclusive of the tail, which is still longer.
THE HYDROMYS (Iydromys leucogaster).-Two varieties have been described, but they are by some considered to be one and the same species. They have been termed, respectively, the white-bellied and the yellow-bellied Itydromys. They are aquatic animals, about twice as large as an ordinary rat. They have only four molar teeth. The hind feet are pentadactylous; the posterior being semipalmate. The tail is remarkably thick at the root, and only thinly haired. These animals are found at Van Diemen's Land, and other islands off the coast of Australia.
THE HAMSTER (Cricetus frumentarius) is a wellknown Europeaa animal, found in various parts of Russia, Germany, and especially in Thuringia, as well as in Siberia. It lives in subterranean holes, where it hoards up large stores of grain. It is torpid during the winter months. The fur is greyish-yellow abore, and black inferiorly, and it is marked by three spots on each side ; these marks being sometimes light-coloured, and at other times quite black. The Hamster possesses several pouches, and the tail is very short and hairy. The fore-feet are tetradactylous.

THE PHLEOMYS (Phlaomys Cummingii) is a comparatively large animal from the Philippine islands. The fur has a blackish-brown colour gencrally, with a reddish tinge on the back. Its length is nearly twenty inches, excluding the tail, which is not so long as the borly. The fore-fect are four-toed; the claws loeing large, compressed, and curved inwards. It was first described by Mr. Wraterhouse, in the proceedings of the Zoological Society for the year 1839.

There are many other murine genern and species, for whose consideration we hare not suffeient space.

## Family V.-ARVICOLIDAE.

The Swimming Arvicoles or Voles are distinguished from the true mice ehiefly by the character of the teeth. The ineisors are large, ehisel-shaped, and coloured deep yellow in front; the molars have flat crowns presenting enamelled folds, in the form of alternating triangles, on either side. The fore-feet are tetradaetylous, with a rudimentary thumb. The muzzle is obtuse, and the ears are not large. The tail is rather short, rounded, and hairy.
THE WATER RAT (Avvicole amphibia) has a very close, thick, and shining fur of a rich reddish-brown colour, which becomes paler inferiorly (fig. 46). Its habits are almost too well known to require deseription. Frequenting the banks of almost every stream, canal, or dyke in this country, it constructs its burrows upwards from the water's edge. "It dives

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\text { Fig. } 46 .
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The Water Rat (Arvicola amphibia).
and swims with great facility, instantly seeking the water upon every alarm, and plunging at onee to the bottom; from whence, however, it is obliged to return to the surface for respiration about every minute. It has often been asserted that the water vole lives upon small fish, earthworms, and insects, and it has even been accused of destroying young dueks. There is not, however," observes Mr. Bell, "the slightest foundation for this opinion." It feeds on roots and various aquatic plants. The female produces five or six young at a single birth.
the field vole (Arvicola agrestis), or Meadow Mouse, is about four inches in length, exelusive of the tail, which measures rather more than an inch. Its habits are extremely destructive. It feeds on various vegetable matters, grain, \&c., and is particularly fond of carrots. It is very prolifie, the female producing from five to seven young at a birtll. The best method of destroying these pests is by entrapping them in holes cxeavated in the ground ; these pits should be wider below than above.

THE BANK VOLE (Arvicola riparia) is, in common with the foregoing, a native of Europe. It is three inches and a quarter long, and the fur is of a bright chestnut red above and greyish beneatly. The tail is
about half the length of the body. It is not very abundant in Britain, and but little is known respecting its habits.

THE YELLOW-CHEEKED VOLE (Arvicola xanthognathus) is an American species, and is abundant in the neighbourhood of Fort Franklin, and also aniong the Rocky Mountains, especially in localities where the woods have been destroyed by fire. Its habits are similar to those of the common water rat. Length of the body is from five to eight inches. The females prodnce seven young at a birth.

WILsON'S VOLE (Arvicola Pennsylvanicus) is, according to Sir John lRichardson, very abundant from Canada to Great Bear Lake. It infests barns and storelionses, where it hoards up grain and seeds of various kinds ; it is said also to be very partial to the bulbs of the Philadelphia lily. The body is about three and a half inches long, the fur being brownish and white underneath.

RICHARDSON'S VOLE (Arvicola borcalis), or Nortiern Meadow Mouse, is about four and a half inches long, exclusive of the short tail, which measures ouly an inch. Its habits are similar to those of the YellowChecked species. It is found in abundance on the borders of the Great Bear Lake. The fur lias a chestnut tinge mixed with black; under the belly it is greyish.

THE SCANDINAVIAN LEMMING (Myodes Lemmus) is about the size of an ordinary rat. The fur is of a ruddy yellow colour, variegated with black. Its proper residence is among the mountains of Norway and Sweden, but it has a remarkable propensity to emigrate at certain periods. Van der Hoeven remarks, that on these oecasions multitudes of them " eat everything bare on the road, like locusts. This usually forbodes a hard winter. The number of these animals thus suddenly appearing in situations where they were previously mknown, gave oceasion in former times to the strange opinion that they descended from the clouds." It is sometimes ealled on this account the Northern Mouse of Passage.
the Greenland lemming (Myodes Greentandi-cus)-Plate 15, fig. 49-was first described by 1)r. Traill, from a specimen procured by the distinguished navigator, Captain Scoresby. The body is six and a quarter inches in length, the tail measuring only threequarters of an inch. There are no external ears. The fore-fect are hairy beneath, the digital claws being rounded and sharply pointed. The central line of the back is marked by a dark band. The muzzle terminates in a sharp nose. The eyes are near each other, and comparatively small.

THE HUDSON'S BAY LEMMING (Myodes Irudsonius) is scarcely so large as the preceding, and, according to Richardson, is distinguished by the two central claws of the fore-fect being unusually large; they are likewise compressed, "their very blunt extremity being rendered donble by a deep transverse notch." Although this species is very easily tamed, very little is known respecting its habits.

BACK'S LEMMING (Myodes trimucronatus) inhabits the wooded distriets of North America, and is named after Captain Back, who first discovered it on the banks of Point Lake. Sir John Richardson states,
that "in the winter it travels under the snow in a semi-eylindrieal furrow, very neatly eut to the depth of two inches and a half in the mossy turf. 'These hollow ways eross each other at various angles, but oeeasionally run to a considerable distance in a straight direetion. From their smoothness, it was evident that they were not merely worn by the feet, but actually cut by the teeth." The muzzle of this speeies is blunt, and the nose of a black colour ; the fur has a eliestnut hue, being greyish underneath.
the sLepez (Spalax typhlus), or Blind MoleRAT, is a very singular animal (fig. 47). It is also

twelve in number; they have flattened crowns, the inner border of the upper series being marked by a single cnamelled fold, and the outer by three folds; this complieated arrangement is reversed in the lowerseries (fig. 42). The feet are pentadaetylous, the digits of the hinder feet being clothed at the margins by long hairs. 'The tail is more than half the length of the body, being double-edged towards the free end, and covered throughout with seales and short hairs. The habits of the beavers are aquatie. Fossil remains of several species have been fomd in various parts of Europe; some of those obtained from the erag deposits in Norfolk and Suffolk differing in several respects from the skeletons of those now living, and being, in the view of Professor Owen, clearly distinctive of a much larger species. There can be no doubt, however, that the Beaver, which, though searce, is still living in Europe, formerly abounded in Great Britain; and there is every reason to believe that it is identical with the Ameriean species, which we have now to deseribe.
THE COMMON BEAVER (Custor fiber) Plate 15, fig. 50.-This well-known animal is one of the largest, and at the same time the most interesting of all the Rodents, and consequently demands at our hands a more lengthened consideration than any of the foregoing.
known by the names of Podolian Marmot, Zemni, and Sfochor Nomon, the latter name being that employed by the Cossacks. It is characterized by the presenee of large incisor tecth, and twelve complex molars. The head is cren broader than the body, flat on the crown, and truneated in front. There are no ears; whilst the eyes are almost rudimentary, being represented by tiny specks partly concealed by the fur. The limbs and fect are short, and armed with small claws. The fur is soft, dense, and of an ashy-grey colour, inelining to red. This animal, observes Mr. Broderip, "burrows extensively beneath the turf, driving at intervals lateral passages in its search for roots, particularly that of the bulbous Charophyllum. Openings to the surface occur at distances of some yards from each other, and there the earth is raised into hillocks, sometimes of two yards in circumference, and of considerable height. It works stoutly and rapidly, and on the approach of an enemy instantly digs a perpendieular burrow. Though it cannot see, it lifts its head in a menacing attitude towards its assailant, and when irritated snorts and gnashes its tecth, but emits no ery; its bite is very severe. In the morning it often quits its hole, and during the season of love basks in the sun with the female." According to a popular superstition in the Ukraine, any one who has squeezed this animal to death in his hand, and who has been bitten by it in so doing, has conferred on himself the power of euring goitre by merely touehing those who are suffering from this disease. The Slepez is about eight inches in length.

## Family VI.-CASTORIDE.

The Beavers are readily distinguished from all other Rodents by their flattened scaly tail, which in the typical species has an oval outline. The molar tecth are
Vor. I.

The body measures nearly three and a half feet in length, exclusive of the tail, which would give another eleven or twelve inches. Ordinarily the fur has a rich reddish-brown colour; though in some cases it is spotted, in others black, and in a third rare variety quite white. In Europe the Beaver occurs sparingly along the banks of the Rhone, the Danube, and the Weser; but in the northern districts of Canada it is still very abundant in places. At one time such were the multitudes destroyed annually, that it was feared this useful animal would become totally extinct. To prevent this, however, the furriers of the Hudson's Bay Company and certain Indian tribes, lave adopted arrangements by which a moderate supply of furs will always be fortheoming, for the manufacture of hats and other articles. The most interesting circumstance in the history of these animals is the extraordinary skill they display in the construction of their dams and dwellings. Many excellent records of their habits, in this partieular, have from time to time appeared; but for minuteness and aceuraey of detail none have equalled the account given by the trateller Hearne in his "Journey to the Northern Ocean." We shall, therefore, record his observations in extenso, which are as follows:-"Where the beavers are numerous, they are found to inhabit lakes, ponds, and rivers, as well as those narrow creeks which connect the numerous lakes with which this country abounds; but the two latter are generally chosen by them, when the depth of water and other circumstanees are suitable, as they have then the advantage of a current to convey wood and other necessaries to their labitations, and beeause in general they are more difficult to be taken than those that are built in standing water. They always choose those parts tliat have such a depth of water as will resist the frost in winter, and prevent
it from freezing to the bottom. The beavers that build their houses in small rivers and ereeks, in whieh water is liable to be drained off when the baek supplies are dried up by the frost, are wonderfully taught by instinct to provide against that evil by making a dam quite aeross the river, at a convenient distanee from their loouses. The beaver dams differ in shape aecording to the nature of the place in which they are built. If the water in the river or ereek have but little motion, the dam is almost straight; but when the eurrent is more rapid, it is always made with a considerable eurve, convex towards the stream. The materials made nse of are driftwood, green willows, birch, and poplars, if they ean be got; also, mud and stones intermixed in snch a manner as must evidently contribute to the strength of the dam; but there is no other order or method observed in the dams, except that of the work being earried on with a regular sweep, and all the parts being made of equal strength. In plaees which have been long frequented by beavers undisturbed, their dams by frequent repairing become a solid bank, eapable of resisting a strong foree both of water and iec; and as the willow, poplar, and birch generally take root and shoot up, they by degrees form a regular kind of planted hedge, which I have seen in some places so tall that birds have built their nests among the branches. The beaver houses are built of the same materials as their dams, and are always proportioned in size to the number of inhabitants, which seldom execeds four old and six or eight young ones; though by chance I have seen above double that number. Instead of order or regulation being observed in rearing their houses, they are of much ruder structure than their dams ; for, notwithstanding the sagacity of these animals, it has never been observed that they aim at any other convenience in their houses than to have a dry place to lic on ; and there they usually eat their victuals, which they occasionally take out of the water. It frequently happens that some of the large houses are found to have one or more partitions, if they deserve that appellation; but it is no more than a part of the main building, left by the sagacity of the beaver to support the roof. On such oceasions it is common for thoso different apartments, as some are pleased to call them, to have no communication with each other but by water; so that, in fact, they may be called double or treble houses, rather than different apartments of the same house. I have seen a large beaver house built in a small island, that had near a dozen apartments under one roof; and, two or three of these only exeepted, none of them had any communication with each other but by water. $\Lambda$ s there were beavers enough to inhabit each apartment, it is more probable that each family knew their own, and always entered at their own doors, without any further connection with their neighbours than a friendly intercourse, and to join their united labours in crecting their separate labitations, and building their dams where required. Travellers who assert that the beavers have two doors to their honses, one on the land side and the other next the water, seem to be less aequainted with these animals than those who assign to them an elegant suite of apartments. Sneh a construetion would render
their louses of no use, either to protect them from their enemies or grard them against the extreme cold of winter. So far are the beavers from driving stakes into the ground when building their houses, that they lay most of the wood erossways and nearly horizontal, and without any other order than that of leaving a hollow or eavity in the middle. When any unnecessary branches project inward they eut them off with their tecth, and throw them in among the rest to prevent the mud from falling through the roof. It is a mistaken notion that the wood-work is first eompleted and then plastered; for the whole of their houses, as well as their dams, are from the foundation one mass of mud and wood mixed with stones, if they ean be procured. The mud is always taken from the edge of the bank, or the bottom of the ereek or pond, near the door of the house; and though their fore-paws are small, yet it is held so elose up between them under their throat that they earry both mud and stones, while they always drag the wood with their tecth. All their work is executed in the night; and they are so expeditious that in the course of one night I have known them to have colleeted as much mud as amounted to some thousands of their little handfuls. It is a great piece of poliey in these animals to cover the ontside of their houses every fall with fresh mud, and as late as possible in the autumn, even when the frost becomes pretty severe; as by this means it soon freezes as hard as a stone, and prevents their common enemy, the wolverene, from disturbing them during the winter. And as they are frequently seen to walk orer them, and sometimes to give a flap with their tail, particularly when phunging into the water, this has, without donbt, given rise to the vulgar opinion that they used their tails as a trowel with which they plaster their houses; whereas that flapping of the tail is no more than a custom which they always preserve even when they become tame and domestie, and more particularly so when they are startled. Their food consists of a large root, something resembling a calbage stalk, which grows at the bottom of the lakes and rivers (the plant being, according to Sir John Richardson, the yellow water lily, Nuphar lutcum). They also eat the bark of trees, particularly those of the poplar, birch, and willow; but, the iee preventing them from getting to the land in the winter, they have not any barks to feed on during that season, execpt that of such sticks as they cut down in smmmer, and throw into the water opposite the doors of their houses; and as they generally eat a great deal, the roots above mentioned constitute a prineipal part of their food during the winter. In summer they vary their diet by eating various kinds of herbage, and such berries as grow near their haunts during that season. When the ice breaks up in the spring the Beavers always leave their houses, and rove about until little before the fall of the leaf, when they returu again to their old habitations, and lay in their winter stock of wood. They seldom begin to repair the houses till the frost commenees, and never finish the outer coat till the cold is pretty severe, as hath been already mentioned. When they erect a new habitation they legin felling the wood early in summer, but seldom begin to build until
the middle or latter end of August, and never complete it till the eold weather be set in." Further on our author remarks, that "in respeet to the Beavers dunging in their houses, as some persons assert, it is quite wrong, as they always plunge into water to do it. I am the better enabled to make this assertion from having kept several of them till they became so domesticated as to answer to their name and follow those to whom they were aceustomed, in the same manner as a dog would do, and they were as much pleased at being fondled as any animal I ever saw. In cold weather they were kept in my own sitting-room, where they were the constant companions of the Indian women and ehildren, and were so fond of their company, that when the Indians were absent for any considerable time, the Beavers displayed great signs of uneasiness; and on their return showed equal marks of pleasure by fondling on them, crawling into their laps, lying on their backs, sitting erect like a squirrel, and behaving like children who sce their parents but seldom. In general, during the winter, they lived on the same food as the women did, and were remarkably fond of rice and phom-pudding. They would eat partridges and fresh venison very freely, but I never tried them with fish, though I have heard they will at times prey on them." The flesh of the beaver is considered to be a luxury by the Indians, especially if roasted with the skin on. Sir John Richardson says that its flavour is like that of pork, and that it sits heavy on the stomach, requiring strong digestive powers for its assimilation. The female beaver is provided with eight teats, and usually produces about the middle or towards the end of May a litter of from four to eight or even nine young. The voice of the cub resembles the cry of an infant.
the musquash (Castor zebethicus), Musk-rat, or Ondatra, is a small kind of beaver, having a strong musky odour, which some consider to be pleasant. The body is fourteen inches in length, exclusive of the tail, which measures about nine inches. The hind feet are not webbed. The fur has a ruddy-brown colour generally, being darker on the head and along the central line of the back. The tail is flattish, rounded at the sides, and blunt at the extremity. The Musquash inhabits marshes and lakes, and the grassy banks of sluggish rivers in North America, betwcen the latitudes of thirty and sixty-nine degrees. It feeds chiefly on vegetable matters, but it would appear to be very partial to fresh-water mussels. These animals eonstruct huts on a small scale, somewhat after the fashion of their more powerful congeners, the huts being of simple construction and proportionately small; the interior is lined with dry grass, the aperture of access being under the water. They are much hunted by the Indians, who spear them whilst they are snugly enscouced within their humble dwellings. Several hundred thousand skins are annually imported into England.
the coypu (Myopotamus Coypus)-Plate 16, fig. 51-is by some naturalists placed among the Hystricide, but in the arrangement and character of its tecth it corresponds with the beavers. The tail, however, is not compressed, but rounded and hairy; white the fifth toe of the hind feet projects beyond the web-like membrane which conjoins the remaining toes. The
fur las a dusky-brown colour generally, the tip of the muzzle and chin being whitish; whilst a yellow patch occurs on either side of the head immediately beneath the opening of the ear. The Coypu, which is nearly as large as the common beaver, is an inhabitant of the rivers and streams of South America, on both sides of the Andes. It is not exclusively confined to freshwater lakes and streams, for Mr. Darwin states that it is abundant in the Chonas Arehipelago, living in the bays and channels formed by the small and numerous islands of that group. Like the musquash, it appears to be fond of shell-fish. The flesh is said to be excellent eating. By the South American traders the furs are sold under the title of otter skins, several hundred thousand being annually imported into Europe.

## Family VII.-HYSTRICID $\not \subset$.

The Porcupines are readily distinguished by the possession of stiff, rigid bristles or quills, similar to those found in the Hedgehogs; their characteristic rodent incisors, however, at once showing the order with which they are properly associated. The molar teeth are sixteen in number; they have flat crowns, marked by undulating lines of enamel, transversely disposed and slightly raised above the dentine. The tongue is rough and armed with horny scales. They have fourteen ribs. The clavicles are almost fully developed, being articulated to the sternum, but only loosely connected to the scapula by ligamentous bands. They have five toes behind, the anterior feet being tetradactylous, and the rudimentary thumb merely represented by a warty tribercle. The Porcupines inhabit the warmer regions, both of the eastern and western hemispheres. They live in burrows, emerging only to feed upon roots, young shoots of shrubs and trees, as well as bark and various kinds of fruit.
THE COMINON PORCUPINE (Ifistrix cristata)-Plate 16, fig. 52 -is an inhabitant of Southern Europe and Northern Africa, being, in the former continent, found in Italy, Sicily, and Spain. The body is about two feet long, including the short tail ; its colour is grizzled or variegated, owing to the alternating shades of white, brown, and black with which the quills are marked. On the back of the head, the neck, and on the hinder parts, the quills are represented by stiff bristly hairs; those on the tail form hollow horny tubes suspended by slender stalks, which, though originally closed at the ends, become subsequently opened by continual use-the animal delighting to shake them together with the view of creating a peeuliar rattling sound. The longest spines are considerably thicker than an ordinary goose quill, and are upwards of twelve inches in length. The liabits of the Porcupine are nocturnal, and its food consists of vegetable matters, such as roots, fruits, young shoots, and leaves. During the coldest winter months it hybernates for a short period, retreating within its capacious burrow, which has generally two or more apertures of ingress. Finally, it is almost superfluous to remark, that this animal has no power of shooting its quills, as some have imagined.
the canada porcupine (Ifistrix pilosa) has a tolerably wide distribution in North America, being
found between the latitudes of thirty-seven and sixtyseven degrees. It has been known from the carlicst times, and has the credit of being a remarkably sluggish animal. It makes its burrow ehicfly among the roots of old trees, and is most abundant in sandy distriets, where it feeds upon the bark of the banksian pine and other conifers. On being disturbed, it utters a whining cry. From the observations of Sir John Rielardson, it would seem that this species has the power of detaehing its quills! "It is readily attaeked," he says, "by Indian dogs, and soon killed, but not without iujury to its assailants, for its quills, which it ereets when attaeked, are rough, with minnte teeth direeted backwards, that have the effeet of rendering this seemingly weak and flexible weapon a very dangerous onc. Their points, which are pretty sliarp, have no soonce insinuated themselves into the skin of an assailant than they gradually bury themselves, and travel onwards mitil they cause death by wonnding some vital organ. These spines, which are detached from the porcupine by the slightest touch, and probably by the will of the animal, soon fill the mouths of the dogs whieh worry it, and unless the Indian women carefully pick them out, seldorn fail to kill them. Wolves occasionally die from the same eausc." The flesh of this poreupine is eoarse, but appears to be cujoyed by the Indians. The female produces two young at a birth, usually towards the latter part of the spring. The fur has a liver-brown colour, the spines being more or less white.

THE BRAZILIAN PORCUPINE (Symethercs prohensilis), or Coendou, is a native of Guiana, and bears a general resemblanee to the above, especially in its habits, which are nocturnal. It is peculiar, however, in presenting a long prehensile tail, which is thinly haired and amulated towards the free extremity. The hind fect are tetradactylous. Like the Canadian species its movements are very sluggish; but it is materially assisted in climbing trees by its tail, which organ is even more uscfully employed dhring its downward progress; it is also no less than eighteen inehes in length. The coendou is further charaeterized by a short abrupt muzzle armed with long white whiskers.

THE JAVANESE PORCUPINE (Iystrix fasiculata) is a small species measuring little more than a foot in length, while the tail would add only another four or five inches. This organ las very few hairs ou it, their place being supplied by flat blackish scales, arranged in the form of rings; at the tip, however, there is a tuft of long flat bristles, bearing, as remarked by Buffon, a resemblance to narrow slips of parchment eut in an irregular manner, the tuft leing abont two inches long, and of a white colour. The general colomr of the body is that of a dusky-brown. Its habits are like those of its congeners. When irritated it bristles up its spincs, aud looks capable of resisting almost any enemy. It is not confined to Java, but is found on the Malayan peninsula, and on most of the islands of the Indian Archipelago.

There are many other Rodent forms which have been grouped togetleer into various sulfamilics. Of these we neerl only mention the genera Cercolabes, Achimys, Capromys, Aulacodus, Loneheres, and Cercomys, which are pretty closely allied. The genera

Orycterus and Bathicrgus are associated together in Dr: J. E. Gray's arrangement - under the family Aspalacins-the last-named genus being represented by several interesting species. Among thesc may be mentioned-

THE SHORE MOLE (Buthiergus maritimus), which is a native of Southern Africa. It is provided with very large ineisors, the upper ones being grooved longitudinally. This peeuliarity is not found in those members of the family oecupying the sand-litls of the interior. All of the species, however, possess sixteen molars, which lave the erowns divided by a transverse line of enamel. They have no ears, very small eyes, and short tails. The fore-feet are furnished with strong fossorial claws, that of the sceond digit being particularly large. They fecd prineipally on roots.

## Family VIII.-OCTODONTIDA.

The species included under this head have no trio roots to their molar tecth; these organs usnally display only a single fold of enamel on either side of their flattened erowns, but in a few instances a secuurd fold is observable on the inside of the lower series. The hind feet are in most cases pentadactylous, but in some tetradaetylous. The members of this family, though of small bulk, are comparatively strong, and well adapted for burrowing under ground. They are found in the South American continent, especially in the central and more southem distriets. With fow exceptions, the whole structure of their skeleton, the form of their skull, and the stout fore-limbs, armed with powerful elaws, demonstrate their adaptability to a subterraneous mode of existence.
CUMING'S OCTODON (Octodon degns), is a native of Chili, and is sometimes called the Chlifai Squinel, from the habit it has of serambling up bushes and low brnshwood. The fur has a brownish-yellow colour generally, and is very pale underneath. The ears are conspicuous, rounded, and thinly haired. The thmmbs of the fore-feet are only feelly developed; while the claws of all the toes are somewhat concealed by the hair, especially those of the hind feet. The food of these animals consists mostly of lierlage, but in times of scarcity they feed upon the bark of species of mimosa and cestrum. Mr. Darwin states that they may be secn by lundreds in the hedgerows and thickets of eentral Chili, and that their numerous burrows freely intercommmieate. Their labits resemble those of rabbits, and they prove very destructive to fields of young corn; when disturbed while feeding, they seamper off to the hedgerows with their tails uplifted.

THE SCHIZODON (Schizodon fusens) inhabits the eastern slopes of the southern Andes. The fur lias a deep brown colour above, while it exlribits a pale yellowish tint below. 'This animal was first discorered by Mr. Bridges, who found it in the Valle de las Cueras, at a height from between five to scren thousand feet above the level of the sea. Its habits are nocturnal, but it seldom eomes out of its hurrows, whieh are by preference made in grassy swamps, near to small mountain streams.

POPPIG'S SPALACOPUS (Spalacopus noctiragus) is
also an inhabitant of Chili, possessing liabits very similar to the above. The fur is glossy, and displays a rich purple-brown and blackish tint. The ineisors are smooth and of a pale yellow eolour in front. The molars are so uniformly indented on either side, that each resembles a figure of eight. The ears are very small, the tail being particularly short. The claws of the feet are compressed and curved inwards; those of the fore-feet are rather shorter than the toes.

BENNETT'S HABROCOME (Habrocoma Bennettii) and another speeics- $H$. Cuviericonstitute a distinet genus, which in the structure of the skeleton, approaches very closely to the Chinchillas. The auditory bulle are remarkally large, while there are no less than seventeen pairs of ribs. The incisor teeth are narrow; the crowns of the superior molars have a single fold internally, those of the lower being angular in form and direeted obliquely forward. These animals have rather large and thinlyhaired cars. The whiskers are particularly long. The feet are four-toed, and the tail is moderately developed. The fur is very soft and thick.

THE BRĄZILIAN CTENOMYS (Ctenomys Brazilien$s i s)$ is an inhabitant of the continent from whence it owes its specific name, and also of La Plata, Paraguay, and Bolivia. The molar teeth are simple, decreasing in size from before backwards; the last has a semicylindrical form, that of the upper series being obliquely lunated, with the concavity dirceted outwards, whilst that of the lower group is oval. The eyes are small, the ears only rudimentary; the tail being rather short and covered with adpressed hairs. The forefeet are furnished with powerful claws, at the base of which are numerous strong bristle-like hairs direeted inwards. Its labits resemble those of the family generally. Several other species are known.

## Pamly IX.-CHINCHillidex.

The Chinchillas are elosely allied to the previous family, having four rootless molars on either side of each jaw, and simple, smooth incisors; the molar tecth being made up of narrow, parallel plates of dentine, transversely disposed and surrounded by enamel. In addition to these characteristic marks, the Chinchillas have their postcrior limbs nearly twice as long as the anterior pair. The tail is also much developed, and tufted with long bristly hairs at the extremity. The ears are remarkably large, the internal auditory bullce being also extensively developed. The clavicles are well formed. The Chinchillas are natives of the South American eontinent.

THE CHINCHILLA (Chinchilla lanigera) measures about nine inches long, exclusive of the tail, which would add some five or six inches more. The fur has an ashy-grey colour generally, being mueh paler under-


The Chinchilla (Chinclilla lanigera).
neath. The eyes are large and full, while the broad ears are particularly attractive ; the whiskers are correspondingly extensive (fig. 48). The anterior feet are pentadactylous, the internal toe or thumb being very small; the posterior fect have only four digits. The fur is beautifully soft and delieate, and consequently fetcles a comparatively ligh price; multitudes being destroyed anmually for the purposes of sale, \&e. In regard to its habits, the best account that we have is that given by the Italian naturalist, Molina. "This little animal," he says, "lives in burrows under ground, in the open country in the northern provinees of Chili, and is very fond of being in company with others of its species. It feeds upon the roots of various bulbous plants, which grow abundantly in those parts; and produces twice a year five or six young ones. It is so docile and mild in temper, that if taken into the hands it neither bites nor tries to eseape, but seems to take a pleasure in being earessed. If placed in the bosom, it remains there as still and quiet as if it were in its own nest. This extraordinary placidity may possibly be rather due to its pusillanimity, which renders it extremely timid. As it is in itself peculiarly cleanly, there ean be no fear of its soiling the clothes of those who handle it, or of its communicating any bad smell to them, for it is entirely frec from that ill odour which characterizes the other species of rats. For this reason it might well be kept in houses without annoyance and at a trifling expense, which would be abundantly repaid by the profits on its wool. The ancient Peruvians, who were far more industrious than the modern, made coverlets for beds and valuable stuffs out of this fur." The Chinchillas are fortunately extremely prolifie, otherwise they would lave been extinet long ago. A
female preserved in the Zoological Soeicty's Gardens, Regent's Park, produced seven young ones at a single litter. From cighty to a hundred thousand skins are annually imported into this country.

THE CHINCHA (Lagotis Curieri) is about the size of an ordinary ralbit, possessing long cars and a greyish-coloured fur. All the feet are tetradactylous, the digits being furnished with rather small claws; each molar tooth is made up of three lamine; the whiskers are very long, some ten or twelve of the bristles being particularly stout. This animal lives on the western slopes of the Andes, and has often been conionnded with the viscacha, from which, however, it is quite distinct. According to Ulloa's obscrvations, as quoted by Mr. Bennett, the Cirinciras "conceal themsclves in holes of the rocks, in which they make their retreats, not forming burrows in the earth, like rabbits. There they congregate in considerable numbers, and are mostly seen in a sitting posture, but not cating; they feed on the herbs and shrubs that grow among the rocks, and are very active. Their means of escape do not consist in the velocity of their flight, but in the promptitude with which they run to the shelter of their holes. This they commonly do when wounded, for which reason the mode of killing is by shooting them in the hear." There is a sccond species, the Lagotis pallipes of Bennett, which closely resembles its fellow. One remarkable peculiarity possessed by these animals consists in the caducous character of their fur ; this immediately after death, falls off on the slightest touch, so that, in an economic point of view, the skin is rendered almost valueless.

THE VISCACHA (Lagostomus trichodactylus) is also known by the names of Biscacho and Mamiot Diana. It lives on the eastern declivities of the Andes, and is quite distinct from the chincha, which occupies the western slopes of the same chain of mountains. Various interesting accounts of the habits of this species have been given by different writers, and more particnlarly by Darwin, Bennett, and Dobrizhoffer. These records are in general very similar, though differing in a few particulars. Mr. Darwin states that in the evening the Viscachas come out of their holes "in great numbers, and there sit quietly on their haunches. They are, at sucl times, very tame, and a man on horseback passing by, scems only to present an object for their grave contemplation. They do not wander far from their burrows. They run very awkwardly, and when lurrying out of danger, from their elevated tails and short front legs, much resemble great rats. Their flesh when cooked is very white and good, lout it is seldom used. The Viscacha has one very singular habhit, namely, dragging every liard object to the montlo of its lurrow. Around eaclı group of holes many bones of cattle, stones, thistle-stalks, hard clumps of carth, dry dung, \&e., are collected into a heap, which frequently amounts to as much as a wheelbarrow would contain. I was credibly informed," adds Mr. Darwin, "that a gentloman, when riding in a dark night, dropped his watch; he returned in the morning, and by searching in the neiglibourhood of every viscacha-hole on the line of road, as he expected, soon fomed it. This habit of picking up whatever may be lying on the ground
anywhere near its labitation, must cost much trouble. For what purpose it is done I am unable to form the most remote conjecture ; it cannot be for defence, because the rnbbish is chiefly placed above the mouth of the burrow, which enters the gromed at a very small inclination." The fur of the Viscacha has a greyishdusky colour, the tail is brownish-black, and the face is marked witl several black and white bands.

## Family X.-CAVIDA.

The members of this family, as we propose to retain them, may be fairly subdivided into two minor groups -namely, those which have rooted grinders, and those whose molars are rootless. Some have separated them into two distinct families ; but in most particulars they are very closely allied. The molars are sixteen in number, being more or less complicated by laminar plates. The front feet are cither three or four-toed, the hind feet being generally tridactylous, and in some cases pentadactylous, with the two onter digits feebly developed. The claws are strong, compressed, and arched. The Cavies are all inhabitants of the Sonth American continent. Their bodies are clothed with short hair ; the cars are moderately developed, whilst the tail is either very small or altogether wanting.
the patagonian cavy (Dolichotis Patagonica) frequents the desert wastes of the sonthernmost parts of America, extending as far north as La Plata. It is considerably larger than our common lare, a fullgrown example weighing as much sometimes as thirty pounds. The fur presents a mixture of grey and rust colour, the under parts of the head, neck, and belly being white. The molars have no roots; the incisors being smooth and nearly white. The fore-fect are four-toed; the linder ones, three-toed. The large ears are broad at the base, and more tlian half the length of the head. The legs are high-a feature by which it onght to be readily distinguished from the hare, but is generally overlooked by uninformed travellers. In regard to its habits, it is, like its congeners, fond of burrowing, and, accorling to Mr. Darwin, "when found in the same districts with the riseacha, it will avail itself of the excarations of this little animal for a retreat. The Patagonian Cavies wander at times to great distances from their homes, and usually two or three are seen together on these occasions. The animal in its mode of running more nearly resembles the rabbit than the hare, and though its limbs are long it cloes not rim very fast. It seldom squats after the mamer of the hare, is very slyy and watchful, and feeds by day." The female produces two young at a birth.

THE ROCK CAVY (Cavia rupestris) is a native of the rocky distriets of Brazil generally. It is likewise found abmedant in the higher regions bordering the Rio Pardo and Rio de St. Francisco. It is a taller species than the abore, and is remarkable as having the mails of the tocs blunt, and so small that they scarcely project beyond the large digital toe-pads with which the fect are also snpplied. It has no tail, and the ears are shorter than one half of the head. The flesh is considered good eating.

THE RESTLESS CAVY (Cavia aperca) is gencrally considered to be the originator of our domestic variety of eavy, commonly callcd the guinea-pig. It is an inhabitant of Brazil, and is found in Paraguay and La Plata. The hairs are brown, with reddish-ycllow points, the throat and inferior parts being either white, greyish, or dirty yellow. In the tame varieties the prevailing tint is white, with blaek and orange-eoloured spots. According to Dr. Rengger, this species lives wild, in little societies, varying numerically from six to fifteen individuals. Its priucipal feeding time is in the morning and evening. In respect of its procreative powers in the domesticated state, few animals surpass it. The female produces from six to twelve young at a litter, aud this frequently takes place several times during the year. In six or eight weeks the young are themselves ready to give birth to other offispring.
the bolivian cavy (Cavia Boliviensis) occupies only the higher altitudes of Bolivia. The fur has a greyish-yellow colour, being whitish underneath. The incisors have an orange yellow tint. This species is very shy, and, from the statement of Meyen, is believed to be extremely abundant on the lofty plains of Tarna and Tajari. Several other species of eavy are found in Brazil and different regions of South Ameriea
THE CAPYBARA (Hydrochorus Capybara) inhabits the banks of almost every river in Brazil, Guiana, and Paragnay, being also found more or less abundant throughout the whole continent of South America. This is the largest species of rodent now existing, the body attaining sometimes a length of four fect. The superior incisors are grooved longitudinally in front. The molars are made up of numerous laminæ, and they are so disposed in the posterior teeth, that Cuvier was led to indicate an affinity on the part of this animal with the clephant-a view which enjoys the sanction of the best comparative anatomists. The head of the Capabara is long, thick, and drawn out towards the muzzle. The feet are slightly palmated ; the digits being armed with broad ungular claws. The skin is clothed with long, thin, and scanty hairs; constituting another feature which serves to remind us of the pachydermatous mammals. There is no trace of a tail. According to Maregrave, as recorded by Broderip, this aberrant rodent lives on herbs and fruits. It is a nocturnal animal, swimming across rivers and torrents in search of food, and raising a horrible noise on such occasions. Multitudes of them congregate together on the banks of streams, where they are attacked and destroyed by hunters before they ean plunge into the water. Those, however, which succeed in getting into the stream are safc; for though slow of foot, they are expert swimmers. Some writers aver that they are fond of fish; but this seems doubtful.
the Paca (Ccelogenys Paca) is a moderately large South American rodent, measuring about two feet in length, and like the foregoing presents some affinities with the pachyderms. The general colour of the fur is dark-brown above and white underneath; the sides being prettily marked with four or five longitudinal rows of white spots, extending backwards from the shoulder to the rump. The Paea is furnished with buceal pouches; the upper lip is eleft, and there is a large
fold of integument on the cheeks. The tail is very feebly developed. The fore-feet are tetradactylous, a rudimentary thumb existing in the form of a claved warty tubercle; the hind fect are three-toed. The Paea frequents low forests in the neighbourhood of water. It forms burrows whiel are comparatively superfieial, and have threc openings. Though hearylooking and stout-built, it is tolerably swift on foot. Its habits are noctumal, feeding on fruits and herbage. The fenale produces a single young one at a birth. The flesh is exeellent eating.
THE AGOUTI (Dasyprocta Aguti). - The several species of the genus which this animal represents are characterized by tetradactylous feet in front, and tridactylous feet behind, and in this particular thcy correspond with the paca. This rodent is about the size of a lare, and, as a kind of game, seems to supply the place of our "puss" in Brazil, where it is much hunted. The general colour of the fur is yellowishbrown ; a mottled or speekled appearance being produced by the hairs in the region of the neek from accumnlations of brown, yellow, and black colour. The Agoutis do not construct burrows, but frequent thickets, and when pursued generally scek for holes under old trees, or any place calculated to afford a semblance of security. When eaptured they utter a plaintive cry, and offer little or no resistance. Their claws being blunt and straight, they are unable to clamber up the trees. These animals are very prolific, the femalc bringing forth several young at a single birth. Many other species oceur in Brazil and the adjoining West Indian islands.

## Family XI.-LEPORID A.

The Hares are at once distinguished from the other families of the rodent type, by the circumstance of their possessing four ineisor teeth in the upper jaws. Two of these are very small, and are placed immediately behind the anterior pair, so as to present the appearance of double tecth, hence the Hares are sometimes called the Duplicidentates. The molars are generally twenty-two in number, six on cither sile above, and five correspondingly opposed below. They are destitute of roots, and are made up of two distunct lamine. When the mouth is closed the lower series project inwards beyond the margin of the upper ones. This arrangement being assoeiated with a certain facility of movement of the condyle of the lower jaw at its articulation, not found in other Rodents, it must be evident that the Hares cmploy a ehewing action somewhat similar to that found in the ruminating mammals. The last molar tooth of the superior serics is very small. The orbital fosse arc perforated by a common foramen opticum. The bony palate is ineomplete; whilst, in the typical forms, the clavicles are also imperfectly developed. The soles of the feet are clothed with hair, there being five digits in front, and foul posteriorly: The claws are long and narrow. The tail is cither short or entirely absent. The Hares have a very wide geographical distribution in the hemispheres, being more partieularly abundant in North Ameriea.

THE COMMON HARE (Lepus timidus)-llate 16, fig. 53-is familiar to crery one in thesc islands, and is to be met with throughout Europe, except in Norway and Sweden. The general colour of the fur is tawnygrey, inclining to brown on the back, and to a rusty tint lower down; underneath the belly and throat it is white, as well as on the inferior surface of the tail, which, however, is usually directed uppermost. The ears are longer than the head, and more or less tipped with black in different individuals. Respecting its habits, they are almost too well known to need any lengthened reeord. To the sportsman, hares afford the excitement of the hunt, the amusement of the course, and the pastime of the gun. Of all the various methods employed in destroying these comparatively defenceless animals, perhaps that of shooting them is the least cruel, and therefore the most perfectly legitimate. The barbarities of the slaughter-house, where cattle are daily sacrificed for civilized man's consumption, are not one whit less cruel than the ordinary method cmployed for destroying game by shooting; and these animals, are "nothing to be refused," if received with thankfulness. While deprecating inost sincerely any wanton cruelty in the use of these gifts, we hold the ordinary methods of destroying game to be quite consistent with mercy and humanity; and of one thing we are tolerably certain, that if man did not undertake to destroy these defenceless ereatures in the usually summary manmer that he does, their natural enemies would cffect the same result, in ways far less consideratc. For example, witness the case of the agonies of the poor hare (secn by the Rev. F. W. Hope, and recorded at page 91) with a weasel sticking to its throat! Witness again the instances where they fall into the merciless clutches of the for, or even into the penetrating talons of the hawk tribe! Surely a charge of shot, or the sudden gripe of a greyhound, renders the agonies of death less prolonged and less painful than do the natural modes of death above cited. And, if so, why display a false and useless sentimentality in denouncing the conduct of those who, with the gum, cut sliort the existence of these creatures which are designed to form part of his means of subsistence? Whilst writing these very words, an important batch of game, inchiding "puss," arrives from a friend in the country; and we respectfully beg to inform our readers that we shall allow no qualms of conscience, on the score that these creatures have fallen under the torture of powder and shot, to destroy the satisfaction we hope to derive from their consumption. 'This, at all events, is a practical view of the question. The hare feeds exclusively on regetable substances, and causes terrible injury to young plantations, fields of early wheat, and other cereal crops. The habits of the hare are for the most part nocturnal. During the day they rest in open ficlds and stubbles, and especially in grassy situations. For partial conccalment and comfort, they construct superficial hollows in the soil. These excavations are technically termed "forms," and they are more or less perfect, according to the character of the situation chosen. Here they rest in a cat-like crouching manner, with the chin and throat resting on the front paws. Hares are good swimmers, when occasion requires. Tlus, in the fiftl volume of

Loudon's Magazine, Mr. Yarrell has recorded the fullowing interesting circumstance:-" A harbour of great extent on our southern coast has an island near the middle of considcrable size, the nearest point of which is a mile distant from the mainland at high water, and with which point there is frequent communication by a ferry. Early one morning in spring, two hares werc observed to come down from the hills of the mainland towards the sea-sidc, one of which from time to time left its companion, and proceeding to the very cdge (f the water, stopped there a minute or two and then returned to its mate. The tide was rising, and, after waiting some time, one of them, exactly at high water, took to the sea, and swam rapidly over in a straight linc to the opposite projecting point of land. The observer, on this occasion, who was near the spot, but remained umperceived by the hares, had no doubt they were of different sexes, and that it was the male that swam across the water, as he had probably done many times before. It was remarkable that the hares remained on the shore near half an hour, one of them oecasionally examining, as it would seem, the state of the current, and ultimately taking to the sea at that precise period of the tide called slack-water, when the passage across could be effected withont being carried by the force of the stream either above or below the desired point of landing. The other hare then cantered back to the hills." The female generally produces two young at a litter, but frequently as many as three, four, and even five; the leverets having their sight at the time of birth, and being able to shift for themselves at the expiration of about a month. A full-grown hare weighs eight or nine pounds, but an instance has been given of one which weighed upwards of thirteen pounds. The flesh is usually considered good eating, but in some specimens we have found it decidedly coarse. In cold climates the fur becomes lighter duning the winter months. Black varictics also occur in this country ; a fine specimen of this kind was shot a few years since on the grounds of Sir Edward Kerrison, of Broom Hall, in the county of Suffolk.

THE ALPINE HARE (Lepus variabitis) is a mative of the mountainons districts of Northem and Southern Europe. The Alpinc hare is rather smaller than the common form, and has a light, fulvous-brown fur, which becomes white on the approacl of winter. The ears, however, which are shorter than the head, remain black-coloured at the tips throughout the cold season. The head itself is small, as is also the tail, when compared with that of Lepus timidus; the posterior pair of limbs being also shorter.

THE IRISH HARE (Lepus Hibernicus). -From a carcful cxamination of several specimens, Mr. Bell considers this hare as specifically distinct from the above. It differs from the common hare in the relative proportion of the ears and head, which are nuch smaller; whilst it is distinguished from the Alpine species by the size and "form of the body, the tail, and the texture and colour of the fur," the latter exhibiting a uniform rufons-brown tint.

THE AMERICAN HARE (Lepus Americanus) is tolerably abundant throughout the more wooded parts of the entire northern continent from which it derives
its speeifie title. In form, size, and general appearance it very elosely resembles our English rablit; fceding on grass and various vegetable mattcrs, and being particularly fond of willow bark. During the winter, grcat numbers are destroyed on the banks of Maekenzie river by the Hare Indians, who capture them with suares. Aecordung to Sir John Richardson, this species las numerous other destructive enemies, "sueh as wolves, foxes, wolverines, martens, ermines, snowy owls, and various hawks; but the Canada lyux is the auinal which pcrhaps most exclusively feeds upon it. It has been remarked that lynxes are numerous only when there are plenty of liares in the neighbourhood. At some periods a sort of epidemic lias destroyed vast numbers of hares in particular districts, and they lave not recruited again until the lapse of several years, during which the lynxes were likewise searce. In the spring and summer the lares are much infested by a species of cime.x. In the fur countrics this hare becomes white in the winter." In the milder districts the ordinary greyish-brown colour is retained throughout the cold season-a phenomenon which also occurs in the Alpine species. Several thousand furs are annually imported to this country, under the title of rabbitskins, but their valuc is scarcely sufficient to reward the trouble of exportation.

THE PRAIRIE HARE (Lepus Virginianus) very closely resembles our common English species, not only in form and general appearance, but also in its habits and swiftness of foot. It is tolerably plentiful on the plains bordering on the Saskatchewan, and on those of Columbia. In winter the fur becomes pure white.

THE POLAR HARE (Lepus glacialis) is a large species, and now very generally considered to be distinct from the Alpine, or varying lare. The fur is quite white, except at the free ends oi the cars, which are tipped with brownish-black. Its weight is said to cxtend to as much as fourteen pounds. The authority above mentioned states, that "although it does not frcquent thick woods, it is often scen near the small and thin clumps of spruce fir which are seattered on the confines of the barren grounds. It seeks the sides of hills, where the wind prevents the snow from lodging decply, and where, even in the winter, it can procure the berries of the Alpine arbutus, the bark of some dwarf willows, or the evergreen leaves of the Labrador tea plant. It does not dig burrows, but shelters itself amongst large stones, or in the crevices of rocks, and in the winter-time its form is generally found in a wreath of snow at the base of a cliff." It does not appear to be at all a shy animal, for Captain Lyon remarks that, while on the coast of Winter Island, the hares went out on the ice to the ships, to feed on the tea-leaves thrown overboard by the sailors. It may generally be approached within shooting distance without much difficulty. During the Arctic explorations of Dr. Kane and other bold adventurers, this little animal formed a frequent addition to their scantily provided feasts.

THE RABBIT (Lepus cumiculus) is familiar to every resident in the country throughout Enrope. The brownish grey colonr of the fur, becoming quite white underneath the tail and belly, associated with a ruddy tinge
about the neck, are charaeters familiar to all. 'The ears are nearly as long as the liead, but do not present the black markings at their euds, such as we find in the hares. The habits of the rabbit are too well known to require minute detail. Their destrnetive propensities are so great, that the generality of farmers extirpate them by every means at their disposal. Not only, however, do these little animals afford a considerable source of food to our population, but their skins are so lighly valued for manufacturing puposes, that in addition to those procured at home, we liave several hundred thousand slins anmally imported into this country from Germany. Fortunately the rabbit is extremely prolific; and as it begins to brecd at the age of six months, and is capable of producing litters of scren or cight young, six or seven times in the year, Pemmant has calculated that in the course of funr years, other conditions being favourable, the progeny of a single pair and their offspring, would anount to upwards of a million individuals!

