



SYSTEMATIC DICTIONARY
OF
MAMMALS OF THE WORLD

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Introduction and General Notes

A DICTIONARY, to fulfil its proper function, should contain information on every aspect and feature of its subject. There are, however, practical considerations which limit severely the amount that can be included in one small volume. Therefore, the first problem has been to decide what shall be included and what shall be left out. It is clearly impossible to deal in a book of this size with each of the 4,000 to 5,000 known species of mammals. In any event, little is known of some of them apart from the description of their external features.

The next difficulty is that so much more is known about some species than others; and the mammals of one continent may be better known than those of another continent. Australia, and more especially South America, are two areas for which details of habits are still needed for much of the native faunas. Even in regions where the opportunities for close study have been greater, knowledge about the various species is markedly uneven. Added to this, the more that is known about a species, the less easy is it to summarise the information, since habits and physiology are found to vary, if only slightly, from individual to individual or from community to community in different parts of the range of the species.

The only practical method has been, therefore, to allot a certain proportion of the pages to each order of mammals, then to include within each section descriptions of those species about which most information is available, adding where possible more shortened notes on related forms. Where statistical information is included the data are often insufficient to serve as more than a rough guide. For the rest, the book aims at being no more than a source of easy reference to the kinds of information that are not readily available elsewhere between the covers of one volume.

At certain points in the text are included brief notes on several related species in conjunction with the fuller notes on one particular species. Even these may not be sufficient to emphasise how much information has had to be omitted or to stress how much more numerous mammals are than these brief notes might lead one to suppose. In two places more particularly, under both hares and mongooses, very full lists are included of the known species. If these do nothing more, they serve to remind us that over and above the mammals described here there are many more that have had to be ignored owing to lack of space.

The bulk of the information contained in this book was put together

ten years ago in co-operation with Mr. R. W. Hayman, of the British Museum (Natural History), in the form of notes destined for another purpose. These were compiled from various specialist books on mammals, with information added from scientific papers scattered through the journals of scientific societies. To these have been added details from first-hand observation of the living animals and data checked from examination of museum specimens. Those original notes were valuable also because they sprang in so large a part from Mr. Hayman's extensive knowledge of the subject, and this is the fitting moment to express my indebtedness to him for his ready help at all times.

Since that time, ten years ago, additions to these notes have been made, mainly in a desultory and somewhat random manner, more for my own information than with a view to publication, and the nature of these additions may account for the contents of the book being at times, perhaps, slightly out of balance in giving undue emphasis to some species or families and too little to others.

The statistical information has been drawn, for the most part, from the *Handbook of Biological Data* (1956) edited by William S. Spector, and to other tables such as *Gestation Periods: A Table and Bibliography* (Third Edition, 1955) by J. H. Kenneth and G. R. Ritchie. Acknowledgement is readily given for the help derived from these. *Mammals Living and Extinct* (1891) by W. H. Flower and R. Lydekker, although now seventy years old, is remarkably comprehensive and correct, even by modern standards, and has been a constant source of reference. Hardly less so has been the section on mammals in the three-volume *Harmsworth Natural History* (1911).

For the distribution and names of the species valuable guides have been found in the several check-lists of mammals published between 1940 and 1955 by the British Museum (Natural History) under the authorship of Sir John Ellerman, T. C. S. Morrison-Scott and R. W. Hayman. These cover the rodents of the world, the mammals of Europe, Asia and North Africa, and southern Africa. *Mammals of Western Europe* (1912) by G. S. Miller, another British Museum publication, deals with the species of that area in greater detail.

For information on mammals of particular regions the main sources of information have been the many non-technical books on British and European mammals, notably *A History of British Mammals* (1910) by G. E. H. Barrett-Hamilton (and later M. A. C. Hinton), *British Mammals* (1952) by L. H. Matthews, and *Zoogdierengids* (1955) by F. H. van den Brink; on Africa, *The Mammals of South Africa* (1951) by A. Roberts; on Australia, *The Furred Animals of Australia* (1947) by E. Troughton; on North America, *The Mammal Guide* (1954) by Ralph S. Palmer, *The Journal of Mammalogy*, and *Fieldbook of Mammals* (1957) by E. Laurence Palmer.

In the pages that follow, the presentation is in the quasi-tabular form which, in various modifications, is in current use in comparable scientific writings. This, and the abridged language demanded by reasons of space, must necessarily cause much to be omitted that a reader may wish to know. An attempt to offset this is made in the following notes.

Diurnal and Nocturnal: In the past it has been customary to divide animals comfortably into diurnal, those active throughout the daylight hours, and nocturnal, those that sleep by day and move about at night. It was also recognised that some, notably among the bats, were crepuscular, or active mainly at twilight. Within the last twenty years our ideas on this have undergone a radical change. Some of the larger and medium-sized mammals that customarily come out at night have been found to be active for at least part of the day, or to be so at certain times of the year. More important, and this applies to the smaller mammals, some are neither diurnal nor nocturnal but divide the twenty-four hours of the calendar day into regularly alternating periods of sleep (or rest) and active movement, each of a few hours' duration. These are said to have a three-hourly or four-hourly rhythm of activity.