THE LITTLE-CHIEF HARE (Layomys pinceps) is the nanne applied by Sir John liichardson to a small rodent, less than seven inches in length, and which inlabits the Rocky Mountains of North America. The fur is blackish-brown above and greyish beneath ; the head being short and thick, and the ears somewhat rounded. It has no tail. "It is often seen at sunset, momited on a stone, and calling to its mates by a peculiar shrill whistle. On the approach of man it utters a feeble ery, like the squeak of a rabbit when hurt, and instantly disappears, to reappear in a minute or two at the distance of twenty or thirty yards, if the object of its apprehension remains stationary." They do not appear to eonstruct any kind of burrow, but make their habitations among crevices in the limestone rocks. The Little-Chief IIare is distinguished from its cougchers in prosenting small digital pads at the base and end of its tocs; thesc have a black tint. The claws are also dark-eoloured, sloort, compressed, and concealed by the fur.
THE CALLING HARE (Lagomys musiltus)-Plate 16, fig. 54 -is a native of the south-eastern parts of Russia and the slopes of the Ural Mountains, as woll as of the western side of the Altai chain. The head is long, the ears large, short, and rounded, and the tail absent. The molar teetle are twenty in number; that is, five on either side of eaelı jaw. The body is about six inches only in length. The fur has a greenish-brown colour, being loary underneath. The Calling Hares frequent sumny banks in the neighbourhood of woods. They form burrows amongst the shmbs and herbage ; their openings bcing difficult to detect, but for the peculiar cry which the occupants make. This noise, which can be heard at a considerable distance, is uttered at regular intervals every morning and evening, and sometimes during the day if the weather be cloudr. The Tartars apply to it the name of barking mouse, while the Cossacks of the Wolga call it Scmlanoi sactshik, or groundharc. The young at the time of birth are blind and destitute of fur.

Closely allied to this species is the Ogotoma of the Mongnls (Layomys Ogotonat), which is fuund to the south of Lake Baikal.

## Order VIII.--EDENTATA.

The group of mammalian individuals to which the above title is applied, vary considerably in their skeletal claraeters, while the ordinal sign by which they are indicated is altogether a misnomer. It is doubtless unnecessary to inform our readers that the term EdenTATA implies that the animals thus called are toothless; nevertheless, in a work like the present, it is not only correct that as few words as possible should remain unexplained, but that when an ambiguous phraseology is, through general aequiescence, adopted, an explanation of its meaning and the cause of its retention should both be satisfactorily explained. We have to romark, therefore, that the Edentata are so called mercly from the circumstance that the several speeies of the order possess neither incisors nor canine teeth; though, indeed, an cxception to this rule ocemrs in the case of two kinds of armadillo, the jaws of whiel display two incisors above, i.e., one on either side at the posterior part of the intermaxillary bone, and two correspondingly opposed on each side towards the anterior part of the lower jaw; these latter apparently being entitled to come under the same serial eategory. Be that as it may, if any one doubts this statement let lim procure and examine the skull of the six-banded armadillo, or in the event of not being able to procure the cranium, let him turn to the exceedingly accurate figure given in the 212th Plate of Cuvier's "Ossemen Fossiles;" and he will, we are assured, be convinced as to the incisive eharacter of the superior pair just mentioned, from a consideration of the position which they occupy. He will at the same time be satisfied as to the very slender grounds on which the members of the present family are called Edentates. In all of them, we admit, there is a more or less conspieuous defieiency of dental organs at the fore part of the mouth (lig. 49); but, as if further to demonstrate the absurdity of the common title, the molars are in

Fig. 49.


Skull of the Armadillo.
some speeies remarkably numerous, no less than one humdred small grinders being observed by Frederiek Cuvier in the jaws of the great armadillo of Surinam! luat without dwelling further on this point, we pass on to notice that the teeth, if eonsilered by themselves, are extremely simple both in their structure and external configuration, presenting no roots at their basal surfaces; this part of their conformation being hollowed out so as to favour a continuous and progressive growth from bolow upwards. Histologically speaking, they are made up of dentine and cement, and have no cuamelled cappings or ridges on thair crowns. In regard to the skelcton, striking differenecs oeeur in the
various genera, aeeording as to whether they pursue arborcal habits, feeding on vegetable matters, as in the sloths-Plate 34, fig. 112-or, on the other hand, exhibit insectivorous propensities, and do not possess the power of elimbing, as in the ant-eaters-Plate 33., fig. 107. Among the most striking of these differences are those whiell refer to the structure and configuration of the osseous element entering into the constitution of the liead, tail, and extremities. Can anything be more signifieant than the attenuated, narrow, and long eranium of Myrmecophaga, and the abrupt, short, and broad skull of Bradypus? Observe how conversely the comparison holds good in respect of the limbs-drawn out and armed with long elaws in the sloth; shortened and furnished with trowel-like nails in the ant-eater! And, lastly, remark the powerful tail in the last-uamed animal, while the caudal development of the former is reduced to a mere useless appendage. It is needless to enlarge further on these distinctions, yet we cannot quit this introductory part of our subject witlout calling attention to the gigantic sloths of a former epoch. 'Lhe skeletal elements of the Mylodon and Megatherium exhibit a relative massiveness which utterly throws into the shade any features of a similar kind seen in the stoutest living Edentates, while pachyderm skeletons look slender and feeble in comparison with their monstrous bones! The dwarfish living representatives of that giant race still occupy the swamps and woods of South America; and, whilst not a few of the sealy tribe also oecur in the tropical regions of the eastern hemisplere, none of any sort are known to inhabit the continent of Europe.

## Family T.-MANIDE.

The Scaly Ant-eaters or Pangolins are, in every sense of the term, true Edentates, being altogether destitute of teeth. They have a long, round, extensible tongue, and very small ears, which in some instances are scarcely visible. Speaking generally, their most claracteristie feature consists in the possession of an integumentary armature of trenchant, horny, imbricated seales. These are disposed in rows somewhat like tiles on the roof of a house, and when the animals roll themselves up, after the manner of hedgeliogs, into the form of a ball, the slarp posterior edges of the scales project like so many points of a cupping lancet, and together constitute a powerful means of defence. Numerous lighteoloured hairs project from between the seales. The liead is elongated and narrowed in front. The limbs and feet are short, pentadactylous, or tetradactylous, and furnished with curved fossorial elaws. The tail is largely developed and of very remarkable strength. The skelcton displays no elavicles, and there is no coccum in connection with the intestinal camal. The Pangolins are natives of the warmer regions of $\Lambda$ sia and $\Lambda$ friea. Their movements are comparatively slow; they feed upon rarious kinds of inseets, and more cspecially upon ants and termites.

THE SHORT-TAILED PANGOLIN (Manis penta(lactyla), or Badgareit, is also known as the Broadtailed Manis, and is supposed to be the Phattagen described by Alian. It is an inhabitant of the continent of India and Ceylon, and is the largest species at present living. In the interior of IIndostan the natives apply to it a number of curious names: thus, in the Decean, it is termed the "tiled-cat;" elsewhere it is ealled the "land-carp;" and in Ceylon the "negumbo devil." The body approaches four feet in length, including the tail, which is not quite so long as the body and head together. Although this animal is very valuable as a destroyer of white ants and their huge nests, it would appear from the observations of travellers that the Badgareits are frequently subjeeted to mere wanton eruelty on the part of the Asiatic natives.

THE LONG-TAILED PANGOLIN (Manis tetradactyla) -Plate 17, fig. 58-is so mamed on account of the extraordinary development of the eaudal extremity. It is a small animal, about three feet in length at the most; but the tail is twice as long as the body, and contains no less than forty-seven vertebral segments, while in the animal above deseribed there are only twenty-six of these bones. This species, the seales of which are black, and yellow at the margins, is a native of the eoast of Guinea.

THE MANY SHIELDED PANGOLIN (Manis multiscutata), or Piiatagin, has been thus named by Dr. J. E. Gray, from the circumstance that the horny seales forming its dermal armature are disposed in rows varying from nineteen to twenty-one in number; whereas in the two species above noticed, there are only eleven rows. This species, the seales of which are small, of a yellowish-grey colour, and threc-pointed posteriorly, is also a native of the coast of Guinea.

TEMMINCK'S PANGOLIN (Manis Temminclit) is a native of Southern Afriea, being found to the north of Cape Colony, in the neighbourhood of Mozambique, and also in Sennaar. The body is rather more than two feet in length, ineluding the tail, whieh measures about a foot. The seales are disposed in cleven rows, the last fonr rows having only four seutes in each, while those of the anterior series have five. It is a searee animal, its almost total extinction having been brought about by a prevailing superstition among the natives that it has some evil effect upon eattle. Accordingly, when they eatel any unfortunate Pangolin, they burn it alive as an offering to the deity, in the hope that some advantage may acerne to their flocks! It is, however, a poor harmless little beast, feeding, like its congeners, prineipally upon ants.

## Family II.-MYRMECOPIIAGID AE.

Under this head are brought together the Ant-eaters properly so called. They are distinguished from the pangolins by the substitution of an abundant hairy fur in place of the sealy covering above deseribed. None of the typieal Ant-eaters display any organs of dentition; but in the aberrant genus Orycteropus, we find in young individuals upwards of twenty molars. Usually also the ears are slort, rounded, and feebly dereloped;
but in the partieular genus referred to they are long and sharply pointed. The tail is of considerable length in all the species. Another peculiarity of great interest has reference to the fect; for here we notice in the fore-limbs that the ultimate phalanges of the toes, which support the claws, are so constrmeted as to allow the movements of the latter being restrieted to flexion inwards ; and in orcer to maintain this position, there are powerful ligaments which keep the phalanges direeted towards the palm, and never allow the digits to be stretehed out in the manner of the plantigrade carnivora. The relative size and strength of the toes is also very significant, botle in this family and in the preceding; in those which have five toes the central digit attains an enormous bulk, while the outer pair are comparatively small. In order, moreover, to affurd adequate power for the digging and burrowing propensities of these animals, the phalanges are all closely connected together up to the base of the ultimate phalaux, converting the liand into a sort of trowel similar to that found in moles. From what has been advaneed, therefore, it will readily be remarked, that the Ant-eaters do not walk on the soles of their feet; neither do they tread on their strongly-curved toes, which would damage the claws, but, in the fore-feet at least-as may be seen by refering to the drawing of the Great Ant-eater given in Plate 17, fig. 57the anterior part of the body is seen to rest entirely upon their outer edge; and that part of the hands thms subjected, as it were, to an unusual pressure, is in these ereatures supplied with an efficient eallous pad to protect the outer phalanges from injury. Another eireumstance in the organization of these creatures which has especial claim upon our attention, is the remarkable development of the anterior part of the head, and the more than coextensive elongation of the tongue. In the typical speeies this organ is rounderl, and marked by amulations whieh indicate the several museular rings entering into its composition; but in the aberrant genus previously alluded to, the lingual organ assumes a flattened form: in the typieal species it can be extended to nearly twiee the length of the head. Such, in brief, are the leading characteristies of this singular family; all of them pointing to their insectivorous habits, and demonstrating a special design in their construction and adaptability to the mode of life they lead. Having tom open the labitations of ants and other nest-building insects, the swarming myriads issue forth to give battle to the unceremonious intruder ; the slimy and extensile organ is immediately presented to the astonished crowd, who, collecting on the glutinous appendage, are, within less than a second of time, drawn within the capacions maw of the keen and small-eyed myrmecopliaga! The typieal species seem, in Soutl America-where they alone oceur-to represent the sealy pangolins of Asia and Africa; but the single aberrant genus Orycteropus is a native of the last-named continent.

THE GREAT ANT-EATER (Myrmecophaga jubata)Plate 17, fig. 57 -is a native of Brazil, Surinam, Columbia, Paragnay, and, in slort, of all the tropical districts of Sonth America. By the English and Spanish colonists it is. known as the Ant-bear; but one would
have supposed that its attenuated head and toothless jaws would have been sufficient to have preserved it from such a misplaeed designation. And this leads us to diverge a little from the immediate subjeet of our deseription, and to remark low singularly perverse are colonists in all quarters of the globe on the subject of animals. It is in vain that you shall protest that the Great Ant-cater is not a "bear." It is in vain that you shall explaiu the non-existence of sea-serpents, or prove to demonstration that tigers, properly so ealled, do not live in Afriea! Your Duteh settler, and yonr English explorer, having met with a "spotted hyaena," or with a "serval," forthwith put it down for a fact that tigers-yes, real tigers!-occur in Africa. Even this very dily, white we are writing-24th September-a member of the Livingston expedition records in the Times an encounter with a tiger; and thus, with the apparent sanction of those who, we are assured, know better, these false notions are propagated from age to age. But we must return to our edentulous ant-eater. This great species measures about four feet from the tip of the snout to the root of the tail, whieh, if incheded, would give us another thirty inehes, or upwards of three feet if the long laair at the extremity be taken into eonsideration. The head alone is about fourteen inehes long, being extremely narrowed towards the snout. The cyes are particularly small, and protected by naked lids. The fur is long, and more espeeially at the anterior part of the back, over the region of the shoulders. The tail is very busly, the long harsh hairs assuming a bristly character. The general colour of the fur is greyish-brown; but the under part of the chest and throat is black, and from this part there proeceds obliquely upwards on either side a dark band, which, as it passes over the shoulder, gradually diminishes and beeomes narrowed to a point over the region of the loins. This black line is also rendered more eonspieuous by parallel bars of a whitish tint whieh embraee it, so to speak, throughout its entire length. Aecording to D'Azara the Great Ant-eater generally invades low swampy grounds, and the banks of rivers and stagnant pools; and althongh not able to climb, it is frequently found in dense thickets. Its movemerts are slow, and even when pursued it is easily overtaken by any person on foot. Being very stupid it offers but a feeble resistanee, and consequently is easily taken or destroyed. It passes the greater part of its existence in a state of repose, sleeping with the head doubled up inderneath the hairy chest, whilst the thick tail is enrved over the body to protect it from the powerful rays of the sun. These animals are nowhere very numerons, and consequently have no diffieulty in procuring sustenanee from the multitudes of ants' nests which abound in the warm parts of South Ameriea. The female produces a solitary eub, whieh she earries about on her baek, even after it laas attained sufficient growth to shift for itself.

THE LITTLE ANT-EATER (Dyrmecophaga diductyla) is also known by the name of the two-toed ant-eater, from the circumstance of the fore-feet being didactylous. The hinder extremities are tetradactylous. This species is of very diminutive proportions; the entire borly being less than fourteen inches in length, and the tail appropriating more than hall of
this measurement. The fur has a pale fulvous eolour generally; but it is brownish on the back. The head is mueh shorter than in the great ant-eater, the snout terminating more abrupily. The skeleton exhibits several peculiarities, but we have only space to mention the remarkable breadth of the ribs. The Little Ant-eater is a mative of Brazil and the northem parts of South America. Its habits are similar to those of its more powerful congeners. Von Sack, in his "Voyage to Surinam," gives an interesting account of the tame ones in his possession; and after deseriling their eharacters, he tells ns that the inliabitants of that eountry aver, that when captined these animals will not be induced to eat, and only lick their paws after the fashion of a bear. "When I obtained the first," says Von Sack, as quoted by Mr. Ogilby, "I sent to the forest for a nest of ants, and during the interim I put into its enge some egrgs, honey, milk, and meat; but it refused to touch any of them. At length the ants' nest arrived; but the animal did not pay the slightest attention to it either. By the slape of its fore-paws, which resemble nippers, and diller very mueli from those of all the other speeies of ant-eaters, I thought that this little ercature might perhaps live on the nymphæ of wasps, \&c. I therefore broucht it a wasps' nest, and then it pulled out with its nippers the nympher from the nest, and began to eat then with great eagerness, sitting in the posture of a squirrcl. I showed this phenomenon to many of the inhabitants, who all assured me that it was the first time they had ever known that speeies of animal to take any nourishment. The ants with which I tried it were the large termites upon which fowls are fed here." Aceording to Von Sack and most observers, the tail is employed as a prehensile organ. It is, as we have seen, larger than the body, very stout and broad at its origin, thickly clothed with short hairs, and much attenuated towards the extremity. Generally speaking, the fur displays a thick, soft, shining, woolly texture. The female, it is said, prodnces a single young one at a birth, although it is furnished with four mammæ.

THE TAMANDUA (Mypmecophaga Tamanclua) is, in respect of size, intermediate between the two abovedescribed species; the borly measuring upwards of two feet in length from the extremity of the snout to the root of the tail, while the latter organ would give us nearly eighteen inches more. The colour of the fur is suljeet to considerable rariation ; and to so great an extent is this the case, that a number of wellmarked forms lave been reeognized, and by some the more noticeable of them liave been regarded as so many distinct species. Most, if not all, display a dark band on the fur, rmming diagonally over the shoulders from below upwards. The woolly hairs are eomparatively short, and the tail instead of being busliy at the tip, as in the great ant-eater, terminates in a narrow, sealy, prehensile point. The feeding halits of the Tamandua very elosely resemble those of the last-named animal ; but it infests the thickest forests of Brazil and the neighbouring distriets, living almost exclusively on the trees. It is particularly partial to honey, and proves terribly destructive to the wild and stingless liees whieh form their nests among the lighest branehes.

The female brings forth a single cub at a birth. For some months the young prescrves a pale-yellow colour, and is earried about on the back of its parent until it is able to shift for itself.
THE AARD-VARK (Orycteropus Capensis) or GroundHOG, differs from the foregoing in several important particulars. Some of these we have already described in our introductory observations; but we lave further to observe regarding the feet, that they are comparatively shorter and stouter than obtains in the true ant-eaters, the anterior pair being tetradactylous, and the posterior pentadaetylous. A very distinetive character is seen in the head, whieh is furnished with large pointed ears; while the tail, being of moderate length, not so long as the body, is very thick, rounded at the root, and densely clothed with hair (fig. 50). Altogether it is a stout, heary animal, the large bones
of the neek in particular demonstrating its strength in the cervieal region. The fur, whieh is very seanty, cxhibits a greyish-brown colour generally. The permanent tecth of the adult, twenty in number, have a simple form and structure, being made up of rootless cylinders, those in front displaying a slightly flattened aspeet at the sides. The Aard-vark is a very eommon animal throughout the southernmost parts of Afriea. It is rather larger than the eommon badger, attaining a length of upwards of four feet. Its habits are noeturnal, and it eonstruets large subterrancous burrows with extrordinary rapidity. It appears to live entirely upon ants, and for this purpose the tongue is largely developed, and armed with a glutinous seeretion. This organ, however is not so long as in the true anteaters, while it is at the same time more flattened and attenuated. The Aard-vark invariably fixes his retreat

Fig. 50.


The Aard-vark or Ground-hog (Orycteropus Capensis).
near to some large ants' nests, which he ventures only to attack after dark. He is a timid ereature, and does not move far from his burrow; and when attacked, should he succeed in gaining aecess to his abode, it is next to impossible to get him out ; for it is said he can burrow faster than his enemies ean dig. According to those who have witnessed its method of procuring food, the Aard-vark, having approached an ant-hill, fortlwith proeeceds to seratch a small part of it, just sufficient to allow of the introduction of its long, narrow snout. These ant-hills, it must be remembered, are sometimes three or four feet in heiglt, and contain myriads of inseet inhabitants - strongly enseoneed in faneied security complete! "Here," observes Mr. Ogilby, "after having previously aseertained that there is no danger of interruption, lie lies down, and inserting his long slender tongue into the breach, entraps the ants, which fly to defend their dwellings upon the first alarm, and, mounting upon the tongue of the Aard-wark, get entangled in the glutinous saliva, and are swallowed
by whole seores at a time. If uninterrupted he continues this process till he has satisfiel his appetite; but on the slightest alarm he makes a precipitate retreat, and seeks security at the bottom of his subterranean dwelling. Hence it is that these animals are seldom seen, even in those parts of the country in whiel they are most numerous. Like other noeturnal amimals, passing the greater part of their lives in slecping and eating, they become execedingly fat, and their flesh is eonsidered to be wholesome and palatable food. The hind quarters particularly, when ent into hams and dried, are held in great csteem."

## Fhiny HI.-DASYPIDA.

Under this title are brought togetlier an interesting little group of animals familiarly known as the Armadillos. We treat of them in this place beeause they represent a type of structure intermediate between the ant-eaters and the family we have next to consider-
namely, the sloths. The armadillos are readily recognized by their hard coat of mail, consisting of numerous many-sided plates elosely soldered together. The individual scales have most commonly a hexagonal form, are osseous in strueture, and so combined as to form a series of bueklers completely investing the superior and lateral parts of the body. In order, however, to allow a certain degree of movement, a series of slightly elastic bands, varying in unmber, are found intersecting the dermal shield at the centre of the baek. 'These zones are partly bony and partly integumentary, the latter structure having a dense pliable, and leathery consistence. The front and upper parts of the head are also furnished with a small shield, the scutes resembling tesselated pavement. The internal skeleton likewise displays several points of interest. The clavicles are well developed, the first rib on either side being remarkably broad. Another peculiarity is seen in the presence of a second spinous-like ridge, projecting from the posterior and outer surfaces of the scapula. This is also seen in the true ant-eaters, but not in the aard-vark. The acromion process of the shoulder-blade is likewise unusually prominent. The teetl have a cylindrical form, and vary considerably in different species. The feet are in some cases all furnished with five toes; but in others the anterior pair are tetradactylous. The under parts of the belly are loosely clothed with a thin fur, whilst a few thin wiry hairs also project from between the scutes of the dermo-skeletal bucklers, and from the soft parts of the semi-clastic zones. The tail is long in a few species, but in others very short. It is usually protected by rings of small scutes, which in certain forms degenerate, so to speak, into mere tubercles, whilst in others this organ is altogether naked. The armadillos are natives of South America; and in that country we find the fossil remains of an allied genus called the Glyptodon, which was a large animal, possessed of immense strength and a proportionately thick and complicated dermal armour. The armadillos feed on vegctable matters, and construct burrows into which they retreat when pursued.

THE PEBA (Dasypus peba)—Plate 17, fig. 56-or Black Armadillo, is very abundant in the district of Paraguay ; being also found in Guiana and Brazil, but not to the soutl of the Rio de la Plata. This species las likewise been designated the Long-tailed Armadillo, the Black Tatou, the Tatouhou, and the nine, eight, or seven banded armadillo, according to circumstances; these bands having been regarded as critcria of specific distinetness, and the same animal deseribed as so many separate species. The Peba is not quite a foot and a half in length, exclusive of the tail, which measures other fourten inches. The head is elongated, and much narrowed towards the snout. The ears are conspicuous, long, sharply pointed, and closely approximated. The limbs are short, and the feet comparatively small. The dermal armature may be divided into three portions, namely, the cephalie, liumeral, and iliae bueklers, according to the regions they invest. The two latter are made up of semieircular parallel rings, whose coneavity is directed forwards towards the head, and between them are the
bands which oecasionally overlap each other during the turning movements of the body. The molar teeth are thirty-two in number ; that is, eight on eaclı side of either jaw. The Peba is an expert burrower, and when pursued its only ehance of escape depends upon its gaining access to its dwelling. It is generally found in the more open grounds and cultivated districts. The olfactory powers of this little animal are extremely aclite ; and as affording an example of this faculty, D'Azara relates the following incident-" My friend Noseda," he says, "laving arranged a trap for the purpose of taking chibigazous, and having placed in it, by way of bait, a cock with a small quantity of maize to support him, it so happened that a few grains of the maize fell through between the boards which formed the bottom of the trap. An armadillo arrived during the night, and wishing to get at the maize thus accidentally spilt, opened a trench or burrow at some distance from the trap, and without deviating a hair's breadth from the straight line of his direction, pushed it on to the very spot where the grain had fallen, and possessed himself of the booty." The food of the Peba and its allies consists principally of regetable matters, such as maize, potatocs, roots of the mandioc, fallen fruits, \&c. ; but it also at times partakes freely of animal food in the shape of ants, worms, frogs, lizards, vipers, eggs of birds, dead and halfdecomposed carrion of wild cattlc-in short, almost anything, including even the contents of human graves when access can be gained to them. Notwithstanding all this, the South American natives and colonists generally, pronounce its flesh to be a real delicacy, especially when roasted in the shell.

THE PICHEY (Dasypus minutus) is a very diminutive species of armadillo, measuring only ten inches from the tip of the muzzle to the root of the tail, which latter organ is about half the length of the body. It is an inhabitant of the Pampas lying to the south of Buenos Ayres, extending nearly to the borders of Patagonia. The bands between the humeral and iliac bucklers vary in number according to the age of the animal. Gencrally speaking, these are either six or seven, cach ring consisting of a number of lineally arranged quadrangular plates. The tail is scaly, and tolerably well furnished with hairs. The limbs and claws are of moderate size. The Pichey constructs burrows, but is often seen abroad even during the day, and only occasionally retires into its habitations. In other respects its habits are beliered to resemble those of its congeners generally; and in common with the majority of them its flesh is highly esteemed, being excecdingly delicate and well-flaroured.
the tatouay (Dasypus Tatonay) is a comparatively rare species found in Brazil and Guiana. It is ealled the Wounded Armadillo, from a notion entertained by the natives that its tail las been deprived of the osscons covering seen in other species. This organ is about cight inches in length, and is almost entirely destitnte of any protecting crust, the maked skin being thinly clad with short brown lairs above, and a few scales on the lower surface. The body is about a foot and a lialf long, the licad being less narrowed anteriorly than in the preceding species. The
molars are thirty in number-fourteen below and sixteen in the upper series. The ears are largely developed, and about two inches from root to tip. One of the most distinguishing characteristics is seen in the cnormous enlargement of the digits of the anterior feet. These clearly demonstrate the exalted nature of its burrowing powers; but beyond this little is known of its habits. In the catalogue of Edentata preserved in the British Mnseum, this species is denominated Xenurus unicinctus.

THE POYOU (Dasypus sexcinctus) is one of the commonest forms of armadillo, and is especially abundant in the province of Paraguay. It is at once recognized by its remarkable breadth as compared with its leeight. The body measures sixteen inehes from the tip of the muzzle to the root of the tail; this organ being about eight inches long, and protected at the base by three or four osseous plates in the form of rings, while throughout the remainder of its extent it is corered with small scaly tubercles. The limbs, as we have hinted, are very short; nevertheless the animal is very swift of foot. The head is broad, flat, triangular, and truncated at the muzzle; the ears being of moderate size, and widely separated from each other. Its habits are similar to those of its congeners; but as it is particularly fond of carrion, its flesh is not considered by the Spanish and other European colonists of South America to be so good eating, as those species whose diet is exclusively vegetable.

THE HAIRY ARMADILLO (Dasypus villosus) is rather smaller than the above, and is a native of Bienos Ayres and the districts south of the Rio de la Plata. So abundant is it in the plains of these regions, that D'Azara writes as follows:-"In an expedition which I made into the interior, between the parallels of $35^{\circ}$ and $36^{\circ}$ south latitude, I met with vast multitudes of this species of armadillo; so that there was scarcely an individual of the party who did not each day capture one or two at least; for, unlike the Poyou, which moves abroad only during the night, this animal is to be found at all times, and upon being alarmed promptly conceals itself, if not intercepted. In March and April, when I saw them, they were so extremely fat that their flesh surfcited and palled the appetite; notwithstanding which, the pioncers and soldiers ate them roasted, and preferred them to beef and veal." The distinguished Spanish officer and naturalist further observes, that the Hairy Armadillo "scents the carcasses of dead horses from a great distanee, and runs to devour them; but, as it is unable to penetrate the lide, it burrows under the body till it finds a place which the moisture of the soil has already begun to render putrid. Here it makes an cntrance with its claws, and eats its way into the interior, where it continues feasting on the putrid flesh till nothing remains but the hide and bones; and so perfectly do these preserve their position, that it is impossible from a mere external view to auticipate the operations which the armadillos have been carrying on within." This species does not construct burrows for the purposes of habitation, and is always met with on dry open grounds. It is, as the name implies, better provided with hair than obtains
in the case of its congeners. The bands vary mumerically, there being usually six or seven. The teeth are thirty-two in number, equally divided above and below. The ears are conspicuously developed; but the most characteristic feature of this species arises from the sharp, projecting margin of the lateral bands and tesselated bucklers at the lower part of the body.
the mataco (Dasypus tricinctus) is another very interesting form of armadillo living in Brazil, Paraguay, and Buenos Ayres. It is also denominated the Bolita, on account of a propensity to roll itself up into a ball. It is nearly as large as the Poyou, excluding the tail, which in the Mataco is reduced to a mere appendage scarcely more than two inches in length. The limbs and feet are rather small and fecble. The head is short, pear-shaped, and armed with a cephalie mail ; whilst the bucklers, which are made up of osseous polygonal plates somewhat irregularly disposed, are strongly developed and separated from each other by three broad, movable bands; this latter eharaeter rendering the Mataco distinct from all other species of armadillo. The cars are comparatively short and rounded. The Mataco is rather a scarce animal, probably from the facility with which it is captured; for, when pursued, having 110 burrows wherein to hide itself, and being a slow rumer, its only mode of defence consists in rolling itself up into a helpless sphere.

THE GREAT ARMADILLO (Dasypus gigas) is not only distinguished by its great bulk, but also by the possession of a multiturle of molar teeth, varying in number from eighteen to one hundred. Exclusive of ${ }^{\circ}$ the tail, the body measures about forty inches in length, while the caudal extension would give us some sixteen or eighteen inches more. The ears are small, but the head is more eylindrieal than in the generality of species. The humeral and iliae bucklers are made up of numerous rows of square-shaped plates, and are separated from each other by twelve or more movalle bands inclosing scutes of a similar character. The long tail is comparatively stout at the base, and is armed throughout with a close-set mail of osscous rings, presenting externally an appearance of spiral lines erossing each other obliquely. The native Botueodos employ this dermal armour of the tail to form speaking trumpets, which they use in the densely wood-bound forests of Brazil and Surinam. The digits of the fore-feet are enormously developed, as in the Tatouay, the middle and fourth tocs being furnished with large trenchant claws. These digging weapons they employ with such skill and power, that in burying their dead the natives are obliged to place strong barriers of stakes, planks, and stoncs in order to have a resting-place for their departed companions, secure from the depredations of this gigantic carrion-loving armadillo.
THE PICHICLAGO (Chlamydophorus truncatus) forms the type of a remarkably aberrant genus, in many respects closely alliced to the true armadillos. It is a native of Mendoza, on the eastern slopes of the Cordilleras, and of other parts of Chili. In point of size it comes very near to the common mole, the body measuring a trifle more than five inches from before backwards. Its anatomy has been rery closely investigated by Dr.

Harlan of New York, Mr. Yarrell of London, and Dr. Hyrtle of Vienna ; and each of these distingnished naturalists have published lengthened memoirs upon the subject. From their combined deseriptions we gather the following particulars:-The molar tectl are thirtytwo in number, lave a simple strueture, and are equally distributed above and below. The head $p^{\text {resents the }}$ figure of a eone, sharply pointed at the imizzle, and widening out at the occiput; the bones of the skull do not display any trace of sutures in the adult cranimm, and over the upper part of the frontal elements there arise two small globular osseous masses, the function
of which will be immediately rendered apparent. Scarcely any trace of an ear can be detected on the outer surface, this organ being represented by a patinlous opening, marked by a slightly elcrated margin, and situated immediately behind the small, blaek, halfconcealed eyes. The oral opening is not large ; but the nose is furnished with an extended cartilaginous septum internally. One of the most striking peculiarities of the Pichiciago consists in the uniform hard dermal armatnre, protecting the entire length of the licad, neck, and back (fig. 51). This coriaceons covering is made up of numerons square, rhomboidal,

Fig. 51.


The Pichiciago (Chlamydophorus truncatus).
or enbieal plates, closely conneeted together by a tough leathery development of the epidermis; these plates are disposed in rows, of which there are twentyfonr. Thronghout the greater part of its extent, this shield is only loosely attached to the body by soft connective tissuc ; but, along the central line of the back, it is more firmly adlıerent to the capitals of the vertebral spinons processes, whilst, at the free part of the head, it is very firmly fixed to the two frontal osscous prominences above described. Postcriorly the dorsal shield terminates abruptly, imparting to the linder quarters an musual appearance. This part of the body, however, is carefully protected by five semicircular rings of plates, having a strueture precisely similar to those on the back. At the lowermost part, the anal shield is notched for the growth and lodgment of the tail, into which erevice this organ is, as it were, lodged, and is, under ordinary circumstances, donbled up beneath the belly. It presents the character of a rigid cylinder, but at the tip it is flattened ont in a spatulate manner, to form a kind of paddle. At the semi-circumferential margin of the anal shield, and along the side of the dorso-cephatie covering, there is developed an extensive fringe of silky hairs, the nuder parts generally being thickly clothed with fur. All the fect are pentadactylous, the claws of the anterior pair being remarkably long. slightly curved, and sharply pointed; the several digits are intimately bound together, and are so disposed that
the claws when acting together form a kind of scoop. The hinder cextremities are, comparatively speaking, small and feeble, the tocs being also more widely separated from cach other. Respecting the liabits of the Pichiciago very little is known, but from the statements of Mr. Closeberry, the oriminal discoverer of the species, there is every reason to believe that its mode of living very nearly resembles that of our common mole. It dwells almost entirely muder gromd, its limbs at once showing low unfitted it is for rapid progression on the surface. The female is said to carry her offispring beneath the margins of her dorsal shield; but this statement requires confirmation.

## Family IV.—BRADITIDA.

Following Cutrier, some naturalists prefer to consider the Sloths muder the family title of Tardigrada, as indicating one of the most remarkable characteristics of this tribe of animals. The tardigrades then, or, in simpler plrase, slow-moving Edentates, are at once distinguished ly a peculiar conformation of the extremities, ardmirably fitting them for an arhoreal mode of existence, but rendering their morements on the gromud very awkward, for the obvions reason that they are umatural. If we examine the skeleton of an ordinary Sloth-Plate 34, fig. 112-the first thing that strikes ins is the musual size and extension of the limbs, and especially of the anterior pair ; the latter are
very nearly twiee as long as the hinder extremities, and in this feature we are inevitably reminded of a similar arrangement in the limbs of eertain quadrumana whose habits are in some respects analogous to those of the family under consideration. On eloser inspection of the hands, it will be noticed that the bones of the carpus and metaearpus are short and ankylosed together, whilst the terminal digits are long, and furnished with immense hooker elaws. These prehensile talons are closely eurved towards the palm while not in use, or in a state of rest; but when the animal requires to grasp a fresh braneh, they are forcibly extended by muscular contraction, assuming a position like that given in the raised arm of the aecompanying representation, above referred to. The hind feet are similarly constructed, and a glanee at their position, with the soles direeted obliquely inwards, is sufficient to show how unnatural it is to represent a Sloth walking all-fours on a plain level surface. In the older natural history collections of the United Kingdom, nothing is more common than to observe the errors into which taxidermists have fallen in mounting and displaying the stuffed skins of Sloths; and we eould still point to fine eollections where the tardigrade edentates may be seen sprawling on the floor in the most approved style, with their backs toward the sky! Having personally inspected, with care, the prineipal museums of natural history in London, Edinburgh, Glasgow, and Dublin, we have no lesitation in saying that, if any one wished to see the way in which Sloths ought to be stuffed, they would do well to take a glance at the specimens preserved in the muscum of Trinity College, Dublin-and they are not the only evidences of taxidermal skill to be seen in the Irish capital. But, to return to our skeleton, and the figure reduced from that given in Cuvier's eelebrated "Ossemens Fossiles"-let us next examine the head (fig. 52). Here we have a striking contrast when eompared with the attenuated crania of the ant-eaters.

Fig. 52.


Skull of the Sloth.
The Sloth's hearl is short, rounded, flat, and truncated at the muzzle; the jaws are generally furnished with cighteen molar teeth-the anterior pair, above and below, haring been regarded by Cuvier as incisors; the young individual carries twenty molars. In the construction of the bones of the trunk, and espeeially of the pelvis, we notice other interesting adaptations to the peeuliar habits of these creatures; but among these we have only spaee to mention the remarkable elongation
of the neck. This eerrical extension was at one time supposed to be due to the presence of nine true neckvertebre; but some years since, Irofessor Bell satisfaetorily demonstrated, from prepared skeletons in his own collection, that the so-called eighth and ninth cervical veretebre were, in reality, true rlorsal segments, seeing that he lad discovered a pair of little rudimentary ribs attached to each of the osseous elements in question. "The objeet," says Mr. Bell, " of the inereased number of vertebre in the neck, is evidently to allow of a more extensive rotation of the hearl for, as each of the boncs turns to a small exient upon the sueeeeding one, it is elear that the degree of rotation of the extreme point will be in proportion to the number of movable pieees in the whole series. When the habits of this extraordinary animal are eonsiderect, hanging as it does from the surface of boughs with the back downwards, it is obrious that the only means by which it could look towards the ground must be ly rotation of the neck; and as it was necessary, in order to effect this without diminishing the firmness of the cervieal portion of the vertebral column, to add certain movable points to the number possessed by the rest oi the class, the additional motion was acquired by modifying the two superior dorsal vertebre, and giving them the office of cervical, rather than infringing on a rule which is thus preserved entire without a single known exception." As we shall immediately have occasion to return to the consideration of the lahits of these animals, we have here only further to observe that the Sloths are all natives of the forests of South America, where they feed upon vegetalle inatters, chiefly leaves. The extinct genera, Megatherium, Megalonyx, Scelidotherium, Erinathopsis, and Ereptodon, are also referable to this family, forming the suldivision of gravigrade edentates.
the ai (Bradypus tridactylus) or Three-Toed Sloth-Plate 17, fig. 55-is the best known of all the speeies. The specific term applied to it rests upon the arbitrarily assumed grounds that it is the only species which is furnished with the three toes; but there is every reason to belicere that at least two other Slothsthe $B$. gularis of Riippecll, B. torquatus of Illiger, and B. infuscatus of Wagler being regarded as so many distinct species-have tridactylous feet. Be this as it may, the generality of naturalists appear eontent to retain the old Linnæan appellation, and we shall not deviate in the present instance from their eombined authority: The $\Lambda_{i}$ inhabits the most secret recesses of the South American forests. The body is enveloped by a coarse shaggy fur, and so disposed about the short round head, as to impart to the physiognomy a human look. The fur has a greyish eolour generally; young individuals being frequently spottel with brown and white; the under parts liave usually a light fulvous tint. When deseribing the skeleton, we took occasion to remark somewhat on the labits of this animal, and espeeially referred to its awkward behaviour when plaeed on a level surfaee. One of the most singular errors into whiel the great Freneh anatomist fell, was that of aseribing to the Ais defieieneies and imperfeetions of organization, as if they were not well adapted to the mode of existenee whieh the Creator had been pleased
to assign to them. "These animals inhabit trees," says Cuvier, "and never remove from that on which they are located until they have stripped it of every leaf, so painful to them is the requisite exertion to reach another!" Our readers are well aware liow frequently these errors have been exposed by Bell, Blyth, Buckland, Broderip, Owen, and a host of other distinguished English writers; nevertheless we have pleasure in quoting some apt remarks of the last-hamed authority, recently given in his manual of the "Skeleton and Teeth." Alluding to the Ai, Professor Owen observes that "it is less able to raise its trumk above its limbs than the seal, and can only progress by availing itself of some inequality of the soil offering a holdfast to its claws, and enabling it to drag itself along. But to judge of the creative dispensations towards such an animal by observation of it or report of its procedure minder these unnatural circimstances, would be as reasonable as a speculation on the natural powers of a tailor suddenly transferred from his slopboard to the rigging of a slip under weigh, or of a thorougl-bred scaman mounted for the first time on a full blood-horse at Ascot. Rouse the prostrate Sloth, and let it hook on to the lower bough of a tree, and the comparative agility with which it mounts to the topmost branches will surprise the spectator. In its native South American woods, its agility is still more remarkable, when the trees are agitated by a storm. At that time the instinct of the Sloth teaches it that the migration from tree to tree will be most facilitated. Swinging to and fro, back downwards, as is its habitual position, at the end of a branch just strong enough to support the animal, it takes advantage of the first branch of the adjoining tree that may be swayed by the blast within its reach; and stretching out its fore-limb, it hooks itself on, and at once transfers itself to what is equivalent to a fresh pasture. The story of the Sloth volnntarily dropping to the ground, and crawling under pressure of starration to another tree, is one of the fabulons excrescences of a credulons and gossiping zoology." Such, in brief, is a fair estimate of the capabilities of the $\Lambda i$ in a state of nature; and the testimony of such trustworthy travellers as Stedman and Waterton as to its power of rapid motion under certain circumstances, las long placed the matter beyond dispmte. "He travels at a good round pace," says the latter, "and were you to see him, as I lave done, passing from tree
to tree, you would never think of calling him a sloth." In conclusion, we may remark, that the female is furnished with two mamme, and produces one yomg at a single birth, which adheres to the parent by its elaws mitil able to shift for itself. The Ai is much sought after by the natires, who consider the flesh to be execllent eating. When on the move it utters a short plaintive cry resembling our pronunciation, in a shrill voice, of the two-lettered name by which it is appropriately called.

THE GIPAKEIOU (Bradypus torquatus) is, like the above, a native of the north-easterly districts of Brazil, but it occurs more sparingly. The fur exhibits a frizzled, ferruginous aspect along the under parts of throat and belly; but above it las an orange-yellow colour generally, whilst the face is black and destitute of hair. A more characteristic feature is seen in the presence of a deep black band, forming a sort of collar round the neck; its specific distinctness being rendered still more certain by differences observable in the structure of the cranium, compared with that of other sloths. The habits of the Cipakeiou closely resemble those of the ai.

THE UNAU (Cholapus didactylus), or TWO-TOED Slotir, has been generically separated ly Illiger from the above-described species, on account of certain peculiarities in the teeth, associated with a comparative elongation of the liead on the one hand, and a shortening of the anterior pair of limbs on the other. The fore-feet are, as above indicated, furnished with only two digits; and the tail, which in the ai is reduced to a mere stumpy appendage, is altogether wanting in the Unau. The first molar teeth of this animal are long, and sufficiently acuminated at the summit to resemble ordinary canines, whilst the superior pair, dining the closure of the jaw, are placed in front of the lower ones. Besides these spurious canines, there are fourteen other molars, fom on cither side abore, and three on either side below, the crowns of which are wedge-shaped, that is to say, in their worn condition. In regard to the skeleton, its clavicles are fully dereloped, and the bones of the carpus and tarsus become very early consolidated together. The Unau is abont half as large again as the common ai, whilst the fur exlibits a dark-greyish brown colour generally; being here and there tinged with red. A living specimen of this singular species may be seen in the London Zoological Socicty's Gardens, liegent's Park.

## Order IX.-RUMIINANTIA.

Tirnougiout the entire mammalian series, there is not a better defined gromp than that formed by the ruminating quadrupeds here associated together under the above distinetive title. This was the opinion of the greatest of Freuch naturalists, and it is in no degree contra-indicated by Professor Owen, in whose more exacting system of classifieation-an ontline of which is given at page 8-these cud-chewing species colleetively maintain their zoological continuity, as a subordinate division of the even-toed ingulates-more precisely called Artiodactyla.

The essential features by which the ruminants may be distingnished are not confined merely to one or two trifling characters, but involve the structure and morphology of several important organs and appendages. In a few words they may be stated as follows:-All the feet terminate in two digits, the ultimate plaalange of each being armed with a tightly investing hoof; and the opposed surfaces of these hoofs are flattened in such a way as to impart to the foot an appearance of splitting in the mesial line. With an exception in the case of the camels, all the species are destitute of incisive
teeth in the upper jaw, the vaeant space bcing occupied by a callous pad; the lower jaw is invariably furnished with six ineisors, but in all the ruminants not included in the last-named family, the two canines of the lower jaw are eloscly approximated to the incisors, and, forming a very close rescmblance in form and size, are easily mistaken for true incisors. In the typical speeies, also, there is always a wide unoceupied space intcrvening betwecn the molars and eanincs of the lower jaw, while, when the latter are present in the upper maxillary bone, a similar, though somewhat shorter interspace, is eorrespondingly manifest above. The typical species likewise usually display six molar tecth on each side of either jaw, their flattened erowns being surmounted by two double and irregularly creseent-shaped folds of enamel; the conver outline being directed inwards in the superior scries, and outwards below. But the most interesting charaeter by which all the species are noted, consists in the multiple character of the stomach, which is divided into four eavities, so as to provide for the ruminating aet (fig. 53). This organ-we say it unhesitatingly-affords one of the most striking illustrations of the special evolu-
tion of a complex mechanism from the general or more simple type of structure seen in the majority of mammalia, whilst, to the mind of an unprejudieed truthsecker, it irresistibly indieates evidence of creative design : and we hold this argument to be in no way lesscued by the casily demonstrated faet, that two if not tlree of its divisions are essentially modified dilatations of the lower end of the cesophagus, 1 ! This is a department of natural history knowledge too important to be slurred over in a work like the present; thereforc, before proeceding to explain the ruminating function, we arc carcful to notice the form and mechanism of this beautifully eonstructed organism. Most people arc aware that the first compartmont, $B$, is called the paunch. This is much larger than any of the other so-called stomachs, cxhibits a rhomboidal ontline rounded at the angles, and occupics no inconsiderable portion of the entire abdominal cavity of the animal. Certain constrictions externally, corresponding with folds of the lining membrane internally, cause this organ, when carefully scparated from its other stomachal conncetions, to assume the appearance of an enormously

Fig. 53


Stomach of the Sheep.
distended coil of intestinc, bent upon itself in the form of the letter S. In the typical ruminants the internal surface is closcly beset with villous projections, which impart to the membrane a rough, shaggy aspect, the cogeney of which is variously maintained at different perts of the mucous surface; the villi forming small, flattened, prominent, pedunculated masses, in shape resembling racket bats. Such is the general character of the panneh in ordinary ruminants; but in the aberrant camcline gencra we find very material differences. Instead of presenting a rugous internal surface crowded with these baton-like villosities, the mucous lining membrane is conspieuously smooth. The most remarkable feature, lowever, arises out of the formation of numerons pouches, specially fitted for the reception and retention of water (fig. 54). These sacs, whieh may be looked upon as so many protrusions of the wall of the riscus, are arranged in two distinct groups, one on the right side and the other on the left; the former being by far the more numerous, and, in the full-grown dromedary, measuring about onc foot and a half in length and six inches in breadtlı. The eells of each group are disposed in parallel rows, separated from one another loy strong museular bands, given off from a single large bundle of fibres, whieh commenecs at the upper catremity of the
panch, and procceds in a longitudinal dircction, so as to divide the cavity into two compartments. The muscular fasciculi are arranged transuersely, and give off sccondary bundles at tolerably regular intervals, so that the rounded orifiees of each cell are guarded by powerful square-shaped muscular lips. Some oí the pouches arc more complicated than others, being subdivided into numerous smaller bags by foldings of the internal lining membranc. The largest of the reservoirs in the adult dromedary have, when distended, a depth and width of about three inches. A structure analogous to this is found in the llamas; but it is not so strongly developed. This leads us, in the next place, to describe the second stomach of the ruminants, otherwise ealled the reticulum or water-bag, c (fig. 53). This organ las been recgarded by some as a mere alpendage of the paumeh; but it is as much cntitled to a distinctive recognition as any other of these comected viseera. In respect of size, it is comparatively small, presenting a globular outline, and forming a sort of cul-dc-sac between the first and third stomachs. Its most characteristic feature is scen in the presence of multitudes of polygonal cells, from which circumstanee it has been popularly called the honcy-eomb bag. In some speeics, as, for cxample, in the rein-decr and girafic,
these eells are limited by very narrow walls of separation, scareely elevated above the level of the general surface; and in the horned ruminants the mueous surfaee is further charaeterized ly a great number of minute and slarply-pointed conieal papilla, oecupying every part of the eavity; being most prominently marked along the ridges of the lamina, so as to give to these slighltly-elevated folds of separation a toothed margin. In the camels and llanas the honey-eomb cells aequire a form and eapacity strictly analogous to the water-cells of the paumel ; but there are some slight struetural modifications apparently conformable with

Fig. 51.


Water-cells in the paunch of the Camel.
the more temporary or immediate purposes which they subserve. The apertures of the cells of the paunch, which have been designed to retain water for a lengthened period, are narrow and guarded by productions of the lining membrane, whilst those of the second stomach-destined to be continually parting with their aqueous contents during the ordinary aet of rumina-tion-are patent, and not eovered in by speeial membranous folds. Moreover, in the distended state of the eells, the external surface of the pauneh is marked ly a corresponding number of vesieular bulgings, whereas, in the retienlum, the walls remain uniformly smooth, and do not exhibit on the outside any marked traces of the internal water-cells; nevertheless the compartmental subdivisions are more numerous and complieated than those of the first stomach. Another distinetion between the ordinary horned and the nontypical hornless ruminants, may be seen in the absence of any internal cutieular lining membrane in the reticulum of the camels. But we must now pass on to notice the third stomachal viscus. Before doing this, however, we lave to remark, that in all ruminants there is siluated a short trough-like eanal at the superior
and anterior margin of the retieulum, constituting the remains, as it were, of that portion of the gullet which las not, aecording to the developing theory, become involved in the first and second great gastric dilatations. This grooved ehannel forms a bond of intereommunieation between the ossophagus and the three first digestive eavities, and it is furnished with an extension of the muscular tunies of the gullet, so as to fit it for a two-fold office to be presently described. The third stomach, or manyplies, 1) (fig. 53), intervenes between the retieulum and the fourth or true digestive earity; communicating with the former by a minute aperture, and with the latter by a very wide opening. It is the smallest of the four great stomachal organs; but the extent of its absorbing mueous surface bears no relation to its diminished bulk, seeing that the latter is enormously inereased by a remarkable folding of the internal lining nembrane whose duplieatures resemble the leaves of a book, whenee it is sometimes ealled the psalterium. The leaf-like folds are disposed lengthways, and in the empty condition of the organ are closely applicd against each other. In breadth they exhibit proportionate differenees, so that we find an alternating assemblage of lamiuse presenting three gradations of development; one forming a very narrow fold, another very broad, and a third of intermediate width, serially interealated between the two. Altogether about forty sueh septa may be counted in the sheep, and more than double that number in the ox. Internally the snrface is beset throughout with small conieal eminenees, similar in eharaeter to the rilli of the reticulum; those oceupying the free margins. of the folds being more conspicuously developed. The manyplies is much clongated in the eamels, and considerably larger than the waterbag of the same aberrant group. In all ruminants the fourth stomach, E (fig. 53), constitutes the true digestive eavity, being functionally and morphologieally analogous to the simple gastric organ of the non-ruminating mammalia. This viscus is about one-third of the size of the paunch, smooth externally, pyramidal in shape, and terminates by a narrow tubular portion at the inferior or pyloric extremity, at which position the muscular walls aequire inereased thickness. Internally the seereting membrane is marked by irregularly disposerl longitudinal folds, slightly elevated above the surface, and intereommunicating by smaller foldings of the same nature, laving a more or less oblique direction. The lining membrane is soft and smooth, and instead of being provided with villous appendages, is furnished with minnte follieular openings leading to gastric glands like those of the human stomach. At the pyloric extremity, in addition to the ordinary narrowing usually seen at this part, there exists a special valrular process, developed from the mueous membrane at the eommeneement of the duodenum-this structure being evidently designed to guard more effectually the entrance to the intestinal passage. At this point, therefore, we are naturally led to explain the function of rmmination, which is elaracterized by the following phenomena as they suceessively follow eaeh other under ordinary cireumstanees:--I'he foord, on being received into the mouth, undergoes a reery partial mastieation, and in this crude state is speedily
earried down the gullet, where, on arriving at the lower part, the lips of the museular channel, placed at the entrance of the first three stomaels, separate so as to insure its passage into the paunch. In like manner, subsequent to the act of drinking, the margins of the oesophageal groove open, and the water is conveyed into the cells of the reticulum. In the eamels a part of the fluid passes into the first cavity, there to be retained by the great water-eells, as a special provision against those contingeneies which their mode of existence involves. While the coarse vegetable food is being macerated by the moisture secreted from the walls of the paunch-and probably also from the water taken in by the mouth, some of which may liave entered the cavity-portions of the indigestible mass are transmitted into the second stomaeh for further maceration, and from thenee into the grooved canal above deseribed, to be here monlded into the form of pellets, and returned to the mouth by a kind of reversed peristaltic action. The softened bolus thus brought back into the mouth, is destined to receive a thorough and complete remastieation, constituting that part of the process familiarly termed "ehewing the cud." This phenomenon is accompanied with an action of the jaws which difiers somewhat in particular species. Thus, it has been shown by Professor Owen that in the eamels the bolus is triturated alternately from side to side; whereas the action of the teeth in the horned ruminants, including the giraffe, is always in one direction-it may be from right to left or left to right-oceasioned by the rotatory motion of the jaw. The necessary reduction of the aliment having been accomplished, it is again transferred to the stomach in a pulpy semifluid condition; but this time, instead of entering the first or second cavities, it passes directly along the now-closed oesophageal groove into the third stomach, or manyplies. In this viscus the superfluous moisture is supposed to be absorbed before the bolus is ultimately transmitted into the fourth stomach, in whiel organ the true digestive act remains to be fulfilled. In the newly-born ruminant, the first, sccond, and third stomachs are very incompletely developed; and no chewing of the cud being necessary, the food passes minterruptedly into the fourth. In the ealf a peculiar organic aeid is sccreted by the lining membranc of the true stomaeh, which, it is well known, possesses the singular power of converting the albumen of milk into curd and whey. In the young, as well as in the adult aumal, various foreign substanees are occasionally found in the paunch, and sometimes in the retienlum. The coneretionary masses are either made up of hair, vegetable fibres, or calcarcous particles, generally acglomerated together in a rounded or oval form. The hairy balls found in the calf and cow result from the licking of their own hides, or those of others; and the individual hairs, on being transferred into the stomach, are collected together, and rolled by the aetion of this organ into the characteristie slapes above mentioned. In the camel we find them in the form of pedunculated pellets, strung together in grape-like bunches. In the chamois, the formation of the so-called bezoar stones, takes places in consequence of a partiality for saline matters, which the animal gratiiies by licking fragments
of rock containing saltpetre. Thus a variety of earthy and silicious particles are at the same time swallowed, and by the secretions and peristaltie aetion of the stomach, are agglutinated together, and converted into curious pebble-like formations.
Before leaving this part of the snlject, we deen it right to notice our diseovery of two very remarkable peculiarities oecurring in the alimentary canal of the aberrant genus Camelopardalis. The first of these consists in the presence of pouch-like folds in comection with the compound glands of the intestine; whilst the second is a similar, but far more striking development of the glands, situated close to the opening by which the small intestine communicates with the large colon and eœcum. This structure we believe to be altogether unique throughout the entire mammalian scries; and although we first directed attention to it at the Glasgow


Remarkable compmund gland situated at the junction of the large and small intestives of the Girafte.
meeting of the British Association in 1855, and have subsequently given details in the third volume of the new series of the Eidinburgh Philosoplical Journal, and in the article "Riminantia," published in Dr. Todd's "Cyclopaedia of Anatomy and Physiology," we make no apology for again specially inviting the atten-
tion of naturalists to so interesting a structure (fig. 55). Here we lave an intestinal gland, made up as it were of from fifteen to twenty little pouches, combined to form a beantiful network of cells, seven of them bearing no inconsiderable rescmblance to the water-earrying reservoirs of the reticuhme. Tliese latter lave a depth of from three to four lines, whitst the remainder are more or less incomplete; and those farthest from the ilco-colic orifice are mere depressions, the walls of separation being scarcely elevated fiom the surface. In other ruminants the ouly peculiarity affecting the alimentary canal, which is worthy of notice, consists in the remarkable lengthening of the intestinal tube generally, and in the bulky development of the coemm. There are some curions modilications of stucture to be seen in tlic liver and gall-bladder; but these distinctions will be more appropriately indicated when comparing and describing the several claracteristics of the cameline and cervine families.

The skeletal characters are tolerably miform throughout the order, execpt in so far as they relate to mere size and strength, and to the presence or absence of those remarkable cranial outgrowths, commonly called horns. We shall treat of the latter structures when specially considering the horned families. Meanwhile we take occasion to notice, that whatever be the length of the vertebral column, we invariably find the bones of the neck to be ouly seven in number ; and the beauty of this law, though previously mentioned as affecting the entire mammalian series, cannot be more cogently illustrated than by comparing the long-necked camels and girafle with the slort-necked cetaceawhich have yet to be described. Taking the skull of the ox (fig. 56) as a type of the ruminant cranium, it

is only necessary to observe its general breadtly and massiveness; the cerehral division bearing a very small proportion to the cutire mass. This disparity prevails throughout the whole order, the bones of the face occupying fully two-thirds of the entire length, and the area of the face on section being nearly double that of the cranimm.

## Family I.-BOVIDA:

The group of animals commonly termed Oxen constitute a division of the hollow-lorned ruminants, which, althongh very closely allied to the sheep and antelopes, are easily recognized by their bulky and massive appearance gencrally, and particularly by their broad muzzle. and powerful limbs. A still more striking character istic is to be seen in the lateral direction of the horms, which usually incline upwards, or forwards in a crescentic, mamer. In the constitution of the skeleton, there are mumerous variations in the form, position, and degreo of development of the several osseous elements; but these are not of sufficient importance to be detailed at length. In regard to the cloven hoof, we may mention what we have omitted in our general introduction to the order, namely, that this split condition of the foot is evidently designed to impart lightness and elasticity to the spring ; and in view of giving frll effect to such an arrangement, many ruminant species are provided with a special glandular sebaccous fullicle between the toes, whose office it is to furnish a lubricating secretion, calculated to prevent injury from friction of the digits one against the other. According to Sir Charles Bell, there is yet another intention in this cloven form, viz., that of aiding the voluntary elevation of the foot, when it has sumk deeply into the soft ground. "We may observe," he says, "how mucl more easily the cow withdraws her foot from the yielding margin of a river than the horse. The round and concave furm of the horse's font is attended with a rachum or suction as it is withdrawn, while the split and conical-shaped hoof cxpands in sinking and is easily extricated." In regard to the economic purposes which this family subserves, they are not second to those of any other group of animals, for they supply us with capital in the form of labour, fat, milk, leather, horns, \&c. Geographically; they enjoy a wide distribution, both in the eastern and western hemispheres; whilit mumerous fossil remains testify to their abundance in the tertiary epoch.

THE OX (Bos taurus) is known to every one, and yet, notwithstanding our familiarity with it, we are scarcely in a position to decide whether it is a descendaut of the great ancient British wild ox-Bos urusor whether it may not be a domesticated rariety of another species. We incline to the latter opinion; and laving ourselves carcfully examined the cranium of Bos mimigenius, we are quite satisfied that the Ox is not derived from that source. Cuvier, Bell, and other eminent maturalists have expressel their opinion that the view first referred to is the correct one; lut, on the other hand, we have the weighty authority of Professor Owen, whose sentiments are tlus conrincingly expressed:-"It seems to me more prohalile," he says, speaking of our domestic cattle, "that the herds of the newly-conquered regions would be derived from the already domesticated eattle of the Roman colonists; of those 'boves nostri,' for example, by comparison with which Casar endeavoured to convey to his cometrymen an idea of the stupendous and formidathe uri of the

Hereynian forests. The tanning of such a species would be much more difficult than the importation of the breeds of oxen already domestieated and in use by the founders of the new colonies. And that the latter was the chief, if not the sole source of the ox of England, when its soil began to be cultivated under Roman sway, is strongly indicated by the analogy of modern colonics. The domestic cattle, for example, of the Anglo-Amerieans have not been derived from tame desecndants of the original wild eattle of Nortls Ameriea; there, on the contrary, the bison is fast disappearing before the advance of the agricultural settler, just as the auroch (Bison priscus) and its contemporary the urus have given way before a similar progress in Europe." Professor Owen believes that no living descendant of Bos urus exists on the habitable globe, and that it is only known to us by its fossil remains; but there is reason to suppose the auroch and European bison to be ilentical. Be this as it may, the common ox is specifically recognized among existing forms by its flat forehead; the horns being plaeed at the two extremities of a prominent erest, which separates the forchead from the oeciput. All our domesticated eattle-so widely seattered over the face of the earth -are derived from this species; the various celebrated breeds representing so many more or less permanent types of variation. Oxen, although usually slaughtered for food before many years have clapsed, are eapable of attaining an age of twenty-five years and upwards. It is somewhat singular that the corv should have a period of gestation precisely equal in duration to that of the human female, namely, two humdred and eighty days. The calf at the time of birth displays incisive and eanine tecth in the upper jaw; but, as has been previously linted, the fall of the milk tecth leaves the upper jaw destitute of these organs in the adult animal; their place being supplied by the development of a thick callous pad.
the european bison (Bison Bonassus) appears, as we have already stated, to be identieal with the great fossil auroch, or Bison priscus of Owen. At one time it was common in Germany and the south of Sweden; but at the present day it occupies a comparatively restrieted range, being found only in the forests of Lithuania, Moldavia, Wallachia, and the Caucasus. "These animals," says Mr. Broderip, "have never been domestieated, but herds of them are protected in certain localities in the forest of Bialowicza in Lithuania, under the direction of the Emperor of Russia. There are twelve herds thus kept, each herd being under the superintendence of one herdsman. The estimated number of all the herds is eight hundred. They teed on grass and brushwood, and the bark of young trees, especially the willow, poplar, ash, and birch. They do not attain their full stature till their sixth year. They are very shy, and ean only be approached from the leeward, as their smell is exceedingly acute. When accidentally fallen in with, they become furious, and passionately assail the intruder. When taken young they become aceustomed to their kecper; but the approach of other persons excites their anger. Two young specimens were presented to the Zoological Society of London by the Emperor of Russia. Though
it had been stated that the auroch had a natural enmity to domestic eattle, and that the young obstinately relused to be suckled by the domestic cow, the ealves sent by the emperor were suckled by a cow in the Regent's Park Gardens, and very speedily became attached to their foster-mother. These ereatures unfortunately died a few months after they had been brought to this country." The lisons, generally, are distinguished from oxen by their homs, which take origin in front of the so-called occipital ridge, and by the convexity of the forchead; they have also fourteon pair of ribs, being a pair in excess of the number found in the ox. The limbs of the auroch are also comparatively long; its voice has the character of a grunt, and the dusky-brown fur is curled and woolly, especially in the region of the neek, where it is profuse, forming a sort of beard under the chin and throat. By some naturalists, the Caucasian varicty is thouglit to be a distinet species; but this is exceedingly doultful.
the american bison (Bison Americanus) or Buffalo-Plate 18, fig. 59-is generally admitted to be distinet from the above, yet it must be confessed that the two speeies very elosely resemble each other. So far as the form of the skull, the homs, the firr, and the bulk of the animal are concorned, there is little or no difference; but the limbs and tail are comparatively short, and, according to Mr. Blyth, it is provided with an additional pair of ribs. The buffalo is an inhabitant of all the temperate parts of Central and North Ameriea, and at a period not very far baek, but anterior to the rise of civilization in that country, this fine animal roamed at will throughout the length and breadth of the continent -at least from the Atlantic to the Pacilie, excepting the extreme northem and soutliern latitudes. It lias never existed in South Ameriea, neither indeed has any other member of the borine family, unless previously introduced by European colonists. At the present time they range over the wild prairies of the far west ; but, like the diminishing tribes of human kind who dwell in those distant regions, it is evident that their numbers are becoming "small by degrees and beautifully less." Notwithstanding our satisfaction at seeing eivilization extending to the remotest corners of the habitable globe, there is something melaneholy in reflecting on the past history of these amimals, associated as it is with the coeval disintegration of ancient peoples, to whom, indeerl, the buffaloes have all along afforded a principal means of subsistence. These animals are still very numerous on the plains watered by the Saskatehewan River, being found as far morth as Slave Point. Much has been written respecting their habits and the different modes in which they are eaptured by the uative Indian tribes; and most of us remember the stirring and beautiful illustrations exhihited in this country by Mr. Cattlin, in whose" Letters and Notes on the North American Indians" abuudant information is given about these imposing creatures. Catesby, Washington Irving, Sir John Franklin, Sir John Richardson, and others, supply most interesting particulars; but we have space only to give a few notices from the two lastmentioned authors. The latter affords us a condensed view of what has been previously written in regard
to the habits of the bison, and says that they "wander constautly from place to place, cither from being disturbed by hunters or in quest of food. They are much attracted by the soft tender grass which springs up after a fire has spread over the prairic. In winter they scrape away the snow with their feet to reach the grass. The bulls and cows live in separato herds for the greatest part of the year, but at all seasons one or two old bulls generally accompany a large herd of cows. In the rutting season the males fight against cach other with great fury, and at that period it is very dangerous to approach them. The bison is, however, in general, a shy anmal, and takes to flight instantly on winding an enemy, which the acuteness of its sense of sinell enables it to do from a great distance. They are less wary when they are assembled together in numbers, and will then often blindly follow their leaders, regardless of, or trimpling down the hunters posted in their way It is dangerous for the hunter to show himself after having womded one, for it will pursue him, and although its gait may appear heary and awkward, it will have no difficulty in overtaking the flectest muner" Sir J. Richardson then proceeds to mention the ease of a Mr. M•Donald, who one evening went out to look for game. "It had become nearly dark when he fired at a bison-bull which was galloping over a small eminence, and as he was hastening forward to see if his shot had taken effect, the wounded beast made a rush at him. He had the presence of mind to seize the animal by the long hair on its forehead as it struck him on the side with its horn; and being a remarkably tall and powerful man, a struggle ensned, which continued mutil his wrist was severely sprained and his arm was rendered powerless. He then fell, and after receiving two or three blows became senseless. Shortly afterwards he was found by his companions lying bathed in blood, being gored in several places; and the bison was couched beside him, apparently waiting to renew the attack had he shown any signs of life. Mr. M'Donald recovered from the immediate effects of the injuries he received, but died a few months afterwards." Of the various modes of taking the American buffalo, none display the courage and dexterity of the Indian so much as that of hunting them on horseback. "An expert hunter," says Sir John Franklin, "when well mounted, dashes at the herd, and chooses an individual which he endeavours to separate from the rest. If he succeeds, he contrives to keep him apart by the proper management of his horse, though going at full speed. Whenever he can get sufficiently near for a ball to penctrate the beast's hide he fires, and seldom fails of bringing down the animal ; though of course he cannot rest the piece against the shoulder, nor take deliberate aim. On this service the lunter is often exposed to considerable danger from the fall of his horse in the numerous holes which the badgers make in these plains, and also from the rage of the buffalo, which, when closely pressed, often turns suddenly, and rushing furiously on the horse, frequently succeeds in wounding it or dismounting the rider. Whenever the animal shows this disposition, which the experienced hunter will readily perecive, he immediately pulls up lis horse and goes
off in another direction." The most powerful adversary of the buffalo is the great grisly bear, whose strength is sufficient to crush the largest bull. A fullgrown male will weigh as much as two thousand pomuds, althongh an ordinary specimen eomes eonsiderably below this amount. The body is about cight and a half feet in length, from the tip of the muzzle to the root of the tail.
the cape buffalo (Bubalus Caffer) is a native of South Africa, where it is known hy several other names, such as the Cape Ox, the Buffel, and the Bokolokolo, the latter title being that employed by the Bechuanas. It occurs in large herds in the plains and forests of the interior. It is an extremely heary and powerfully built species, a full-grown specimen weighing as much as five and forty stone or upwards. The body is, in some individuals, nearly nine feet in length, exclusive of the tail, which is three feet long, terminating in a tuft of coarse black hair, reaching below the looks. The fur exhibits a leaden-black colour. The horns are massive ; very broad at the base, where they are closely approximated; and spreading from thence, horizontally, are turned upwards and inwards at the tips, which are separated from each other by an interspace of about four feet. Respiecting the habits of the Cape buffalo, the early travellers, 'Thunberg and Sparrmann, give us some interesting data; and from their olservations, and that of several later writers, these animals appear to be most formidable antagonists. Their ferocity when wounded is perfectly frightful. The herds are usually found grazing in the immediate vicinity of some large wood; in numbers varying from twenty or thirty up to at least five hundred. Their behaviour, when fired upon, seems to vary according to circumstances. Captain Harris having fallen in with a herd, thus briefly describes their conduct:-"Creeping close upon them, I killed a bull with a single ball; but the confused echo reverberating among the mountains alarming the survivors, about fifty in number, they dashed panic-stricken from their concealment, ignorant whence the sound proceceded; and everything jiclding to their giant strength, I narrowly eseaped being trampled under foot in their progress." Mr. Andersson's account of an encounter with these animals is rery animated:-" $\Lambda$ herd of buffaloes," he says, "at least two lmundred in number, suddenly rushed past us with the violence of a tornado, breaking down and crashing everything that opposed their headlong earecr ; and raising so great a cloud of dust as nearly to conceal their dark forms from view. I fired into the midst of them at random, and had the satisfaction to see a eow drop to the shot. The report of the rifle brought the whole herd almost immediately to a stand, and facing romd, they eonfronted us in one dark mass. Taking adrantage of a tree at some little distance ahead, I stalked to within about one hundred and fifty paces of this formidable phalanx. Resting the grm on a branch, I took a stearly aim at the leading bull; but though I very distinctly heard the bullet strike him, he did not flineh in the slightest degree. One of the natives having by this time mustered courage to steal up to me with my rifle, I fired a second time, though at another of the herd,
but with no better result. Six several times at the least, did I repeat the dose ; and though on each occasion the ball told loudly on the animal's body, neither it nor any one of the herd, strange as it may appear, budged an inch! They seemed to be chained to the spot by some invisible power, eying one all the while with an ominous and sinister look. Their strange and unaccountable bearing, puzzled me beyond measure. I expected every instant to see them charge down upon me. But even had this happened-though I am free to confess I felt anything but comfortable-my personal safety would not, perhaps, have been much endangered, as by ascending the tree against which I was leaning, I should lave been out of harm's way. However, I was not driven to this extremity; for, whilst about to ram down another ball, the whole herd suddenly wheeled about, and with a peculiar shrieking noise, tails switching to and fro over their backs, and heads lowered almost to the ground, they made off at a furious pace." From an examination of the ground where they stood, and by information received from the bushmen, Mr. Andersson subsequently ascertained that two of the animals had been mortally wounded.
the indian buffalo (Bubalus arna) is another huge specics, the body measuring ten and a half feet from the extremity of the muzzle to the root of the tail. In the wild state it is called the Arna; but the tame varicty, so common throughout India, is termed the Bhainsa. The wild buffalo lives in large herds, and inhabits the marshy swamps and low grounds in the immediate neighbourhood of large forests. It is readily recognized by the uniform shortness of the tail; by the tufts of hair which protect the forehead and knees; and eliiefly by the enormously developed horns, which are particularly long and directed backwards in one variety, and much curved and spread out laterally in another. Like its congeners, the Arna is celebrated for its ferocity. "He seems to look with disdain on every living object, and to rely on the great strength he possesses to overthrow whatever may be opposed to his rage. The smallest provocation irritates him incredibly! And such is his courage that he will sometimes even attack a group of elephants going for fodder. I do not think," says Captain Thomas Williamson, "there can be a more menaeing object than a single wild buffalo disturbed from wallowing in the mud." This is a propensity to which they are very much given ; and it is one which, associated with certain external characters-such as the thickness of the skin, its scanty covering of hair, \&c.-scrves to demonstrate a partial alliance of the buffaloes to the true pachydermatous mammalia. We cannot here, however, enlarge upon this topic. In the wild state the Indian buffalo proves a most terrible opponent, not only to the elcilint, but to the tiger also. One of the principal sources of entertainment given-on anniversary celebrations and such like occasions-by the Indian families of distinction, has ever consisted in affording a display of the cruel ferocity of the tiger and buffalo. We have neither space nor inclination to describe these desperate encounters at any length ; but we quote a few observations in order more particularly to show the behaviour of the animal under considera-

Voi.. I.
tion. "The buffalo, on entering the area, smells the tiger, and becomes instantly agitated with eagerness. His eyes sparkle with fury, as they quest around for the skulking enemy, which is generally attacked the instant it is distinguished. The buffalo, shaking his head and raking the ground for a few seconds with his foot, places himself in the posture of attack; and with his face brought parallel to the surface, his horns pointing forward, and his tail indicating both his determination and his vigour, rushes forward at lis full speed." Such is the attitude this beast usually assumes when charging an enemy; and we can readily understand the amount of presence of mind necessary for any human being who may clance to become an object of resentment. A remarkable display of this mental discipline is recorded by Captain Williamson, in the case of a Dr. Knight, when out shooting in the neighbourhood of Daudpore. "A buffalo bull, which was at a considerable distance, after shaking his head and stamping with his fore-foot, at length fairly made at the doctor, who was fortunately provided with an excellent rifle, of a large bore. The doctor, knowing what sor't of a business it was likely to prove if he awaited the buffialo's arrival, mounted a smart tanian or hill pony, which was led by his syce or groom, and made ofl towards a very heavy cover, and had time to conceal himself. The buffalo passed on after the doctor, who did not fail to give Punch (which was the horse's name) every provocation to exertion. Mis speed did not, however, equal that of his pursuer, which, though appearing to labour much, took immense strides, and was fast coming up. The doetor, finding it impossible to escape in this way, reined up suddenly, and dismounted. He had scarcely time to turn his horse's flank, and to level his rifle over the back of the sadule, before the buffalo, being within the usual distance, lowered his head and commenced the charge. The doctor, who was a remarkably good slot, fired, and happily lodged the ball between the horns of the animal ; which, though killed outright, did not drop until within three or four yards of Punch's side." In conelusion, we may remark that the female Arna, after a gestation of ten months, produces one or two calves in the middle of summer. The tame buffalo, introduced into Italy so early as the seventh century, is a true variety of this species. As a beast of burden it possesses numerous advantages over the solidungulate horses, being able to traverse muddy swamps two or three feet in depth with comparative facility. This animal is also much valued for its strong leatliery hide; but as a source of food it is much inferior to that of ordinary cattle.

THE ZEBU (Bos Indicus) is one of those animals with whose existence every reader of oriental history is familiar. Regarded with veneration, and even worshipped, the Zelu, or Brahmin bull, seems to lead a happy life ; wandering to and fro from village to plain, grazing where it will, or recciving the votive offerings of the devout. Even its cxcrement is esteemed sacred; the dried dung being used for fuel in cooking foodupon which it is supposed by the natives to exert some beneficial influence-and also employed in deciphering objects on their filthy walls. The Zebu is easily recog-
nized by its convex forchead, immense chest and dewlap, and more particularly by a remarkable hump on the shoulder, which, like the amalogous formation seen in the dromedary, consists entircly of fat. Some kinds are provided with short, widely separated horns, but in ecrtain varieties these appendages are entirely wanting; in others, again, and these are the most common, the horns attain considerable development. 'This speeies varies exceedingly both in respect of size, and in the colour of the hide; generally speaking, the fur is greyish-white, and ash-coloured. The Zebu is not only found in India, but is also met with in Persia, Arabia, and even in Africa. It is in many places employed in harness to draw light velicles, and also as an ordinary beast of burden for liarder work. Its flesh, though far superior to that of the speeies last described, is not considered equal to that of the common ox. The hump is regarded as a delieacy; its choiceness depending apparently more on the manner in whieh it is served up, than upon any inherent virtue in the fatty mass itself.

The gYall (Bos frontalis), or Jungle Qx, is about the size of a large bullock. Considerable differenee of opinion has all along existed respecting its origin. By some it has been regarded as a cross breed between the Indian buffalo and certain varicties of the zebu, and by others as altogether distinet. Be this as it may, it is a well-marked form, and is distinguished more especially by the horns, which are short and thick, flattened from before backwards, and directed laterally with a slight inclination upwards. The Gyall is found in the mountainous distriets of northcastern India, and, as a domestic race, appears to thrive most satisfactorily in the province of Chittagong. According to Mr. Lambert, the bull is naturally very bold, and will defend himself against any of the beasts of prey. "The fomale differs little in appearance; her horns are not quite so large, and her make is somewhat more slender. She is very quiet, and is used for all the purposes of the dairy, as also for tilling the ground ; and is more tractable than the buffalo." The fur exhibits a blackish-brown colour generally; whilst the length of the body, from the tip of the muzzle to the root of the tail, is upwards of nine fect. One varicty of this speeies, termed the Asseela Gymale, is regarded by some as the progenitor of the variety under consideration. It is provided with longer horns, which are strongly curved throughout, the space between the tips measuring about fourteen inches. Over the shoulders there is a considerable elevation; but it does not aequire the signifieance assigned to it in the himped varictics of eattle. It is not at all ferocious, even in its wildest condition. It frequents the neighbourhood of forests, eropping shoots and leaves of shrubs in preference to grass.

THE GOUR (Bos Geurus) is by some considered to be a distinct speeies. It is a bulky animal, measuring, according to Dr. Traill, very nearly twelve feet from the tip of the muzzle to the end of the tail. The Gour inhabits certain momtainous distriets of Central India, being partienlarly abmondant on the Mysa l'at mountain in the distriet of Sergojah. It oceurs in herds of from twenty to thirty and upwards, which, like the gyalls,
prefer to browse on leaves and tender shrubs-a marked peculiarity, which militates rather against the statement of Dr. 'Traill, that the habits of these two species are different, and, in our view, lessens the value of his persuasion, that these two animals are specifically distinet. However, the Gour is an important kind of ox. It is a formidable opponent in combat, and is said to be more than a match for the tiger. According to Mr. Hodgson it is with great difficulty reared in a state of eonfinement.
the yak (Bos puëphagus) or Grunting Ox, is a native of 'Illibet, where it is found both in the tame and wild state, inhabiting " all the loftiest plateaus of ligh Asia between the Altai and the Mimalaya, the Belur 'Tag, and the Peling mountains." It is a comparatively small species, and readily distinguished ly its small mane on the lack, and more especially by the tail, which is elothed with long hair like that of a horse. This appendage, duly prepared and sometimes dyed, is highly valued as an article of trade, and is sold to the Chinese, Turks, and other eastern nations, who employ it as an ornamental badge of distinction usually attached to their caps or turbans. Scveral varieties of the Yak are known, and employed for different purposes. Hofmeister, in his "Travels in Ceylon," speaks of the Yak oxen as very beautiful animals. Whilst being ridden they were shy, restless, and apparently disposed to attack their riders. " $\Lambda \mathrm{s}$ the steepness increased," he says, "these poor animals began to moan, or rather grunt, in the most melancholy manner ; and this uncarthly music gradually rose to such a violent rattle, that, driven rather by its irksome sound than by the discomfort of our saddleless seat, we dismounted at the end of the first half hour." The fur of the Yak is usually black, the back and tail being sometimes quite white. Various cross breeds have been produced between this species and the common ox.
THE MUSK $\mathbf{0 X}$ (Ovibos moschatus) is a native of the icy regions of North America, and is in those distriets an exceedingly valualle animal, supplying the Esquimaux with one of their prineipal sources of foorl. It is readily distinguished, not only by its moderate bulk, but also by its long-haired, woolly hide (fig. 57). The ears are short, and well-nigh concealed by the fur. The horns are remarkably broad at the base, where they closely approximate, separated by a hairy interspace in the female. They are curved obliquely downwards at first, suddenly hending upwards again towards the tips. The first halt of the hom is rongh and lightcolonred; but the remaining narrowed portion is smooth and black at the extremity. The forehead is conver, the face being prolonged forwards into a hairy mizzle. The long fur has a rich brown colour generally, but is whitish on the limbs, where it is not so fully developed. The best account of the halits of this animal is that of Sir John liichardson, who writes as follows:-"Notwithstanding the shortness of the legs of the Musk ox, it runs fast; and it climbs hills and rocks with great ease. One pursued on the banks of the Copper-mine, sealed a lofty sand cliff, having so great a deelivity that we were obliged to erawl on lands and knees to follow it. Its footmarks are very
similar to those of the carabou, but are rather longer begiming of September, and bring forth one calf about and narrower. These oxen assemble in herds of from twenty to thirty, rut about the end of August and the
the latter end of May or begimning of June. Hearne, from the circumstance of few bulls being seen, supposes


The Musk Ox (Ovibos moschatus).
that they kill each other for the cows. If the hunters keep themselves concealed when they fire upon a herd of Musk oxen, the poor animals mistake the noise for thunder, and, forming themselves into a group, crowd nearer and nearer together as their companions fall around them ; but should they discover their enemies by sight, or by their sense of smell, which is very acute, the whole herd seek for safety by instant flight. The bulls, however, are very irascible; and, particularly when wounded, will often attack the hunter, and endanger his life, unless he possesses both activity and presence of mind. The Esquimaux, who are well accustomed to the pursuit of this animal, sometimes turn its irritable disposition to good account; for an expert hunter, having provoked a bull to attack him, wheels round it more quickly than it can turn, and by repeated stabs in the belly puts an cond to its life." The Musk ox is most abundant in comparatively inaccessible districts, where rocks and craggy slopes, unadorned with trees, seem to form its special home. If it could be more casily procured, the woolly fur, finer than that of the bison, would be much more extensively employed for cconomic purposes. According to an authority recently quoted, the carcass of the Musk ox, exclusive of the offal, weighs about three hundredweight. When well fattened, the flesh of the cow has a tolerably pleasant flavour; but that of the males or females, when lean, has a musky taste, and is hoth tough and highly coloured. We have said that the foot-prints of this animal ean searecly be distinguished from those of the reiudeer; but according to the experience of Mr. Peterson, who accompanied Dr. Kane on his aretic travels, those of the ox are much larger, but not wider. Bchind the prints there were slight
brushings of the show, caused by hair growing from the pastern joints.

## Family II.-AEGOSCERID I.

Partly for convenience sake we here associate under the above title the closely allied genera represented by the sheep and goats. It is admitted that, in a purcly zoological or anatomical point of riew, it is difficult to impart a separate family definition to this group; nevertheless there is a tout ensemble abont these animals which, in our opinion, justifies such a step. Even the most superficial observer camot fail to notice a very marked difference in the general aspect of these ereatures, when compared with oxen properly so called. The goats are characterized chiefly by their long homs, which are directed upwards and backwards, are more or less angular in front, rounded behind, and generally: marked by transverse bars or ridges. The chin is clothed with a long beard. On the other hand, the sheep, which have no beard, have the horns directed at first backwards, and subsequently bent spirally forward. None of the members of this family exhibit the lachrymal sinuses, so characteristic of the majority of the antelopes and decr. The value of these animals to man is too well known to require lengthened comment.

THE SHEEP (Oris arics).-Any attempt to enumerate or describe the principal raricties of sheep would, in a work like the present, be quite out of place. It is impossible to determine with certainty how many species of sheep exist; but there is reason to beliere that all the forms may be reduced to one or two original species. Our domesticated breeds are supposed to be
derived from the Mouflon (Ovis musimon), which is found in Cyprus, Candia, Corsica, and Sardinia. How far this affects the question of the specific identity of such kinds as the Thibet sheep (O. ammon), llate 18, fig. 60, the Argali of Central Asia (O. argali), and the Rocky Mountain sheep ( 0. montamus), Plate 18, fig. 61, of North America it is not easy to decile. From the earliest ages of human history the sheep lias becu employed in the service of man, affording him food and materials of clothing, \&c. Now-a-days they supply us with meat, suet, leather, wool, tallow, and manure ; the latter substance indirectly conferring many other advantages, by proving a source of fertility to varions crops of grain and fodder. Among the more interesting varictics we may particularize the That-tailed sheep of Persia, Tartary, and China, whose caudal appendage is transformed into a globular mass of fat weighing as mnch as sixty or seventy pounds. Another interesting form is the Ovis polyceratus, inhabiting Nepaul; the male being provided with four horns. These last-mentioned organs attain an enormous development in the Rocky Mountain sheepPlate 18, fig. 61-each of them measuring nearly three feet along their outer curvature, from base to apex. In the catalogue of ovine rumimants preserved in the British Museum upwards of thirty well-marked varieties of sheep are indicaterl, and this enumeration does not separately take into consideration the multitudinous sub-varieties, or domesticated breeds, which are found in the United Kinglom, and in various parts of Europe.
the wild goat (Capra agagras), or Paseng, is believed to be the progenitor of our domestic goats, in the same way that the Monflon is supposed to be the original stock of our sheep. The Paseng is a native of the mountains of Persia and the Caucasus, and is distinguished by its sharp horns, which attain a very large size in the male. The varieties to which it is beliered to have given origin are exceedingly numerous; the various kinds differing not only in form, size, and colour, but also in the character of their hairy covering, and in the number and disposition of their horns. The Angora variety has beautiful long silky hair; whilst the wool of the Thibetan goat supplies the natives of India with material for the fabrication of the celcbrated cashmere shawls. The female, after a period of five months' gestation, usually produces two young at a birth. Though goats are chiefly valued for their skins, the milk of the female, and especially the flesh of the kids, are highly estecmed. The Rocky Monntain goat (Capra Americana) is possibly a mere variety of the common wild species.

THE IBEX (Capra ibex), Plate 19, fig. 62, is a native of the Swiss $A \mathrm{lps}$, and probably of the mountainons ehains of Southern Europe generally. It is provided with immense horns, which are arched backwards, and marked with prominent node-like rings throughout their entire length. The Ibex or steinboc, as it is sometimes called, is subject to great difference, those examples found in the Cancasus and in Asia being, in all likelihood, mere varicties, although they are described by some as distinct species. The lhex is a very liardy animal, and is said to leap fearlessly down rocky precipices, falling on its massive and par-
tially elastic horns, which afford the necessary security against injury.

## Fanily IIf.-ANTILOPID A.

By far the greater portion of the hollow-horned ruminants belong to this family, in which the osscous axis of the homs is solid, persistent, and destitute of eavities or pores. A large number of the antelopes possess laclurymal siruses or tear-pits, in common with the deer tribe. The homs have usually a more or less conical form, eylindrical, sometimes compressed, annulated at the base, and directed obliqucly backwards. These appendages are usually two in number, simple and unbranched; but in some cases there are four horns, as, for cxample, in the Jungliburka and Chousingha, whilst those of the Cabrit have an additional prong. This may be considered as equivalent to the brow antler of the deer, and elearly indicates an approach towards the cervine type of ruminant. Most of the antelopes are remarkable for their very graceful and slender build; the structure of their limbs being beautifully adapted for rapid flight. They are widely distributed throughout the eastern hemisphere, being more particularly abundant in Africa, where rast herds of them supply the natives with food, and too often afford the European hunter an aimless pastime-in those cases where they are shot for mere sport only. Like the generality of ruminants they are, for the most part, gregarious in their habits.

THE GN00 (Catoblepas gnu)-Plate 19, fig. 63-is a native of South Africa, and forms an aberrant type between the borine and the antilopine ruminants; but its more distinetive characters undoubtedly indicate a closer alliance to the present family. The body is nine and a half fect in length, and stands ahout four fect six inches at the shoulder. The muzzle is large, bristly; hroad, and square-shaped, the nasal apertures heing operculated. The horns are broad at the base, where they expand into a broad protecting plate on the forehead; from this point they are directed downwards and slightly outwards over the eyes, and then making a regular curve upwards terminating in a sharp hooked extremity. The chin is furnislied with a thick beard, similar tufts of black hair being situated below the eyes. A flowing whitish mane extends along the neck, from the occiput backwards to a point beyond the withers. The ears are comparatively small. The tail resembles that of a horse, has a white colour, and reaches to the ground. Between the fore-legs and along the central line of the thorax, the brisket is clothed with a thick shaggy derelopment of black hair. The general colour of the fur is that of an amberbrown, passing into brownish-black. The limhs are particularly slender, terminating in bluish-black hoofs, which are pointed and compressed anteriorly. The ndder of the female is provided with four mamme. The habits of the Gnoos are gregarious, and ther are exceedingly wild and swift of foot, following one another in single file, and skimming the plains with extraordinary relocity; they are extremely restless, seldom remaining long at one spot, and migrating from place to place in rast herds. Captain Ilarris,
from whose benutiful work, entitled "Portraits of the Game and Wild Animals of Southern Africa," the annexed illustration of the brindled species is given, furnishes the following proof of their speed, and of their resemblance to a lion when seen at a great distanec. "Whilst erossing the boundless plains of the Vaal river, we had an opportunity of remarking the very similar appearance of the two animals, in twiee witnessing the animating but abortive pursuit of a herd of Gnoos by an enormous lion, rendered perfectly furious by the qualms of hunger, and still more desperately frantic at the disappointment entailed by the slippery heels of his intended vietins, who, on both oecasions, left their grim pursuer far behind, pufing and blowing, to gramble over the loss of the moming repast which he had vaiuly promised himself." The same eloquent writer, thorough sportsman, and competent naturalist, says-"These ungainly beasts are nevertheless shot from horseback without much difficulty, and can scarcely be pronounced formidable except in external appearance. The eyes are lowering and expressive of great ferocity; the solid casque of the horn, by which their beetling brows are overshadowed, greatly heightening their aspect of suspicion and rindictiveness. Like other animals possessing dispositions far more gentle and tractable, the Gnoo is naturally prone to charge in self-defence when wounded or foreed into a corner ; but, after fracturing its leg, I have repeatedly driven a reluctant individual up to the waggons, either to escape the trouble of carrying his sirloin, or becanse

I had expended the last bullet in my pouch. In the wild districts bordering on the colony, where a succession of level plains are traversed by low ranges of bare stony liills, praucing troops, consisting of from fifteen to thirty Ginoos of various sizes, are to be seen engaged in the most wanton frolics, and may easily be henmed into a valley and compelled to run the gauntlet." And further on he adls:-"The curious and inquisitive disposition of the Girioo, ofter induces the herd to discontinue their giddy gambols, and slowly to approach the passing caravan with an air of langhable defiance, formed in a compact square, gazing, menacing, stamping with their slender fore-fect, and at length halting within rifle range to serutinize the bold intruders nuon their lone and hereditary pastures." Such is Captain Harris' account of the whimsical eharacter of this singular antelope, and it is fully borne out ly the less animated descriptions of other travellers. The female Gnoo usually produces a solitary calf at a single birth, which at first exhilits a whitish cream-coloured fur, subsequently becoming reddish-grey. The flesh of the adult is coarse, but that of the calf is considered excellent. The tail is used for making chowries, whilst the hide is brayed and converted into riems or thongs; in this state it is chiefly employed as harness, being also applied to other economic uses as a substitute for rope or twine.

The brindled gnoo (Catoblepas Gorgon), Kokoon, or Gohgon, is readily distinguished from the common species by its arched face, laterally directed


The Brindled Gnoo (Catoblepas Gorgon).
horns, deep bluisl-black hide striped with obscure vertical bands, absence of any tufts of hair between the fore-legs, and immensely thick, elerated and powerful shoulders (fig. 58). The body measures nine feet in length, including the tail and head; the latter alone being twenty-three inches from the tip of the muzzle to the oceipital crest. The Brindled Groo inhabits the interior plains of Southern Africa to the north of Orange river, its mamers being similar
to those of its congeners. According to some authorities the name Kol:oon ought to be applied to the common species; but we prefer the authority of Captain Harris, who remarks that it is thus named by the Bechuanas, while the Dutch colonists eall it the Bastaard, and the Hottentot tribes designate it the Baas or Kaop. He gives also the following graphic description of its manners:- "When excited by the appearance of any suspicious object, or aroused by any
unusual noise, the Fokoon is wont to appear much more grim and ferocious than it actually proves; not unfrequently approaching with an air of defiance, as if resolved to do battle with the hunter, but decamping upon the very first exhibition of hostility on his part. On being pursued, the herd bring their aquiline noses low between their knees, and flowrishing their streaming blaek tails, tear away in long regular files at a furious gallop; wheeling euriously about at the distance of two or three hundred yards, advancing boldly towards the danger, tossing their shaggy heads in a threatening manner, presently making a sudden stop, presenting an impenetrable front of horns, and staring wildly at the object of their mistrust. The slightest demonstration, however, is sufficient to put the whole squadron to flight, when they make a somewhat shorter excursion, again wheel in a circle, show a more menaeing and imposing front than before, and most probably take up their position within sure rifle range. When engaged in grazing, they have an extremely dull and clumsy appearance, and at a little distance might often be mistaken for wild buffaloes; but their usual manner is sportive, at one moment standing to gaze at nothing, and at the next seampering over the plain without any apparent object iu view, making various grotesque curves and plunges, with their preposterous bonassuslooking heads laid between the fore-legs." The flesh of the Fokoon resembles that of beef, and is much sought after by the natives. The hide is dressed with the mane and beard attached, and when earefully prepared is converted into useful and ornamental eloaks, shawls, and tippets.

THE NYL-GHAU (Portax picta) —Plate 20, fig. 67is a native of India. It is as large as a stag, the summit of the shoulders standing more than four feet from the ground. The fur exhibits a tawny, ferruginous colour generally, being in the male of a uniform bluishgrey at the upper parts. The head is furnished with a pair of short horns, abolit seven inches in length, which are slightly recurved forwards; they do not exist in the fomale. The muzzle is remarkably attenuated; the cars are rounded, and the lachrymal sinuses rather large. The neck is broad and compressed laterally; and at the under part, near the middle line, it is furnished with a conspicuous tuft of hair. Immediately above this beard-like development there is a whitish spot; two similar patches being also seen on cither cheek, below and in front of the eye. Besides these, the pasterns are marked with white spots forming more or less distinct bands round the ankle-joints. The mane is pretty strongly developed, especially over the region of the shoulders, where it forms a thickish tuft. The tail is long and buslyy at the tip. According to Mr. Ogilby, the Nyl-ghau dwells principally in dense forests, "whence it occasionally makes excursions very carly in the morning, or during the night, to feed upon the corn-fields of the natives whieh happen to be situated in the vieinity of the jungle. It is a vicions animal, of very uncertain temper, and as it is both powerful and resolute, and frequently turns upon its pmisuers, it is seldom made an olject of chase, exeept by the native prinees, who employ elcphants for this purpose, or inclose the game in nets." It is likewise added, that
"even in confinement, and when domesticated from birth, the violent and changeable temper of the Nylglau cammot be trusted. Previous to making an attack, it drops upon the fore-knees, advancing in this position till within a proper distance ; then darting suddenly forwards with the velocity of an arrow, and with a force which no ordinary animal can withstand." The female commonly produces two young at a birth, her period of gestation extending over a period of eight months.

THE BOSCH-BOC (Trayelaphes sylvatica) is an inhabitant of Cape Colony and Caffraria, dwelling more particularly in forests near the sea-coast. The body of a full-grown male stands two feet cight inches high at the sloulder, and measures rather more than five feet in length. The fur exhibits a bright-chestnut colour generally, being darker superiorly, but marked along the spine by a narrow white streak; white spots also exist on the cheek, as well as on the flanks and fetlocks. The forchead has a deep siemna-brown colour, and the neek is eneireled by a collar-like band of a still darker hue. The horns are about a foot long, thick below, and gradually attenuated towards the rather blunt extromities; their position is crect, and they are marked by spirally directed ridges in front and belind, which disappear after traversing the first two-thirds of their length. The cars are large and rounded, the limbs stoutish, the tail of moderate extent, and the muzzle naked. There are no lachrymary openings. The females are hornless, and furnished with four mammx. Respecting the habits of the Bosch-boc, Mr. Ogilby states that it never quits its forest haunts except during bright moonlight nights, "when it comes out to graze on the border of the forest, or to make incursions inte the neiglibouring gardens and corn-fields. Its voice resembles the barking of a dog, and its deccifful tone sometimes leads the benighted traveller into the most remote and lonely depths of the forest, in the rain search after some human habitation, which lie is all the time leaving behind him. It is a slow rumer, and easily caught when surprised; but it keeps close to the woods, through which it penetrates with great ease, running with the horns couched backwards along the sides of the neck to prevent them from impeding its course by striking against the branches, and having the neek and throat frequently denuded by rubbing against the underwood, as it forces its passage through the thick covers." The Boseh-bocs are monogamous, or solitary, the male and female being usually found together, or accompanied only hy one or two offspring.