Food: The same comfortable division of animals into herbivores, carnivores, insectivores, piscivores, etc., although convenient, lacks precision. Too often a carnivore, regarded as flesh-eating or mainly so, has been found to take a high proportion of fruit and vegetable. Even typical herbivores, such as cattle and deer, are known, on occasion, to eat flesh or carrion. An easy division on the basis of typical diet is therefore no more than a generalisation. In a similar way, it is usual to give items in the known diet of a species, and this again is the only practical way to express the information. All the same, the statement that a given species includes in its diet the dozen or so items listed is apt to be an over-simplification. It does not allow for the fact that, as in the human species, there may be local diets, seasonal preferences, individuals that differ from the majority of their kind in accepting or avoiding certain items of diet; nor the fact that animals, like ourselves, are subject to whims and fads, or will make do with one thing if the more typical items of diet cannot be obtained. This can be epitomised in the authenticated story of a domestic goat and a dog that became companions, the story ending with the goat invariably eating the meat food put down for the dog and the dog consuming the vegetable mash provided for the goat.

It is possible also that wild herbivores eat more flesh than we suppose, and it is certain that some carnivores take a fair percentage of vegetable food. There is positive information that some duikers, which are otherwise typical herbivores, will eat carrion; and one of

the surprises from recent investigations on the red fox is the amount of grass and wild fruits it consumes.

These few remarks about diet make it necessary to touch, however briefly, upon the subject of mammalian dentition. The study of teeth constitutes a highly-specialised field and for fuller details reference should be made to a more comprehensive work, one of the best being *Mammals Living and Extinct* by Flower and Lydekker. It is sufficient to remark here that the teeth, and to a lesser degree the structure of the skull, are important items in the identification of mammalian orders and families, and often of species. It follows therefore that the main lines of classification of the mammals must be influenced largely by a comparative study of teeth and skulls. The importance of this is reflected in the names of several of the orders (e.g. Carnivora, Insectivora, Rodentia, Edentata).

A typical set of mammalian teeth includes incisors, canines, premolars and molars. There are, however, many departures from this by the loss of one or more categories or by modifications in the numbers and sizes of the teeth. The names of the orders just quoted remind us that basically dentition is correlated with diet, but as always in matters concerning living organisms there may be many exceptions to any apparent rule. For example, the name Carnivora implies flesh-eaters with teeth adapted to a diet of flesh. The typical dentition of a carnivore includes incisors used mainly for seizing small prey*, canines for slashing blows in defence or aggression, and cheek-teeth (pre-molars and molars) for slicing flesh or crunching bones. Characteristic also is the greater development of one cheek-tooth in both upper and lower jaws on each side, which work on each other to slice flesh and are known as the carnassials. Yet, although a member of the Carnivora may possess this type of dentition, and its relationships may be recognised by its teeth, this does not mean that the pattern is rigidly invariable within an order, nor that that member feeds mainly on meat. The giant panda is an undoubted member of the Carnivora although it feeds mainly on bamboo shoots, and correlated with this vegetarian diet the cheek-teeth have broader crowns and the carnassials are less in evidence than in the typical carnivore dentition such as is found in the dog or the wolf. Hyenas, in accordance with their capacity for chewing even large bones, not only have greatly strengthened jaws and strong muscles for working them but have stout teeth that still preserve the pattern of the typical flesh-shearing dentition although modified to the extent of being markedly more robust. By contrast, the aardwolf, also a member of the Hyaenidae, and outwardly looking very like the striped hyena, feeds on termites and has teeth that are weaker and much reduced in number, so that they present almost a ghost of the typical carnivore dentition.

*Also used at times for grooming the fur.

The Insectivora have a similar pattern of dentition to the Carnivora, except for the absence of the carnassials and the pointed cusps on the cheek-teeth, which make them suitable for holding and chewing hard-coated insects. Most members of this order feed mainly on insects, but there are notable exceptions, as in the moles that feed mainly on earthworms and hedgehogs that eat slugs, worms and other soft foods. A member of the Insectivora is, therefore, a mammal having the dentition of an insect-eater but it may or may not subsist on insects alone. Conversely, bats which feed exclusively on insects have a dentition similar to that of the Insectivora but they are classified in a separate order, the Chiroptera, not only because of the many modifications they show for flying but also on the characters of the skull.

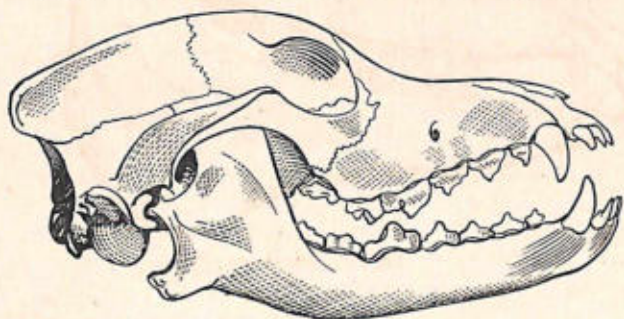
In some instances, special modifications may mask the true affinities of the teeth, even though, as a rule, the main pattern is preserved. In the ring-tailed lemur, for example, the lower canines are directed forward and lie alongside the outer incisors, the complete set of front teeth so formed serving the dual purpose of extracting pulp from soft fruits and also for combing the fur.