THE K00D00 (Strepsicaros Fudu) is also an inhabitant of the wilds of Caffraria and Southern Africa, generally frequenting also the borders of streams, and not refusing to take to the water when occasion may require. It is a very large and atiractive species, measuring upwards of nine feet in extreme lengtl, and standing more than five feet high at the shoulders. The horns are massive and beautifully curved into two wile-spreading spiral eireles; they are upwards of three feet in length, of a brown colour, having their tips directed ontwards and upwards. The muzzle is l,road, the ears large and pointed at the cnds, the forehead black, the shoulders mueh elevated, and there are no suborbital sinuses. The fur has a buffegrey colour
generally, the limbs being reddish below the knees, the rump white, the tail, which is two feet in length and tapering, being rufous and whitish at the margins; three white spots exist on the cheek, and a pale band passes along the central line of the back, giving off, as it were, at right angles, five or six transversely-disposed whitish bands, directed downwards on either side towards the belly. These markings are not so conspicuous in the female, which is also of slighter build, destitute of horns, and furnished with four mamma. The Koodoos are gregarious, and, though still found within the colony, are comparatively scarce. They are deservedly admired by travellers who lave seen them in the wild statc. "Of all the varied and beauteous forms of animal life to be found in the boundless woods and plains of tropical South Africa, the Koodoo is unquestionably the most distinguished for clegance and gracefulncss, umited with strength." So writes Mr. Andersson, who considers it a perfect picture, and "onc of the grandest-looking antclopes in the world." The same ardent sportsman gives us an account of a curious method adopited by the natives for its capture :-"The Bushmen have a way of their own of hunting the Koodoo, viz., by ruming it down, not by speed of foot, but by gradually exhausting it! When a hunt of this kind is decided on, a number of these pcople assemble, armed with assegais, \&c. Having started the animal, one of the party takes up its "spoor" at a quick pace, the rest following more leisurely. On feeling fatigued the leading man drops behind his comrades, and the next in order takes up the pursuit, and so on, until they sccure the prize. Sometimes this is effected in the course of a few hours; but it happens also that the chase lasts for a whole day, or even longer. All depends on the ground. If stony or rocky, the men hare an immense advantage over the animal, which, under such cireumstances, soon becomes foot-sore, lies down repeatedly, and after a while is found unable to rise, when it is quickly despatched. The women and children carry water on these occasions for the hunters, so that, should the animal prove very enduring, his pursuers may not be necessitated to give up the chase for want of that indispensable necessary." The flesh of the Koodoo is highly esteemed, and the hide is converted into various articles of clothing, harness, \&c.

THE ELAND (Boselaphus oreas) is a magnificent animal, the largest of the antclopes, and on many accounts descrving of an extended notice. It is also known by the names of the Cape Elk, Ganna, and Impoofoo - the latter tcrm being employed by the Bechunas and Matabili. The importance of this ruminant will be at once appreciated when it is mentioned, that not ouly is its flesh of the most palatalle and nutritious character, but experiments have recently established the fact that it will readily breed in this country. When it is added, morcorer, that several are now thriving in the parks of English noblemen, and that a single individual weighs from fifteen hundred to two thousand pounds, it will be easily understood that the day cannot be far distant when the Eland slall become permanently domesticated in this country, and supply wholesome food, at least to the table of the wcalthy. Not long ago an Eland, bred and fattencd in

England, was slaughtered for the express purpose of testing its epicurean qualities, the result of which was that lioyalty, both on this and the other side of the chanmel, partook of the renison, and pronounced it excellent. lrofessor Owen extulled its qualities in the columns of the Times, whilst many other distinguished fellows of the Zoological Society testified to the accuracy of lis judgment. In short, every body pronounced a favourable opinion, in terms very similar to those of the gifted author of the "Game and Wild Animals of Southern Africa," who amusingly says:-"Both in grain and colour it resembles beef, but is far better tasted and more delicate, possessing a pure game flavour, and exhibiting the most tempting-looking layers of fat and lean; the surprising quantity of the former ingredient with which it is interlarded, exceerling that of any other game quadruped with which I an acquainted. The venison fairly melts in the mouth; and as for the brisket, that is alsolutely a cut for a monarch! With what satisfaction would not King Jamic of hunting memory, have drawn his good blade adown the breast of a plump Eland, to be rewarded with five full inches of 'prime whitc fat on that ilk,' instead of three, as on the occasion in Greenwich Park, when Nigel assisted his sporting Majesty in the sylvan ceremony? The vast quantity of tallow yielded by the fat bulls, furnished us with constant material for manufacturing 'dips' in a candle mould with which we were provided; and during the greater part of our journcy it was to the flesh of this goodly beast that we principally looked for our daily rations, both on aecount of its vast superiority over every other wild flesh, and from the circumstance of its being obtainable in larger quantities with comparatively less labour." Here we must pause to mention the principal characters by which this gigantic antelope is easily distinguished (fig. 59). An adult male stands fully six feet high at the shoulder, or even more ; the length being in some cases upwards of nine feet from the nose to the root of the tail. The horns are nearly straight, massive, conical, furnished with a strongly-developed spiral ridge, which gradually disappears at the upper third, where the ends become attenuated and sharply pointed. In the female the horns are longer, slighter, and less markedly furrowed. The forchead of the male is clothed with a thick bundle of stiff, wiry, brownish hairs; the tuft being bordered on cither side by a band of yellow-orange colour. The ears are comparatively small and the muzzle broad, the neck thick, the dewlap very prominent and fringed with long brown hairs, the legs rather short, the shoulders and lind quarters enormously devcloped, the fur short and of a rufous-dun or ashy-grey colour generally, the tail being about twenty-six inches long and tufted at the extremity. The female exhibits a bead-like tuft of hair on the mender part of the neek, has a more ferruginous colour, and is furnished with four teats. Ricspecting the labits of this interesting animal, it is well known to frequent only the more open plains of the interior; "rejoicing especially," says Captain Harris, "in low belts of shaded hillocks, and in the isolated grores of Acacia capensis, which, like islands in the ocean, are seattered orer many of the stony and gravelly plains of the interior; large herds of them are also
to be seen grazing like droves of oxen on the more verdant meadows, through which some silver rivulet winds in rainbow brightness leetwixt fringes of sighing bulrushes. Fat and lethargie groups may be seen seattered up and down the gentle acelivitics, some grazing on the hillside, and others lazily basking in the moruing
sunbcam. Advaneing, they appear to move like a regiment of cavalry in single files, the goodliest bulls leading the van; whereas, during a retreat, these it is that uniformly bring up the rear." At one time Elands were abundant in the inmediate neighbourhood of Capc Town, but now very few are found within the


The Eland (Boselaplus oreas).
borders of the colony. Considcring the facilities which exist for their destruction, evcry effort should be made to follow up the experiments of domestication so successfully commenced by the Zoological Socicty, and steps should be duly taken to secure more specimens from the colony, ere thacy are driven far up into the interior, or altogether exterminated. Finally, we may remark that Dr. Livingstone discovered to the north of Sesheke a beautiful striped variety of Eland, distinguished by vertical streaks on the back, and by black patches on the outer side of the fore-arm.
the harte-beest (Acronolus Caama), or Canma, is also called Intoosel by the Matabili. It is a large species, with a long head and much elcvated shoulders. 'The horns are of moderate length, approximating closely at the base, diverging at first, and again converging towards the tips. The back, the nose, and the hind and fore legs are marked with dark streaks; the chin being also black. The general colour of the fur is greyish-brown, with a decp red cast. The tail is hairy and reaches down to the hocks. The Harte-becst oecupies the plains of the interior of Southern Africa in immense herds, and is one of the most common species. Its flesh, though inferior to that of the cland, is nevertheless finc-grained and lighly esteemed. The female is provided with two mammx, and produces only one call at a birth.
the sassabe (Acronotus lunata), or Bastard Marte-beest, is likewise a native of Southern Africa, oceurring in small herds in the district inluabited by the Bechuanas. 1 full-grown example stauds about
four and a half fcet high at the shoulder, and is furnished with horns nearly twelve inches in length. The body is stoutish, the neck short, the limbs slender, the withers elevated, the lachrymal sinus inconspichous, the cars being eight or nine inches long. The general colour of the fur is rufous-grey; the upper parts and legs have a decp brown tint, the forchead being marked by a dark longitudinal band. The Sassabe is naturally tame, but is mnch hunted by the natives. The female is comparatively small, and furnished with two mammx.

THE BUBALE (Alcephalus bubalus) is widely distributed over the entire regions of Northern Africa, being especially abundant in Barbary. It is gregarious in its habits, and naturally docile in disposition. By the Arab natives it is termed the wild ox, or Beliker-clWash. It is a large splecies, and is readily distinguishod by its remarkably compressed and straight forchead. The horns are of moderate length, lyrate, stout at the base, and strongly amulated throughout.

THE COMMON ANTELOPE (Antilope corvicapra), or Sasin-l'late 19, fig. 65-is a native of Persia, India, and the southern parts of Asia generally, where it dwells on rocky hills and open plains. It stands something less than three fect lhigh at the shoulder, and is furnished with slim legs, a short tail, and a pair of large horns, which are beautifully ammulated and spirally curved. The full-grown male is almost black above; the inside of the legs, under parts of the nock and belly, and the rump romaining white. The Sasin is altogcther an elegant specics, and remarkably swift of
foot, leaping, it is said, as much as thirteen fect in height, and clearing a space of twelve yards at a single bound! The flesh is insipid.
the pallah (Antilope melampus), or Betjuan, is a native of South Africa. It is a fine species, standing upwards of three fect high at the shoulders. The horns are twenty inches in length, lyrate, and coarsely annulated. The gencral colour is rufous, being much darker above than below, whilst the belly is quite white. The tail is about a foot long, white at the extremity, and marked by a dark-brown streak down the middle. The Pallah is gregarious in its labits; only six or eight individuals constituting a herd. The females are hornless, and provided with two teats. The flesh is coarse, but patable.
THE MADOQUA (Antilope Sulticna) is a remarkably small and slim-built antelope inlabiting the mountainous districts of Abyssinia. The summit of the shoulder is only fourteen inches above the level of the ground; but it stands rather higher on the hind quarters. The horns are correspondingly thin, and about three inches in length, whilst the tail is only rudimentary, measuring seareely more than one inch and a half from root to tip. The females are hornless.

THE GUEVI (Cephalophus pygmeus) - Plate 19, fig. 64 -is even smaller than the species ahove described, and has been variously designated the ligmy antelope, Kleene, Blauw-boe, and Monmetzi. It is a native of South Africa, dwelling either singly or in pairs amongst dense woods and thickets near the sea-coast. The head is long and pointed, with a wide muzzle, short round ears, and diminutive horns; the latter bcing less
than two inches long, black, conical, and strongly ammulated. The tail is about the same length, dark above and white below. The fur exhibits a dullbrownish, buff, or mouse colour, generally ; being lighter underneath. The females are hornless.

THE MOHR (Antilope Moliv) is an inhabitant of Western Africa, and stands about two and a half feet in height at the shoulder. The horns are of moderate size, thick, and strongly annulated at the lower twothirds of their extent, the tips being rather sharp, and bent forwards. The fur exhibits a deep brownish-red colour generally, but is white underneath and on the back part of the rmmp. The Muhr is lighly valued by the Arabs on account of the bezoar stones or concretions fome in its intestines.

THE SAIGA (Antilope colus), or Colus, is an inhabitant of eastern Europe from P'oland to the Caucasus, being also found in Northern Persia and Siberia. It is of moderate size, and rather bulky in appearance. It is gregarious in its habits, many thousands of them herding together, and migrating southwards during the cold season. They are much hunted and valued for the sake of their horns, which are light-coloured, semitransparent, and slightly twisted on their axis; the skins of the young are likewise highly estcemed, and employed in the manufacture of gloves.

THE CHIRU (Antilope Hodgsoni) is another gregarious species inhabiting the open plains of Thibet. It is a fine animal, measuring three feet in height at the shoulder, and furnished with amulaterl horns more than two feet in length. The fur displays a bluishgrey colour generally, overcast with a rufous tint.


The Spring-boc (Gazelle Euchore).

The tail measures about eight inches from root to tip. The Chiru is shy, bold, swift, and, like other species in which bezoar stones are found, is very partial to saline matters, which it lieks greedily.

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THF SPRING-BOC (Gazella Euchore) is a beautiful little ereature, everywhere scattered over the plains of Southern Africa in countless herds (fig. 60). The horns are black, lyrately disposed, provided with about
twenty prominent ammulations, and curved inwards at the tip. The fur exhibits a bright rufous-dun colour, the flanks being marked on either side by a broad, rich, and deep ehestnut-coloured band. The belly and insides of the legs are quite white. One of the most curious features in this species consists in the presence of several folds of integrument over the rump and loins, which, when the animal is cxeited, are unfolded, and by the snow-white aspect of the fur at this point, present a very singular appearance. The tail is about eight inelies in length, and tufted with black hairs.
the gazelle (Gazella Dorcas) is a native of Northeastern Africa, and from its extreme elegance of form, coupled with large, full, lustrous eyes, has deservedly acquired distinction. The Gazelle or Corime, as the female is sometimes ealled, stands less than two feet high at the withers, and is furnished with a pair of strongly amulated horns about ten inches in length. The ears are conspicuous and sharply pointed. The fur is more or less fawn-coloured or fulvous, but varies according to age. The habits of the Gazelle are gregarious. Considering their slender build, they are remarkably courageous, and will unite to defend themselves against the strongest Carnivora, although they usually fall vietims to these overpowering enemies.

THE STEEN-BOC (Antilope tragulus) was formerly a very common species, inhabiting the mountainous plains and open valleys of Southern Africa; but now it is becoming comparatively rare in the colony. It stands about twenty-two inches high at the shoulder, and is furnished with round slender horns, about four inches long. The ears are large, but the tail is only rudimentary, and scarcely an inch in length. The fur has a rich rufous colour. The habits of the Steen-boc are monogamous, or solitary; the females being lornless, and provided with four mammæ.

THE GRYS-BOC (Antilope melanotis) pretty closely resembles the stecn-boe, both as respects its solitary habits and general appearance. The horns are about three and a half inches long, the general colour of the fur being of a deep chocolate red. The ears are broad and rounded. The Grys-boe is found more particularly among the wooded districts bordering the seaeoast. The females are hornless, and provided with only two mamme.
THE DUIKER-BOC (Antilope Grimmia), or Impoon of the Matabili, is also a Cape species frequenting those districts near the sea-coast, and possessed of monogamous habits. It is about two feet in height, the lorns being four inches long, and marked by a longitudinal ridge in front, which traverses fon or five rings at the middle. The fur is yellowish-brown ; but in winter it assumes a cinereous olive tint; the forehead being clothed with a patch of long fulvouscoloured hair. The tail is short, black, and tipped with white. The fomale has four mamme; her horns being very short, and concealed beneath the hair.
THE BLESS-BOC (Antilope albifions), or WiuteFiced Antelope, is a mative of Southern Africa, inlabiting the plains bordering on the Vaal river, and herding in immense flocks. A full-grown buck stands three feet and a half in height, and carries a pair of diverging annulated horns, measuring from
twelve to fifteen inches in length. The fur has a deep chocolate colour in front, gradually passing into a hoary bluish-white on the back and shoulders, the belly being quite white. The tail is long, reaching to the hoeks. The female is similar, but of lighter build.

THE RHEE-BOC (Antilope C'apreolus), is a gracefully formed Cape species, occurring in small herds amongst the hills and rocks in the neighbourhood of water pools and dried-up rivers. It stands about two feet four inches light, and is furnished with straight, slender, vertically'-pointed horns, nine inches in length. The fur has a light rufous-grey eolour, being white maderneath the belly; its texture is woolly. The females have four mammæ, and are homless.
the Reit-boc (Antilope cleotragus), or Ingialla, possesses similar habits, and is a comparatively rarc species, occurring only in the miore northern parts of Cape colony, and higher up in the interior. It is larger than the forcgoing, standing three feet high; the homs measure about a foot in length, and are anmulated. The cars are long and pointed; the tail being also conspicuously developed. The fur exlibits a dull ash-grey colour, having a rufous tinge above, while it is lighter underneath. Thic females have four mammæ, are smaller than the bucks, and hornless. The reit-boc is gregarious in small families.
the water-boc (Antilope ellipsiprimna), or Phiтомок of the Matabili, stands upwards of four feet at the shoulders. The homs are strongly annulated, upright, diverging, of a whitish-grcen colour, and upwards of thirty inches in length, the last six inches being smooth and destitute of rings. The fur has a greyisl-brown tint generally ; a white patch oecurs on the throat, and a similar streak before each eye. The ears are full and romnded; the tail being brown and tufted, and scarcely reaching to the hocks. There are no suborbital sinuses. The females are hornless, and have two mamme. The Phitomoks are gregarious, inhabiting the banks of the rivers of Southern Africa, especially those of the Limpopo and Mariqua.
the gems-boc (Autilope Ory.p), or Fiookana, of the Matabili, is found chiefly in the Karroo, or in the open plains of Namaqualand in Southern Africa. It is a strong, bulky, and courageons specics, and is armod with a pair of formidable homs, which are mpards of three feet in length, almost straight, divergent, amnulated below, horizontally disposed, and tapering to a point; between them a black stripe passes down the forchead, which is crossed by a similar band above the muzzle. The ears are white, with black margins. The fur has a rusty iron-grey colour generally; it supports a mane, the hairs of which are reversed in direction; the under parts of the belly and thorax, as well as the legs, being white. The tail is bushy; black, and three feet long. The females have two mamme, whilst their horns are even longer than those of the buck.

THE BLAUW-BOC (Antilope leucopheara). - Not a little confusion has arisen in regard to this species, the name here given laring been applied to the little slatecoloured antelope. The Blauw-hoc is, with its varieties, also known as the Bastard Gems-boe, Roan Antelope, Etel: of the Matabili, and Takhaitze ; the latter constituting a well-marked variety, known ly its increased
size, large beard, and fine flowing mane. It is also distinguished for its fiereeness. The Etak, properly so ealled, stands about five feet high at the shoulder, and is furnislled with scimitar-shaped horns two feet in length; they are strongly curved backwards, and marked with about thirty conspicuous amulations. The face is blaek, with white streaks in front and behind the eyes; the muzzle and under parts being also white. The ears are pointed, and fourteen inehes long. The fur cexhibits a roan or reddish-white eolour generally. The females are hornless.
THE LECHEE (Antilope Lechée) is a large animal, inlabiting South Afriea, on the banks of the river Louga. In its habits and eharaeter, it very closely resembles the Water-boe. The horns are elongated, amulated, and curve forwards at the tip. The fur has a light brown colour gencrally, the limbs being much darker. In the male the mane is slightly developed; the tail being tufted and black at the extremity. Both Dr. Livingstone and Mr. Andersson have given interesting particulars of this specics. The, former says, "It is never found a mile from water; islets in marshes and rivers are its favourite haunts, and it is quite unknown except in the contral humid basin of Africa. Having a good deal of curiosity, it presents a noble appearance as it stands gazing with head erect at the approaching stranger. When it resolves to decamp it lowers its head, and lays its horns down to a level with the withers; it then begins with a waddling trot, which ends in its galloping and springing over bushes like the pallahs. It invariably runs to the water, and crosses it by a succession of bounds, each of which appears to be from the bottom." Mr. Andersson informs us that "great numbers are annually destroyed by the Bayeye, who convert their hides into a kind of rug for sleeping on, carosses, and other articles of wearing apparel."

THE NAKONG (Antilope Anderssonii).-Bclieving this antclope to be new to science, we do not hesitate to recognize it under the above specific title. Dr. Gray thinks it may be referred to Ogilby's broad-horned antelope, but the characters, in so far as they are given by Mr. Andersson, lead us to a different conclusion. The fur displays a subducd brown colour, which is darker on the back and on the fore-part of the hcad and legs; having an ashy tint underneath the belly. The hair is long, and coarse in texture. The horms are black, closely resembling those of the koodoo. Its habits are similar to those of the last-described species. "By means of its peculiarly long looofs, which are black-not unfrequently attaining a length of six to seven inches-it is able to traverse with facility the reedy bogs and quagmires with which the lake country abounds." Mr. Andersson adds that the natives frequently, at partieular seasons, capture the Nakong by means of pitfalls.
the leucoryx (Antilope Leucory.r), White AnteLOPE, or Oryx - Plate 20 , fig. 60 -is a native of Eastern Africa. The fur has a milky-white colour generally, the throat and neck being rufous-brown; dark bands also occur on the forchead and eheeks, two of them passing vertically dormwards from the imner corner of the eye. The mane is short and reversed;
the tail bcing lengtly and tufted at the tip. The horus are very attenuated, annulated at the lower laalf, and slope olliquely backwards with a very slight eurvature. The Leueoryx is gregarious in its habits, and feeds freely on acacia shrubs.
THE ADDAX (Antilope Addax) is a native of Northern and Central Afriea, and is a bulky, thick-set animal, standing upwards of three fect at the shoulder. The lorns are long, narrow, spirally twisted, ringed to within five inches of the tips, sharp at the points, and measuring about thirty-six incles from base to apex. The forehead is elothed with a patch of black curly hair; the mane is well developed, the fir having a greyish-white tint generally; but the head and neck are rufous-brown. The Addax has monogramous habits.

THE CHOUSINGHA (Antilope quadricornis) or Four-Horned Antelope, is an inhabitant of the northern and well-wooded districts of India, being found especially in the districts of Bahar and Orissa. It is a comparatively small species, standing about tiventy inches at the shoulders. The horns are smooth, black, conical, and sharply pointed; the posterior pair bcing three inches in length, while the anterior are scarcely a third of that measurcment. The fur has a reddish colour generally, being whitish underneath. The females arc hornless, and of a paler hue; they usually produce two young at a birth. The Chousingha is excessively wild; it is also monogamous.
the cambing-outan (Antilope Sumatrensis) is an inhabitant of the liilly forests of Sumatra, and in its habits approaches the goats and chamois. The horns are about six inches in length, slightly eurved backwards, broad below, and sharp at the apex. The body is stoutish, and clothed with a long decp browncoloured fur, approaching to black, except on the back of the head, neek, and shoulders, and inside of the ears, where it is quite white; the mane bcing well developed and the tail moderately long. The liabits of the Cambing-outan are wild and restless.

THE CHAMOIS (Antilope Rupicapra) is an inhabitant of the alpine slopes of Western Emrope, and, like the preceding specics, is closcly allied to the æegoscerrine family. It is clothed with a deep-brown woolly fur, the head being of a paler colour, and banded on cither side by a dark streak, which passes from the angle of the mouth to the cye and base of the ear, enveloping both. The horns are from six to eight inches long, running nearly parallel to eacl other, and curving backwards at the tip. The tail is short and black. The habits of the Chamois arc wild and impetuous, like the torrents which it overstrides in rapid flight. It feeds on young shrubs and various alpine herbs.

THE PRONG-HORN (Antilope furcif(r) or CABRIT, is an interesting species, as it presents a sort of transitional form between the antilopine and ecrrine genera; and it is for this reason that we have reserved its consideration until compelled to draw our descriptions of the members of the present family to a close. The Prong-hom is a native of the western borders of North Ameriea gencrally, bcing more particularly abundant on the borders of the Saskatehewan and Columbia rivers. It is a stoutish animal, upwards of three feet ligh at the shoulder, and at onee reeognized by its
peculiar horns, which arise from the forehead immediately above the eyes, giving off a sort of brow autler
about half way up, and curving suddenly backwards and inwards at the tip (fig. 61). Below the prong the

Fig. 1.


The Prong-horn or Cabrit (Antilope furcifer).
horns are rough, like those of the deer; but above they are black and smooth. The fur has a fawn colour gencrally; being whitish on the throat, chest, belly, and rump. The Prong-horn is gregarious in its habits, frequenting open plains and liilly grounds. The flesh is coarse and unsavoury. The horns of the female are rudimentary.

According to Sir John Richardson, "the most northerly range of the Prong-horn antelope is latitude $53^{\circ}$, on the banks of the north branch of the Saskatchewan. Some of them remain the whole year on the south branch of that river; but they are merely summer visitors to the north branch. They come every year to the neighbourhood of Carlton House when the snow has mostly gone. Soon after their arrival the females drop their young, and they retire southwards again in the autumn as soon as the snow begins to fall. Almost every year a small herd linger on a piece of rising ground not far from Carlton House, until the suow has become too deep on the plains to permit them to travel over them. Few or none of that herd, however, survive until the spring, as they are persceuted by the wolves during the whole winter. They are found in the summer season in the fifty-third parallel of latitude, from longitude $106^{\circ}$ to the foot of the Rocky Mountains. According to Lewis and Clark, they also abound on the plains of the Columbia, to the west of the mountains, where they form the chief game of the Shoshonecs." Our authority also adds, that "the Pronghorn appears on the bauks of the Saskatchewan, sometimes a solitary animal, sometimes assembled in herds of ten or twelve. Its sight and sense of smell are acute, and its speed is greater than that of any
other inhalitant of the plains, allhough I have been informed by Mr. Prudeus, that when there is a little snow on the ground, it may with some little management be run down by a high-bred horse. The Indian hunters have no difficulty in bringing an antelope within gun-shot by varions stratagems, such as lying down on their backs and kicking their heels in the air, holding up a white rag or elothing themselves in a white shirt, and showing themselves ouly at intervals. By these and similar manocurres the curiosity of a herd of antelopes is so much roused, that they wheel round the object of their attention, and at length approach near enough to enable the hunter to make sure of his mark. From this disposition of the Pronghorned antelopes, they are more easily killed than any of the deer of the distriet which they inhabit."

Had space allowed, we should have supplied short notices of several other antelopes, including the Lob, Sing-sing, Nagor, Haar, \&e.

## Family IV.-CAMIELOPARDIDE.

Altlough represented only by a single genus, the characters of this family are sufficiently distinctive and osculant between the antilopine, cervine, and cameline species, to warrant the propriety of their being separately treated. We have already taken occasion to mention one unique structure in connection with the intestinal canal; but there are others searecly less cliaracteristic, being also more obrions. Firstly, we notice the horns, which are solid, persistent, and completely invested with a hairy integument. A question has been raised as to the existence of a central
or third horn. If our space permitted, we should be able to remove all doubt upon this point, having carefully compared a number of crania together, and satisfied ourselves as to the substantially correct views originally enunciated by Ruppel in "Reise in Nordlichen Afrika." Another peculiarity in the cranium arises

Fig. 62.


Front view of the Skull of the Giraffe.
out of a remarkable extension of the frontal, ethmoidal, and sphenoidal cells (fig. 62). These form a series of large intercommunicating air cavities on the top of the head, reaching from the middle of the face to the occiput. Finally, the special elongation of the tongue, the prominent orbits, the powerful ligamentum nuchæ, the long muzzle, the usual though not invariable absence of a gall-bladder, and some other minor peeuliarities, satisfactorily demonstrate the legitimacy of the grounds on which the Giraffe may be considered as the representative of a distinct family.

THE GIRAFFE (Camelopardalis Giraffa), or Camel-OPARD-Plate 22, fig. 73-is a native of Abyssinia and the plains of Central Africa generally. It is a singularly beautiful and attractive creature, and is the tallest of all animals living on this planet-the head of a full-grown example occasionally reaching as much as eighteen feet, and the shoulders twelve feet, from the ground. The fur is short, whitish underneath, and marked throughout by angular fulvous red spots, which have a dark rusty tinge in the centre. The upper lip is extensile and undivided, the ears large, the eyes expressive, the body short, the tail boing nearly three feet in length and tufted with black hair. The Giraffe is gregarious in small troops. It is natnrally gentle, timid, and docilc, and, as Captain Harris
observes, has no other means of protection than that afforded by the swing of the head and neek, and by the kicking of its heels, seldom employing the latter even when hemmed into a corner. The speed of Giraffes is considerable, and often sccures the safety of these harmless animals; their movements during flight being characteristic and peculiar. The limbs of either side do not, as is well known, more alternately, as in the trot of a horse ; but the fore and hind legs of one side are advanced almost at the same instant, so as to produce a swinging action of the body. Their tails are also partly raised and curled during flight, the tufted ends being restlessly switched to and fro. The Giraffe feeds upon mimosa twigs and blossoms. In its selection it would appear to be guided rather by sight than by taste or smell ; for Professor Owen mentions that onc of the fine specimens preserved in the Zoological Society's Gardens, Regent's Park, observing a lady's bonnet to present a very flowery aspect, suddenly, yet gently and politely, applied its extensile tongue to the gandy trash, and without further coremony consigned the tokens of her vanity to the maccrating influences of its capacious paunch! In like manncr the conceit of a peacock lias been observed to subside under the magie touch of this lingual wand; for the bird having invaded the paddock, one of the Giraffes took occasion, when the uplifted tail had duly displayed this poor bird's pride, to gather a bunch of the brighteyed fcathers on his tongue, and swiftly raising the astonisherl intruder ligh into the air, gave him a vigorous shake, permitting him again to reach the paddock ground, from which he hastily retreated to hide his diminished tail and head!

## Family V.-Cervid Te.

The true stags and deer are at once distinguished by the presence of deciduous branching horns in the male; the females being in nearly all cases hornless. These organs vary much in character, being rounded in some species and flattened in others. They are in reality outgrowths from the cranium, and, being developed periodieally, have an important physiological significance. Without detailing the anatomical and morphological changes which these singular organs amnally undergo in the more typical forms, we deem it suffieient to indicate the peculiar phenomena whiell are contemporaneously developed during the periodical renewal of the antlers; and we do so in language we have elsewhere employed. A strong determination of blood to the head takes place at the spring of the year, and the ressels surrounding the frontal eminences enlarge. This increased rascular action results in the secretion of a fibro-cartilaginous matrix, manifesting itself externally by a budding, commencing at the summit of the core, at the spot where the horns of the previous season had separated. In the carly condition the horn is soft and yielding, and it is protected only by a highly rascular periostem and delicate integument, the cuticular portion of the latter being represented by mumerous fine lhairs closely arranged. From this circumstance the skin is here termed the "relvet." As derelopment goes on, a progressive consolidation
is effected, the ossification proceeds from the centre to the circumference, and a medullary eavity is ultimately produced. While this is taking place, a corresponding clange is observed at the surface. The periosteal veins aequire an enormous size, and by their presence occasion the formation of grooves on the subjacent bonc. At the same time osscous tubercles of ivory hardness appear at the lase of the stem; these coalesce by degrees, and inclose within their folds the great superficial vascular trunks, which are thus rendered impervious. The supply of nutriment being thus cut off, the first stage of exuviation is accomplished by the consequent shrivelling up and decay of the periosteal and integumentary envelopes. The full growth of the horns is now consummated, and the animals being aware of their strength, endeavour to complete the desquamation by rubbing them against any hard substances which may lie in their path. 'Ihis action is technically termed "burnishing." After the rutting season, the horns are shed, to be again renewed in the ensuing spring; and every year they become more perfect, as represented in the accompanying woodeut, fig. 63. The letter referenees respectively indicate the


Development of the horns of the Red Deer.
several stages of development following upon that of the second year, in which the horn has the form of a simple unbranclied stem, $a$. Like the antelopes, the stags are very swift of foot; but most of them live within, or in the immediate neighbourhood of large forests, browsing on grass, leaves, various herbs, and the shoots of young trees. Hossil remains of deer are very numerous both in tertiary and recent formations; those of the Bramatherium and Sivatherium discovered by Dr. Falkener in the Sivalik hills of Northern India, showing that in former times some members of this family attained the most gigantic proportions.
the elk (Alces Mulchis), or Muose-deer-Plate 21 , fig. 71 -is an inhabitant of the northern regions of both lemispheres. It is a large and ungainly-looking animal, standing about six feet at the shonlders, and furnished with massive palmated horns, which occasionally weigh upwards of sixty pounds, and spread out laterally over a space six foet in width. The head alone measures upwards of two feet from the tip of the muzzle to the occiput, the nose being hairy and swollen out at the upper border. 'The eyes are small, the ears long, the neck provided with a coarse mane, the body short and rounded, and the tail only three or four inches
in length. The fur is rery coarse, rough, and wiry. Respecting the habits of the EIk, we may observe that it is naturally very timid, and when taken young is easily domesticated. Its movements look awkward as it glides along in a kind of sluffling, ambling trot, but when severely pressed it gallops with great rapidity. During the wam season it is grecgarions and frequents low swampy grounds, often taking the water, through which it swims with marked facility; resorting in cold weather to sheltered forests. The flesh of the Elk is highly esteemed, and the hide extremely valuable.

THE REIN-DEER (Turandus Rungifer), or CARI-Bow-Plate 22 , fig. 72 -is a native of the most northerly districts of both hemispheres; being an animal of the utmost importance to the inhabitants of those icy regions. Space would fail us were we to enter minntely into a consideration of the various purposes to which this thoroughly domesticated species is applied; or if, on the other land, we attempted to clear up the disputed point as to whether the North American and Lapland forms are one and the same species or entirely distinct; those who are interested in this question shoukl consult Mr. Andrew Murray's Memoir, puilished in the Edinburgh New Philosophical Journal for 1858. The Rein-decr is furnished with eylindrical horns, and on account of the great variety of shape which the branches assume, any attempt to establish specific distinctions, merely on the characters of the antlers, must necessarily be attended with difficulty. The habits of these animals are too well known to be here described at any length. Elks undertake extensive migrations at different seasons, with the riew of obtaining a constant supply of food, which consists, for the most part, of various species of lichen. The females are provided with four mamme, two of which are spurious; they also support a pair of slender horns, very closely resembling those of the male.
the wapiti (Cerrus Canadensis), or Grey Mloose, is a large North American deer, standing about four feet six inches at the shoulders. The horns are cylindrical, and weigh about thirty pounds. The fur is redlish-brown ; the hair on the throat of the male being much elongated, and the rump in both sexes marked ly a patch of light-coloured hairs, bordered on either side with a blackish streak. The Wapiti is a stupid creature, gregarious in its habits, and often utters a peculiar shrill ery, which, like a donkey's braying, is stated to be particularly disagreeable. Its flesh is coarse and insipid.
THE RED DEER (Corvus Elaphius), or COMMON Stag, is a native of the more temperate regions of Europe and Asia, and thongh not so abundant in this eountry as in former days-when the chase was the peculiar delight of English noblemen-yet it is still snfficiently cared for in the wilds of Scotland and the western isles, where the deer-stalker enjoys his healthful and exciting sport. The fur of the stag exlibits a fulvous-hrown hue generally, the rump being markerl by a pale patch on either side of the short, stumpy tail, which is also of a light colour ; in the fawn the hide is marked with whitish spots. The period of gestation in the hind extends orer eight months, the young being produced in the month of May. During the
winter both sexes colleet in vast herds; but in the rutting season the stags frequently engage in the most desperate encounters, the struggle of a pair of males oceasionally ending in mutual slaughter Sometimes the antlers are inextricably fixed by the "tynes," both animals being thus left to perish, as it were, in each other's arms!

THE FALLOW DEER (Cervus duma) is mueh smaller than the stag, and is the species most commonly scen in the parks of this country. In summer the fur is fulvous and spotted with white, but in winter it becomes blackisl-brown; the rump being always more or less whitish, and banded on cither side by dark streaks. The tail is dark above and white underneath. The horns are palmated supcriorly; the flattence expansions being bordered with short "tynes" or dentalations. The fallow deer is now scattered all over Europe, but there is reason to believe that it was originally brought from the coast of Barbary. Black and even white varietics are not uncommon.

THE AXIS (Cervus Axis) is a remarkably elegant and permanently spotted form of decr. It commonly goes by the name of the Spotted Stag-dece. It is an inhabitant of Northern India, but freely breeds in Europe ; and in its native haunts on the borders of the Ganges it is much hunted. On such occasions it often displays considerable resistance, and when brought to bay charges the horsemen with great violence. The Axis stands about two and a half fect at the shoulders; the fur having a fawn colour gencrally, passing into a dark brown on the back, whilst the under parts are quite white. The females are hornless.
THE ROEBUCK (Cupreolus Dorcus) is a native of the temperate parts of Europe, and though not so abundant in this country as formerly, is still tolerably plentiful in the wilder parts of Scotland. This species is readily known by its horns, which divide into three short branches or "tynes" (Plate 21, fig. 70). The Roebuck is monogamous in its habits; the female usually producing two fawns at a birth, her period of gestation bcing five months. The venison of this deer is of inferior quality.
With regard to other members of the cervine family, we can only briefly notiec the following:-
the muntjak (Cervus Mountjac), or Kidang. This is a very interesting species, inhabiting Hindostan, Ceylon, Jara, and most of the islands of the Indian Archipelago. The distiriguishing characteristics of this animal consist in the possession of two large tusk-like canines in the upper jaw, and in the columnar extension of the cranial bones, forming clongated pedestals for the support of the two-pronged horns (fig. 64). The forehoad is likewise marked with three unusual foldings of the skin (fig. 65). In general appearance the Muutjak resembles the last-described species, but, whilst the body is somewhat stouter, the limbs are, on the other hand, more slender; it is also rather larger. According to Horsfield, the Muntjak "selects for its resort certain districts, to which it forms a peculiar attachment, and which it never voluntarily deserts. Many of these are known as the favourite resort of this animal for sereral gencrations. They consist of moderately clevated grounds, diversified by ridges and valleys, tending
towards the acclivities of the more considerable mountains, or approaching the confines of extensive forests."

Fig. 64


Skull of the Muntjak.
The same authority states, that "the Kidang is impatient of confinement, and is not fitted for the same degree of domestication as the stag. It is, howerer,

Fig. 65.


IIcad of the Muntjak.
oceasionally found in the inclosures of natives and Europeans, but requires a considerable range to live
comfortably; it is cleanly in its habits, and delicate in the choice of food. The flesh affords an excellent venison, which is often found on the tables of Europeans. The natives eat the males, and always present them in a conspicuous place in their feasts; but in eonsequence of some peculiarities in the habits of the females, they lave an aversion to them as food." The Muntjaks are monogamous, and when found in small troops, the latter hisually eonsist only of the members of a single family.

THE MUSK-DEER (Moschus Moschiferus) is an inhabitant of the elevated plains of Central Asia, extending as far as the eastern provinees of China. It is about the size of the rocbuek, but unlike that speeies, stands much higher on the haunches than at the shoulder. One of the most distinguishing peculiarities, however, arises out of the presence of a pair of long eanines in the upper jaw, whieh in the males project outwards below the chin. Another still more distinctive feature consists in the presence of a glandular pouch in the immediate vicinity of the navel. This oceurs only in the male ; it is about the size of a hen's egg, and contains an unetuous brown seeretion, which is the musk of commeree. A single grain of this substance is sufficiently odorous to impregnate the atmosphere of an ordinary room for several years, without apparently diminishing in quantity! The fur of the Musk-deer varies mueh in colour; it is more or less brownish, the throat being white, with light bands on the sides of the neck; whitish grey spots also occur along the lateral parts of the body. The ears are long and narrow. The feet are furnished with largely-developed spnrious hoofs. The tail is very short. Respecting the habits of this animal, Pennant states that it is naturally shy and timid. It frequents the most inaccessible rocks, and often sucecerds in evading the hunter's skill.

There are several other small kinds of Musk-deer, such as the Napu (Tragulus Javanicus)-Plate 23, fig. 76 - and the Peesoreh (Meminna Indica); these are not furnished with the umbilieal pouch.

## Family VI.-CAMELID 灰.

The Camels differ from the typieal ruminants in many important particulars. They are entirely hornless; their most distinctive feature, however, consisting in the presence of ineisor teeth in the upper jaw. Altogether they lave thirty teeth; eight incisors, one on either side above and six below; four eanines and eighteen molars, of which latter six are spurious. Another peeuliarity in this family is seen in the beautiful provision of water-eells in the walls of the paunch-of which full particulars have already been given. The feet are callous underneatll, partially bisulcate, and furnished with rudimentary hoofs, which only protect the upper surface of the toes. Finally, from some other minor characters, chiefly osteological, it is elearly evident that the Camels make a decided approach towards the solidungulate and paehydermatous types.

THE DROMEDARY (Camelus Dromedarius), or Oneinumped Camei-P'late 23, fig. 74-has been eelebrated from the earliest historie times; and though no longer known in the wild state, is still abundant in the East,
forming an indispensable companion to the traveller as he journeys over the wild sandy wastes of Egypt and Arabia. Well may the Arabs call this creature the "ship of the desert;" for a more elegant or appropriate title could not be devised. Bearing a heavy cargo of goods to the extent of six hundred or even a thousand pounds weight; supporting a storehouse of nourishment in the form of a huge bundle of fatty matter on its back; supplied internally with an unfailing reservoir of thirstrefresling water; armed with sole-protecting foot-pads, in the form of broad elastic eushions, which extend for a considerable distance on cither side of the toes; the camel, thus befittingly adapted for a toilsome journey, moves at the bidding of his guide; steers with undeviating course through the trackless paths of the sandy plains, and sustains with ease and cheerfulness the superabounding load! On rolls the blast with desolating waves of seorching sand; elouds of impalpable dust rise ligh into the air, obliterating all trace of the sunny sky; the suffocating wind threatens death to man and beast; the water-skins have parted witl their treasure, and dried under the effects of intolerable heat. At length the storm has subsided, but the parehed lips only tcll too truly that all must perish! There is one resource left-at least such is the testimony of history. To save his earthly lord the burdened beast must die. The friend in need-who has pillowed his master's head, and warmed his chilled frame at night-must, at the hour of death, supply the life-restoring draught; thus imitating, as it were, the example of that nobler saerifice which has conferred imperishable blessings upon mortal man! In some cases, indeed, a dire fatality earries off the whole company of the akkabah or caravan, such as happened in the year 1805, when no less than two thousand persons and eighteen hundred camels perished from the overwhelming fury of a terrible simoom. In regard to the eharacters by which the Dromedary is distinguished we need say little, as the solitary hump is sufficiently distinctive. For food the eamel is contented with the poorest and driest of priekly herbs, but the amount taken is exceedingly moderate for so bulky an animal. In Europe these animals are little employed; but at Pisa, in Tuscany, a stud has been kept up ever since the middle of the seventeenth century; and there they breed freely. The hide, fur, flesh, \&c., of the Dromedary are employed for various ceonomic purposes, upon which it is needless to dwell.
the bactrian camel (Camelus Bactrianus) is an inhabitant of Asiatic Turkey, Persia, and the elevated plains to the north of the Himalaya mountains. It is a comparatively rare species, but easily recognized by its possessing two lumps on the back. The Baetrian camel is stout, thickset, and awkward-looking, and varies very much in colonr, the fur being long and shaggy, especially underneath the chin and throat. A fine example is still living in the Zoologieal Society's Menagerie, Regent's Park.
the llama (Auchenia glama) or GuanacoPlate 23, fig. 75.-Much diversity of opinion exists as to whether two or more species of this genus are known. Some, who follow Dr. J. E. Gray, believe that there are four species; but we incline to the persuasion that
this reekoning gives us at least one too many. These animals are natives of Peru and Chili, and represent, in the western hemisphere, the eamels of the East. They have no humps on the back, are a much smaller species, and have a dense woolly fur, which, in the wild state, exhibits a pale eliestnut-brown colour. The fur of the domestieated Llama is rariously tinted. The sole-pads, instead of being broad as in the camel, are double and narrow, each division being limited to one side of the eloven foot, whilst the nails, in lieu of being weak, are powerfully developed and strongly curved. The Llamas freepuent rocky places; and in consequence, therefore, of the easy separation of the toes, combined with the modifieations of the pad and hoof here referred to, it becomes at once cvident that such a condition of the foot is peculiarly adinpted to an animal whose life is destined to be spent-unlike that of his desert-traversing congener-on the rugged slopes and precipices of the Andes. As a beast of burden,
the Llama is not capable of sustaining a load of more than two hundred pounds weight, half that amount being ordinarily considered sufficiently oppressive. Attempts have recently been made to introduce the Alpaca-the Llamu Pacos, of some authors-into Australia, and the experiment has already been attended wilh suffieient success to warrant the belief that ere long they will become extremely useful and abundant in the colony. The alpaea may, after all that has been nrged to the contrary, only constitute a well-marked variety of the Guanaco. Though not employed as a beast of burden, it is a much more valuable animal than the Llama, the lair of the fur being mueh longer, and of a soft, silky texture. Respecting the Vieugna (Lluma Vicugna), which is by all authorities regarded as a distinct species, we have only room to remark that it possesses a fine fulvous woolly fur, whieh is extensively employed in manufacture by the natives of Peru.

## Order X.-SOLIDUNGULA.

In the arrangement of Cuvier, the solidungulate quadmpeds form the third family of the order Paehydermata ; but, by general consent, it is admitted that the present group is worthy of being separately treated in the manner here proposed. In Professor Owen's system, the solidungulates constitute a subdivision of his odd-toed ungulates or Perissodactylit. The members of this order are at once characterized by the circumstance of their possessing, or rather appearing to possess, only a single toe, which is ineased in a solid box-like hoof; there are, however, on cither side of this large central toe, rudimentary digits, in the condition of two splint-like bones, corresponding to the second and fourth metacarpal and metatarsal bones of the human extremities. Another distinguishing feature is seen in the dentition, which is made up of forty teeth; twelve of these are incisors, equally divided above and below; four are canines, the upper being almost invariably absent in the female ; the remaining twenty-four being molars, whose crowns are flat and

Fig. 66.

skull of the Horse.
square-shaped, and marked by four cresecutic folds of enamel-those of the upper jaw having a small additional fold at the inside. If the accompanying figure be examined it will be noticed that a considerable interspace exists betreen the incisors and the anterior grinders (fig. 66) ; it is throngh this vacuity that the bit is introduced for the purpose of controlling and

Yol. I.
directing the horse's speed. The stomach of the solidungulates is simple and undivided; the ecceum and large intestines being extremely capacions, and the gallbladder entirely wanting. Finally, it may be remarked that fossil solidungulate remains have been fomed in the tertiary deposits of various parts of the world, but it is impossible to deternine low many species of the order may have roamed over the uncultivated plains of geologie time.

## FAMily-EQUIDEE.

All the members of the order may be associated together under a single family title, as above, or they may be considered as belonging to a single genus. The family eharacters are the same as those of the order. All existing speeies were originally inhabitants of the eastern hemisphere-the mountain plains and wastes of Asia and Africa constituting their native abode. In the wild state they are gregarious; their speed is swift, and grass forms the principal clement of their food.

THE HORSE (Equus Caballus)-Plate 24, fig. 77 -is of all animals the most lighly estecmed, and deservedly so. Although it does not prove sueh a valuable source of food as certain of the ruminants; nevertheless, in an indirect mamner, it supplies us with the means of procuring sustenance from various sourees, proving absolutely indispensable to the agriculturist. To enter into a history of the uses to which this matchless quadruped has been put, or to enumerate the countless varieties of breed into whieh it has passed, would lead us far beyond the limits assigned to our deseription of the present family ; suffice it to say; that all the well-known domesticated forms are only varicties of an original wild stock, and that it is doubtful if this original type exists in the condition of its native progenitors. It is true that thoroughly wild breeds roam at large over the wild steppes of Asia and the spacious plains of South America; but all these are believed
to have returned to this state from that of a more or less complete form of domestication. Of the sereral eharacters which speeifically distinguish the horse from its congeners, it is perhaps only necessary to particularize the "flowing mane and flying long-haired tail," associated with a pair of morderately developed ears, and eallosities both on the fore and lind legs. In the wild state the head is larger than in the finer domestieated breeds. "The horse," says Mr. Rarey, "aecording to the best accounts we can gather, has been the constant servant of man for ncarly four thousand ycars, cver rewarding him with his labour, and adding to his eomfort in proportion to his skill and mamer of using him; being to those who govern him by brute force, and know nothing of the beanty and delight to be gained from the cultivation of his finer nature, a fretful, vicious, and often dangerous servant; whilst to the Arab, whose horse is the pride of his life, and who governs him by the law of kindness, we find him to be quite a different animal. The manner in which he is treated from a foal, gives him an affection and attaclnnent for his master, not known in any other comntry. The Arab and his children, the mare and her foal, inlabit the tent together; and although the colt and the mare's neck are often pillows for the children to roll upon, no accident ever occurs, the mare being as careful of the children as of the colt. Such is the mutual attachment between the horse and his master, that he will leave his companions at lis master's eall, cver glad to obey
his roice. And when the Arab falls from his horse, and is unahle to rise agrain, le will stand by him and neigh for assistance; and if he lies down to sleep, as Fatigue sometimes compels lim to do in the midst of the desert, his fiithful steed will watel over him, and neigh to arouse him if man or beast approaches. The Arabs frequently teach their horses secret signs or signals, which they make use of on mrgent occasions to call forth their utmost exertions." These are the words of the master and author of "The Modern Art of taming wild Ilorses." Few men have done more to perfect the method of treating this gifted animal than has Mr. J. S. Rarey; but space compels us to desist from cularging on a subject, to which special works are necessarily devoted.
THE QUAGGA (IIippotigris Quagga). -If naturalists are prepared to admit the propricty of generically separating the horse from the ass, we may respect the opinion of Colonel IIamilton Smith, who has cousidered the zebras worthy of similar distinction. Their characters are evidently osculant between the two abovementioned animals; and we are not prepared to accept the opinion of those who believe that their asinine leatures maintain the ascondancy. The Quagra is a native of South Africa, and is especially abundant on the open plains below the Taal river, where it herds in immense numbers. The ears and tail are decidedly equine; the neek is furnished with an erect mane, banded alternately brown and white. The upper parts of the

Fig. 67.


The Qnagga (Ilippotigris Quagra).
hide are rufous-hrown ; the head, neek, and shoulders being lined with dark stripes, which beeome fainter as they approach the middle of the back. The chest, belly, legs, and tail, except at the root, are quite white. If there be preponderance on either side, surely these
characters lean rather to the equine than the asinine group. All along naturalists have exhibited singular discrepancies of opinion in recard to this animal. It is now many years since the Zoological Socicty's Gardens first displayed living examples of the Quagga; but, as

Captain IIarris justly remarks, the period is not remote when confusion rode rampant on the question under consideration! "Disguised in a tail borrowed from the rump of the domestic ass, the subject of the aunexed portrait (fig. 67) sat for its picture to M. Buffon, and may be found in the voluminous works of that eminent author, doing duty for a female zebra! Even Baron Cuvier has fallen into the error of describing the Quagsa to be the proprictor of an asinine taila mistake which is the more surprising since it is stated by the same author in his 'Regne Animal,' that 'among the equipages occasionally cxhibited in the gay season in Hyde Park, and other fashionable places of resort, may be seen a curricle drawn by two couaggas, which seem as subservient to the curb and whip as any welltrained horses.'" The average height of the Quagga is about four feet and four inches at the shoulder. In its native haunts it is sociable and peaceable; but if roused by an enemy it exhibits great courage, and is said to repel the attacks of large earnivora, on some occasions at least, successfully. Its voice is uot unlike the bark of a dog.
the Zebra (Hippotigris Zebra), or Wilde Paard of the Cape colonists-Plate 24, fig. 79-oceupies the mountainous parts of Southern Africa. It is somewhat less in height than the Quagga; the mane being erect and bushy, with alternating bands of black and white. The entire body, head, and limbs are striped with
narrow black bands, the upper ones being united to the central longitudinal streak on the back. The general ground-colour of the lide is white. The hoofs are narrow, and much hollowed out at the sole. Zebreas are very shy and gregarious in their habits, living in troops sometimes rumbering upwards of a liundred individuals. In a domesticated state numerous liybrids have been produced by association with the horse and ass. The flesh of the zebra, though eatable, is coarse, oily, and unpalatable. According to the testimony of Mr. Andersson, the subdued neighings of the Zebra have a very melancholy eharacter when heard at a distance; and, on one occasion, this enterprising sportsman mistook its moribund groanings for the gasping ejaculations of a drowning man. The female is furnished with two mamma.

BURCHELL'S ZEBRA (ITippotigris Burchellii) is an inhabitant of the plains of Southern Africa to the north of Orange river. The Cape colonists call it Bonti Quagga, and by the native Bechuana and Matabili it is termed the Peechey. It stands about four fect six inches high at the shoulder, and is a comparatively stout-built species. The mane is erect, five inches in depth, and more or less marked by alteruating bands of black and whitc. The muzzle is black; the ears and tail being thoroughly equine in character. The head and inpper parts of the body have a reddish-brown ground colour, being beautifully streaked by irregularly

Fig. 68


Burchell's Zebra (Ilippotigris Burchellii).
sinuous, broad, black bands, which do not unite with the longitudinal dorsal line; the latter widens towards the croup. The tail, legs, and under parts of the chest and belly are quite white (fig. 68). The femate is similarly marked, and is furnished with four mamma. Like its congeners, Burchell's zelbra admits of being
tamed ; but, under the most farourable circumstances, it is considered unsafe, obstinate, and treacherous. Respecting its habits and appearance in the wild state, none have so effectively written upon this subject as Captain IIarris:-"Fiereo, strong, flect, and surpassingly beautiful, there is perhaps no quadruped in crea-
tion, not even excepting the mountain zebra, more splendidly attired, or presenting a picture of more singularly attractive beauty, than this free-born of the desert. It would be difficult to convey to the iminitiated a suitable idea of the sparkling effeet produced by their vivid and strikingly-contrasted colonrs, when scen pawing the valley in all the pride of conscious liberty, or flying in compact columns before the equestrian fue." Warming up with the vision of a mighty herd bounding over the sandy main, our eloquent anthor continues :-" Anon, a dark pillar of dust rises from the plain, and undisturbed by any breath in heaven, mounts upward to the clear azure sky like a wreath of smoke-three ill-omened vultures soaring in circles above it. Nearer and more near rolls on the thickening column, until several dark living objeets are shortly perecived daneing beneath it. Emerging from the obscurity, their glossy and exquisitely variegated coats, glittering in the sun's rays, ventre au terre, the head of a column of Burehell's zobras next appears, and instantly afterwards the serried horde sweep past in gallant array; their hoofs clattering on the hard ground like a regiment of dragoons. Tearing by at racing speed, straining neek and neek with their shaggy whimsical-looking bovine allies (i.e. Brindled Gnoos), their own striped and proudly curved necks seem as if they were clothed with thunder, and their snowy tails are streaming behind them. Now the troop has wheeled and halted for an instant to survey the foc. A powerful stallion advances a few paces with distended nostrils and stately gait; his mane newly hoggerl, and his ample tail switching his gaily checkered thighs. Hastily recounoitring the huntsman, he snorts wildly, and instantly gallops back to his cohort. Away they scour again, neighing and tossing their striped heads aloft, switching their light mulc-like tails in all the pride of flectness and freedom. Another halt and another reconnoissance. Her small equine ears laid vicionsly down, a skittish mare has now fallen out of the ranks, and is in the act of delivering both her active hecls plump into the ribs of an admirer, whose wantonness has prompted him to seize a tempting opportunity for inflicting upon her sternum an amorous bite ; and now, with a neigh of exultation and a vain-
glorious toss of her coquettish head, free and unfetterech as the wind, away she carcers again, still waited upon by her lover, who is nothing daunted by his rebniff; and their forms are finally concealed ly the cloud which follows the heels of the again retreating squadron." 1 gorgeous specimen of this truly beautiful species, may now be seen in the Regent's Park menageric.
THE ASS (Asimus vulyaris) has been generically scparated by Dr. J. E. Gray, and is readily distingmished from the rarious kinds of horse by its tail, which is clothed with short hair at the npper part, and only tufted at the extremity; the hind legs being likewise devoid of warty callosities. The fur las a grey colour, and exhilits a dark streak along the central line of the back, crossed by a similar band rumning over the shoulders. The ears are of great length; the forchead being also slightly arched. Respecting the qualities of this animal, we need say little. No unfortunate beast of burden is so much neglected on the one hand, or maltreated on the other. As to its origin, naturalists are divided in opinion; some maintaining that it is a domesticated varicty of the Koulan, or wild ass of Persia (Asinus onayer), others believing that the last-named is only the domestic animal whiel has returned to a wild state-the original stock having altogether disappeared. Whichever riew is correct, we think there can be little donlit that the two forms are specifically identical, and consequently that they have desecuded from a common parent.
the kiang (Asinus Hemionus), or Tschikitei, is another kind of wild ass, intermediate in character between the above-described species and the horse. The ears are of moderate length, the fur is smooth, and of a bright rufous-bay tint; the legs having a pale straw colour. A dark broad streak rums along the contral line of the back, but it is not crossed ly any similar band over the shonlders. The Kiangs herd together in small numbers, roaming over the sandy steppes of Central Asia. The males are fine animals. standing sometimes as much as fourteen hands high at the shoulder; and, moreorer, they neigh like horses. A noble specimen has been recenty hronght over to this country, and may be scen in the Zoological Society's Menagerie, liegent's Park.

## Order XI.-PACIIYdERMATA.

Although naturalists are divided in opinion as to the best mode of classifying the non-ruminating hoofed quadrupeds, all are agreed that the dissimilar groups, collectively associated by Cuvier under the title of Pachydermata, camot fairly be regarded as zoologically equivalent to the Ruminantia. It is in this view that we have adopted a somewhat modified outline of the Cuvierian arrangement, while at the same time we are prepared to recognize the more perfected idea developed in the recent elassification of the Mammalia by Professor Owen. The Paehydermata, as here retained, ean scarcely be recognized as having any special characteristic common to the entire order,
unless we are permitted to notify the more or less hardened skin, which is to a considerable extent naked or destitute of hair. In our opinion, too much stress has been laid upon this dermal peculiarity, seeing that it is shared by many other Mammalia, and is in no wise distinctive ; the order las, however, derived its name from this trivial circminstance. Hitherto we have detailed the more remarkable features of the several natural groups in a general introduction to each order; but such is the variety of character presented by the several families in the present instance, that it is better to reserve these particulars for separate consideration.

## Family I.-ELEphantide.

Excluding the oceanic cetacea, the living representatives of this family are the most bulky of all existing Mammalia. In the miocene and pleistocenc deposits of the tertiary cpoch, the remains of extinct species are extremely abundant; some of them-such as the mastodon, Plate 32, fig. 100, and deinotherium-being generically distinct. Probably the latter genus should be regarded as the type of a separate family, seeing that the lower jaw is supplied with cnormous tusks, in a manner altogether unique ; their crowns being directed downwards and baekwards, and the roots inserted into a prolongation of the symphysis or anterior central promincnce of the inferior maxillary bonc. Whatever differcnces may have existed in these aberrant forms, the true clephants are distinguished by the possession of a remarkable nasal appendage or proboscis, commonly called the "trunk." This organ has a tapering cornueopial outline; it is pierecl at the tip for the two nostrils, and at the centre of the upper margin is furnishacl with a finger-like process which, in conjunction with a thumb-like thickening of the inferior border, scrves the purpose of a hand. The extraordinary prelicnsile powers of the trunk are familiar to every one ; but when it is considererl how readily the same instrument can detaeh a straw or uproot a tree, our conceptions of its muscular and tactile powers can scarcely be too highly exalted. Another peculiarity in the organization of these proboscidean paehyderms has reference to the bulky aspect of the head. This feature, however, is not due to any inercased development of the brain, but simply to a remarkable extension of certain air sinuses in conncetion with the eranial boncs (fig. 69). The vertieal clevation of the forehead thus conferred upon the elephant, has led many to ascribe to the animal an almost super-quadrupedal intelligence ; but if, in this ease, their opinions arc based upon phrenologieal considerations, it is our duty to inform such enthusiasts that the frontal prominence and clevation of the cranial vertex bear no relation whatever to the bulk of the brain contained within the comparatively restrieted cerebral cavity. That elcphants possess considerable sagacity, no one will renture to deny; but that they display this mental quality in rirtue of any corresponding enlargement of the great nervous centre, is utterly inadmissible. Another interesting peculiarity in this family consists in the form and arrangement of the tceth. Ordinarily, it is stated that the dentition comprises two incisors, no canines, and three molars; but in reality the grinders arc more numerous, no less than seven being consecutively dereloped on each side of either jaw. This apparent discrepancy results from the circumstance, that only two molars are present on onc side of cither .aw at the same time; but, in the progress of growth and age, those first employed give way to a succession of similar tecth developed from behind. In like manner the two large permanent incisors are preceded by a similar pair, which, howerer, have never attained full development. Histologically speaking, the tusks consist entirely of dentine, which, on transterse scction,
exlibits an clegant serics of decussating curvilincar strix. This appearance is peculiar to the ivory of elephants, and considerably cuhances its commercial value. In a structural point of vicw, the molars arc


Vertical Section of the Skull of the Ele hant.
still more remarkable. If refercnce be made to Plate 32 , fig. 102, it will be observed that the grinding surface is marked by a number of parallel bars. These consist of alternating plates of the three different substances which ordinarily enter into the composition of the mammalian tooth ; the white bands representing plates of cnamel, each inelosing a central lamina of ivory or dentine, whilst the several outer spaces between these formations are filled up with a special osscous derelopment termed cement. In the African clephant the enamelled plates have a lozenge-shaped outline, as secn in Plate 32, fig. 101 ; in the Siberian mammoth, or Elephas primigenius, they are more numerous and closely approximated; and in the mastodon are elcrated into a series of tuberculated eones. In regard to the skelcton, we may remark the general massiveness of all the bony clements, the twenty pairs of ribs reaching backwards almost to the pelvis, the remarkable breadth of the scapula in proportion to its length, the prodigious derelopment of the external condyle of the humerus, the simple form of the femur, the peculiar articulation of the supcrior extremity of the radius, and the oddtoed, pentadactylous feet. The digestive organs are cxtremoly bulky as in herbivorous quadrupeds generally. The gall-bladder is complicated by numerous internal septa, and intimately connceted with the walls
of the intestine. The mamma are two in number, situated beneath the anterior part of the chest. lilephants herd together in considerable numbers, subsisting entirely on vegetable matters.

THE INDIAN Elephant (Elephias Indicus)see Frontispiece-is a native of the peninsula from whence it derives its specific name; and also of Ceylon, Sumatra, and Borneo. From the earliest times it has been employed as a beast of burden; and in European menageries it has ever formed one of the most attractive otjects of amnsement to natural listury loving people. It is distinguished from the African species by its oblong head, which is concave anteriorly; by the character of the enameled ridges on the crown of the molar teeth already described; by the comparative smallness of the ears; by the very short tusks of the female; by the paler colour of the hide; and by the circumstance of its having four mails on the liinder feet. It is not our intention to dwell at any length upon the habits of the elephant in a tame or semidomesticated state, otherwise we slould be led to record numerous anecdotes in which the sagacity of this animal has been very unduly exaggerated and embellished with erroneous statements. The following particulars, however, will be found interesting: "Elephants," says Captain Williamson, "lave a great dislike to eamels, though they will travel with them, when laden, willont showing it much. Nothing distresses this majestic animal more than being closely followed by a horse, especially at a canter or other quiek pace. Probably the clattering of his hoofs creates alarm. An elephant caunot bear the approach of dogs, or other small quadrupeds; and if, in proceeding through a grass jungle, game should start near lim, he will frequently evince great uneasiness. In heary covers elephants are of infinite service, their bulk, and the noise occasioned by their movements, often rousing game which would else remain seereted, and their height giving a commanding view to their riders." Elephants have likewise a particular hatred of the rlinoeeros, and can scarcely be indneed to approach within sight or smell, even though the animal be dead. Their disposition is extremely capricious in the tame state, and their mode of resenting real or fancied insults is often attended with terrible destruction to life and property. Instances of this are too well known to need illustration. For the capturing of elephants in the wild state, various methods are adopted in different parts of India. The most usual mode is by driving them into a lieddah, or large inclosure strrrounded by a deep trench and external paling, strongly built, and propped from without by large wooden beams. Several thousand natives are employed in frightening and driving them into this decor: ; but the operation is usually attended with much difiniculty. When once secured within the area, their subsequent submission and domestication is only a work of time. Another mode of taking them is ly means of koomkics or decoy elephants; these are females tanght to simulate wanton wiles; and being conducted ly their drivers to the saun, or isolated male, which they propose to take, the mususpecting beast is secured by the malouts whilst engaged in the all-
absorbing pleasures of courtship and fancied secrecy. Ropes being passed round his legs, and the hind pair haring been fastencel to a tree, the drivers now steal from beneath his body, and the koomkies leave the least to his fate. On defecting the suare, he becomes perfeetly furious, destroying whatever may be in his way, "tearing up the tufts of grass by the roots, rending from the tree such branches as may be within his reael, and eventually straining to throw down the tree itself by his weight, or to pull it up with his trunk. In short, his whole powers are in action on this occasion; and it is not until being completely overcome with fatigue, and nearly dead from liis natural tliirst, which is greatly augmented by constant roarings, that he sulsides into a sort of tranquillity:" In a day or two he takes food from the mahouts who constantly visit lim; and at lengtl he permits himself to be conductel to the home of the successful proprictor. A third mode of capturing the elephant is lyy means of the phecun or slip knot. This consists of a stont rope, ten or twelve yards long, and at least an inch in thickness, with a sliding noose at the free extremity. A single small-sized elephant being selected out of a herd, a skilful mahout, mounted on a tame elephant, gives ehase; and throwing the loop over the animal's head, he soon moderates or ehecks its progress by tightening the cord. The breatling bceoming straightened, the driver is not long in aequiring entire control over his captive, which is ultimately conducted to a place of security. A fourth plan consists in digging pits; luut this method is lighly objectionable, as the animal sometimes sustains irremediable injury. Before coneluding we may remark that the Indian elephant rarely exceeds nine feet in height ; the average stature being about eight feet at the shoulder. The tallest specimen ever known in Bengal measured, it is said, nearly twelve fect, and was proportionately bulky. Mr. John Corse, however, who kept a large establisliment for the rearing of elephants at Tipperall, has stated, in a memoir communieated to the Royal Society in 1799, that the largest species he ever heard of did not exceed ten feet six inelies. The same authority states that the period of gestation in the female, extends over a space of twentytwo months; only one young becing produced at each birth.
THE AFRICAN ELEPHANT (Elephas Afficamus) ocenpies an extensive range in the interior plains and forests of the continent from whence it derives its specific title. As already linted, it is at once distinguishoch from the Asiatic spreeies by the remarkable size and expanse of the ears, by the presence of well-developed tusks in the fomale, ly the darker aspect of the skin, by the lozenge-shaped ridges of enamel on the erowns of the molar teeth, and by the presence of only three nails on the hinder feet. The male attains a height of twelve feet at the shoulder, and is on an average taller than its Indian congener; its tusks are much larger, measuring between eight and nine feet in length, anl weighing upwards of a lundred pounds, those of the female being four feet long. The weight of ivory of rarious kinds ammally brought over to this country is said to amount to foir hundred and sixtr-cight tons, which is equivalent to a sum of about $\{300,000$ sterling;
and as it also appears that at least fifty-two thousand elephants' tusks are imported, it neeessarily follows that twenty-six thousand of these gigantie animals are yearly put to death to satisfy our demand for its raluable ineisor teeth! If the present species, therefore, did not oecupy an extensive area of distribution, a very few years would, at this ratio of destruetion, suffice to render it altogether extinet. The improvements in fire-arms have rendered the slaughter of this beast a matter of comparative ease; and looking back on the page of listory, it is not a little curious to observe the ridicule east upon the statements of those who first, single-handed, undertook hunting expelitions into the interior of Africa. We even find the distinguished author of the "Oriental Field Sports" severely questioning the veracity of Monsieur Vaillant, who, at the elose of the last century, pullished an account of his sporting successes in the plains of the great African continent. "No native of Bengal, nor any European resident there," says Captain Williamson, "would undertake such a piece of rashess as to go out shooting wild elephants!" Time, however, silently works progress, and our libraries now teem with records of daring adventure with this most formidable proboscidean pachyderm. Dr. Livingstone has borne testimony to the substantial accuraey of Mr. Gordon Cumming's writings, and we are not aware that any one has thought it necessary to doubt the no less remarkable statements and experiences of Mr. Charles John Andersson. Some of Mr. Cumming's exploits appear to have been accompanied with unnecessary cruelty, which is the more to be regretted, as, under ordinary circumstances, the manifest sufferings of these huge mammals in the agonies of death should be sufficient to excite sympathy, and induce the sportsman to deprive them of life in the swiftest mamer possible. The behaviour of the young when deprived of a parent is particulanly worthy of remark. Thus, Captain Harris having shot a female elephant whilst hunting in Cashan mountains, was much struck with the subsequent conduct of its helpless calf. It was about three and a half feet high, and emerged from a bush, uttering mournful notes. "We had observed the unhappy little wretch," he says, "hovering about its mother after she fell, and having probally been unable to overtake the herd, it had passed a dreary night in the wood. Entwining its little proboscis about our legs, the sagacious creature, after demonstrating its delight at our arrival by a thousand ungainly antics, accomparied the party to the body of its dam, which, swollen to an enormous size, was surrounded by an inquest of vultures. Seated in gaunt array, with their shoulders shrugged, these loathsome fowls were awaiting its decomposition with foreed resignation; the tough hide having deficd all the efforts of their beaks, with which the cyes and softer parts had been rigorously assailed. The eonduct of the quaint little calf now became quite affecting, and clicited the sympathy of every one. It ran romnd its mother's eorpse with touching demonstrations of grief, piping sorrowfully, and vainly attempting to raise her with its tiny trunk. I confess I had felt eompunctions in committing the murder the day before, and now half resolved never to assist in another; for, in addition to
the moring behaviour of the young elephant, I had been unable to divest myself of the idea that I was firing at my old farourite, Moulct-Bulihsh, from whose gallant back I liad vancuished so many of my feline foes in Guzerat." The captain, nevertheless, recovered himself sufficiently to assist in hewing out the tusks, an operation of no small difficulty even in the female. The elephiant calf was next conducted to the waggons, but perished in the course of a few days, as did two others much older, which they afterwards captured. This also leads us to remark, that, notwithstanding the anxiety which naturalists have displayed in regard to the importation of a living African elephant, and the care with which they have condueted the preliminary operations, all their efforts have as yet failed to prove successfinl. In a very recent attempt, the young proboscidean perished before it liad left the shores of its native comntry. With regard to the experienees of other Afriean adventurers, some of them possess a thrilling interest, and to those whose conceptions of the delights of hunting rise in proportion to the narrowness of escapes encountcred, we particularly commend the following most extraordinary adventure:-On a magnificent tropical moonlight night, Mr. Andersson, alone, as usual, took up his position on a narrow neck of land between two pools of water. He was protected ly a smail slü̈rm, built of stones, and had with him two or three guns and a blanket. Presently a noise like the passage of a train of artillery broke upon his ear, and an immense elephant appeared, followerl ly others, to the number of eighteen. "Their towering forms told me at a glance," says Mr. Andersson, "that they were all males. It was a splendid sight to behold so many huge creatures approaching with a free, sweeping, unsuspecting, and stately step. The somewhat elevated ground whence they emerged, and which gradually sloped towards the water, together with the misty night air, gare an increased appearance of bulk and mightiness to their naturally giant structures. Crouching down as low as possible in the skïrm, I waited, with beating heart and ready rifle, the approach of the leading male, who, unconscious of peril, was making straight for my hiding-place. The position of his body, however, was unfa vourable for a shot; and, knowing from experience that I had little chance of obtaining more than a single good one, I waited for an opportunity to fire at his shoulder, which is preferable to any other part when shooting at night. But this chance, unfortunately, was not afforded till his enormons bulk towered abore my head. The consequence was, that while in the act of raising the muzzle of my rifle over the skärm, my hody eaught his eye, and, before I could place the piece to my shoulder, he swung himself round, and with trunk elerated and ears spread, desperately charged me. It was now too late to think of flight, much less of slaying the savage beast. My own life was in imminent jeopardy; and seeing that if I remained partially crect he would ineritally scize me with his proboscis, I threw myself on my back with some riolence, in which position, and without shouldering the rifle, I fircd upwards at random towards his ehest, uttering, at the same time, the most piereing shouts and eries. The change of position in all human
probability saved my life, for, at the same instant, the trunk of the enraged animal descended precisely on the spot where I had been previously couched, sweeping away the stones, many of large size, that formed the fore part of my skeirm, like so many pebbles. In another moment his broad fore-fect passed directly over my face. I now expected nothing short of being crushed to death; but imagine my relief when, instead of renewing the charge he swerved to the left, and moved ofl with considerable rapidity-most happily without my having received other injuries than a few bruises, oceasioned by the falling of the stones." Notwithstanding all this, Mr. Andersson suatched up another rifle, and, taking aim, pulled the trigger, when the piece missed fire ; had this happened in the first instance, nothing could have prevented his immediate destruction !

## Fanily II.-mifinocerid A.

The Rhinoceroses are at once recognized, not only by their peculiar solitary or clonble horms, but also lyy their thick, seabrous, tuberculated skin, which, falling into distinct folds over various regions of the body, resemoles an artificial defensive armature. The horns are strictly integumentary, being composed, as it were, of mumerous bristles firmly bound and incorporated together. The heal is much elongated; the jaws supporting, in young individuals, thirty-six tecth, that is, cight incisors and twenty-eight molars. Of the latter, those in the upper division have subquadrate crowns, surmounted by two transverse ridges; whilst the crowns of the lower series are narrower, more elongated, and marked by curved lines, whose concavity is turned inwards. The superior incisors are much compressed, and directed obliquely forwards; those of the lower jaw being large and pointed. The outer incisors above, and the two inner below, are very small and concealed. Among the principal skeletal peculiarities, we may mention the remarkably thick, rough, elevated, and arched nasal bones, the general massiveness of all the osscous clements, the presence of nineteen pairs of ribs, the complete development of the ulna and fibula, the forked spine of the pelvis, and the existence of only three series of digital phalanges. The digestive canal is about eight times as long as the cutire body. Fhinoceroses feed upon coarse herbage, and are natives of the warmer regions of the Eastern hemisphere.
the indian rhinoceros (Rhinoceros Iulicus) is the species best known-Plate 25, fig. 80-and was formerly termed $R$. unicomis, in contradistinction to IR. bicornis; but, as Van der Hoeven has very justly remarked, these terms onght no longer to be retained, because we are now acquainted with six or seven distinct species, two of them being furnished with a single hom each, and the others with two horns. The species under consideration enjoys a pretty extensive range in Eastern India, Siam, and Cochin China, being especially abundant on the borders of the Ganges. It is chiefly found in dense jungles and shady forests, far from the haunts of man. It is remarkably savage, and attacks eleplants without the slightest compunction; and
seems to take a wanton delight in destroying every living creature that comes within its reach. This animal has a singular habit of dunging in one spot; and these high dung-heaps, while they serve the purpose of indicating to other animals that danger is nigh, also afford to the native sportsman a meaus of guiding him as to the best spot for erecting platforms from which he secures his rietim. I'he skin of the Indian Rhinnceros, when dried, will take a high polish, and as it is more or less capable of resisting the force of a leaden bullet, fetches a high price; the fat is also much used by the native doctors as an unguent.

THE JAVANESE RHINOCEROS (Rhinoceros sonduicus) also possesses ouly a single horn. It is distinguished from the preceding, however, by the compratively slender head, by the proportionally clevated legs, ly the character of the dermal armour, consisting of numerous jolygonal scutes, whose centres are depressed and give origin to short bristly hairs, the ears being also bordered by long, stiff, and closely-set bristles. The tail is hairy muderneath. By the Jaranese this animal is also called the Wurak, and it is sometimes described as Rhinoceros Javanus, a title given to it by F. Cuvier; the one here adopted being that employed ly Baron Cuvier and Dr. IIorsfield. According to the latter, the Warak is grecgrious in its halits, and forms decply excavated retreats along the declivities of mountains and hills. It docs not appear to possess the ferocious character of its Indian congener ; but at nighttime it frequently causes scrious damage to coffiee and pepper plantations.
THE SUMATRAN RHINOCEROS (Rlinoccros Sumatrensis) posscsses two horns, and was formerly confounded with one or other of the African species. The posterior horn is very short, conical, and placed a little before the eyes. The hide is rough and slightly provided with hairs; the foldings of the skin lueing quite inconspicuons. It is shy in disposition, and is seldom seen near the haunts of men.
bruce's rhinoceros (Rhinoceros Africanus) is the form most commonly known in Africa, and is more frequently described moder the vague titles of the African and the Two-lormed Ihhinoceros. It is the Gargatan, or Rhizaster of the Cape Colonists, the ChuFuroo of the Matalili, and the Borele of the Bechuanas. Neither of the homs are of very great length, the posterior one being comparatively short; both lave a greenish-brown tint. The hide exhibits a yellowish-brown colour, being flesly underneath, and not furnished with folds. The tail is about two fect long, and bristly at the tip. The habits of Bruce's Rhinoceros closely resemble those of the Indian species. It is remarkably sarage and dangerous to approach when wounded. Mr. Andersson mentions an instance where some Namaquas had shot one of these animals as it was rising from its sleep. One of the party, imagining it to be dead, approachecl, mounted, and stabbed the carcase. "The beast, however, had only been stumned; and as soon as he felt the cold steel enter his body; he started to his feet and made off at full specd. T'his action was so instantancous as to prevent the man from dismounting, whilst the other Namaquas were paralyzed with fear. Fortmately,
however, after the beast had run forty or fifty paees, he suddenly stopped short, and looked round. The favourable opportunity was not lost; for one of the
party, more eourageous than the rest, instantly fired, and, as good luck would have it, brought the animal to the ground with his terror-strieken rider elinging to
lig. io.


Burchell's Rhinoceros (Phinoceros simus).
his baek." The same distinguished traveller remarks, that when the Rlinoceros is shot, it usually falls forward on the knees, and not on its sides-a result which secms explicable from the great breadth of the body combined with shortness of the limbs. The Gargaten feeds on the shoots, roots, and young branches of the wait-a-bit thorn.

SLOAN'S RHINOCEROS (Thinoceros Keitloa) is better known as the Kcitloa, and easily distinguished by its homs, which are nearly of equal length ; the anterior horn being cylindrical, and curved backwards near the tip; the other compressed and almost straight throughout. The hide exhibits a brownish-yellorr colour, pretty elosely resembling the above; but there is a black mark on the inside of the thigh. Both these speeies are commonly termed "black," in eontradistinction to the two succeeding white species. The Keitloa is an extremely morose, sulky, and sarage beast, and when wounded becomes perfectly maddened with rage. Mr. Andersson nearly lost his life by the repeated attacks of a female, whose leg he had broken by a shot. One of her horns ripped up his right thigh from near the knee to the hip; and having sustained at the same time severe bruises and internal injury, his ultimate reeorery was only effecterl after prolonged and painful suffering. The Ficitloa is rery swift of foot. Notwithstanding their apparent ungainliness, all the rhinoeeroses possess the porrer of rapid progression to a greater or less extent.
bURCHELL'S RHINOCEROS (Thinoceros simus) is known as the White Rhinoceros, or the Witte RhinVol. I.
aster of the Cape Colonists; beiug also termed the Chicore by the Matabili and Monoolino by the Bechuanas (fig. 70). It is distinguished from the foregoing, not mercly by the pale whitish-brown colour of the hide, but more particularly by the remarkable elongation of the head, which measuring about four fcet from the muzzle to the cars, nearly equals one-third of the eutire length of the body! It is also further characterized by a much greater bulk and sizo, as comparert with the above; the nose heing likewise square-shaped. The full-grown anterior horn is three feet in length, sharp at the point, and curred backwards. The disposition of this species is comparatively mild; and, unlike that of its blaek congeners, its food consists entircly of grasses.

OSWELL's RHinoceros (Rhinoceros Oswellii) was, in the first instance, scientifically indicated as a distinet species by Dr. J. E. Gray of the British Muscum. By the Bechuanas it is termed the Kobaabe. In point of size and general appearance, this animal closely resembles the foregoing; but, obserres Mr. Anderssori, "it is with regard to their horns that the two species chicfly differ from cach other; for whilst the anterior horn of the monoohoo has an arerage length of two or three feet, emrving backward, that of the Kiobaaba not unfrequently exceeds four feet, and is slightly pointed forward, inclining from the snout at an angle of fortyfire degrees. This rhinoceros is also the rarer of the two, and is only found in the more interior parts of Sonth Africa." The posterior horn is about a foot long, short, conical, broad at the base, and narrow at the 2 A
tip; the extromity of the anterior horn boing slarp, and worn away in front by friction on the ground.

## Family III.-IIIPPOPOTAMID E.

The Hippopotamuses formerly occupied an extensive area of distribution, as may be gathered from the numerons fossil remains occurring in the tertiary beds of Great Britain and Europe. At least five or six distinet species have been indicated. Taking our living Afriean example as a type of the family, its principal distingnishing characteristies may bo deseribed as follows. 'The body is clothed with an almost naked skin; the abdomen nearly reaching to the ground. The head is broad and flat, and furnished with thirtycight or forty tecth; there being eight incisors, four eanines, and from twenty-four to twenty-cight molars, according to the age of the animal. The inferior incisors project horizontally forwards, the central pair being the longer. The worn crowns of the large eanines are perfectly smooth and opposed vertieally. The posterior molars are large and complieated. The ears are romarkably short; the head terminating anteriorly in a broad, abrupt muzzle, whilst the nostrils are much clevated. The feet are tetradactylous, the digits being armed with small hoofs. The tail is short. IIippopotamuses aro heavy, awkward-looking animals on land ; but they display a singular agility and gracefnlness of motion in water. Aquatic plants, and especially grasses, constitute the bulk of their food.

THE HIPPOPOTAMUS (Hippopotamus amphibius)Plate 25 , fig. 81 -is an animal which has always been regarded with considerable interest, although its uses to man are not of the highest order. It is faniliarly known as the River-horse; and is the Barnich of the Nubians, the Sea-cow or Zcc-Koe of the Cape Colonists, and the Imfooboo of the Caffres and Matabili; it is probably also the Behemoth of sacred history. $\Lambda$ full. grown male Hippopotamus sometimes attains a length of nearly twelve feet, whilst the girth of its body measures searcely less. The liide exhibits an inky-brown colour generally, being at the same time more or less tinged with a fleshy redness about the mouth and inforior parts. The latter tint is very marked in young individuals. The habits of this extraordinary creature have been studied from the earliest times, and almost every African traveller of modern date has contributed something to our knowledge of its powers. Burehell, Burcklıardt, Harris, Smith, Cumming, Livingstone, Andersson and others, have witnessed its sportive wiles in the reedy streans of its native land; whilst at home naturalists have been amply rewarded by watehing the behaviour of the two fine examples preserved in the Zoological Society's Gardens, Regent's Park. The Parisians enjoy a similar advantage at the Jardin des Plantes of the Fronch capital, and they have cven witnessed the birth of two young; but on both occasions tho jealons mother sacrificed her much admired offspring! The first was born in May 1858, and its death resulted, perhaps, rather from accident than intention; for, we are informed, that after swimming about a while it attempted to get on dry gromud; but the deseent from the sleeping apart-
ment into the bath not being sloped, it experieneed some diffieulty in raising itself from the water; and whilst the mother was engaged in assisting it to clamber up the steps, she bruised and otherwise injured the body to such an extent that the poor little creature died the same crening. The sceond jurenile behemoth perished from injuries inflicted by the mother some days after its birth. In the hope of rearing a young Hippopotamus in England, the Zoological Society has spared neither pains nor expense to render the pair in their monageric comfurtable in each other's socicty. It is satisfactory to observe that the favoured couple live amieably together; but whether it be owing to the chilling influences of our cliangeable climate, or to prudential motives resulting from hippopotamine reasonings, or to other circumstances which invalidate the procreative function-we believe we are correct in stating that no reciprocations of affection lave yet appeared sufficiently demonstrative to afford a bolict that the authorities in question are at present likely to be rewarded for their trouble. In the wild state these animals display extreme solicitude for their young, which they earry on their necks while in the water; and, as the ealves camnot remain long submerged, the mother rises more frequently to the surface when her offspring is with her. Whilst tending her young the female cannot be carelessly approached, and she will vigoronsly defend her offspring. All who have read Dr. Livingstone's "Travels" will remember the partial capsize and wetting he and his Makololo companions sustained from the infuriated rush of a female Hippopotamus, "whose young one had been speared the day before." Mr. Andersson and Captain Owen record similar eatastrophes. The formor says-"An immense Hippopotamus, with its calf, mehsed out from amongst the reeds where she had been conecaled, and, passing under our raft, almost immediately afterwards made her appearance on the surface of the water. Upon sceing this, I lost no time in firing ; but, though to all appearance mortally wounded, we lost sight of her at the time. A few minutes afterwards, however, on coming to a bend of the river, we fell in with the eanoe that had been sent on bottom upwards; and found, to our great consternation, that the wounded beast in going down the stream had eaught sight of the canoe, and, instantly attacking it, had with one blow of her head eapsized it. The men sared themselves by swimming; but all the loose artieles were either lost or spoiled by the water." In the instance mentioned by Captain Owen, the boat was completely smashed, and sank; but, as in Dr. Livingstone's ease, being close to the shore, all succeeded in landing safely. The Hippopotamus is nocturnal and gregarious in its habits. Large herds, to the number of thirty or forty and upwards, are frequently seen at one spot, some snoozing on the bank, and others noisclessly gliding through the limpid waters. They love a still reach of the stream, "and prefer to remain by day in a drowsy; yawning state; and though their eyes are open they take little notice of things at a distance." Dr. Livingstone adds, that "the males nitter a loud succession of snorting grunts, which may be heard a mile off." Among the rarious modes of
destroying this persccuted animal, that of shooting them is of course the most effective; neverthcless, the sport is attended with much difliculty, as, when in the water, they are only vulncrable immediatcly behind the car. Like the Egyptians of old, the present native Beyeye employ the harpoon, and our unhappy behemoth is drawn out of the water in all the agonies of a helpless resistance. On land the harpoon is also employed as the principal part of a trap called the "downfall." The instrument, loaded with heary weights, is suspended from the bough of a tree, and is in commection with a string below, which being touched by the beast causes the weapon to descend on its luckless pate. The IIppopotamus is also tilken in pitfalls. Its flesh is palatable, and very highly csteemed. The hide is extensively employed in the manufacture of whips or sjamboks; whilst the canine teeth are especially valuable for making artificial tecth, the ivory fetching as much as thirty shillings per pound. For these reasons, multitudes of hippopotamuses are destroyed annually.
Some naturalists believe that a smaller kind of hippopotamus fonnd in certain parts of Western Africa ought to be regarded as a distinct species. This form was first described by Dr. Morton under the title of Hippopotamus minor, and subsequently as Hippopotamus libericusis. One of its distinguishing peculiaritics consists in the presence of only two incisor tecth in the lower jaw. Dr. Leidy has given a minute description of its ostoological characters in the second volume of the Journal of the Academy of Nutural Sciences of Philadelphia. It has even bcen regarded as the type of a new genus.

## Fimily IV.-TAPIRIDA.

In their gencral appearance the Tapirs manifestly approach the pigs, whilst in respect of conformity to type, their considerable bulk, associated with a proboseidiform muzzle and more cxalted stature, retain a cogency of derelopment sufficient to indicate their transitional character. If the skull of an American Tapir be


Skull of the Tapir.
cxaminel, its form will be seen to represent a pyramid having three facets, whereas that of the hog has four. A more significant feature, however, obtains in the clevated and arched character of the nasal bones, and in the lofty interparictal ridge surmounting the rertex of the cranium (fig. 71). The jaws are furnished with forty-two tectly; that is to say; twelve incisors equally divided abore and below, four canmes, and
twenty-six molars, of which latter, scven occur on cither side in the upper series. A wide interval separates the canines from the premolars. The spinal column possesses only four lumbar vertebree; but there are twenty pair of ribs. The hladebone of the shoulder exhibits a decp, circular notch at its anterior margin; the homologically corresponding bone of the lip, or ilium, being T-shaped. The anterior limbs are furnished with four digits; but the hind fuct are tridactylous. The fossil gems Peleotherium has three toes on all the feet. The Tapirs are found inhabiting the recdy forests of tropical 1 sia and America, where they feed on grass and herbage.

THE COMMON TAPIR (Tipirus Americanus)-Plate 25 , fig. 82 - is a native of South America, and, though found in all parts of the continent, from the Straits of Magellan to the Isthmens of Darion, is more particularly abundant on the east coast of the continent. It stands rather high on the legrs, and frequently attains a length of six feet from the extremity of the prolioscidiform muzzle to the root of the tail. The hide has a deep-hrown colour approaching to black, leeing scautily furnished with short hairs closely applied to the surface of the skin. The cars are of moderate size, the cyes small, and the muzzle extremely attenuated and prolonged into a proboscis, which is naked and flesh-coloured at the tip. The neck is surmomed by a short, bristly, black manc. The tail is insignificant. The Common Tapir is monogamous and noctumal in its habits. Sclecting the decpest recesses of the forest, it snoozes lazily during the day, and when the shades of croning gather darkness, it wanders furth to commit its nocturnal depredations along the grassy and luxmrious slopes of a neighbouring stream. Herbs of ceery sort seem to be deroured without much selective care ; and, swinclike, it occasionally swallows putrid recretable matters, as well as all kinds of garbage. A tame specimen in the possession of D'Azara hroke open and demolished the contents of a silver snufi-hox! Even in the wild state, their stomachs have been found to contain rarious eartly products, besides picees of wood and pebbles. The Tapir is possessed of very considerable strength ; it naturally cyhibits a mild disposition, but when attacked offers a stont resistance. It is casily domesticated. The flesh is coarse and insipid.

ROULIN'S TAPIR (Tupirus villosus) is also an inhabitant of South America. It is found, howerer, on mountainous slopes uprrards of four thousand fect alore the level of the sea. In some respects it is said to approach more closely to the Malayan sjeccies. The lide is of a dark black colour, and thickly clothed with hair. The nasal bones are more elongated than in other existing species-constituting a feature which occurs more markedly in the extinct genus above mentioned.

THE MALAYAN TAPIR (Tapirus Malayames) or Bari Alu, is a native of Sumatra, Bomeo, and the Malaccas. It is a comparatively rare and unknown animal, and was first introduced to our notice by Major Farquhar in 1816. Subsequently Sir T. Stamford liaftles communicated a more detailed account of this animal, which was pullished in the thirteenth rolume of the Limman Socicty's Transactions for 1821. IIc
writes as follows-"The Malay Tapir resembles in form the American, and has a similar flexible proboscis, which is six or eight inches in length. Its general appearance is heary and massive, somewhat resembling the hog. The eyes are small. The cars are rounded and bordered with white. The skin is thick and firm, thinly covered with short hair. There is no mane on the neck, as in the Ameriean species. The tail is very slort, and almost destitute of hair. The legrs are short and stout, the fore-feet furnished with four toes, the hind feet with three." The most characteristic feature, however, has reference to the colour of the hide; which has a deep glossy black lme generally, but is white on the rmmp, baek, and sides of the belly, the line of demarcation being clearly defined. In the young state it is for the lirst three or four monthis more uniformly blackish above and white moderneath, being at the same time "loeantifully marked with spots and stripes of a famm colour." The young specimen domesticated by Mr. Farquhar became so exceedingly familiar, that it was wont to feed, like a peited dog, on bread, cake, and all kinds of vegetables. A full-grown female measures upwards of eight feet from the tip of the nose to the base of the tail. The male is somewhat smaller.

## Family V.-SUID Fi.

The various mombers of this family are familiarly known as swine, and are with few exceptions characterized by the possession of four toes on each foot, the anterior digits being furnished with strong hoofs; while
the posterior pair, which barely reach the ground, are likervise ungulated (Plate 33, fig. 108). The number of teeth varies; but the eanines of the male are usually more or less conspicuous externally. The head is prolonged in front into a mobile truncate, snout. The tail, on the uther hand, is short, or only rudimentary. The skull presents the form of a quadrangular pyramid, whose apex is represented by the extended muzzle. In the wild state swine are mostly found in low marshy furests.
THE WILD BOAR (Sus Scrof $(t)$ is the progenitor of all our common swine; in form and gencral appearance it does not differ very materially from our domestic $\operatorname{hog}$ (fig. 72), which has the skull rather more elevated. When provided with its full complement of teeth there are twelve incisors, cqually divided above and below; four exserted, prism-shaped, recurved canines, and twenty-cight molars-in all, forty-four. The premulars are more or less compressed; the posterior grinders being tuberenlated. The Wild boar is an iuhalitant of the furests of Asia and Europe generally; and although no longer known in this comntry, it was formerly found in Great Britain, and probably also in Sweden and Denmark. It is an exceedingly fieree and vindietive animal, eapable of inflieting severe wounds on its encmies-be they men, horses, or tigers. It is duultful whether the hunter experiences so much danger in pursuing the larger Carnivora as he dues in chasing the wild log. In India, however; this sport is much in rogne, and attended with varied excitement. During the hunt, "it is extremely common to sce a party divide after

Fig. 72.


The Tame Poar (ㄷus Scrofa).
various hogs, cither started at the first from the same cover, or roused in the progress of clasing a single one. Where it is known that two or more are in the bund, eane, \&e., which is beating, a portion of the horsemen follow the horse that starts, learing ticcir comrades to manage the remainder. Nothing can execed the interest created when, as sometimes occurs, two or three parties are following each their respective game. Some may be seen spuring on with the utmost
energy; others pulling hard to restrain their frightened or too impetuous steeds; perhaps one or more in different stages of falling ; others stopping to dismount and recover spears which had missed threir oljeect; and crentmally a successfnl Nimrod triumphing over his fallen rictim." Captain Williamson also adds, that "hunted hogs, and indeed sometimes as a matter of caprice those not disturbed, will attack any ohject they may chance to sce, sneli as peasants, cattle, ifc. They
are greatly attracted thereto by any attempt which is made to eseape from them. Such as trust to their speed are for the most part soon overtaken, and receive a cut of the tusk in each thigh, the boar putting his nose between their knees, and giving them a violent toss!" For the greater part of the year the boar is found alone, but during the spring hunters often come upon a pair and their litter. At such times the sow offers no inconsiderable resistance, and frequently punishes her enemies with a remarkably scvere bite. One which attacked Captain Williamson seized him by the foot, which, on being suddenly withdrawn by the hunter, left part of the boot in her mouth! During the season of love, the boars display towards each other the most ungovernable animosity. The period of gestation extends over a space of one hundred and twenty days, the domestic sow producing from ten to fourteen pigs at a single litter. The voracity and destructive habits of the hog are too well known to require description. According to Vander Hoeven, single-hoofed varieties exist in the neighbourhood of Upsal, and also, it is stated, in some parts of Hungary. Into the merits of pork we do not enter; nevertheless it is fortunate that multitudes of people enjoy a food which is so easily accessible. As to its ancient prohibition in the East, one might almost be inclined to believe that it was originally forbidden on account of the pig's liability to be infested with young cystic larvae or scolices of the common tape worm fuund in man; and yet it is perhaps neeessary that the Tunia solium should dwell in its human host; and therefure meazled pork is occasionally eaten! We cannot here further discuss this curious question.

THE MASKED BOAR (Sus larvatus), or Boscii-vark is an inhabitant of the plains and forests of Southeastern Africa, the Cape, and the island of Madagasear. It is a large animal, between five and sia feet long, and standing about two feet four inches in height at the sloulder, presenting a truly formidable appearance. Its hidcousness is much increased by the presence of two nipple-like warty excrescences on either side of the muzzle ncar the tusks; these are supported on bony protuberances. The canines are large; the superior pair projecting horizontally. The hide exhibits a dirty brown colour, and is furnished with bristles which have a more marked development on the neck and back. The tail is about a fout long and tufted at the extremity.
the papuan boar (Sus Papuensis), or Beae, is a smaller species, searcely cxeeeding half the length of the preceding, and of a much more slender build. It is tolerably abunlant in the forests of New Guinea. The superior canines are comparatively feeble, resembling the incisors. The lide is clothed with short, stoutish bristles, which are ringed with black and white, the skin of the young pig is brown, the back being marked by five jelluwish bands. In the young state these animals are captured and reared by the natives fur fool; the pork being highly esteemed, nut only by themselves, but by European culunists also.

THE BABYROUSSA (bubirussa aifurus) is an inhabitant of Celebes, Buurou, and other casterly islands of the Indian Archipelago. By the natives it is absurdly called the star-hog, from its standing rather high upon its legs; and the erroneuns figure given by liso in his edition of the "Natural History of East lndia,"

Fig. 73.


The Babyroussa (Babirnssa alfurus).
by Bontius, is calculated to give foree to this palpable misnomer. The jaws are furnished with thirty-two tecth ; that is, eight incisors, four canines, and twenty molars. The canines of the upper jaw are enormously enlarged in the male; and, ascending from their sockets,
which are also directed upwards, they areh orer the face, their crowns being dirceted hackwards and downwards. The corresponding tusks of the lower jaw are also very conspicuously dereloped (fig. 73). The eanines are not enlarged in the female, and she exhibits a more
slender build generally. So far as we are aware, the use of the large tusks in the male have not been satisfactorily explained. Those of the lower jaw are doubtless intended as defensive and offensive weapons; but as the superior pair often reenrve sufficiently to toueh the forehead, they camot prove very formidable instruments of attack. It seems scarcely enough to say that they are designed to protect the eyes from injury during the animal's progress through thick bushes; and there seems more aptness in the old notion that they are employed to support the liead by suspension to a bough, whilst the animal is slecping in the standing posture. This idea, however, rests more upon theory than upon observation.

THE ETHIOPIAN WART-HOG (Placocluctus AElliopicus) Arrican Boar, Ingooloolb, or Thlke-Valik, is an imhabitant of the Cape of Good Hope. In common with its congeners, it is claracterized by the possession of a large skull, fumished with frightful-looking tusks; those of the upper jaw are enormously developert. The teeth vary in number, the ineisors being usually absent in this speeies. The eanines are directed upwards and outwards. The molars of the permanent series are twenty in number; that is, five on either side abore and below; but twelve of these become deciduous, so that in the old animal only eight may be present. The last grinder is remarkably clongated, and consists of mmerons eylindrieal tubes of dentine and cnamel, cemented together. The Wart-hogs are provided with thick, flesliy, wen-like lobes on the checks, which, associated with the prominent warty excrescences below the small, sinister-looking eyes, impart additional hideousness to these animals. The

Valke-vark is about two feet six ineles high at the shoulder, and nearly five feet in length. The hide exhilits a reddish-brown colour; the upper parts being clothed with long stiff bristles-tlrose on the erown of the head radiating, as it were, from a common eentre. The muzzle is broad and truneated abmptly. The tail is about twenty inches long, very narrow, and tufted at the extremity. The Talke-vark is gregarious in its halits.

ELIAN'S WART-HOG (Phacocharus AEliani) cnjors a more extensive area of distribution over the African continent than the above; examples haring been procured from Cape Verd, New Guinen, Abyssinia, and the Mozamlique. It is also called the IHaruju, or Hollup, and is readily distingnished from the foregoing ly the presenee of incisor teeth in both jaws, of which there are generally two above and six below; the bones of the forchead being also slightity depressed in this animal, but convex in the valke-vark. The hide exlibits an carth-brown colour, and is sparsely eluthed with bristly hairs, exeept along the central line of the neck and back, where they furm a well-developed mane, whose individual bristles are eight or mine inehes in length. A single lair loulb commonly gives origin to several bristles. The tail is nearly maked, but tufted at the tip, as in the above. Both species live upon roots and bulbs which they grub up with their powerful tusks, aided by a leneeling posture to facilitate the wedge and lever-action of the snout.
THE COLLARED PECCARY (Dicoty?es torquatus), or Tajazou, is a small kind of log, living in Mexico and the southern distriets of the United States, being at the same time more extensively dispersed over the

Fig. 74.

eontinent of Soutl Ameriea. The members of this genus differ from ordinary pigs in several interesting particnlars:-Firstly, the hind fect are tridactylons; the outer toes being absent. Secondly, the metacarpal and metatarsal bones of the large anterior digits are
elosely united. Thirdly, the eanine teeth, thongle welf developed, do not project from the moutll externally. Fourthly, the loins support a peculiar gland which exhales a fetid odour. Fifthly, tlure is no tail; its place being occupied by a slight prominence or
tuberele. Some other minor peeuliarities exist; and Cuvier mentions that the aorta, or prineipal arterial trunk of the body, is very commonly enlarged or aneurismal at different parts of its course. This, however, is elearly an abnormal state, for whieh it is not easy to account, unless, as in the similar case of the ass, it be owing to the presence of parasites in the blood of the kind, belonging to the genus of Entozoa ealled Strongylus. The habits of the Collared Peecary are similar to those of swine in general ; its food consisting of roots, bulbs, aeorns, and other fruits, earthworms, grubs, and insect larve of all kinds, found in or upon the damp marshy soils, where this animal delights to wallow. Although the Tajazon has been domesticated, its flesh is not sufficiently soft and palatable to be employed as a substitute for common pork; and were it more pleasant it eould seareely supplant the ordinary hog; as the female only produees two young at a birth, and a full-grown individual seldom exceeds fifty lbs. in weight.

THE WHITE LIPPED PECCARY (Dicotyles laliatus), or Tagnicate, is a larger species, weighing almost double that of the Tajazon, with which, however, it was formerly confounded. It is readily distinguished by the pale eolorr of the lips, the rest of the hide being brown as usual; it is also of a stoutcr build, the snout being likewise more prolonged and expanded at the tip. For an interesting account of the habits of this animal we are indebted to Mr. Bennett, who observes that the White-lipped Pecearies, unlike the former, "eongregate in numerous bands, sometimes amounting, it is said, to more than a thousand individuals of all ages. Thus united, they frequently traverse extensive districts ; the whole troop occupying an extent of a league in length, and directed in their march, if the accounts of the natives are to be eredited, by a leader who takes his station at the head of the foremost rank. Should they be impeded in their progress by a river, the ehief stops for a moment, then plunges boldly into the stream, and is followed by all the rest of the troop. The breadth of the river and the rapidity of the current appear to be but trifling obstaeles in their way, and to be overeome with the greatest facility. On reaching the oppositc bank, they proceed directly on their course, and eontinue their mareh even through the plantations which, unfortunately for the owners, may happen to lie in their way, and which they sometimes eompletely devastate by rooting in the ground for their favourite food, or devouring such fruit as they find there. If they meet anything unusual in their way, they make a terrific clattering with their teeth, and stop and examine the object of their alarm. When they have ascertained that there is no danger, they eontinue their route without further delay; but if a huntsman should renture to attaek them, when they are thus assembled in large numbers, he is sure to be surrounded by multitudes, and torn to pieces by their tusks, if he is so untwise as to neglect his only chance of escape, whieh consists in elimbing a tree, and thus getting fairly ont of their reach. The smaller bands are by no means equally courageous, and always take to flight at the first attaek." The White-lipped Peecary appears to belong exclusively to South America, being very abundant in the provinees of Guiana and Paragnay.

## Family VI--HYRACID $\mathbb{E}$.

The group of small quadrupeds assoeiated under the above title, constitute a distinct family, the members of which, though insignificant in respect of bulk and numbers, nerertheless possess a special claim upon the attention of the scientifie naturalist. By those who have not sturlied the subject, it will hardly be eredited that these little animals, formerly classed with the Rodents on account of their marked resemblance to that family, present a close approximation to the pachyderms, and more particnlarly to the rlinnoeeroses. This alliance, howerer, is very obvious, when we examine the condition and characters of the feet and teeth-as was, in the first instance, pointed out by Baron Cuvier, and sulsequently insisted on by Wiedemann, Swainson, Lesson, Gray, and others. Ticgarding only the anatomieal peculiarities, it would be more eorrect to place this family between the Tapiride and Rhinoceridie ; but as its external features present so marked a deviation from those of the two families just mentioned, we prefer to consider this aberrant group in the present position-as furthest remored from the ordinary pachydermal type. The Hyracidx are furnished with thirty-eight or forty teeth, namely, six incisors, two above and four below, and twenty-four or twenty-eight molars. In the latter ease, there are no less than sixteen premolars or spurious grinders-the canines being always absent. The incisors do not exhibit a true rodent structure, but are conical and similar to those of the hippopotanus. The molars, on the other hand, are very like those of the rhinoceros; the crowns of the upper set being distingnished by two enamelled eminences, and eomected by a ridge to the outer margin, whilst those below display two semieircular ridges, whose convexity is directed outwards. The anterior limbs are furnished with four toes, but the hind feet are tridactylous. The digits are provided with small flat hoofs; a remarkable exception obtaining to the imner toes of the liind feet, which terminate in eurved and sharply-pointed claws. Both as regards the skeleton and viscera, we find many other moditieations of structure more or less conformalle with the true pachydermal type, amongst which may be specially mentioned the existence of no loss than twenty-one pairs of ribs-a number far exceeding that of any rodent, and giving a pair more than is found either in the proboscidean tapirs or elephants. In the skull the malar bone forms a eomplete orbital ring. The Hyraeidæ are also provided with a double cceum; and this, strangely enough, aeeording to Professor Owen, indicates an affinity to the sloths: whieh edentate group, we may mention, eontains an animal-the Unan -possessing a still larger number of ribs, namely, twenty-three pairs. On this subject Professor Owen, without referring to the ribs, and merely reflecting on the faet which an examination of the eoccum lad suggested to his mind, rery pithily remarks:-"It is interesting to find, that while the facies of Hyrax so far simulates that of a rodent as to hare deeeired the older haturalists, and to have concealed from them those unerring indications of its alliance with the Pachydermata which the osseous system exhibits; yet
that nature, as if in confirmation of ler ahhorrence to the saltus, had left in the internal structure of this singular animal an impression borrowed from the type of the Edentata." However agrecable to our taste, we cannot pursue the sulject further, and have only ly way of conclusion to observe, that the skin is thickly clothed with laair, the face being well supplied with stoutish bristles on the muzzle and inmediately above the eyes; similar thiek hairs are also here and there interspersed throughout the fur at different parts of the body. The ears of Hyracide are short; the tail being represented externally by a mere tuberele. Herbage and various linds of grass constitute their food.
THE DASSE (Hyrax capensis), khiphas or Cape Hyrax, is an inhabitant of the mountanons districts of Southern Africa generally, both inland and along the coast. It is about the size of a rabbit, and conceals itsclf in the holes and crevices of rocks (lig. 75). It lives in colonies, and feets upon grasses, aromatic herbs, and the young twigs of bushy shrubs. Shonld any enemy approach while the colony are basking in
the sum, as they are frequently wont to do, an alarm is immediately someded by their sontinel, and away they all scamper to their hiding-places; the warning ery being peculiarly shrill and prolonged. The Dasse is readily tamed, and, according to Mr. Judston Read, two examples kept lyy a friend of lis became very agrecalle companions. "They would find him out," he says, "when lying on the sofa or in bed, and, climbing up, shelter themselves on his breast within his waistcoat, or ereep mander the bed-clothes at his back, and, lying quiet, enjoy the warmeth." Another one, "when allowed to run unconfined ahout the room, was inclined to be sociable, but was restless and inquisitive, climbing up and examining every person in the cabin, and startling at any noise, which caused it instantly to rum and hide itself. But, from confinement, it became sitvage and snarling, and tried to bite when anytling was put near its cage. Both wild and in restraint it is remarkably clean in its habits, always frequenting and depositing its dung in one place. From its faintly erying in its slecp we may conclude that it dreams. I

have also heard it," adds Mr. Read, "chewing its food by night when everything has been quiet. In its food it was pleased with varicty, eating first a few leaves of one plant and then of another, and greedily lieking salt when given to it. In its passage home its food was Indian corn bruised, hread, raw potato, and onion, with a small quantity of water, which, in drinking, it partly lapped and partly sucked np . It was very sensible of cold; for when a candle was placed near the bars of its eage, it readily acknowledged the little warmth given out by turning its side, and sitting still to receive the full benefit of the rays of heat. I an inelined to think that the female does not produce more than two young ones at a time, from having observed, in several instances, but two following the old ones." The flesh of the Cape Ilyrax is stated to be excellent eating.
the daman (Ifyrox Siriacus), or Sthin Hyrax, is a distinet species, but appears to be identical with the Abyssinian form described by Ehrenberg as the

IIyrax Abyssinieus, mader which title it is also entered in the catalogue of Mammalia preserved in the British Muscum. It is a native of Palestine and the mountainous borders of the Red Sea generally; it is believed to be the Shaphan of seripture history: The body is about twelve inches long. possessing a similar measurement in height. The fur exhihits a greyish-hrown colour above, being fulvous at the sides, and whitish monderneath; the individual hairs are amulated by these sereral shades; their relative amount rarying according to the region of the body in whieh they occur. The Damans are gregarious, selecting for their habitations those inaccessible caverns and clefts, whieh the rocks of Syria so abundantly aftord. Like the Cape Hyrax, they delight to bask in the sum near their smig retreats, exlibiting the same natural caution and timidity. The eonies are, as Solomon aptly cxpresses it, a "fechle folk," although they have "their dwellings in the roeks."

Two or three more species have been described. Of theso may be mentioned, Smith's Hyrax (Hyrax arboreus) from South Afriea; this form possessing arboreal habits, and being distinguished by its longer fur, which also displays a white spot on the back. Another species, capable of climbing trees and feeding on their fruits, is the Hyrax Sylvestris of Temminck.

This form inhabits New Guinea and other parts on the west coast of Afiica, and it is remarkable as possessing only twenty-four grinding teeth; that is, three premolars and three true molars on cach side of either jaw, the orbital ring being at the same time more complete than obtains in any other meniber of the fanily.

Order XII.-CETACEA.

Althougu scientific naturalists have unifurmly insistal on the mammiferous character of the cetacea-at least since the days of Cuvier, and also, in some degree, from the time of Linnæus- the majority of people still class them with fishes; but the only grounds on which these animals can with any propriety be said to resemble the fiuny tribe, are those which refer to their form and the conversion of the anterior limbs into finlike paddles. Even here, however, a elose inspeetion of the leathery hide, of the modified limbs, and of the horizontal tail, is sufficient to indicate a wide departure from the fishes properly so called, in which the tail is vertical, the fins composed of numerous rays, and the integuments more or less converted into separable seales; and what is still more distinctive, we also find conspicuous indications of the reproductive organs externally, as well as mammary glands in the female. Anatomical investigation has likewise shown that these gigantic denizens of the deep breathe by means of lungs, and that they have a pulmonic and systemic circulation, as obtains in other mammals. Taking the skeleton of the common Greenland whale-Plate 32, fig. 90-as a type of zoophagous cetacea, it is extremcly interesting to observe how its several osseous elements have become modified in form, and altered in bulk, in order to meet the exigencies of a creature destined to live in a medium so different from that generally enjoyed by the mass of mammalian vertebrates. Commencing with the head, the first thing that strikes us is the remark. able extension of the bones of the face, the inter-maxillary and superior maxillary bones arching forwards to form a kind of rostrum, whilst the lateral divisions of the lower jaw converge towards the tip of the snout, forming a curve on either side seareely less conspicuous. The cranial bones are not less altered; the nasals are short, the temporals square-shaped, the frontals remarkably narrowed and directed obliquely outwards and backwards, the vertex of the skull being almost entirely occupied by the upper flattened portion of the oecipital bonc. All these characters are well displayed in the accompanying woodeut (fig. 76). If our attention be next directed to the vertebral column, we find on the one hand an almost complete abrogation of the cervical region, and a striking augmentation of the caudal elcments on the other; taken as a whole, however, the bone-chain is massive and well developed. The most interesting feature in connection with this part of the
skeleton has referenee to the vertelree of the neek, which in all eases maintain their typical number, although, in the true whales, they are completely ossified


Skull of the Greenland Whale (Balxna Mysticctus), seen from above.
together so as to form a single mass, more or less fissured by deep clefts, whieh serve to indicate the original existence of seven distinct vertebre in the embryonic condition. But this is only true of the whalebone whales, for in other members of the order the several segments are more or less free; there being six anchylosed together in the spermaceti, and two only in the piked-whales, the dolphins, and the porpoises; in the latter the first and second vertebre are conjoined; but in the Balanopteric the union takes place between the second and third cerrical segments. In the herbivorous cetacea all the bones are permanently free, and this is also the case in the sou-sou or dolphin of the Ganges. In regard to the dorsal and lumbar vertebre, all that we need remark is, that both series vary in number, in different genera, while their spinous and transverse processes become more and more conspicuous as they approach the caudal series. One, two, or three vertebrex have been assigned to the sacral or pelvic region, but these do not differ in structure from the previous group; and but for the existence of rudimentary pelvic bones, it would be searecly fair to say that any should be classed in this eategory. The vertebre of the tail are extremely numerous, upwards of thirty being present in the Rorqual; structurally they vary quantitively and morphologically, gradually diminishing in bulk and complexity of outline from before backwards, until we ultimately find them reduced to a simple compressed nodule at the free extremity of the organ. Of the rudi-
mentary claracter of the pelvic bones we have already spoken, their attenuated form bearing no resemblance to the ilia of those quadrupeds in which the posterior limbs are present. The ribs are chiefly noticcable in respect of their mode of articulation to the dorsal vertebree and the great degree of curvature, which is necessary to make room for the bulky thoracic viscera; a few of the anterior ribs are articulated by their heads to the bodies of the vertebre and by a tubercle to the transverse processes, but the remainder lave only a single mode of comncetion and have no true articular facets at their attached ends. The paddles or anterior extremities are wortly of particular consideration. Tn them, as has been already hinted, are to be found evidences of conformity to type, having a significance not less forcible than that enunciated when treating of the bones of the neck. Viewing the limb from without, there is nothing to indicate the parts severally denominated arm, fore-arm, and shoulders; but upon dissection we find all the osseous elements ordinarily entering into the constitution of these segments fully represented and easily recoguized. With the exception of the liumero-scapulur articulation, all the bones are dirmly invested and packed together by fibrous tissuc, so as to prevent motion upon one another; and what is more noticcable, is, that they lave all become shortened lengthwise, whilst their breadih has somewhat increased, as it were, by compression within the tightly investing teguments. In some species, as in the common mysticcte, the digital phalanges are more numerous than usually obtains in the feet of pentadactyle quadrupeds. If we turn our attention to the skeleton of any of the herbivorous cetacea-such, for example, as that of the Dugong, Plate 34, fig. 109-not only do we observe a less considerable departure from the ordinary mammalian type, as instanced by a comparison of the bones of the hand, arm, fore-arm, and shoulder; but in contemplating the structure of the head and neck, it is evident that we lave moved a step higher in the seale of organization. The seven cervical vertebre are distinct, though still remarkably compressed from before backwards, and the skull, whilst visibly contracted in the same direction, presents, nevertheless, several peculiaritics sufficiently cogent to demand special notice; these will be immediately considered when deseribing the general characteristics of the Manatidoc. Meanwhile we pass on to notice very briefly, some of the more striking modifications of the visecera, as well as other internal and external arrangements equally suggestive. And, firstly, as respects the organs of respiration-which are chiefly to be noted on acconnt of their singular communication with the air by means of two nostrils situated at the top of the head in the true whales, and by a single opening similarly placed in the dolphins; in the lerbivorons species these passages terminate in front of the muzzle, as in mammalia generally. Having, on several occasions, dissected the common porpoise ivith very great care, we are in a position to testify to the accuracy of laron Curicr's accomnt of the singular manner in which the windpipe terminates, especially within a vertical extension of the phargnx, which is commonly designated the spouting apparatus, the exter-
nal openings above being vulgarly called the blow-holes. "If we trace the ocsoplagus upwards," says Curier, "we find that when it arrives opposite the plaryns, it appears to divide into two passages, of which one is continued onwards to the moutl, while the other mounts to the nose; this latter passage being surrounded with mucous glands and fleshy muscular bundles. Some of these are longitudinal, arising from the circumference of the posterior orifice of the bony nostrils, and desceuding along that canal to the pharynx, and its lateral path. The others are amular and appear to be a continuation of the proper muscle of the pharynx, and as the larynx rises into this passage in the form of an obelisk or pyramid, these annular fibres have the power of grasping it by their contractions. Mucous follicles which empty their sceretion by conspicuous excretive orifices are abundant at this part. The lining membrane of the nasal passage having reached the vomer, assumes a peculiar texture; becoming thin, smooth, very dry, of a black colour, and apparently destitute of nerves and vessels. The two osscous nasal canals are closed at the superior or external orifice by a fleshy valve in the form of two semicircles, attached to the anterior margin of that opening, which it closes by means of a very strong muscle lodged above the intermaxillary bones. In order to open it some forcign body must press against it from below. When this valve is closed, it cuts off all commmineation between the nasal passages and the cavities abore them. These cavitics consist of two large membranous pouches formed by a dark-coloured mucons skin, which is much wrinkled when they are empty; but assuming, when distended, an oval figure, which in the porpoise equals the size of a common wine-ghass. These two pouches are lodged bencath the integuments, in front of the nostrils; they communicate with an intermediate space immediatcly abore the nostrils, the latter opening externally by a transverse semilunar slip. Very strong muscular fibres form an expansion, which closes in the upper surface of this apparatus; these fibres radiate from the whole cirenmference of the cranium to unite above the two ponches, being adapted to compress them forcibly. Let us suppose the Cetacean has taken into its mouth some water which it wishes to cject; it moves the tongne and jaws as if about to swallow it; but closing the pharynx, the water is forced up into the nasal passages, where its progress is accelerated by ammular fibres, until it raises the valve and distends the membranons pouches above. Once in these sacs, the water can be retained there until the animal wishes to spout. For that purpose, it closes the valve to prevent the descent of the water into the nasal passages, and it forcibly compresses the sacs by means of the nuschiar expansions which corer them; and the fluid, thus compelled to escape by the narrow erescentic aperture, is projected to a height corresponding to the force of the pressure." Intimately connected with respiration-or rather, we should say, with the power of remaining muder water for a considerable length of time withont respiring-we find a special reservoir for arterialized hood; not formed however, by any unusual cnlargement of the artcrial trimks, but by a remarkable extension of certain small arteries whichare twisted upon
themselves in various directions. Often have we gazed upon this rete mirabile, as it is called, with astonishment; and although it has been figured by several authors, and especially by Breschet, from whose memoir the annexed eut is given, none of these representations fully portray the singularly complicated appearance produced by these vascular tortuosities (fig. 77). This structure was first accurately described and explained by the cclebrated John Hunter, who observes that "the intercostal arteries divide into a vast number of branches, which run in a serpentine course between the pleura, ribs, and their muscles, making a thick substance, somewhat similar to the spermatic artery in the bull. These vessels everywhere lining the sides of the thorax, pass in between the ribs near their articulation, and also behind the ligamentous attachment of the ribs, and anastomose with each other. The medulla spinalis is surrounded with a network of arteries in the same man-


Intercostal arterial plexis or 'rete mirabile of the Porpoise (1'hociena commumis).
ner, more cspecially where it comes out from the brain, while a thick substance is formed by their ramifications and convolutions; and these vessels most probably anastomose with those of the thorax. The subelavian artery in the Piked whale, before it passes over the first rib, sends down into the chest arteries which assist in forming the plexus on the inside of the ribs. I am not certain but the internal mammary arteries contribute to form the anterior part of this plexus. The motion of the blood in such cases must be very slow." He also adds:-" The descending aorta sends off the intercostals which are very large, and gives branches to this plexus; and when it has reached the abdomen, it sends off, as in the quadruped, the different branches to
the viseera and the lumbar arteries, which are likewise very large, for the supply of that vast mass of muscles which moves the tail." As regards the function of this vascular apparatus, it is evidently comnected with the power which whales have of remaining under water for a long period without coming to the surface, some species having been known, when harpooned, to be submerged for an hour and a half at a time. Co-ordinating with the habits of these animals, we also find peculiar modifications of the digestive organs. In the true whales, numerous plates of baleen are developed from the upper jaw. These lamine of horny substance, or whalebone, as it is commonly termed, are essentially developments of the cuticular layer of the skin. As their special function is to entangle within their layers various medusæ and small mollnscous animals, the lower or depending end of each plate is split up into a multitude of fibres, which, acting like a sieve, render their chance of escape the more hopeless; upwards of three hundred such baleen plates occurring on either side of the upper jaw in the common mysticete. The throat of the whale is comparatively small, and consequently adapted only for the passage of minute animals; in order, therefore, to obtain sufficient food to nourish its bulky frame, it is cvident that millions of ereatures must be hourly swallowed. The whale having come upon a swarm of molluses, or pteropods such as the little Clio borealis, multitudes are immediately entangled in the baleen; and when a sufficient number have accumulated, the enormous tongue is raised forwards and upwards, and thus by one fcll swoop of this organ, the unsuspecting mass are luurled backwards towards the gullet, the water strained from them at the same time escaping upwards through the blow-hole in the form of a conspicuous jet d'eau. Although the finllgrown mysticetes are supplied with these horny plates for the prehension of their peculiar food, it is not true to say that they have no teeth at any stage of their existence; for, in the foctal condition, as the independent researches of Geoffroy St. Hilaire, Eschrieht, and Goodsir have shown, and as we have had an opportunity of witnessing, the lower jaw is furnished with numeronis distinct dental sacs, each of which contains the rudiments of a separate tooth. Here again, therefore, we observe a remarkable conformity to type, in the rudimental development of organs, which, as they can never be required in after life, are consequently never brought to a state of perfection! Consistently with other peculiarities of their organisation, the stomachs of the Cetacea are all more or less complicated. Differences of opinion exist as to the degree of complexity in various species, but on the whole they do not depart materially from that which has often been describerd, and which we have ourselves observed to obtain in the common porpoise. In this species-as also in the white whale, from which the amnexed cut (fig. 78) is taken-the organ consists of four distinct eavities; but in respect of relative bulk and function, it cannot in any measure be said to correspond with the multiple stomach of the ruminating quadrupeds. These compartments communicate with each other continuously, and are not supplied with special reservoirs, reticulations, or lamine, such as are observable in the ruminant
stomach, neither is there any inter-communieating channel common to the three first eavities, by which the aforesaid function could be maintained. In the accompanying figure A represents the ocsophagus, $B, C$, n , and E the four stomachal compartments, F the duodenum. The only approaeh to any unusual extension of the internal seereting membrane, is such as is gained by the presence of numerous rugie or foldings, which are more or less irregularly disposed throughout the entire compartments. Of the other eircumstanees in connection with the alimentary canal which call for particular attention, are those which refer to the great length of the intestimal tube, and to the presence or absence of a coceum. Most of the spouting whales


Compound stomach of the White Whale (Beluga Catodon).
have no coecum, but this appendage is present in the mysticete and in the piked whale. The chylopoietic viscera exhibit several peculiarities of form which need not be dwelt upon; but we may remark, in passing, the entire absence of any gall-bladder in the zoophagous species, whilst it is present in the herhivorous forms. The reproductive organs are largely developed, the mamux of the female being placed in the inguinal region in the true whates and dolphins, and in the pectoral region in the phytophagous manatees and dugongs. The circulatory system lias already, in part, engaged our attention, but the contemplation of sueh a marvellous machinery in these bulky creatnres deserves some furtlier comment. The amount of museular pressure required to propel the life stream from the volnminous earities of the heart of a rorqual is something well ealculated to excito the astonishment of any one possessing the slightest acquaintance with the principles of hydraulic power. The main arterial trunk of the spermaceti whale has a eireumferential measurement of at least three feet, "and when," says the illustrious John IIunter, "we consider these as applied to the circulation, and figure to ourselves that probably ten or fifteen gallons of blood are
thrown out at one stroke, and move with an immense velocity through a tube of a foot diameter, the whole idea fills the mind with wonder." Generally speaking. the form of the heart is preciscly similar to that of other manmals, but in the plyytophagous dugong the apex of the heart is dceply cleft, so that the ventricles are partly detached from one another. In regard to the venous system, it should also be noted that its arrangements, in some parts, are even more plexiform than obtains in the arteries. This is particularly secn in the branehes of the great anterior vena cava, and more especially in the veins which surround the spinal cord; whilst another still more interesting peculiarity connected with this system, is, that scareely any of the veins are furnished with valves internally. All these conditions are admirably adapted to the suboceanic habits of the cetaceans, and taken in conneetion with other struetures yet to le deseribed, manifestly indicate evidences of larmonious design. We allude here prineipally to the charaeter of the dermal and subeutaneous investment of the body. This consists essentially of the same clements whieh enter into the composition of the hide of ordinary quadrupeds; but nearly all trace of hares or bristles have disappeared in the zoophagous species, these structures heing represented only in the embryonic condition of dolphins and in adult whales, by a few bristles attached to the anterior part of the upper or lower jaws. In some species the cuticle is rather thin, but in others it attains a remarkable development, and we have observed it to be upwards of an inch in thickness in the great rorqual. In like manner the corium acquires remarkable density and strength, passing gradually into a fatty tissuc, which is commonly called the blubber, and which varies in quantity in different species, being in some found ouly a few inches thick, and in others surrounding the museles to the depth of a foot and a half or even two feet below the cuticular surface. The larger kinds of whale are capable of yielding upwards of twenty tons of oil, and as the oil is worth about $£ 30$ per ton, the "whale fishery," as it is erroneonsly termed, proves a very lucrative trade. Upwards of twenty thousand tons are amually brought to this country by British whalers, notwithstanding the Amerieans and other nations have vastly increased the competition of late years. "In 1821," says the late Professor Edward Forbes, "the British whale fishery employed one limdred and fifty-nine ships, but the decline of the northern fisheries has redueed their number to the half. We are compensated for this, however, in the energy and success with which our Anstralian colonies are joining in the business; and the rich sourco of blubbery wealth which the north onee was, the south now promises to be. At present we are beaten in whaling by our American cousins; but the great adrantages presented by the proximity of Australia and the Anckland Isles to the southern whaling grounds, are giving us a fresh start, of which we will not be slow to avail ourselves. In 1844 the Ameriean whaling fleet numbered no fewer than
six hundred and fifty vessels, tonnage two hundred thousand tons, and manned by seventeen thousand five hundred men. In 1848 the number was slightly under this estimate, though ineluding one-tenth of the entire shipping of the United States. The social importance of this fishery will be at once appreciated, when it is stated that, about twenty years ago, it was estimated that as many as seventy thousand persons in the Urited States derived their chief employment and subsistence, in one way or another, from the whale fisheries; and the number so deeply interested in them must be even greater at present. Other countries, besides Britain and America, have but a sinall share of these profits: some sixty or seventy vessels from Freneh, German, and Danish ports, make up the number of whalers. It must not be forgotten, however, that the indefatigable Hollanders had at one time a lion's share of the whole fishery to themselves-as long ago as 1680 , there were fully two hundred and sixty ships, and fourteen thousand Dutehmen employed in the trade-nor that the first professional whalemen and original harpooners were Biscayans."

We have thus diverted somerwhat from the immediate subject-matter of our deseription, in order to convey some adequate idea of the immense quantities of oil yielded by the Cetacea, which, in proportion to the blubber itself, is as three to four. Most of the oil is derived from this souree, but it should also be mentioned that the cellular tissue of the tongue and the interior of the large bones, especially those of the lower jaw, likewise contain a large quantity of oil. The fatty matter termed spermaceti, which is found only in a particular group of whales, is derived chiefly from the head of these animals. According to John Hunter, "the purest spermaceti is in the smallest and least ligamentous cells; it lies above the nostril, all along the upper part of the head, immediately under the skin and adipose membrane. These cells resemble those which contain the common fat in the other parts of the body nearest the skin. That which lies above the roof of the mouth, or between it and the nostril, is more intermixed with a ligamentous cellular membrane, and lies in chambers whose partitions are perpendicular. These chambers are smaller the nearer to the nose, becoming larger and larger towards the back part of the head, where the spermaceti is more pure. This spermaceti when extraeted cold, had a good deal the appearanee of the internal structure of a water melon, and is found in rather solid lumps." Chemically speaking, it closely resembles the substance termed cholesterine, and like it, after being melted, conerctes into thin crystalline laminæ of a silvery hue and peculiar greasy fcel. In addition to these matters there is yet another substance found in the intestines of Cetacea, which, though not mueh sought after, is nevertheless of considerable value. This is ambergris. It is a coneretionary formation, of a mottled, grcyish colour ; and when split open, it is found to contain a large number of the horny beak-like processes of cuttle-fishes, derived from the eephalopodous inolluses, on which the spermaceti whales delight to feed. It las a peculiar
strong, diffusible odour, and when pure is soft and waxy on section; chemieally speaking, it consists of a fatty substance or principle termed ambreinc. Ambergris is used to impart an agrecable flavour to certain wines, and one or two grains, mixed and triturated with sugar, is sufficient to flavour a hogshead of claret.
The special organs of sense in Cetacea are constructed on the same plan as those of terrestrial quadrupeds, but, nevertheless, exhibit several peculiarities adapted to their aquatic habits. These are particularly noticeable in the organs of hearing and vision. Externally there is no anricular appendage, and the meatus auditorius is only represented by a very small aperture, searccly large enough to adnit the introduction of a small crow-quill. Internally, the essential part of the auditory apparatus, including the ossicles, are invested by an osseous framework distinet from the ordinary bones of the cranium which inclose the organs of hearing in other Mammalia. The osseous eapsule consists of two distinet portions inelosing the labyrinth and tympanum. The tympanic bone is particularly hard, and very largely developed, having commonly a more or less kidney-shaped outline. This part is usually called the ear-bone, and owing to its density and power of resisting decay and disintegration, we find it very perfectly preserved in the tertiary marine deposits along the Suffolk eoast, where multitudes of them are found associated with other waterworn osseous fragments in the phosphatic pseudocoprolitie beds. Some spccimens in our possession, evidently belonging to a species of porpoise, are very highly silicified, the petrous or kabyrinthie bone remaining in situ, and displaying very clearly the spiral groove of the cochlea and the semicircular eanals. As to the eapacity of hearing enjoyed by Cetacea, much difference of opinion exists-the excellent authority, Scoresby, averring that they are not roused even by the report of a cannon; whilst others, who have also been engaged in whale-fishery expeditions, state that their powers both of hearing and vision are sufficiently acute to render the approael of the harpooners at all times difficult and sometimes unsuccessful. The eye is chiefly remarkable for the great thickness of its external or selerotic coat, an arrangement calculated to maintain in its integrity the ellipsoid form of the erystalline lens and ritreous humour, which would otherwise yield to the pressure of the aqueous medium in which the animal swims. Ordinary whales have no true lachrymal glands, but these organs are present in the herbivorous cetacea, which latter are also furnished with a third eyelid or nietitating membrane. The brain of all the Cetacea is well formed, and provided with numerous convolutions. Though of large size in itself, it is remarkably small as compared with the bulk of the body, representing by weight in the common mysticete only the one three-thousandtlı part of the entire animal. The cerebellum is comparatively bulky; whilst, of the nerves whieh proceed from the base of the brain, the most remarkable are those which pass to the organ of hearing - their conspicuity being especially manifested in the dolphins.

## Family I.-BALIENIDA.

This family consists of the true whales, which are distinguished from the cachalots, the dolphins, and the herbivorous cetacea, by the possession of plates of whalcbone, or more properly baleen, depending from the palatal region of the upper jaw. They have no true teetl, althongh, as we have scen, there are tooth-sacs developed in the lower jaw of the embryonic mysticete. The true whales are further recognized by their preposterously large heads, which in some of the species extend to one-third of the entire length of the body. The nostrils are distinct and longitudinally disposed on the crown of the head. The mammary glands are placed in the inguinal region-an arrangement which also obtains in the cachalots and dolphins. The intestine is furnished with a cœecum.

The Mysticete (Balena mysticetus), or common Whalebone whale-Plate 28, fig. 89-is also known as the Greenland whale, and in Dr. Gray's catalogne of the Cetacea preserved in the British Muscum it is called the Right whale-this term being also applied to the Cape whate (Batena australis) by the South Sea whalers. Our best aecounts of the Greenland whale are all more or less derived from the Rev. Dr. Scoresby's "Journal of a Voyage to the Northern Whale-fishery," and from a paper in the first volume of the Wernerian Socicty's Transactions, from which the following description is abridged. When full grown this species is from fifty to sixty-five feet in length, and from thirty to forty in circumference, immediately before the fins. It is thickest a little beliind the fins, and from thence gradually tapers towards the tail, and slightly towards the neck. It is cylindrical from the neck, witil near about the junction of the tail and the body, where it becomes ridged. The head has a triangular shape. The bones of the head are very porons, and full of a fine kind of oil. When the oil is drained out, the bone is so light as to swim in water. The jaw-bones are from twenty to twenty-five feet in length, and the space between them is abont ten feet from side to side. The tongue is of great size, and yields upwards of a ton of oil ; and the lips, which are placed at right angles to the flat part of the base of the head, yield fully double that amount. The palatal lamine of baleen are not of equal length; neither are the largest exactly in the middle of the scries, but somewhat nearer the throat; from this point they become gradually shorter each way. On each side of the mouth are about two humdred lamine of whalebone. They are not perfectly flat; for, besides the longitudinal curvature, they are curved transversely. The largest laminx are from ten to fourteen feet in length, very rarely fifteen feet. The breadth of the largest at the thick ends, or where they are attached to the jaw, is about a foot. The Greenland fishers estimate the size of the whale by the lengtl of the whalebone; and when the baleen is six feet long, then the whale is said to be a size fish. In suckers, or young whales still meder the protection of the mother, the whalebone is only a few iuches long. It is immediately covered by the under lips, the edge of which, when the mouth is shat, overlap the upper
part. The colour of the hide is black, grey, and white, with a tinge of yellow about the lower part of the head. The back, upper region of the head, most of the belly, the fins, tail, and part of the under jawv, are deep velvetblack. The anterior aspect of the lower jaw, and a portion of the abdomen are white; the narrow portion near the junction of the tail being greyish. The skin of suckers has a pale bluish tint. The cuticle or scarfskin is only as thick as ordinary parchment, whilst the true skin is from threc-fourths to an inch in thickness all over the body. The Greenland whale is not provided with a dorsal fin. The flippers, which are situated about two feet behind the angle of the jaws, measure nine feet in length, and rather more than half the same amount in breadtl. The tail is compressed, semilunate, notched at the centre, and sometimes as much as twenty feet in breadth.

Notwithstanding the many exaggerated statements to the contrary, the Greenland whale seldom or ever exceeds fifty-eight or sixty feet in length. It is a slow swimmer, going at the rate of four miles an hour, though when harpooned, it is said to dive perpendicularly downwards at a speed of seven knots an hour. It occasionally ascends with sufficient force to throw itself entirely out of the water. It seldom remains submerged longer than twenty or thirty minutes, and when it rises again to the surface, it will remain there about the same time if not disturbed. In calm weather it is wont to sleep in this situation. One of the most moring and painful sights which can be imagined, is witnessed when the whalefisher strikes a sucker, in order to secure its dam; whilst to say nothing of the unnecessary cruelty, it is more than probable that this inhuman practice entails scrious injury to the fishery business, by greatly diminishing the chances of future success. According to the testimony of Scoresby, " the young is frequently struck for the sake of its mother, which will soon come up close by it, eneourage it to swim off, assist it by taking it under its fin, and seldom deserts it while life remains. It is then very dangerous to approach, as she loses all regard for her own safcty in anxiety for the preservation of her cub, dasling about most violently, and not dreading to rise even amidst the boats. Fxcept, however, when the whale lias young to protect, the male is in general more active and dangerous than the female." The period of gestation is believed to extend over a space of about ton months. In addition to its powerful and relentless lhuman adversary, the Mysticete has to contend with other enemies, such as the shark, the thrasher, and the sword-fish. It is itself, however, a great destroyer of life; its principal food consisting of shoals of a small pteropodous molluse, specifically known as the Clio borealis. Although the aperture of the throat is scarcely sufficient to admit the introduction of an ordinary hen's egs, yet to satisfy so prodigious a bulk of body, it is crident that myriads of these little creatures must go to form a single mealand if so, what must be the ammual consumption of this huge monster of the deep? Well may Mr. Danwin argue that for every animal which passes througle a full cycle of its life, ten thonsand perish ere they have reached maturity! Into details respecting the -perils encountered by those embarked in the whale fishery,
we cannot here enter. Full particulars are given in Dr. Scoreshy's work. Let it suffice us to observe that between the years 1669 and 1778 the Dutch sent 14,167 ships to the shores of Greenland, and of these 561 were wrecked, no less than 73 having been lost in a single season.

The Greenland whale has occasionally strayed to the northern shores of Scotland and the Zetland Isles; those that have run aground being always found in a very impoverished condition. Even in this state, the monster was in olden times deemed a "Royal fish," and according to Pennant, or the still more authoritative Commentaries of Blackstone, when the whale was accidentally cast ashore the reigning monarchs divided the spoil-" the king asserting his right to the head, her majesty to the tail!"

Of other whales belonging to the genus Balena, we have only space to particularize the following:- The western $A$ ustralian whale ( $B$. marginata) which is furnished with very long and slender baleen; the New Zealand whale, or Tuku Pern (B. antaretica) which attains a length of sixty feet; the Cape whale ( $B$. australis) which is also an inhabitant of the southern ocean and of a uniformly deep black colour ; the Japanese whale (B. japoniea) which is very imperfectly known; and the Scrag whale ( $E$. gibbosa) an Atlantic species, which is characterized by the possession of a series of knob-like protuberances along the middle line of the hinder region of the back, forming a sort of transition to the fin-backed whales. The genus Megaptera is, indeed, closely allied to the above species, and following the classification and nomenclature adopted by Dr. J. E. Gray in his synopsis of the cetacean families contained in the British Museum, we have further to indicate the principal members of the hump-backed genus, therc specified, as follows:-Johnston's Humpbacked whale (Megaptera longinuna) which is a common inhabitant of the northern seas-Dr. Johnston of Berwick described it from a specimen accidentally thrown ashore at Newcastle; the Bermuda Itumpback (M. Amerieana), whose head is covered with tubercles or nodulations, the hide being black above and whitish underneath; the Cape IIump-back or Poeskop (M. Poeslop) ; and the Kuzira (M. Kuzira), the latter being found off the coasts of Japan. The genus Balcenopterci is represented by a single species commonly known as the Pike whale (Balenoptera rostrata). A great deal of confusion, however, still cxists in reference to this species and until the points are more satisfactorily cleared up, we are scarcely in a position to describe it with confidence. According to Dr. Cray, it is identical with the Rorqualus Boops of $F$. Cuvier. It is an inhabitant of the northern seas, and has a black colour above, being reddish-white underneath the belly. A specimen is said to have been captured in the Thames near Deptford, but this example has been considered, by several authorities, only as a young cxample of the Great Northern Rorqual. Dr. Collingwood in his admirable little "Fauna of Blackheath and its vicinity;" has recorded the circumstance as follows:-"On Sumday, October 23, 1842, a whale was observed in the Thames opposite Deptford Creek. Five men put off in
a boat, and attacked it with a large bearded spear; and having pushed it immediately under Deptford Pier they overcame and despatched it. Having by mechanical appliances raised it upon the pier, its dimensions were ascertained to be-total length 14 fect 6 inches; length from nose to angle of mouth, 3 fect 10 inches; tail from fork to fork, 3 feet 10 inches. A full account of this whale is to be found in the Zooloyist for 1842, with a figure; also an account of its capture, with a sketch of the animal, is to be seen in the Illustrated London News, vol. i. p. 388." Similar dificulties exist in regard to the determination of the specific characters of the Great Northern Rorqual of Dr. Kinox, which, according to Dr. Gray, is identical with-

THE RAZOR-BACK (Physalus Antiquorum); and knowing the careful research which this eminent mammalogist has bestowed upon the subject, we shall assume liis determinations in this respect to be correct. We have ourselves frequently examined the skelcton of Dr. Knox's celcbrated specimen, so satisfactorily preserved and exhibited in the elephant-house of the Edinburgh Zoological Gardens, and we can therefore testify to the accuracy of the details given by the three eminent authoritics on comparative anatomy who dissected it. Those who are interested in the details should consult Dr. Knox's original description published in the Transactions of the Royal Society of Edinburgh for 1827, or his more recent memoir-entitled "Contributions to the Anatomy and Natural IIistory of the Cetacea"recorded in the 3rd volume of the Jonmal of the Proceedings of the Linnxan Society. If Dr. Gray's views are right, it would appear that the whale taken at Black Gang Chine, Isle of Wight, in 1842, is also referable to this species; whilst the same may be said of specimens taken both at Berwick and at Plymouth in 1831. Another example was taken off the coast of Ostend in the early part of the present century, and the skeleton subsequently exhibited in London, near the Kiing's Mews, Charing Cross. The hide of the Razor-back has a slatish-grey colour, being whitish underneath; the under border of the baleen, which is short, is blackish, the inner edge being pale-streaked. It is an inhabitant of the northern ocean. Fespecting its habits, Mr. Bell remarks, that they "are different from those of tho common whale. It is less quiet and tranquil in its general movements, seldom lyiug motionless on the surface of the water whilst blowing, but making way at the rate of about five miles an hour. When struck, the velocity of its descent is such as very frequently to break the line, of which Captain Scoresby mentions several instances." It is very doubtful if this species ever attains a length of upwards an hundred feet, though examples have been recorded which were only a few fect short of this measurement.

Dr. Gray has given the scientific appellation of Physalus Boops to a form which he considers quite distinct from the above, and which we may therefore more simply particularize as Gray's Fin-back whale. A specimen of this whale was captured off the Welsh eoast in the year 1846, and it is now preserved in the British Museum under the above title. It is thirtyeight feet in length, has sisty vertebre, and fifteen pairs of rils. The head alone measures nine feet in length.

Several other species of the genus Physalus are indicated in the Museum catalogue.

## Family II.-CATODONTID AE.

The members of this family are sometimes described under the synonymous and equally distinctive title of Physeteridæ, which ineludes the cachalot or spermaeetes, and the short-headed whales. These animals have the nostrils separate and longitudinally disposed; their palate is smooth and destitute of baleen; whilst a still more charactcristic fcature is seen in the presence of numerous large conical tceth in the lower jaw (fig. 79), the upper jaw being edentulous, or furnished with mere rudiments of teeth beneath the gums. The head, though comparatively short in some, is enormously developed. The intestine has no cœecum.

THE NORTHERN SPERM WHALE (Catodon macrocephalus), or Common Cachalot-Plate 27, fig. 87-is also known as the Blunt-headed C'aehalot, and the Spermaceti whale ; generically, it is at once recognized by its elongated head, which is abruptly truncated anteriorly, the blowers being placed near the extremity of the snout, and the dorsal hump is rounded. In its native haunts, this huge monster is found in the northern seas, but

it occasionally visits our own shores. An example was cast ashore on Cramond island, in the Frith of Forth, on the 22 d of December, 1796 ; its length was fiftyfour feet, and the greatest circumference, at a point immediately beyond the eyes, thirty fect; the upper jaw being ascertained to be five fcet longer than the lower, which measured ten feet, and was provided with twenty-three teeth on cither side. The largest tooth was eight inches long, its circumfcrential measurement being the samc. It was deseribed and accurately figured by Mr. James Robertson, in the 60th volume of the Philosophical Transactions. The oceurrence of the Cachalot on the shores of the Orkney and Zetland islands is by no means a rare circumstance, but it is very seldom taken on the English coasts. That it does oceasionally visit our shores, has been satisfactorily shown by Dr. Collingwood, to whom naturalists are indebted-to use his own words-for resuscitating "a still-born record of the Spermaceti whale," which he found in a document contained in Sir Joseph Banks' copy of the Philosophical Transactions in the British Museum. It is entitled an "Extract from a letter from Walberswick, on the coast of Suffolk, dated March 7, 1788," and runs as follows:-" A whale appearing on our coast is a rare phenomenon. The most extraordinary instance that ever lappened of this sort was in February, 1763, after a lard gale of wind northerly, when no lese than twelve whales, which
undoubtedly came out of the Northern Occan, were towed and driven on shore at the following places, all of them dead, and in a liigh state of putrefaction, excepting one." This notable exception was "one at Hope Point, in the River Thames. This was the only one seen alive. He ran aground and smotlicred himself in the mud, and was afterwards made a show of in the Greenland Docks. These were all of the spermaeeti kind, and of the male gender;" "and it is remarkable," adds Dr. Collingwood, "that out of the twelve, (or rather ten, for two stranded on the Dutch coast,) six were found upon the coast of Kent. From an old engraving of the above specimen in my possession, to which a scale is attached, it appears to have been near sixty fcet long. Within a much more recent period, a small Cachalot was captured in the Thames, near Gravesend, but I am not in possession of any particulars of the event." The Cachalot is gregarious in its habits, large multitudes of them herding together. By the South Sea whalers they are termed "schools;" sometimes all consisting of females, and at other of males not fully grown. One or two large "bulls," or "schoolmasters," as they are ridiculously termed, 11sually accompany the fcmale herds, and Mr. Beale reckons that he has secn as many as six hundred individuals of the southern species in a single school! The female is comparatively small, and produces one, and sometimes two young, at a birth. The two recorded by M. F. Cuvier, which were brouglit forth by a whale stranded on the French coast, near D'Audiernc, were each about ten feet in length. The young are of a deep black colour, and mottled with whitish spots.

THE SOUTHERN SPERM WHALE (Catodon polycyphus) very closely resembles the northern species, both in respect of its size and habits. It has the same large head and characteristic jaws, the lower being lodged in a groove of the upper, whilst the crowns of ${ }^{\circ}$ the tecth fit into corresponding socket-like earities, so as to be entirely concealed when the mouth is closed. The southern Sperm whale, or Cachalot, occasionally. attains a length of seventy or cighty fcet, and a spccimen has been minutely deseribed by Mr. Beale which measured eighty-four fect. The skin is usually smooth and dark coloured, almost black; but picbald varieties occur, as well as other differences in the depth of shading. "Olid bulls," says Mr. Beale in his work on the Spcrm whale, " have generally a portion of grey on the nose, immediately above the fore-part of the upper jaw, when they are said to be grey-headed." The same authority observes that the head-which we stated in our introductory observations to contain a large quantity of oil-is "specifically lighter than any other part of the body, and will always have a tendency to rise at least so far above the surface as to elevate the nostril or blow-hole sufficiently for all purposes of respiration ; and, more than this, a very slight effort on the part of the whalc would only be necessary to raise the whole of the antcrior flat surface of the nose out of the water. At very regular intervals of time, the snout emerges, and from the extremity of the nose the spout is thrown up, and at a distance appears thick, low, bushy, and white. It is formed of the expired air, forcibly cjeeted through the blow-hole, and acquires its white colonr from
minute particles of water previously lodged in the chink or fissure of the nostril, and also from the condensation of the aqueous vapour thrown off by the lungs. The spout is projected at an angle of $136^{\circ}$, in a slow and continuous manner, for about three minutes, and may be seen from the mast-head in favourable weather at the distance of four or five miles. When the whale is alarmed or "gallied," the spout is thrown much liigher with great rapidity, and differs much from its usual appearance. Immediately after each spout the nose sinks beneath the water, scarcely a second intervening for the act of inspiration, which must consequently be performed very quickly, the air rushing into the chest with astonishing velocity. There is, lowever, no sound caused by inspiration, and very little by expiration, in this species; in short, nothing of that loud noise called the "draw-back" in the finback and other whales. Ten seconds is occupied by a large bull sperm whale in making one inspiration and one expiration; during six of these the nostril is beneath the water. At each breathing time the whale makes from sixty to seventy expirations, and remains, therefore, at the surface ten or eleven minutes. When the breathing time is over, or, as the whalers term it, he has his "spoutings out," the head sinks slowly; the "small," or the part between the "hump" and the "flukes," appears above the water, curved with the convexity upwards; the flukes are then lifted ligh into the air, and the animal having assumed a straight position, descends perpendicularly to an unknown depth. This last act is called "pecking the flukes," and those who are on the look-out call loudly when they see it -"There goes flukes." The whale continues thais hidden beneath the surface for one hour and ten minutes; some will remain an hour and twenty minutes, and others only for one hour; but these are rare exceptions. Mr. Beale gives us very graphic accounts of the mode of capturing the Sperm whale, which, when excited, seems to be a truly formidable antagonist. Perhaps, however, the most stiring incident, amongst the many daring encounters which have from time to time been recorded, is that given by the Rev. Henry T. Cheever, in his little work entitled "The Whaleman's Adventures in the Southern Ocean," which is edited by that distinguished narigator and cetaccologist, the Rev. Dr. Scoresby. Thms runs the terrible story:-_" The most dreadful display of the whale's strength and prowess yet authentically recorded, was that made upon the American whale ship Essex, Captain Pollard, which sailed from Nantucket for the Pacific Ocean in Augrist, 1819. Late in the fall of the same year, when in latitude $40^{\circ}$ of the South Pacific, a school of sperm whales was discovered, and three boats were manned and sent in pursuit. The mate's boat was struck by one of them, and he was obliged to return to the ship, in order to repair the damage. While he was engaged in that work, a Sperm whale, judged to be eighty-five feet long, broke water about twenty rods from the ship, on her weather bow. He was going at the rate of about three knots an hour, and the ship at nearly the same rate, when he struck the bows of the vessel, just forward of her chains. At the shock produced by the collision of two such mighty masses of matter in motion, the ship shook like a leaf.

VoL. I.

The seemingly malicious whale dived and passed under the slip, grazing her keel, and then appeared at about the distance of a ship's length, lashing the sea with finss and tail, as if suffering the most horrible agony. He was evidently hurt by the collision, and blindly frantic with instinctive rage. In a few minutes he seemed to recover himself, and started with great speed directly across the vessel's course to windward. Meanwhile the hands on board discovered the ship to be gradually settling down at the bows, and the pumps were ordered to be rigged. While working at them, one of the men cried out-"God have mercy! he comes again !" 'the whale had turned at about one liundred rods from the ship, and was making for her with double his former speed; his pathway white with foam. Tushing liead on, he struck her again at the bow, and the tremendous blow stove her in. The whale dived under again and disappeared, and the ship filled and fell over on her broadside, in ten minutes from the first collision. After incredible hardships and sufferings in their open boats, on the 20th December the survivors of this catastrophe reached the low island called Ducies, in latitude $24^{\circ} 40^{\prime}$ sontl, longitude $124^{\circ} 40^{\prime}$ west. It was a mere sandbank, nearly barren, which supplied them only with water and, very scantily, sea-fowl. On this uninlabited island, dreary as it was, three of the men chose to remain, rather than again commit themselves to the uncertainties of the sea. They have never since been heard from, the island being seldom visited. On the 27th of December the three boats, with the remainler of the men, put awny together for the island of Jnan Fernandez, at a distance of two thousand miles. The mate's boat was taken up by the Indian of London, un the 19th of lebruary, ninety-three days from the time of the catastrophe, with only three survivors. The captain's boat was fallen in with by the IJuuphian of Nantucket, on the 23rd of the same month, having unly two men living, whose lives had been elied out only through that last resort of hunger in the wretched, which words shudder to relate! Out of a crew of twenty, five only survived to make the ear of the world tingle at their strange eventful story."
Several other forms of Cachalot exist, which are considered by Dr. Gray and others as entirely distinct species. These are the Mexican Sperm Whale (Catodon Culucti); the Short-headed Whale (Fiogia brericens), which occurs in the neighbourhood of the Cape ; and the Black-fish, or High-fimned Cachalot (Physeter Tursio), which is undoubtedly distinct. This latter species, according to the testimony of Mr. Barclay, communicated to Mr. Bell, is frequently seen off the coasts of Zetland in summer. It was first described by Sir Robert Sibbald, who compared its long perpendicular dorsal fin to the mizen-mast of a ship. The specimen from which his description was taken was cast ashore on the Orkney isles in the year 1687.

## Family iit.-DELPIINIDAE.

Under this lened maturalists have included a great number and varicty of cetacean species, which are collectively recognized by their duuble rows of teeth, cr, in other words, by tecth in botli jaws. They liave smouth
2 C
palates, and the nostrils are united into a single, lunate, transversely disposed blow-hole. In some species the teeth are deeiduotis; in all they are simple in structure, and of a more or less eonieal form ; the head is likewise of moderate size. The intestinal eanal is not furnished witl a eœcum.

THE BOTTLE-HEAD (Ifyperoodon Butzlopf) is an inhabitant of the nortly sea, and oecasionally makes its appearanee on our shores. It is readily distingnished by the attenuated eharacter of the fore-part of the muzzle, whieh is prolonged so as to resemble a beak, and was, in eonsequence, termed the Beaked whale by lemnant. The carliest aeeount we lave of its occurrenee, is that given by Dale in his "Ilistory of IIarwich," from a speeimen taken off the coast, near Maldon, in the year 1717. Its length was fourtecu feet, the circumferenee of the body seven and a half; the flippers being seventecn inehes, and the dorsal fim a foot in length. On this subjeet Dr. Collingwood makes the following remark in lis brochure previously eited:"In the Philosophical Trans. for 1787, in the paper by Hunter 'On the strueture and ceonomy of whales,' is a meagre account of bottle-nosed whales with two teeth, with a figure of the animal. Hunter adds, that 'it was cauglit above London bridge in the year 1783, and became the property of the late Mr. Alderman Pugh, who very politely allowed me to examine the strueture, and take away the bones. It was twenty-one feet long.' Mr. Bell's figure is a redueed eopy of our whale as given by John Hunter. Hunter was doubtful of its species, saying, that it resembled Delphinus Tursio (the Bottle-nosed dolphin), but was of a different genus, having only two tecth in the lower jaw, concealed by the gum. The belly was white, shaded off to the dark colour of the baek. He, however, rightly conjectured that it was the speeies described by Dale ("IIarwich," 411, pl. 14), viz. Hypcroodon Butzkopf, and supposes it to have been a young one, as he mentions a skull which must have belonged to one thirty or forty feet long." Dr. Collingwood has, we fear, in tho remaining part of his "noto" eonfounded Dale's and IIunter's specimens, and has ealled the editor of Pemnant to account for a diserepancy in respeet of measurement-himself altogether overlooking the circumstance, that Dale's specimen was stranded seventy years before Inmer's example appeared in the Thames. In our cdition of Pennant (1776) the length of the Maldon speeimen is correetly given as fourteen feet, and thus eorresponds with the original description; in the edition to which Dr. Collingwood refers, it is given as eleven feet, which is probably a misprint. In eonclusion, we may observe, that a series of carcful dissections of another example of this rare and interesting cetaeean may be seen in the Anatomical Museum of the University of Edinburgh.
THE NARWHAL (Monodon monosccros)-Plate 27, fig. 86 -or Unicorn-whale, is readily distinguished by its remarkable tusk-like tooth which projeets several feet in a horizontal direction from the left side of the upper jaw; the tooth of the opposite side being imperfeetly developed, and remaining permanently concealed within the alvcolus. It is not eertain whether these tecth should be regardel as incisors or eanines, as
their sockets are placed between the maxillary and intermaxillary bones; yet, from the circumstance of the base of their roots being somewhat in front of the inciso-maxillary suture, we incline to the persuasion that they are ineisors. The left nostril is smaller than the right. The colour of the adult Narwhal is dark above, whitislı and marbled at the sides, underneath ; in young individuals the lide is uniformly blaek. The Narwhal is a swift swimmer, and gregarious in its habits; and as it feeds ehiefly upon small molluseons animals, it is diffieult to say what is the express purpose of the large tusk. Aceording to Dr. Scoresby, it is employed to destroy large fishes, sueh as skates and turbot, specimens of this whale having been found to eontain the remains of such fishes in their stomachs. The Grecnland missionary, Mr. Egede, a translation of whose work was published in London in 1745, stated that the tusk is used in piercing ice for the purpose of enabling the creatures to obtain fresla air, without always sceking the open water. Others regard it simply as a weapon of offence and defence, and many exaggerated aceounts of its powers in this respect have been recorded by Lacépedè and others. The ivory of the tusk is very white and dense, and capable of yielding a high polish. Lacépede, in his "Histoire Naturelle des Cctacees," gives a figure of the head of a Narwhal in which both of the teeth were developed to nearly equal length. The quality of the oil obtained from the blubber is superior, and the flesh is mueh prized by the Grecnlanders. Several instanecs have been recorded of this animal's appearance on our shores. The first is that described by Tulpins in 1648, the specimen being twenty-two feet long. Another was thrown on the Lincolnshire coast, near Boston, in 1800, and a third was found close by the shore, at the entrance of the sound of Weesdale in Zetland, on the morning of the 27 th of Scptember, 1808. The last speeimen was most carefully anatomized by Dr. Fleming of Edinburgh, who was then minister of Bressay, and who afterwards communieated a mimute description to the Wernerian Society, which is published in the first volume of the Transactions, p. 131, with three accompanying figures. The animal measured only twelve feet from the snout to the noteh whieh divides the tail. The flippers were fifteen inelies in length; the tusk measured only thirty-nine inehes; and, as in others, was spirally grooved or twisted, and striated externally from right to left, tapering to a blunt and solid point. The oil yielded by this example was of inferior quality. Dr. Floming expressed an opinion that there might be two species of Narwhals, viz., the common and the small-headed-referring the example in question to the latter. Respecting the Lineolnshire specimen which was taken at the village of Frieston, near Boston, Sir Joseph Banks, in a letter to Dr. Fleming, observes: - "The animal when found, had buried the whole of its body in the mud of which the beaeh is there composed, and seemed safely and securely waiting the return of the tide. A fisherman going to his boat saw the horn, which was covered 1 p , and trying to pull it out of the mud, raised the animal, who stirred limself hastily to sceure his horn from the attack " Althongh Sir Joscph Banks communicated similar particulars to

Lacépedè, the French naturalist afterwards carelessly stated in his well-known work that the specimen was captured at Boston in America; and Mr. Shaw in his "British Miscellany," actually represented this celcbrated Lincolnshire specimen, with two fully developed teeth! Strange crrors!

THE NORTHERN BELUGA (Beluga Cutodon) or White whale, derives its name from the uniformly white colour of the skin. It is an inhabitant of the northern seas generally, being especially numerous off the coast of Greenland, in Hudson's Bay and Davis Strait. The Northern Beluga forms a very striking object, and is remarkable for its elegant symmetry and activity. According to Scoresby it is not at all shy, but often follows ships, herding in numbers to the extent of forty or fifty individuals, which are seen gracefully tumbling above and below the ocean's surface. Two examples have been captured off the British coast. One of these was seen in the Medway as recently as 1846 , and it was subsequently shot near Upnor castle. It measured rather more than thirtcen feet in length. The other was killed in the Frith of Forth, near Stirling, on the 6th June 1815. A full account of this specimen (fig. 80) is given by Dr. Bar-
clay and Mr. Neil in the third volume of the Wernerian Society's Transactions, and the skin may be seen, beautiiully preserved, in the Natural History Musemm of the Edinburgh University. On the authority of Mrr. Bald of Alloa, Mr. Neill informs us, "that the animal generally passed upwards when the tide was flowing, and returned down the frith with the ehb; this sometimes happened every day, and sometimes once in two or three days; it came frequently to the surface, and was well known for about three months by the name of the white whale. It was supposed to run up the river in pursuit of salmon, and it was at last killed by the sal-mon-fishers, near the Abbey of Cambuskenneth. The animal had been attacked both with fire-arms and spears," and Dr. Barclay found one of the musket balls in the lungs. It was a male specimen, and measured thirteen feet four inches in length. The flesh of the Beluga is considered good eating by the Cireulanders, whilst the oil is still more highly extolled. Neither the male nor the female exhilit any dorsal tin. The dam usually produces two young at a birth, the suckers having at first a bluish-grey colour. The example slot in the Medway was furnished with thirty-six teeth; twenty in the upper, and sixteen in the lower jaw; but


The Northern Beluga (Beluga Catodon)
it would seem that the teeth of the upper jaw are deciduous in old individuals. In the Edinburgh specimen there were thirty tecth, eighteen above and tirelve below.
THE COMMON PORPOISE (Phoccena communis) or Porpesse, is well known to the inhabitants of the shores of our sea-girt islands. It is the most almudant of all the Cetacea which risit our coasts. The hide exhibits a uniformly deep black colour, except along the central line of the belly where it is whitish. A fullgrown Porpoise rarics in length from five to eight feet. In dissecting several examples, we have been particularly struck with the immense length of the intestines, and in one exampie, shot in the Frith of Forth, we found fire intestinal cestode worms, four of which measured about ten feet each in length, besides others, parasites in the lungs and liver. These entozoa are described in the 22nd volume of the Linnean Socicty's Transac-
tions. Porpoises frequently travel some distance up our rivers, aud it is very intcresting to watch their playful antics as they tumble to and fro on the light famtastic ware. They visit the Thames nearly every year, and sometimes renture as far as London Bridge. Mr. Bell records an interesting note of their appearance many years ago in the river Warcham, in Lorsetshire. On one oecasion, at the close of the year, two that were taken in this river yielded sixteen gallons of oil. "One of them was found to have milk, which some gentlemen tasted, and pronounced to be salt and fishy. About the same season, three years afterwards, three others were driven up the river to the town of Wareham; they were full-grown animals, all about the same size. A fence was put across the river above and below them, in order to retain them for exhibition; but they plunged so riolcutly, and their cries-which they contimed during the night as well as the day-were so
distressing, that after the third day of their captivity, they were, like the former ones, taken from the water and cut up." Porpoises sometimes herd in very large numbers, and on these occasions commit terrible havoc amongst shoals of herrings, mackerel, salmon, Sce. Our conception of their destructive powers is by no means lessened when we consider the number and form of their tecth (fig. 81); there being usually from ninety to a hundred of these organs, from twenty to twenty-five occurring on either side of each jaw, above


Skull of the Porpoise ('hocæna communis).
and below. They are somewhat flattened in form, their crowns being also more or less knobed. The flesh is esteemed a delicacy by the Greenlanders, and also by the inhabitants of our western isles. In the time of Henry VIII. and Elizabeth, it was considered a royal fish, and appeared to be much relished by the courtiers of their day.

THE CAAING WHALE (Globiocephatus deductor). -This species is also known as the Round-Headed Pohpoise, Bottle-Head, Social Wiale, Howling Wiale, Black Wiiale, and in the catalogue of the British Museum is given as the Pilot Whale ( $G$. Svincual). As the generic name implies, the upper aspect of the head is globular; the species is further distinguished by its long pectoral flippers and black skin, the belly and throat being white along the central line. The jaws are seldom furnished with more than fifty teeth. The Caaing Whales herd in large numbers. Mr. Bell states, that an entire shoal of seven hundred and cighty individuals was once captured at Sumburgh in Zetland; and between the years 1809 and 1810 another shoal came on shore at Invalfiord in Iceland, consisting of no less than one thonsand one hundred and ten examples, all of which were taken. Their appearance off the coasts of Orkney, Ketland, and the Faroe Isles, is by no means infrequent, and they prove a source of wealh to the inhabitants. "On the appearance of a shoal," says Mr. Bell, "the sailors endeavour to get to seaward of their victims, and gradually closing upon them, drive them onwards like a flock of sheep, and urge them by shouts and missiles towards the shore; when one of them, some say a leader, being forced on the beach, a curions scoue of self-immolation is acted by the whole herd. They are then attacked by the entire population, who despatch them by various means; and the cries and dying strugerles of the poor animals, some in and some out of the water, the slouts and exertions of the men, and the troulled and bloody sea, combine to form a seene of no trifling interest and excitement." Accord-
ing to Dr. Traill, they blindly fullow a single leader, which if driven on sliore, guarantees the destruction of the entire herd, as their mutual attachment will not allow them to forsake the first victims. Their favourite food appears to be various species of cuttle-fish, though they also take ordinary fish. They yicld excellent oil.

THE GRAMPUS (Grampue orca) is a large, stoutishbuilt species of whale, measuring upwards of thirty feet in length, and having a giith of fourteen feet, ol more. The anterior part of the head terminates less abruptly than in any of the preceding members of this family, and the aninal is further recognized by its pectoral and dorsal fins-the former being broad and rounded, the latter long and elevated. It is an inhabitant of the northem seas generally, and very frequently appears upon our coasts. The largest which has been taken on these shores is that recorded by Lacépède, from notes communicated to him by Sir Joseph Banks. In the words of Mr. Bell, this specimen "occurred in the Thames in 1793. Struck by three harpoons, he rushed off with the boat in which were the persons who had struck him, towed it twice to Greenwich, and once as far as Deptford, against a strong tide rumning eight miles an hour, notwithstanding the repeated pike wounds which he received whenever he appeared above water. It was lilled opposite Greenwich Hospital, and its expiring struggles were so violent that no boat dared to approach it. It was a very large one, bcing no less than thirty-one feet in length, and twelve in circumference." A specimen taken in Lynn harbour on the 19th November, 1830, weighed three tons and a half. They pretty frequently visit the friths of the Tay and Forth; a large number appeared in the latter bay during July and August, 1793. The Grampus proves very destructive to salmon.
THE COMMON DOLPHIN (Delphinus Delphis)-Plate 28, fig. 88-seldom exceeds seven or eight feet in length. though individuals have been occasionally found to measure as much as ten fect. It is readily distinguisherd from the foregoing species by its almost straight back, and by its attenuated, compressed, and prolonged muzzle, which bears some resemblance to a beak. The jaws are of equal length, and furnished with a very mumerous series of teeth, upwards of a hundred and cighty having been counted in some specimens; their form is slender, and slightly curved inwards, and they interlock during the closed state of the jaw. The Dolphin is an inhabitant of the northern seas and the Atlantic Ocean, occasionally making its appearance off our coasts. It is a remarkably active species; and, notwithstanding its voracious and gluttonous habits, was formerly highly estecmed for its flesh. Pemnant records, on the anthority of the celebrated Dr. Caius, that one which was taken in his time was presented to the Duke of Norfolk, who distributed portions of it amongst his friends. "It was roasted and dressed with porpesse sauce, made of crumbs of fine white bread, mixed with vinegar and siggar." The Common Dolphin feeds principally on fish.

THE BOTTLE-NOSE DOLPHIN (Daphinus Tursio) is another North Sea species which has occasionally made its appearance on the British shores. Difficulties exist respecting its identification. It is dis-
tinguished from the common dolphin chiefly by the projection of the lower jaw beyond the upper. There is some reason to believe that the dolphin (D. truncatus) deseribed by Mr. G. Montague in the third volume of the Wernerian Society's Transactions, is referable to this species. This specimen was captured off Totness in Devonshire, in the summer of 1814 . After the animal had been exllibited, the bones were regarded as rejectamenta, and thrown into the river Dart. Mr. James Cornish, however, subsequently suceeeded in recovering the skull, the length of which was twenty inches and a half. "On each side of the upper jaw," says Mr. Montague, "there are sockets for twenty tectl, besides a long depression behind the posterior socket." The under jaw was somewhat longer, and contained twenty-three sockets on cither side. Such of the teeth as were discovered were for the most part worn and flat on their erowns. The others, it seems, were knocked out, and frecly distribnted amongst the curiosity-loving people of Totness!
SOWERBY'S DOLPHIN (Diodon Sowerbei), of which only a single example has yet appeared, is characterized chiefly by the possession of a single pair of teeth, occupying the lower jaw. It was cast ashore near Brodic House, Elginshire, and is thrus deseribed by Mr. Sowerby, in the first volume of lis well-known "British Misecllany":-"The animal is oblong ; black above, nearly white below; sixteen feet long, eleven in circumference at the thickest part, with one fin on the back; lead acuminated; lower jaw blunt, longer than the nuper, with two short lateral bony teeth; upper jaw sharp, let into the lower one by two lateral impressions corresponding with the teeth; opening of the mouth, one foot six inches. Under the throat are found two diverging furrows, terminating below the eyes, which are small, and placed six inclies behind the mouth. Spiracles lunate, the ends pointing forwards." The specimen was a male.

Amongst the many other numerous and interesting members of the present family known to exist, we can only particularize the following :-
PERON'S DOLPHIN (Delphinapterus Pèronii), Rigititwifale Porpoise, or white-beaked Dolphin. This species is found on the southern side of the equator, off and between the opposite coasts of Africa and Brazil. It is gregnrious in its habits, and readily distinguished by the lustrous white beak, abdomen, and pectoral fins, the other parts being quite black. The head is pointed and slightly convex, ; the jaws, in different examples, are furnished with from thirty-cight to forty-two on each side, above and below.
the inia (Inia Geoffroyii), or Bolivian Dolpimn, is a very singular animal, having the breathing aperture placed far backward on a line with the peetoral fins. The dorsal fin is small. The lips are decply cleft to beneath the eye; the auditory meatus being likewise unusually large. Mr. Blyth observes that the species is also remarkable as "occurring thonsands of miles from the sea, appearing to inhabit only the remote tributaries of the Amazon, and the elerater lakes of Peru. The singular character of possessing bristly hairs on the shout has also been observed in them when very young. This species las large swim-
ming paws, and thirty-four tecth on each side, above and below, all of them rough, marked with deep and interrupted furrows, and of an irregular, manmillary shape behind, which is very peculiar. A female specimen measured seven feet long, and the males are stated to be double that size; colour variable, commonly pale bluc above, passing into a roseate hue beneatl. It comes more frequently to the surface than the marine species, and is gencrally met with in troops of three or four individuals."
THE SOU-SOU (Platanista Gangctica) or Dolphin of the Ganges, is anotlier cetacean of considerable interest, frequenting the moutlis, and aseending sonetimes ligh up the rivers. It is readily distinguisher by its elongated and laterally compressed snont, swollen at the extrenity from enlargement of the jaws, which latter support in front numerons long, conical teeth; there being thirty of these organs on each side, above and below. The breathing opening has the form of a longitudinal fissure, whilst the upper borders of the maxillary bones are prolonged npwards in a singular manner. The eyes are very small, and at first sight seareely discernible. The pectoral flippers are subtriangular, tho dorsal fin being placed far back. The Sou-Sou attains a length of seven feet. It was originally deseribed by Pliny, minder the generic title lere employed.

## Family IV.-MANATIDE.

It is a matter of opinion whetler it loe more correct to associate this family with the present order, or with the Pachydermata; for whilst its members appear, by external characters and habits, more intimately allied with the Cetace:a, their internal structure, on the other land, plainly demonstrates a close alliance with the latter group. Some have suggested, not without reason, that they might almost he treated as a separate order; but, all things considered, it is perliaps better, and certainly more convenient, to adopt our present allocation. All the members of this family are vegetable feeders, and, in consequence, most commonly styled IIerbivorous or Plyytophagons cetacea. In conformity with thicir algous dict, we find the tecth modified so as to secure due mastication of the coarse fuei, the molars, when present, being more or less flattened on the crown. The intestinal eanal attains a prodigious length, and in the Rytina is said to measure unwards of trenty tinies the entire length of the animal. The stomach is constricted near the centre, and more or less complicated by cocea and follicles in the different species. The skin is rather lairy, and the face furnished with luristle-like whiskers; but the tail is flattened out transucrsely as in ordinary cetaceans-a circumstance very strongly insisted on by those who, with ourselves, prefer to retain these animals in the present order. The limbs or paddles are furnished with claws ; but there is no trace of posterior extremities. The nostrils are quite separate, placed in front of the abrupt snout, opening near the upper lip. The front of the jaws is covered witl horny plates. The mamme are two in number, and situated below the thorax ; and there are from fifteen to ninetecu pairs
of ribs. One of the most interesting visceral modifications is that of the heart (fig. 82), which may be said to have two apices, secing that the ventricles are partially separated from one another, and independent at their lower ends. In the annexed cut the letters of reference indicate as follows:- $a$, right auricle, $b$ right ventricle, $c$, pulmonary artery, $d$, left auricle, $c$, left ventricle, $f$, the aorta. In most particulars the skeleton strictly conforms to the cetacean type; but in the head and neck we notice several departures, the eervieal


Ifeart of the Dugong (IIalicore Dugong).
vertebre remaining quite distinct, whilst the head is shortened and comparatively massive in some species. In the Dugong-Plate 34, fig. 139-the intermaxillary bones are enormously developed for the implantation of its incisive tusks, whilst the lower jaw is remarkably broad and deep. These cranial peculiarities are not present in other allied genera. The several bony elements of the forc-limbs are more perfectly formed than in the zoophagous cetaccans, the would-be position of the hinder extremities being indicated by an attenuated V -shaped bone, constituting a rudimentary pelvis. True V-shaped bones also exist along the hoemal aspect of the eaudal vertebre. In conclusion, we lave only to observe that all the Manatide are found near the sea-coast, and near estnaries and mouths of rivers, up which they oceasionally wander to a considerable distance, feeding on marine fuei and other kinds of aquatic regetation.
THE MANATEE (Manatus anstralis)-Plate 36, fig. 84 -is an inhabitant of the shores and great open rivers of the South American continent, being particnlarly abundant off the coasts of Guyana and Brazil, where it is commonly known as the Sea-cow. The term Lamantin is sometimes applied to it as well as to another species. The Manatees are gregarions in their habits, and like other Cetacea are derotedly attached to their young, which they defend with great vigour. In the adnlt state the skin presents a greyishhlack colom, whilst, in common with other species of the same genms, the flippers are each provided with fom flattish nails, that of the thumb licing wanting. They lave thirty-two molar teetl, that is, eight on either side above and helow, their crowns being irregularly flat, square-shapecl, and divided trausversely ly
a contral groove. There are no cauines or incisors except in extremely young individuals. Under ordinary circumstances the habits of the Manatee are mild and inoffensive. It is readily taken with the harpoon, and is chiefly valued on account of its flesl, which is stated to be excellent eating. Though formerly very plentiful, the Sca-cow hunters lave greatly reduced their numbers. When these animals raise the anterior half of the body out of the water, they display a fanciful resemblance to a liuman figure, and this eircumstance induced our ancient navigators to believe in the existence of sirens, mermen, and mermaids.

Two other species of the genus Manatus are also known-the Lamantin, properly so ealled (M. Senegalensis of Adanson), which is a native of the western consts of tropical Afrien, and the Mexican Sea-cow (M. latirostris), a very large species, upwards of fiftecn fcet in length, found on the shores of Florida, Mexico, Surinam, and some of the West Indian islands.

THE INDIAN DUGONG (Ifalicore Dugong) - Plate 26, fig. 85 -is a specics of very considerable interest, though much smaller than the foregoing, seldom measuring more than seven or eight feet from the tip of the abrupt and flattened snout to the end of the broad crescentic tail. On turning to the drawing given at Plate 26, fig. 85, it will be seen that the flippers are not furnished with nails, but their margins are thickoned and tuberculated. One of the most characteristic features of this animal arises out of the presence of two large incisors or tusks in the upper jaw, a (fig. 83), the molars being flat, and varying numerically from cight or ten to twenty, according to age and other circumstances. "In the female Dugong," says Professor Owen, " the growth of the permanent incisive tusks of the upper jaw is arrested before they cut the gum, and they remain throngh life conecaled in the premaxillaries. The tusk is solid, is about an inch shorter, and less bent than that of the male ; it is also irregularly cylindrical, longitudinally

indenterl, and it gradually diminishes to an obtnse rugged point. The base is suddenly expanded, bent obliquely outwards, and presents a slatlow excaration." Speaking of other peculiaritics, the same authority also observes that the external form of the Dugong is "not so well calculated for moving rapidly through the water as that of the dolphin and other carnirorous cetacen, which sulbsist by a perpetual pur-
suit of living animals. In these the snout is conical and peculiarly elongated, and in some, as in Delphinus Gungeticus, the jaws are produced to an extreme length, so as to give them every advantage in seizing their swift and slippery prey; whilst in the herbivorous Dugong the snout is as remarkable for its obtuse, truncate character-a form, however, which is equally advantageous to it, and well adapted to its labits of browsing upon the algæ and fuci which grow upon the submarine rocks of the Indian seas. As, from the fixed nature of the Dugong's food, the motions of the animal during the time of feeding must relate more immediately to the necessity of coming to the surface to respire ; its tail, the principal organ of locomotive aseent and deseent, is proportionally greater than in the true Cetacea, its breadth being rather more than one-third the length of the whole body." The Dugong enjoys a pretty wide geographical distribution, being found not only in the Indian seas generally, but also in the Red Sea; formerly large numbers inhabited the shores of the Isle of France. Aecording to Sir Stamford Raffles, and others, they usually feed at two, three, or four fathoms' depth of water. They are abundant off the Malayan coast, and especially at the mouth of the $J o h o r e ~ r i v e r . ~ T h e ~ n a t i v e ~ M a l a y s ~ s p e a r ~ t h e m ~ a t ~ n i g h t-~$ time ; their presence being indicated by a snuffing noise. When caught, the tail is raised up out of the water, as the animal is quite powerless in this position. The habits of the Dugong are gregarious, herding, says Leguat, to the extent of three or four hundred individuals at a single spot. Like other cetaceans, they display extraordinary attachment to their young, defending them to the death ; on being taken the suckers utter a short and sharp ery. All accounts agree in considering the flesh to be delicate and pleasant cating.

One or two other Dugongs have been deseribed. Riippell considers the form inhabiting the Red Sea as a scparate species; and this opinion is shared by several naturalists. It was called by him IIalicore Tabernaculi, from a notion that the skin was employed by the Jews in veiling the tabernacle. The Australian Dugong ( $H$. australis) is generally admitted to be distinet.

STELLER'S RHYTINA (Rhytina Stelleri)-Plate 26, fig. 80 -is one of those interesting mammalian forms whose extinction is only of very recent date, yet so complete as to have left scaree a wreck behind. Diseovered in 1741 , after a few short years it entirely succumbed to
the rapacity of our greedy race, who, without even affording naturalists a fair opportunity of unravelling its curious structure, have swept it from its native shores, and well-nigh obliterated all trace of its existence. It is well for science, that Steller, whose worthy name it bears, was among the number of those unfortunate voyagers who were wrecked on the inlospitable shores of the dreary island where this anmal was first discovered ; and it is still more fortunate that he left an authentic record of his discovery, which was pullished subsequent to his death by the Acarlemy of St. Petershurg in 1749 , and afterwards at Halle in 1753, in a separate treatise entitled " $\Lambda$ usfiiluliche Besehreibung von sonderbaren Meerthieren." At the time of its diseovery on Behring's Island, it does not appear to have been particularly abundant, and since the year 1768 no trace of its presence in a living state has ever been recorded. There can be no doulst, hewever, that considerable numbers previously existed, and these, it appears, have all faller1 a prey to the Aleutian seaotter hunters, whose exploits have been so graphically described by the Russian explorer Von Rotzebuc, and others. Steller's Rhytina attained a length of upwards of twenty-four feet, its greatest circumferential girth being about twenty fect. According to Steller the pectoral flippers contained no digits, which, if correct, is very remarkable; and what is equally singular, there were no teetle either above or below; their absence being amply compensated by the presence of hard undulating lamellx-partly made up of homy tubes and partly calcareous-which covered the jaws internally, and performed all the necessary functions of bruising, masticating, and detaching the sea-wceds, on which these animals lived. Another peculiarity is mentioned as affecting the skin; the epidermis being fully an inch in thickness, and composed of thick cylindrical fibres, which were curiously fulded or fissured, so as to present a very rugged uneven surface; the true dermis remaining comparatively thin. The surface of the hide exhibited a deep brown or purplish-black tint. The head was small when compared with the bulk of the body; the tail, on the contrary; extensively developed and of an oval figure. The stomach is deseribed by Steller as small. In the eatalogue of Cetacea, preserved in the British Museum, this species is alluded to under the title of the Morskaia Korova or Rhylina gigas. It has also been deseribed under the seneric appellations of Stellerus, Minatus, and even 'Trichechus.

## Order XIII.-MARSUPIALIA.

As indicated in the general introrluction to the class Mammalia, the presentorder exhibits several characters widely differing from those displayed by any of the foregoing, the distinctive features having especial reference to the parts concerned in the reproduction and the rearing of their young. It is almost superfluous, therefore, to recapitulate the facts-suecinetly stated at page 8-which liave led naturalists to acquiesee in the arrangement of Cuvier, who first grouped the marsupials
together under the ordinal title above retained; nerertheless it may be well to observe, in bricf, that tho external and internal characters by which these animals are at onee recognized depend upon the presence of aldominal pouches or foldings of the skin, which are inverted in the females for the purnose of concealing, protecting, and nourishing the young, and everted in the males for the lodgment of the reproduetive glands. The young are born in an imperfeetly developed
state, and transferred by the mother into her marsupium, there to be nurtured through the final stages of their fuetal condition, in a maner to be immediately deseribed. Intimately associated with this oxternal specialization of integument, we find the bones of the pelvis, supplemented by two styliform elements, or inarsupial trochlear bones, as they are more properly called. Both in the male and female important minseles are attached to these osseous appendages, which are firmly articulated to the anterior borter of the pelvis by a broad connecting surface, bonnd down by interarticnlar fibrous bands, like those observable in other pelvie synchondroses or liganentous joints. The marsupial lones vary considerably in different species, being clongated, flattened, and curved in the wombat, and comparatively straight and narrow in Perameles. In the koala they are very large and semitar-slaped, $a$ (fig. 84); but only one inch and a half in length in Myrmecolius. The ordinary abdominal museles con-

Fig. S4.

relvis and mirsunial iones of Koala (Phascolarctos cincreus).
neeted with these bones aid them in supporting the marsupium and its contonts, but a special muscle -amalagous to the so-ealled "eremaster" of the male -is developed in the female, whose function it is to expel the milk-scerction of the mammary glands when the young have become located in the pouch and duly attached to the teats. The mode of their comnection with the long nipples is very curious; as, in order to allow of respiratory action being carried on by the foetus in marsupio, it is clearly necessary that the milk should be conveyerl directly into the stomach, without the chance of its blocking up the air passages ; and as yet-to take an example-the little kangaroo can hardly display any involuntary functions, such as might regulate the flow of milk, and therely, in connection with the ordinary reflex action of the laryns, obviate the necessity of any special modifieation of the pharyngeal organs. 'To prevent choking, therefore, the windpipe is extended upwards to the soft palatal nem-
branc, which, aeting like a sphineter, embraces its patent outlet, bringing it into immediate contact, and also in continuation with the nasal passages. At the sane time the teat of the mother is thrnst far back in the mouth, and the injected milk flows freely down to the stomach, precisely in the same mamer as the food of the porpoise, in the first instance, passes the pharynx by two passages into the gullet! One can hardly refrain from comment on so remarkable a modification of structure destined to meet the exigencies of these interesting species; and as, perhaps, our sentiments on this score may derive additional cogency when expressed in the language of an authority-who has contributed more than any other individual to the unravelling of the intricacies and significance of the marsupial struc-time-we liave little hesitation in inviting attention to Professor Owen's comment, including additional details respecting this organization, as it occurs in the kan-garoo:-" Thus aided and protected by modifications of structure, both in the system of the mother and its own, designed with especial reference to each others' peculiar condition, and affording, thereforc, the most irrefiagable evidence of creative foresight, the small offspring of the kangaroo continues to increase, from sustenance exelusively derived from the mother, for a period of about eight months. During this period the hind legs and tail assume a great part of their adult proportions; the muzzle elongates; the external ears and eyelids are completed; the liair begins to be developed at about the sixth month. At the cighth month the young kangaroo may be seen frequently to protrude its head from the mouth of the pouch, and to crop the grass at the same time that the mother is browsing. Having thus acquired additional strongth, it quits the pouch, and hops at first with a feeble and vacillating gait, but continues to return to the pouch for oceasional shelter and supplics of food till it has attained the weight of ten pounds. After this it will occasionally insert its head for the purpose of sucking, notrithstanding another foctus may have been deposited in the pouch; for the latter attaches itself to a different nipple from the one which had been previously in use." Having advanced thus much concerning the most important features of the order, it only remains for us to notice very briefly some other minor characteristics. Speaking generally, it may be said that the numerous species which are thus linked together into one group, present very striking differences in their structure, and consequently also in their laahits of living. These are for the most part indicated in the union of the skull and in the form of the teeth, of the two clavicles into a single furcular bone, and in the condition of the craniodental peculiarities bearing a strict relation to their carnirorous and insectirurous propensities on the one land, and to the mixed nature of their food and purely phytirorons habits on the other. In this respeet alone, therefore, three or fonr, more or less, natural groups are presented to us. But it is not alone in the skeleton that such correlative peenliaritics exist, as many searcely less interesting deriations affeet the brain, the circulatory organs, the digestive organs, and its associated ehylo-poietic riscera. Into these, however, it is not our prorince to enter ; and it must, therefore, suftice us to
observe in conclusion, that the varied members of this order are for the most part met with on the great Australian continent and its adjacent islands. Some few iuhabit the warmer regions of America, and, what is still more interesting, fossil remains of others have been found in Europe, in the tertiary gypsum beds of Paris, and in the Stonesfield slate of the great oolite formation in England.

## Family I.-PHASCOLOMYDE.

This family is probably represented by a single living species only, but the fossil genus, Diprotodun, established by Professor Owen, is also included in it, or in his rlizophagous tribe of marsupials, which is the same thing. This small group is characterized by the possession of two incisor teeth in either jaw, above and below ; there are no canines, and a large interspace scparates the incisires from the molars, which are twenty in number, the anterior four being spurious; they have indistinct roots and flattened crowns. All the feet are pentadactylous, hut the thumb of the lind feet is rudimentary and clawless. The tail is extremely short. The stomach is provided with a special giand ; the coceum being small, lroad, and furnished with a vermiform ఇppondage.

THE WOMBAT (Phascolomys Wombat)—Plate 28, fig. 93-is a short thick-set auimal, from two to three feet in length, and weighing about thinty pounds. The head is large, and furnished with small ears, the tail measuring only laalf an inch. In the skeleton, however-if three of the outer-iifiac vertebral segments be reckoned as belonging to the category of sacral elements-there are no less than thirtech or fourtecn caudal vertelre. Another peculiarity in the skeleton arises out of the presence of fifteen or sixteen pairs of ribs-a number considerably exceeding that of other marsupials. The fur is thick, and of a sandy brown colour below and at the sides, being darker along the line of the back. The eycs are small, and not at all prominent. One of the lest accounts of the Wombat's habits is that furnished by Colonel Collins at the early part of the present contury. "This animal," lie says, possesses no claim to swiftness, as most men could run it down. Its pace is hoblling or shuffling, something like the awkward gait of a bear. In disposition it is mild and gentle, as locomes a grass-cater ; lout it bites hard and is furious when provoked." IIis friend, Mr. Bass, he adds, " never heard its voice but at that time. It was a low cry between a hissing and a whizzing, which could not be heard at a distance of more than thirty or forty yards. He chased one, and with his hands suddenly lifted it off the ground without hurting it, and laid it upon its back along his arm like a child. It made no noise nor any effort to eseape, not even a struggle." Subsequently, however, the little animal shrieked and made its escape, whilst Mr. Bass was preparing to tie it up. Colonel Collins further on observes, that besides living in Furneaux's island, the Wombat inhabits the hills to the west of Port-Jackson. "In both these places its habitation is underground,

Yol. i.
the animal being admirably formed for lnurowing; but to what depth it descends does not seem to be ascertained. According to the account givell of it by the natives, the Wombat of the momitains is never seen during the day, but lives retired in its hole, feeding only in the night ; that inhaloiting the islands is seen to feed all times of the day." Its food consists chicelly of coarse grass and roots. The flesh is said to be delicate and excellent cating. The female produces three or four young at a siugle birth.

From the examination of a skull brought from South Australia, Professor Owen has expressed his helief in the existence of a second species of Wombat, which he has provisionally named Pheascolomys latifions. The fussil genus Diprotodon attained girantic proportions, being nearly as large as the hippopotamus.

## Family II.-MaCROPIDE.

The Kangaroos are readily distingnished by the disproportionate bulk of the hinder parts of the body as compared with those in front, this feature being more particularly noticcable in the development of the tail and hinder extremities. The feet are greatly clongated by an extension of the metatarsal bones and digital phalanges, their soles being applied to the gromed during progression. The powerful tail acts as a fifth limb during the slower movements of the body, mio forms, in conjunction with the hind legs, a firm tripoda? basis of support during the state of rest. The fore limbs are short, pentadactylons, attennated, and furnished with compressed curved claws, the nails of the hind feet being straight and tectradactylons. Speaking generally, the body presents a conical outline, tapering from below mpwards. The cars are largely developeed and oval in shape ; but a more important character is


Skull of the Great Kangaroo (Macropus giganteus).
seen in the teeth-(fig. 85.) According to Professor Owen, there are in the: normal condition of the permanent dental series six superiur and two inferior incisors, no canines, four premolars equally divided above and below, and sixtecn true molars, that is, four on either side of the upper and lower jaws. In the genus of Kangaroo lats or l'otoroos (Hypsiprymmus) canines are present in the upper jaw. In the true Liangaroos the central incisors of the upper are not longer than 2 D
the others, the outer pair being at the same time comparatively broad. In the Potoroos the middle incisors are of considerable length. In all the mombers of this family the head is rather small, and the upper lip is cleft. These animals possess complicated stomachs, and they display great powers of leaping; only using their anterior limbs when feeling. They are foumd almost exclusively in Australia, some few occurring in New Guinea and Van Diemen's Land.

THE GREAT KANGAROO (Mucropus gigenteus)Plate 29, fig. 92-is an animal of very considerable interest, not only on accomst of its anmaing powers of leaping and marsupial peenlianities, but on account of the circumstanec of its being the largest living and indigenous quadruped inlmaiting the great Australian continent. An adult specimen measures upwards of four feet in length, not inchuling the tail, which would give us an additional three feet; its weight occasionally execeding one hundred and forty pounds. The capture of the Great Kangaroo in its native haunts is attended with great and varied excitement; and when it was diseuvered by the sailors under Ciaptain Cook, during one of his ever-memorable voyages, they were not slow to extol and exaggerate its leaping propensitics. It is now very commonly hunted with dogs; but the natives have a peculiar method of their own. According to Captain Grey, as quoted by Mr. Dallas in his excellent little manual entitled "A Natural History of the Animal Kingdom,"-"the native advances quietly in the direction where he expeets to find his game, with every sense on the alert to give him notice of its approach. When the animal is near him he is seen to assume an attitude of intense attention, and, at a given signal, his wives and children, who accompany him, drop immodiately upon the ground. When the savage is thus occupied, you will see at about a hundred yards from him, a kangaroo erect upon its lind legs, and supported by its tail. It is reared to its utmost height, so that its head is between five and six feet above the gromed, its short paws hang by its side, its cars are pointed--it is listening as carefully as the native, and you see a little head pecring out from its pouch to inquire what has alarmed its mother. But the native moves not: you cannot tell whether it is a limman being or the charred trouk of a burned tree which is before you, and for several minutes the whole group preserve their relative position. At length the kangaroo becomes reassured, drops upon its fore paws, gives an awkward leap or two, and goes on foeding ; the little inhabitant of its pouch stretching its head further ont, testing the grass its mother is eating, and evidently delating whether or not it is safe to venture out of its resting-place, and gambol about anongst the green dewy herbage. Meantime the native moves not until the kangaroo, laving two or three times resmmed the atlitude of listening, and having like a monkey seratehed its side with its fore paw, at length onec more abandons itself in perfect security to its feeding, and playfully smells and rubs its little one. Now the watchful sarage, keeping his borly ummored, fixes the spear first in the throwing stick, and then raises his arms in the attitude of throwing, from which they are never again moved until the
kangaroo dies or runs away. Ilis spear being moperly scenred, he adrances slowly and stealthily, no part moving but his legs. Whenever the kangaroo looks round, he stands motionless in the position he is in when it first raises its load, until the animal, again assured of its safety, cives a skip or two, and goes on feerling. Again the native adrances, and this seene is repeated many times, until the whistling spear penetrates the devoted animal." The Great Kangaroo and others of its kindred, breed frecly in this country, many British-hom individuals existing in the Zoological Society's Gardens and in private collections. The flesh is said to be good eating, and not unlike venison in flayour.

The so-called Sooty Kanganoo (Macromes fuliginosuts of Desmarest), as well as two other large species deseribed by Mr. Gonld in his attractive folio "Monograph on Kangaroos," as 1 K. ocydromus and M.melanops, are, in Mr. Waterhouse's view, only probable varieties of the Great Kangaroo. Yery many other species, however, are known to exist, of which we can only specify the following:-The Red Favgatoo (1M. Iamiger of (iould) is a large species occupying the interior of the Australian continent, and frequenting the banks of the river Darling and the Murmmlidgee. The Great lock Kangaioo (M. robustus of Waterhouse), or Black Wallaroo of the natives, is found in hilly localities. The female has a silvery or grey colonr, and is much less than the male; the fur of the latter cxlihitiang a rich black tint. Amongst the smaller species may be mentioned the Black-gloyed KanGaroo (M. Irma), which is about thirty inches in length and fomnd in Western Australia. Desmarest's Red-necked Raygaroo (1/. ruficullis), a species well-known in this country, inloabits New South Wrales and King's Island. A rery tiny species, called the Pandemelon Wallabi (M. Theticles), is only twonty inches long, cxclucling the tail, and is much sought after for the sake of its flesh. The Reb-bellied Tratmaby (M. Billurdicrii) is a gregarious species, as is also the Bhesh-tallen Rock Kingaroo (M. penicillatus). Le 13rux's Kangaioo (Ifalmaturus Asiaticus of Gray) is an inhalitant of New Guinen; it possesses a very long narrow head with shortish ears, the fore-legs being comparatively strong. The fur exhilits a greyislı colonr generally, more or less tinged with yellow, especially underneath. Respecting the small Hare: Kanganoo (Lagorchestes liporieles), Mr. Gould recerds the fullowing amusing little incident:"While out on the plains," he says, "I started a liare kangaroo before two fleet dogs; after ruming to the distance of a quarter of a mile, it suddenly donbled and came back 1 poln mc , the dugs following at its heels. I stood perfectly still, and the animal had arrived within twenty feet before it observed me, when, to my astonishment, instead of branching of to the right or the left, it bounded clear orer my head, and on desecnding to the ground I was enabled to make a successfinl shot, hy which it was procured." Mr. Gould specifieally distinguishes sereral other closely allied forms, and gives beatiful figures of them in lis large work.

In the Trec-Kangaroos the anterior and posterion limbs have nearly the same length, whilst the tail is
longer than the body. The strongly-curved and powerful claws are also rendered subservient to their arboreal
climbing halits. Two species have been deseribed by M. Salomon Nuiller, which he respectively denominates Fig. 86


The Tree-Kangaroo (Dendrologus inustus).

Dendrologus ursinus and $D$. inustus-Fig. 86. Both have moderately well developed ears, whilst the two superior central incisor tecth are scarcely longer than the outer pair.
the potoroo (Ifypsiprimnus minor), or Tangaroo Rat-I'late 20, fig. 91-is a gentle, timid, little animal, about the size of our common rallit. It is a native of New South Wales, and tolerably abuudant in the neimhbourhood of the river Weraganbia. The fur exhilits a greyish-brown colour gencrally, being reddish above and white muderneath the belly. The ears are of large size; the tail being also conspicuously dereloped; more uniform in thickness than oltains in kangaroos proper, very flexible, and slightly tufted at the extremity. The fore-limbs still displiay muel disparity when eompared with the stout posterior pair; the same relation holds good in regard to the feet, the three central claws of the pentadactylous fore-feet being strikingly developed. The muzzle is so considerably attemated and produced, that in the skull the nasals are seen to extend beyond the level of the upper jaw. This animal is further distinguished by the remarkable length of its anterior grinding tecth, or premolars, which are also
sculptured by vertical groves externally; these dental characteristies are also present in congeneric forms, several of whicl have been described as distinct species by Ogilby, Gould, and others.

## Fayily III.-PHALANGISTIDA.

The marsupials associated under this head are eommonly called Plaalangers, and although only some of them exhihit lighly exalted leaping powers-in virtue of assistance derived from a membranons expansion of the skin at the sides of the body-yet, on the whole, they form a tolerally distinct group. Among the more distinguishing peculiarities are those which hare reference to their partially carnivorons dict and arboreal habits. The disparity between the hind and fore legs no longer exists, whilst the posterior fect lave become pentadactylous, the thumb remaining marmed, and the second and third toes conjoined as far forward as the base of the clatrs. The tecth rary considerably in different genera ; thus, in the true Phalangers there are only cight incisors, disposed as in the kangaroos, and sixtecn constant true molars-although occasionally we
find also two or four eanines. In all eases the upper central incisors are comparatively large, the lower being consplicuous and procumbent as in the Kangaroos. In the Pigmy Petaurist, or Flying Phalanger, there are twenty-four permanent molars in addition to the four eanines, whilst other members of the genus Petaurns display twenty-eight molars, the anterior twelve coming under the eategory of spurious grinders. In the genus Phascolarctos, on the other hand, there are only two canines oecupying the upper jaw, and twenty molars, the antcrior four being false. All the Phalangers are provided with a simple stomaels and a long eoccum. In most eases the tail is extensively developed, but in the aberrant genus Plaseolactos it is merely rudimentary. In some, the tails are prehensile. The habits of the family are arboreal and noeturnal; they feed partly upon fruits and leaves, and on small birds.

THE VULPINE OPOSSUM (Pleclengistce vulpina) is a very common species in Australia, and is much hunted by the natives, who are particularly fond of its flesh. It is ealled in their strange language the Whettapooroo. Although somewhat fox-like in appearance, it is a much smaller animal, measuring about twentysix inches in length, exelusive of the tail, whieh would give us some additional fifteen inelies. The fur exhilits a ruddy buff colour generally, inelining to a ferruginons tint at the lower part of the throat; the tail is black, exeept at the root. The ears are about one inch and a half long; the limbs being also comparatively short. Similar characters likewise exist in another form inhabiting Van Diemen's Land; this is a larger and darker coloured animal, being considered by Messis. Gould and Ogilby to be distinet; they have accordingly imparted to it the combined gencric and specific title P. fulliginosa.

THE SPOTTED PHALANGER (Cuscus maculata), or Scmam-Scimam, has been generically separated by Laeépède and 'Témminek on what appears to be very satisfactory grounds; for we find no less than twelve incisors, six above and the like number below-the total number of all the teeth together amounting to forty. In this animal the tail is prehensile and naked at the narrowed extremity, where it is also marked with rugosities. The Seham-Scham is an inhahitant of New Guinea and the Moluecas, being also called Cocscoes by the uatives of the latter island-hence the generic title adopted by the Frenel naturalist. The fur has a thick woolly texture, having a whitish gromid colour, which is spotted by large, more or less isolated deep brown patches, some of the macula oceasionally rmuing into one another. 'The body is stontish throughont; the ears being remarkably short. It appears to be slothfinl in its movements ; at least suel is the charaeter given to it by M. Lesson.

THE MOUSE-LIKE PHALANGER (Phalangista gli-riformis)-Plate 30 , fig. 94 -has been elevated by Dr. J. E. Gray into a sulgenerie rank, under the title of Dromicirt, on account of ecrtain dental peculiarities; but, " as these modifications of the teeth are unaceompanied by any eliange of gencral structure or of labit, whilst those tectl, which most influenee the diet are constant, it is obvious," says Professor Owen, "tlat these differences of dentition are mimportant, and
afford no just grounds for subgeneric distinctions." The particular tooth-eliaraeters here adverted to, have reference more particularly to the presence of only three true molars on each side of either jaw; but apart from this featire the Mouse-like Phalanger possesses many points of interest. It is remarkally small, the body measuring only four inches in length, exeluding the tail, which would give us upwards of three inehes and three quarters more. This organ is black at the root, and clothed with short stoutish leairs, except at the tip, where it is naked. The ears are large and almost destitute of lair. This little marsupial is only found in Van Diemen's Land. Excellent figures of it are given by Waterhouse and Gould, and by Mr. Bell in the sixtecntl volume of the Limman Society's Transactions.

THE SCIURINE PETAURIST (Petcurus sciureus), or Sugat Squirrel.-The distinguished naturalist Shaw separated the flying Phalangers into a distinet genus-Petaurus-on accomit of the peculiar membranoms expansion of the skin existing betwecu the anterior and posterior limbs, associated with a non-prehensile hairy tail. Five or six species have been deseribed. These are-P. laguanoides, the largest, with a brown fur, whitish-grcy underneath, and hairy ears (fig. 87); P. Australis, or the IIopoona-lioo, with long and naked ears, the fur being fulvons below and marked by dark-coloured bands along the eentral line of the back; $P$. breviceps, $P$. sciureus, $I^{\prime}$. Ariel, $P$. breviceps, and $P$. pygmecus. As has been already indicated, the last-named speeies presents some trilling departure from the other Petaurists as regards the teeth, which led Desmarest to give it the generie title of Acrobates. Respeeting the habits of the Sugar Squirrel-which are very similar in all the speciesMr. Bennett has supplied the following interesting account-"During the day the animal generally remains quietly nestled in the hollows of trees, but becomes animated as night advanees, and skims through the air supported by its lateral expansions, half leaping, half flying from branch to branch, feeding upon leaves and insects. This peculiar mode of locomotion can seareely be considered a true flight, imasmuch as the eutancous folds, which scric the purposes of wings, seem rather destined for the mere support of the animal in its long and apparently desperate leaps, than for raising it in the air, and direeting its course towards any given olject. For this latter purpose they are indeed but little fitted by their strmeture, the want of proper museles in a great measure incapacitating them from performing sueh offices as are dependent on volition. It may be doubted, however, whether these animals are entirely destitute of the power of exereising their will in their flight-like leaps. For the following anecdote bearing upon this sulbject, we are indebted to our friend Mr. Broderip, who related it to us on unquestionable authority - 'On board a ressel sailing ofl the coast of New Itolland was a squirrel-Petauruswhich was permitted to roam about the ship. On one oceasion it reached the mast-head, and, as the sailor who was despatched to bring it down approaehed, made a spring from aloft to aroid lim. At this moment the ship gave a licary lurel, which, if the original
direction of the little creature's course had been continued, must have plunged it into the sea. All who witnessed the seene were in pain for its safety; but it
suddenly appeared to eheck itself and so to modify its eareer that it alighted safely on the deck.'" All the speeies are natives of New South Wales. The Seiurine


Petaurist is also found in New Guinea and its adjacent islands. It is sometimes called the Norfolk Island Flying Squirrel, having been originally described as inhabiting the outlying and isolated spot of land which bears that name. The fur is ash-coloured above and whitish underneath. A brownish line extends from the muzzle to the root of the tail, the latter organ
being tufted and black at the tip. In the little monselike Pigmy Petaurist the hairs of the tail are regularly disposed in two rows, one on either side, like the barbs of a feather.
THE KOALA (Phascolarctos cinereus).- Although this animal has been generically scparated from the Petaurists and true Phalangers, yet there is no reason to

Fig. 88.

place it outside the family limits of Phalangistide. The most striking differences have reference to the thickset body, and more particularly to the extreme shortness and rudimentary condition of the tail (fig. 88). Its dentition for the most part corresponds with those of the Phalangers; but it never displays eanimes in the lower
jaw, and is only furnished with four premolars, one on either side above and below. All the molars are provided with four prramidal tubereles. To the pentadactylous character of the feet, the very large coccum, and other essential features of the family, it is entirely conformed. The digits of the anterior feet separate
into two groups, the pollex and index fingers antagonizing the onter three, so as to afford a strong preliensile action. The Fioala is a native of various parts of Anstralia. It is about the size of a small cog, measuring nearly two feet in lengtl . The fur is eoarse, thick, and long, possessing a peculiar ashy-brown colour. It is eminently arboreal in its hahits, feeding only upon leares and buds, but partly residing in small burrows excavated beneatle the roots of trees. The female is wont to earry her offspring on her back for a considerable period Its movements, howerer, are comparatively sluggish under ordinary eiremmstances.

## Family IV.-PERAMELID AE.

Looking at the dental peculiarities displayed by the mombers of this family-commonly called Bandicoot liats-it will be at once evident that we have passed on to a group of marsmpials, far less phytivorous in their habits than any of the preceding. In short, we have taken up a earnivorous type, and find, accordingly, well-dereloperl eanines, mumerous incisors-ten above and six below-and, in addition, there is a full eomplement of molars-twelve false and sixteen true; but the characters of the latter conform more closely to the insectivorons than to the earnivorous mammals, properly so ealled. Co-ordinating with the multiple arrangement of the teeth, we find a marked extension of the jaws, combined with a corresponding attenuation of the muzzle. The hind fect are mueh longer and stouter than the anterior pair, whereby their leaping powers are increased, the sceond and third toes of the posterior limbs being also conjoined as far as the base of the claws, whilst the digit equivalent to the thumb is perfectly developed in the fore-fect. The outer toes are very short and placed far back-almost conecaled. The other toes are all furnished with powerful claws, enabling their possessors to dig and burrow with facility. Bandicoots are found only in Australia and Van Diemen's Land.

THE LONG NOSED BANDICOOT (Perameles nasutus). - Four or five species are referable to the present genus; for in addition to the one here named, naturalists have recognized P. Lagotis, P. Gumnii, and $P$. obesule as specifically distinet. The first of these three liad been gencrieally separated by Professor Owen, under the title of Thalaconus. It is also commonly known as the Philander, and is furnished with long cars and an cxtensive bushy tail; the muzzle being very mueh produced and abruptly attenuated. The outer ineisor of the upper is not separated widely from its fellows. $P$. Gumnii of Dr. J. E. Gray is an inhabitant of Van Diemen's Land, and is distinguished ly its possession of a very short, white tail; the hamehes being also marked by screral pale-coloured bands. In addition to inseets, it appears to be very fond of bullons roots. $P$. obesule is commonly termed the Spring Bandicoot Plate 30, fig. 95. In the Long-Nosed Bandicoot the ears are moderate and pointed, the fur having a brownish-grey tint above, passing into white bencath; the nose is prolonged beyond the jaw. In all, the coccum is of moderate size. Aecording to Professor Owen, the marsupial ponel, "at least in the full-grown
females of $P$. nusuta, $P$. obesula, and $P$. Lagotis, has its orifice directed duwnwards or towards the eloaen, contrariwise to its ordinary position in the marsupials; this direction of the pouch evidently relates to the proemmbent position of the trumk when supported on the short fore and long hind lecss." During progression, the Bandicoots move the hinid-feet together alternately with the fore-feet, after the saltatory manner of rablits. Their flesh is said to be goord eating.

OGILBY'S BANDICOOT (C'haropus castanotis), or the Pig-fuoted Bandicoor, is a remarkable species, apparently possessing only two toes on the fore-feet; the pollex of the hinder feet is also absent, the outer pair of digits being very eonspieuously developed. The claws of the latter, as well as of the didactyle fore-fect, are particularly strong and adapted for burrowing. This species earries forty-six teeth-eight incisors above and six below, four canines, twelve spurious, and sixteen true molars. The ears are long. elliptical, and nearly naked; but the tail is altogether wanting.

Another aberrant form of Bandicout has been described by Gérvais, and subsequently by Waterlonse and Gould, under the title of Tarsipes rostratus. It is a native of Western Anstralia, arboreal and insectivorous in its laabits, furnished with moderate ears, pentadactylous feet-the thumb of the hinder pair being clawless-and a long prehensile tail. It possesses only two proemmbent ineisors in the lower jaw, four canines, and a variable number of molars, only twelve remaining constant. This anomalous species has no coccum.

## Family V.-Dasyutidde.

The Dasyures constitute a highly carnivorous group of marsupials, elearly representing the trme Carnivora of the placental mammals. The typieal forms have eight incisors above and six below, four well-dereloped eanines, cight pre-molars, and sixteon true molars-in all, forty-two tecth. Aecording to Professor Owen, "the spurious molars have a pointed, compressed, triangnlar crown, with a rndimental tuberele at tho anterior and posterior part of its base. The grinding surface of the true molars in the upper jaw is triangular; the first presents four slarp ensps; the second and thired each fire; the fourth, which is the smallest, only three. In the lower jaw the last molar is nearly of equal size with the penultimate one, and is bristled with four cusps, the exterial one being the longest." In other respects the lower grinders correspond with those opposed above. The anterior limbs are pentadactylons, but the posterior pair have usually only four digits, the pollex being occasionally represented by a small, clawless, warty tuberele. Some of the species are strong and powerfully-built animals. In all, the tail is moderately long, non-prehensile, and generally hairy thronghont. The rarions species are natives of $\Lambda$ ustralial and Van Diemen's Land.

THE URSINE OPOSSUM (Dasyurus Ursinus), or "Native Deril:" as the Tasmanian colonists term it, is a tmly formidable species. It is about the size of our enmmon badger, heing furnished with a coarse hack fint, which is hore and there irregnlarly marked with whitish spots. The tail is rather bare under-
neath. By all aecounts these ursine opossums are perfeet pests, and prove terribly destructive to poultry, sheep, \&e., hardly anything eoming amiss to them. According to Mr. Inaris, they were extremely numerous when the first attempts were made to settle at Hobart Town; but they appeared to have cone good service in affording supplies of fresh food to the eonviets sent thither; their flesh is said to eat like veal. Is the settlement inereased, their numbers diminished, and they were driven into the forest, where they are still pursued and secured by traps. They are extremely rapacious and sarage, both in the wild and semi-domesticated state. 'Ihey utter a hollow barking noise, something like that of a dog; and judging from their resentful perseenting behaviour, appear to have well earned the colonial appellation by which they are so signifieantly eharacterized.

Several other species are known to exist; and of these we may mention-The Longtailed Dasyure ( $D$. macrourus), having a rudimentary hallucinar wart, by
which it is distinguished from the two followingMangê's ( $D$. MLanyii), a smaller species of an olive ground colour; and Shaw's Dasyure ( $D$. viverrimus), or Wild Cat of the Tasmanians-- Mlate 31, fig. 97which has a black fur. All three are marked by large white spots on the body, and in the tro first the tail is similarly distinguished.
THE THYLACINE (Thylucinus Harrisii) is a native of Van Diemen's Land, and is variously termed by the colonists "ponched wolf," hyiena, tiyer, zelura, opossum, and so forth. It cnjoys the distinction of being the largest of all the carnivorous marsupials, and is about the size of an ordinary fox-hound, lout stouter built, and standing lower on the legs. The fur exhiluits a dusky brown color, the erupper being barred transversely by sixteen deep black bands ruming parallel from side to side (fig. 89). The 'Ihylacines are highly earnivorous, and prove terribly destructive to the flocks of sheep, which they seem to prefer to any other kind of animal food, though formerly they must have sub-

Fig. 89


The Pouched Wolf or Thylacine (Thylacinus Harrisii).
sisted, almost entirely, on phalangers and kangaroos. They are seldom captured alive, and appear to be rery wary animals. The Thylacine is noctumal in its habits. It is furnished with forty-six teeth; but the circumstanees most worthy of note are seen in the strongly earnassial charaeter of the molar teeth, and in the great size of the eanines, as complared with other nonplacental mammals. No other living species exists; but a fossil Thylacine has been diseotered in the tertiary gypsum beds of Paris-a fact of extreme interest, taken in connection with other extinet marsupial remains clsewhere formd in Europe, and demonstrating the wide geographieal distribution these creatures maintained in former times.
THE COMMON PHASCOGALE (Phascogale penicil-latus.)-The present genus embraces three or four
very small marsupials, whose dental formula is preeisely the same as that of Chylacims; whilst the only differences appertain to the less cirnassial claracter of the molars-serving to approximate them more elosely to the insectivorous type-and to an elongation of the central incisives, which is more partienlarly manifest in the upper series. All the species are remarkably minute ; one of them-the Antechinus mimutissimus of Gould-being the smallest living marsupial, and measuring less than two iuches and a half long, exelusive of the tail. In many particnlars these animals resemble the entomophagous opossums. The common Phaseogale is about the size of our common rat. The fur is short, thick, and woolly, and of a minform ashy color above, passing into white beneath. The tail is well dereloped, and very bushy towards the tip. Its
habits are arboreo-nocturnal, and in common with its nongeners it preys chiefly on insects and small birds. This species is a native of Australia generally, but has not, we believe, been found in Van Dienen's Land.

THE BANDED MYRMECOBE (Myrmecobius fusciatus) is an inhabitant of South-western Australia, having been originally discovered and procured by Lieutenant

Dale, at about ninety miles to the south-east of the mouth of the Swan River. The Myrmecobe (fig. 90) is at once distinguished from its insectivorous congeners, and also from all other marsupials, by the large number of teetle, of which there are fourteen ineisorscight above and six below-four canines, twelve premolars, and 110 less than twenty-four truc molars; in


The Banded Myrmecobe (Myrmecobius fasciatus).
all, fifty-four. The dental formula thus approaches very closely to that of the extinet-and probably mar-supial-genus Thylacotherium. Professor Owen also obscrves, that it is to a certain extent comparable to the dentition of the armadillos "in the small size of the molar teeth, their separation from each other by slight interspaces, and their implantation in sockets, which are not formed upon a well-developed ridge or process. The molars, however, present a distinet multicuspidate structure, and both the true and false ones possess two separate fangs as in other marsupials." There does not appear to be any necessity to consider this animal as the type of a distinet family. It is about the size of a rat, measuring ten inches from the nose to the root of the tail. The fur exhibits a rufous gromed tint grenerally, the feet being more decidedly red, the back dark brown and banded over the crupper by whitish hairs, similar to those of the thylacine. The head displays a sharply-acuminated muzzle and short pointed ears. The tail is seven inelies long and bushy, the anterior feet pentadactylous, and the hind pair fourtoed, all the digits being armed with strong, compressed, curved claws. Its labits are arboreal, and it burrows under the roots of trees in search of inseets.

## Family VI.-DIDELPIIIDAE.

Under this head are collected together all the American marsupials or opossums, properly so called. The species are extremely mumerous, for the most part confined to Brazil and the neighboming provinces of Guyana, Paraguay, and Pern ; a few being found in Mexico and California, and one in the United States.

A single species only occurs in Chili. The opossums are comparatively small, seldom excceding the size of our domestic cat; the jaws are furnished with eighteen ineisors-ten above and cight below-four canines, and twenty-cight molars, the anterior twelve being spurious (fig. 91). The head is pointed, the ears large

Fig. 91.


Skull of the Tirginian Opossum (Didelphis Virginiana).
and naked, the gape of the montl wery wide, the prodneed muzzle being finmished with a few long bristles. The tail is prehensile, more or less semi-nude or sealy: The feet are all pentadactylous, but the pollex of the hinder pair is opposable to the other digits, and elawless. The opossums are arboreal and noetmmal in their hathits, preying chiefly upon birds, egrs, insects, and eren fruit. Their movements, howerer, are rather sluggish than otherwise, and their presence is recognizable by the peculiar fetid odour of their skin. They lave a simple stomach and moderately capacions ececum.

THE VIRGINIAN OPOSSUM (Diclelphis Virginiana), or Common Possum-l'late 30, fig. 96 - enjoys the distinction of being the first known to maturalists. It
is widely distributed throughout the United States, and is especially abundant towards the south. A full-grown specimen measures twenty inehes in length, exelusive of the tail, for which other fourteen inches must be allowed. The fur has a dusky-brown colour; the individual hairs being whitish, with brown tips. The legs are nearly black, the digits being lighter coloured or whitish. The head is fulvous-white, with a dusky suffusion round the eye; the ears are black, with a yellow pateh at the upper border; the root of the tail is also dark coloured. The Possum is very destructive to poultry, and proves a troublesome pest. The female produces sometimes as many as sixteen young at a birth, which, when at first transferred to the marsupial poueh, are extremely minute. The eyes of the young open about the fiftieth day, when the culs are as large as ordinary mice. The flesh is said to be good eating.

Among tho more interesting or noticeable of the other species, we may mention the following:-Tho Texas Possum (Didelphis Californica), which is distinguished by its smaller size, its less rounded and more pointed ears; the hairy or basal portion of the tail being also sloorter. Aecording to Mr. J. II. Clarke of the United States expedition, this speeies is particularly fond of the black persimmon, an abundant fruit
on the borders of the Rio Grande. The D. Murina is found in Mexico, Guyana, Peru, and Brazil ; the $D$. dorsigera in Surinam. "These species," as Van der Hoeven observes, "earry their young on the back when they are sufficiently developed to leave the teat, to which at first they were attached, whilst they throw their tails like tendrils round the eandal appendage of their parent." In both the tail is fully as long as the body, and the ears are largely developed. Azara's Possum (D. Azarce) pretty elosely resembles the Texas form. Aecording to Mr. Speneer F. Baird, it is distinguished by its white head and neek, with a central darls stripe along the forchead to the dusky part of the nape. The cars and toes are flesh-coloured. The Chabeating Orossum (D. cancrivora)-so ealled from its propensity for eating these erustacea-is a large speeies, possessing no well-defined markings on the head; the gencrieally distinetive, long, and sparsely seattered hairs of the short fur existing more or less abundantly in all the opossums. The fur exhilits a deep black colour.

THE YAPOCK (Chicironectes variegatus), or Petite Loutre of Buffon, is an aquatic form of opossum inlabiting the river banks of Brazil and Guyana (fig. 02). The only point in which it nppears to differ


The Yapock (Cheironectes variegatus)
materially from the ordinary opossums, has referenec to the palmated eharacter of the feet, which are supplied with interdigital membranes. In all other particulars it conforms to the genus Didelphis. The

Yapoek is little more than a foot in Icugtl, exelusive of the tail, which is sealy and prehensile, and nearly as long as the body. It is an expert swimmer, and feeds upor fishes, crustacea, and other aquatic animals.

## Order XIV.-MONOTREMATA.

Tr is not a little signifieant of the universality of plan pervading all vertebrate formations, that we should find on examining the skeleton and viseera of the monotremes, a decided approximation to eertain of

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the distinguishing elaracteristics of birds and reptiles. At first sight there is little to suggest this relationship, exeept in so far as the bill-like jaws of Ormithorynchus are admitted to resemble a duck's beak; but on closer

2 E
examination, several oviparine features will be immediatcly discovered. M. Gcoffroy St. Hilaire first gave the name of Monotremata to the small group of nonplacental marsupial mammals here associated together, thereby indieating the termination of the urino-genital and intestinal passages by a single eloacal outlet-an arrangement also found in birds and reptiles. Equally striking peonliarities aflect the skeleton, these being more especially manifest in the presenee of two clavieles nearly conjoined, and applied against the upper surface of a single furcular bone; there are also well-developed coracoid bones, which are articulated to the sternum. In addition to this there are speeial osscous clements, termed epieoracoids, which are connceted to the steinal and furcular bones, the scapule being likewise attaehed to the breastbone. In the aecompanying woodeut (fig. 93), tho fureular bone or episternum presents a


Sternal apparatus of the Duck-bill (Ornithorhynchus paradoxus).
T -shaped outline, with the lateral free ends direeted towards the shoulder-blades. It coneeals the elavieles, which are slender bones and not united at tho mesial line. The epicoracoids are seen interposed on cither side of the stem of the fureular bone, resting laterally on the thiek coracoids, which latter are articulated to the episternum and manubrial bone of tho sternum below and to the seapular above. Another cireumstanee worthy of remark is that the bones of the skull become very early consolidated; thoso of tho face being much prolonged forwards and flattened out into the form of a beak, whieh is covered by a smooth, naked integument. The jaws are not furnished with teeth; but their place is supplied by numerous rows of horny dentelations, having their spinous points direeted towards the throat, as obtains in the analogous buecal papille in the mouths of ruminants. They also exist on the tongue in the form of conical papille. The fect are short, partieularly strong, and pentadaetylous. The Monotremes lave small eyes, no external ears, and very short tails. In the male Duek-bill the hind feet are armed with a perforated spur, its eliannel containing an exeretory duct belonging to a special glandular strueture placed at the back part of the thigh. This remarkable organ was formerly supposed to be a poison gland; but there is no good ground for suel an opinion. Neither is it merely a weapon of offence and defence; for then we should probably not lave the gland in connection with the spur, and the fenales would probably also be similarly armed. We
have no doubt in our own mind that it is analogous to thoso supernumerary organs often found in the males of the lower as well as in the higher animals. "Sinee then," says Profossor Owen, "this apparatus forms a sexual character, it may be presumed that its funetion is connected with that of gencration. Whether the spur be a weapon for combat among the males, orlike the spiculum amoris of the snail-be used to oxcite the fomale, the injeeted secretion boing an additional stimulus; or whether the spur be mechanieally useful in retaining the female during the coitus, are conjectures which must be verified or disproved by actual observation." The females are furnished with mammary glands; but there are no external teats. The manner in which the function of lactation is performed, and many other facts bearing upon the question as to how the offspring are reared, still remain to be explained.

## Family I.-ORNITHORHYNCHID E.

This family is represented by a single species, whieh is readily distinguiohed from the members of the suceeeding family by its non-fossorial, palmate feet. It is also furnished with eight horny, tooth-like formations regularly disposed, two on either side above and below. The erowns of the anterior pairs are long and thin, those of the posterior set being broader and oval. The snout is prolonged, compressed, broad, and covered by a naked coriaceous integument; the lower jaw is shorter and narrower than the upper, and marked posteriorly by transverse lines. The tongue is very peculiar; the anterior half or narrow portion being covered with eoarse papillæ, whilst the posterior division is broad, slightly overlapping the former, and armed in front by two prominent horny spines. The ornithorlynehus is furnished with eheek-pouches. The fur is hairy throughout; the tail being flattened, broad, and conspicuous.
THE DUCK-BILL (Omithorhynchus paradoxus), or Australian Water Mole-Plate 31, fig. 99-is a native of New South Wales and Van Diemen's Land. A full-grown individual raries in length from eighteen to twenty inches, inelnding the tail, which measures about five inches. The fur exhibits a tawny or rufous colour, one or other of these tints prevailing in different varictics. In tho joung stato tho skin is entirely destitute of hair, and the jaws are short, soft, and flexible. In the adult the tongue is plaeed far baek, the tip being fully an inch behind the anterior opening of the bill. Aecording to Professor Owen, "the raised posterior lobe of the tongue must impede the passage of unmastieated food to the pharynx, and doubtless tends to direet it on each side into the elreekpouelies, whence the ornithorhynehus may transfer its store at leisure to the molar teeth, and complete its preparation for deglutition. An air-breathing, warmblooded animal, whiels obtains its food by the eapture of small aquatic animals while submerged, must derive great advantage from the structure which enables it to transfer them quickly to a temporary reeeptacle, whence they may be extracted and mastieated while the animal is floating on the surface or at rest in its burow."

The Duek-bill feeds on small molluscous animals, various aquatic larve, and especially on water-bugs belonging to the gems Naucoris, which abound in the running streams and lakes of Australia. The most interesting account of the habits of this animal yet placed on reeord, is that given by Mr. Bennett in the first volume of the Zoologieal Socicty's Transactions. Speaking of one which he kept in a semi-eaptive state, oecasionally tethering it to a stake by the river's side, he tells us that "it was execedingly lively, swam in the centro of the stream, and appeared in exeellent health and spirits. Tho water at one part of the river being very elear, I saw its movements distinetly under the water. On diving, it sank speedily to tho bottom, swam there for a short distanee, and then rose again to the surface; it rauged tho banks, guiding itself in its progress aeeording to the impressions received by the mandibles, which appeared to me to be used by it as very delicate organs of tonch. It seemed to feed well; for whenever it inserted its beak into the mud it evidently proeured some food from thenee, as, on raising the head, after withdrawing the beak, the mandibles were seen in lateral motion, as is usual when the animal mastieates. Although several inseets were basking and fluttering about the surface of the water, close to it, no attempt was made to capture them, either from its not seeing them, or from its preferring the food whieh the mud afforded. The motions of the mandibles in this animal, when secking its food in the mud and water, aro the same as thoso of a duck when feeding in similar situations. After feeding it would lie sometimes on the grassy bank, and at others partly in and partly out of the water, combing and cleaning its eoat as usual with the claws of the hind feet. After permitting it to swim, feed, and clean itself for an hour, it was replaced, although with great reluctance on its own part, in its box; it did not, however, as before, betake itself to repose, but commeneed and continued a seratehing on tho sides of the box." During sleep the duck-bill rolls itself up in the form of a ball. For this, and many other interesting facts, we are indebted to Mr. Bennett, who has also given us a full account of the form and extent of the burrows which theso animals construct in the banks of rivers. One of these burrows measured fully twenty fect in length. It commenced in some long grass about five fect from the water's edge, passed upwards in a serpentine direetion, terminating near the surfaee of the ground in a rounded exeavation, the lower part of this hollow forming a nest of dried grass and weeds. In this particular burrow Mr. Bennett eaptured an unlueky ornithorynchus, which, on being drawn out by the leg, manifested the most alarming evidences of fear, its heart palpitating violently. It did not scream, or make any attempt to bite; during its subsequent eaptivity, however, it frequently uttered a soft growl during the night, at whiell time it also made vigorous efforts to eseape.

## Family II.-TACIIYGLOSSIDA.

The members of this family are at onee distinguished from the former by the mixed spinous and hairy charaetor of their fur, as well as by the eircumstance of their possessing a slender subulate muzzle and a merely rudimentary tail. On eloser examination we find that the jaws are entirely edentulous, the palate being armed with several rows of small spines directed baekwards. A more signifieant eharacter is founded on the form of the tongue, whieh is long, narrow, rounded, and very extensile-henee the family name above given-closely rescmbling the lingual organ in their placental representatives, namely, the true anteaters and pangolins. The pentadactylous feet aro short and thick, the digits being furnished with powerful faleiform elaws adapted for burrowing. The second aud third digits of the hind feet are particularly long. The stomach is simple, eapacious, and spherical when distended. The coceum is moderately developed.
THE PORCUPINE ANT-EATER (T'achyglossus Mystrix), or Australian IIedgenog of the colonists, is a native of New South Wales and Van Diemen's Land, but is now rather rare in the first named locality. It is maintained by some, on grounds apparently tenable, that the forms proper to the two habitations are distinet species; but others consider the differences observable insufficient to prove a separate origin. Without offering a positive decision, we strongly incline to the belief that they aro different animals, the form known as the Van Diemen's Land species (T'achyglossus sctosus)-which, however, is not peeuliar to that island, aecording to the testimony of Mr. Waterhouse-being provided with small and narrow digits, as compared with those of T. Hystrix, whilst the hairy appendages of the skin are also longer, the spines, on the other hand, being relatively short. Other minor differenees likewise exist. These animals are about the size of our common hedgchog, varying in length from fourtecu to cighteen inches. The hairy portion of the skin cxhibits a chestnut colour, the spines being whitish except at their tips, whieh are blaek. Like hedgehogs, they roll themselves up when attaeked on the open ground; but their safety is usually more effectually secured by burrowing in the earth, or by entering a previously construeted tumel. These animals feed uron ants, captured by the protrusion and sulsequent retraction of their extensile glutinous tongues, after the manner previously deseribed in our aceount of the typical edentate ant-eaters or myrmecophagas.

Those who desire more extended information respeeting the structure and coonomy of the monotreme marsulpials, are referred to Professor Owen's elaborate article "Monotremata," contained in the third rolume of Dr. Todd's Cyclopredia of Anatomy and Physiology; and also to Mir. Gould's large folio work on the "Mammals of Australia."

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Ifoonuman, the, Semnopithecus Fatellus
IIopoona-Roo, the, I'elcurrus Austrulis.
Horse, thic, Eqquas Caballus
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Leopard, the Sea, Leptoryx Weddellii
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Lepus Americanus, the American IIare .
Lepus cuniculus, the Rablit
Lepus glacialis, the Polar Ifare
Lepus Ilibernicus, the Irish Ilare
Lepus timidus, the common Ilare
Lepus variabilis, the Alpine IInre
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Leucoryx, the, Amilope Leucoryx
Lion, the, Felis Leo
Lion, the Sca, Oluria jubata
Llama, the, Aucheniu gluma
Lori, the Bengal, Loris yrucilis
Lori, the Javanese, Loris tardigradus
Loris gracilis, the Bengal Lori
Loris tarligradus, the Javenese Lori
Loutre, the l'etite, Cheironectes variegatus
Lutra Americuna, the American Otter
Lutra Brazilicusis, the Erazilian Oller
Lutra vulgaris, the Otter
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Lynx, the European, Felis Lynx
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Macacus Nemestrinus, the Bruh
Macacus Niger, the Black Macaque
Macacus Rhesus, the Bhender
Macacus Silenus, the Wunderoo
Macacus Sinicus, the Bonnet Monkey
Macacus Speciosus, the Red-fuced Macaque
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Mus messorins, the Hurvest Mouse
Mus mnsenlus, the common llouse
Mus Rattus, the Black Rat

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Mus sylvaticus, the Long-tailed field-mouse
Musquash, the, Castor zebethicus
Mustela erminea, the Ermine
Mustela putorius, the Polecat
Mustel: rulgaris, the Weasel
Mycetes Seniculus, the Reed Ifowling monkey
Mycetes Ursinus, the Broun Ilowing monken
Mydaus meliecps, the Suranese T'eledu
Mygale moselata, the $1 /$ usid rat
Myodes Girceul:undicus, the Greentened Lemminy
Myodes Mudsonius, the Mudson's Bay Lemminy
Myodes Lemmus, the Scondinavian Lemming
Myodes trimucronatus, Buclis Lemming
Myopotams Coypus, the Coomp
Myoxus arellimirins, the common Dormouse
Myoxus Glis, the (ireat Iormouse
Myrmecole, the Banded, Myprmecobius fusciatus Myrmecobius fasciatus, the Bunded Myrmecobe
Mrymecophaga didactyla, the Little Ant-euter
Myrmecoplaiga jubata, the Gireat Ant-cater.
Myrmecophaga Tannandua, the Tamanduct
Nakong, the, Antilope Anderssonii
Napu, the, Trayulus , Iteremicus
Narwhal, the, Monoton monosceros
Nasalis Larvatus, the Kahan
Nasuu narica, the Broun Coatimondi
Nootoma Drummondii, the Rocky Mountain rat
Nisuas, the, Cercopithecus Pymrhonotus
Nyetipithecus trivirgatus, the Douroucouli
Nyentek, the, Itclictis moschatus
Nyl-Gliau, the, Portax pieta
Occlot, the, Felis pardulis
Octodon, Cuming's, Octodon degus
Octodon degus, Cuming's Octoclon
Ogotona, thic, Lagomys Ogotona
Oudatra, the, Custor zebethicus
Opossum, the Crab-eating, Didelphis cancrivora
Opossum, the Ursine, Dasyurrus Ursinus
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Orang-Outan, the, Simic Satyrus
Order Dimana
" Carnivora
" Cetacea.
" Cheiroptera
" Edentata
" Insectivora
" Marsupialia
" Monotremata
" laclydernata
" Pimmipedia
" Quadrumana
" Rorlentia
" Ruminantia
" Solidungula
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Ounce, the, Felis Luciet
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Liat, the Brown, MIus decumanus
Rat, the Kingaroo, IIypipminmus minor:
Kat, the Musk, Custor zelethicus
Rat, the Musk, Mygule moschata
Rat, the Rocky Momatain, Neotoma Drummondi
Rat, the Tikus-wirok, Mus setifer
Rat, the Water, Areicola amphibia
Ratel, the, Mellivora caterisis
Ratlannchi, the, Merpestes budius
Rein-Deer, the, Taremolus Rimaifer.
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Rhee-boc, Autitope Councolus
Rhinoceros Africanus, Bruce's Ihinoceros
Ihhinoceros bicornis, the Intien Rhinoceros
Rhinnoceros, Bruce's, Rhinoceros Africams
Phinuceros, Burchell's, Rininoceros simus
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Lhinoceros, the Javancse, lihinoceros sonduicus
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Rhinoceros, Oswell's Ihinoceros Oswellii
Rhinoceros Oswellii, Oswell's Rhinoceros
lhinoceros unicornis, the Indian Phinoceros
Rhinolophus Ferrum-equinum, the Circuter horse-shoe But
Ihinolophus hipposideros, the Lesser horse-shoe But
Rhinolophus nobilis, the Noble horse-shoe Bat
Rhynchocyon cirnei, the Ihhmohocyon
Iihynchocyon, the, lihynchocyon cirnei
Rhytima Stelleri, Steller's ILhytima
Rliytina, Stelter`s, IRlytina Stelleri
Mhysama tetradactyla, the suricate
Rimau-D yan, the, Felis mucroscelis
Roebuck, the, Capreolus Dorcas
Sable, the, Martes leucopus
Saig:l, the, Antilope colus
Sassabe, the, deronotus lunate .
Scalops aquaticus, the Shrew-Mote
Schan-Scham, the, Cuscus muculata
Schizodon, the, Schizodon fuscus
Schizodon fuscus, the Schizodon
Scirtetes jaculus, the Alak-Darrgha Jerboa
Sciuropterus genibarbis, the Kechubu
Sciuropterus lepidus, Horsfichl's trlying Squirmel
Sciuropterus Sabrinus, the Greater Flying stumirel
Sciaropterus sagitta, Nieuhoff's Flying Stquirtel
Sciuropterus volans, the Liuropean Flying squirod
Sciurus bicolor, Sparmann's Squirrel
Sciurus Ccpapi, Smith's Squirvel
Sciurus cincrens, the Grey Squirrel
Sciurus getulus, the White-shriped squirrel
Sciurus Iludsonius, the Iludson's Bay Squirrel
Sciurus insignis, the Boklind
Sciurus Lysteri, the Ground Squirred
Sciurus maximus, the Maluber struirrel
Sciurns niger, the Black Eqmirvel
Sciurus palmarum, the Palm Squirrel
Sciurus I'lantani, the Bajing
Sciurus quadrivittatus, the Four-banded Squirvi
Sciurus vilgaris, the common Sfuired
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Sokinah, the, Echinops Telfier-i
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Squirrel, Sparmamn's, Sciurus bicolor
Squirrel, Sparmam s, Sciurus bicolor
Squirel, the Sugar, Peturus sciureus
Squirrel, the Suqar, Pefumus sciureus
Squirrel, the White-striped, Scimms getulus
Star-Nose, the Thick-tailed, Condylara macrour:
Stag, the Cominon, Cervus Elaphus
Dtag, the Common, Cerrus Elaphas
Stecn-boc, the, Antitrpe trayorlus:
Stecn-boc, the, Antilope traynlus
Stemmatopus cristatus. the Crested Scal
Stoat, the, Mustela crminea
Strensiccros Kurlu, the Koodno
Surieate, the, Rhyzana Itradactyla
Sus larvatus, the Musked Eour
Sus P'apuensis, the Popman Boar
Sus Scrofa, the With Boar
Synctheres prehensilis, the Brazilian Porompine

Tachrglossus Itystrix, the Porcupine Ant-cater
Scall, the Great, Phoce barbuta
Scal, the Grey, Ifalichacrus Ijryphus
Seal, the Harp, Phoca Grontuntica
Scal, the Marbled, Phoca anmulata12.5
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28Serval, the, Felis sercal
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new, the Amemcan Marsh, sorex pulustris

Sirar, tic Common, sorex arancas
Slurew, Forster's, Sorex Forsteri
Sluew, the Indian, Sorex indicus
Slurew, the Oared, Sorex remifer
Shrew, Sirvi's, Sorese etreiscus
Shew, the Water, sorex forliens
Siamang, the, Hylobates Syudactylus
Simin Satyrus, the Orung-Outen
Sknnk, the, Mephitis americume
Slepez, the, spethex typhlus
didactylus
Sulenodon, the, Solenodon perradoxus
Solenodon paradoxus, the Sulenodon
orex ci:aneus, the common Shrevo
Sorex ctruscus, Suri's Shreao
Sorex fodiens, the Whater Shrew
Surex indicus, the Thdian Shrew
Sorex palustris, the American Marsh Shrewo Sorex remifer, the Oared Shreu

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Tapir, the common, Tapirus Americanus
Tupir, the Malayan, Tapirus Malayanus
Tapir, Roulin's, Tapirus villosus
Tapirus, Amerieanus, the Common Tapir-
Tapirus Malayanus, the, Molayan Tapir
Tapirus villosus, Roulin's Tapir
Tarandus Ramgifer, the Rein-deer
'Tarsier, the, Tarsius Spectrum .
Tarsius Spectrum, the Tarsier .
Tatouay, the, Dasypus Tatouay
Teledu, the Javanese, Mydurs meliceps
Tenrec, the, Centenes setosus
Thalaretos maritimus, the Polar Bear
Thylacine, the, Thylucimus Ifarrisii
Thylacinus Marrisii, the Thylacine
Tiger, the, Felis Tigris .
Trugelapluss sylvatica, the Bosch-Boc
Tragulus Javanicus, the Nupu .
Trichechus Rosmarns, the Morse
Troglodytes Gorilla, the Gorilla.
Troglodytes niger, the Chimpanzee
Tschikitei, the, Asinus Llemionas
Tupaia javamiea, the Javanese Bangsring
Unau, the, Cholopus didectylus
Ursus americ:nus, the Black Bear
Uisus aretos, the Bromn Bear.
Ursus ferox, the Grisly Bear
Ursus isabellinus, Horsficld's Bear
U'sus labiatus, the Sloth Bear
Ursus syriacus, the Syrian Bear
Valke-Vark, the, Phacocharus Athiopicus
Vespertilio Bechsteinii, Bechstein's Bat .
Vespertilio Daubeutonii, Doubenton's Bat
Vespertilio discolor, the Particoloured Bat
Vespertilio Leisleri, Leisler's Bat
Vespertilio murinus, the Mouse-coloured But
Vespertilio mystacinus, the Whiskered Bat
Vespertilio Nattereri, Natterer's Bat
Vespertilio noetula, the Noctule.
Vespertilio pipistrellus, the Pipistrelle
Vespertilio serotinus, the Serotine
Viseacha, the, Lagostomus trichodactylus
Vison, the, Vison lutreola
Vison lutreola, the Vison
Viverra civetta, the African Cives
Viverra musanga, the Lawak
Viverra Rasse, the Rasse,
Viverra zibetha, the Tanggalung:
Vole, the Bank, Arvicola riparia
Vole, the Field, Arvicola aypestis
Vole, Riehardson's, Arvicola burealis
Vole, Wilson's, Arvicola Pennsyleanicus
Vole, the Yellow-cheeked, Arvicola xenthoynathus
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Zorilla, the, Zorilla striata . . . $\quad$.
Zorilla striata, the Zorilla



[^0]:    

[^1]:    * Professor Wagner's Continuation of Schreber's Süugthiere.
    $\dagger$ It must be remarked, howevcr, that the few species of marsupial animals known to Linncus were all of the ferino family of opossums.

[^2]:    * This mar remind our readers of the story in the "Thousand and One Nights," in which a prince, metamorphosed into an ape, discorers his human quality by writing.

[^3]:    