When all such exceptions and modifications are considered it still remains that the teeth are a good guide to the systematic position of a mammal, and are also a rough guide to the diet. A good example is seen in the order Rodentia (rodents or gnawing animals). These are characterised by chisel-like incisors and flat-crowned cheek-teeth, the canines being absent leaving a gap between the incisors and cheek-teeth known as the diastema, a condition shared by the order Lagomorpha (rabbits and hares). It is the rodent incisors which afford the most ready means of recognising a rodent, yet it was the very facility of this means of identification which resulted for so long in rabbits and hares being classified as rodents. Furthermore, there is need always to guard against being misled by conditions due to convergence. The teeth of the koala, for instance, being very like those of a typical rodent and the teeth of the Tasmanian wolf very like those of a dog, although both these animals are marsupials.

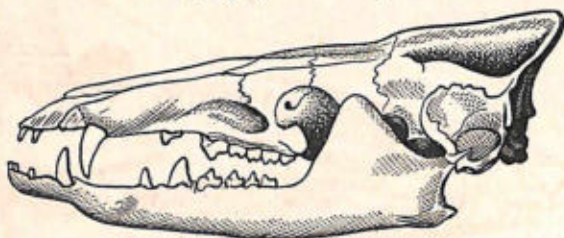
Just as a rodent dentition is characteristic so one quickly comes to recognise, in a general way, the teeth of a herbivore (e.g. horse) and the teeth of an omnivore (e.g. pig), both with flat-crowned cheek-teeth for grinding fibrous vegetation but differing from each other in the incisors and canines. The chimpanzee dentition, like the human, is specialised, but at the same time is intermediate between several of these types, having something of the vegetarian type of teeth, suited more for eating succulent stems and leaves as well as pulpy fruits, yet also able to deal with insects and with flesh in the form of small vertebrates. The ape cannot handle large carcasses nor could the human until he had invented cutting tools.

Generalisation is always dangerous and is especially so in seeking to correlate dentition and diet. It is for this reason that the remarks included here are deliberately tentative. For instance, although rodents

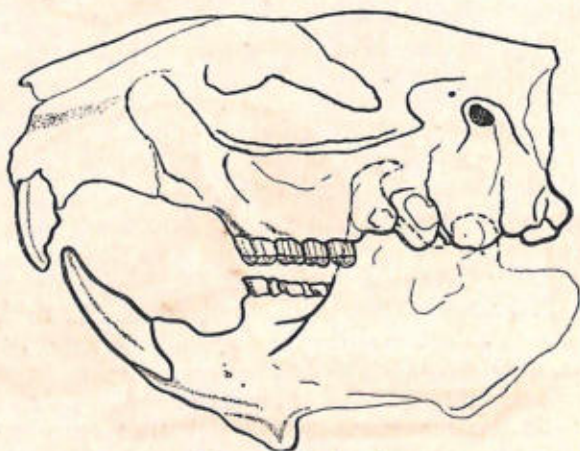
REPRESENTATIVE MAMMALIAN SKULLS



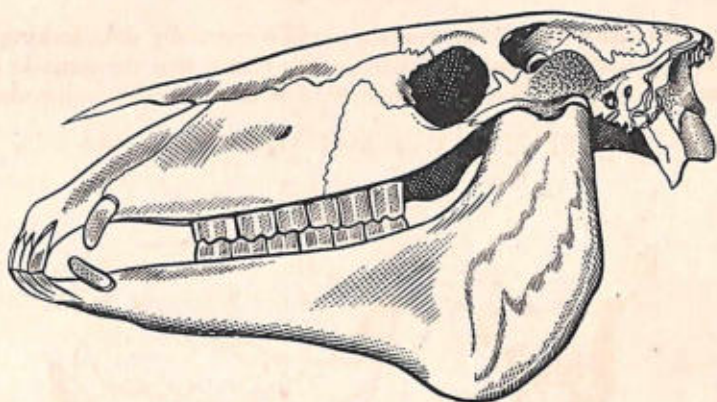
Dog (Carnivore)



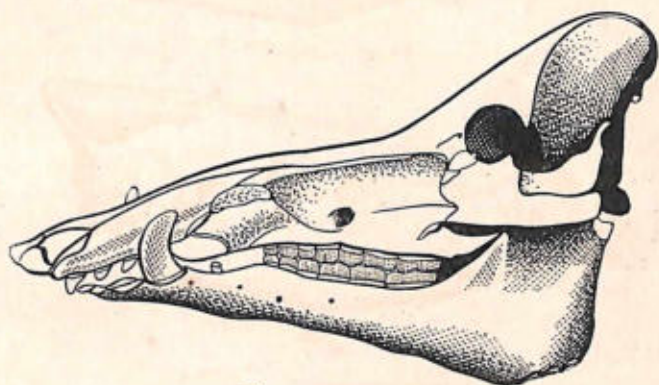
Tenrec (Insectivore)



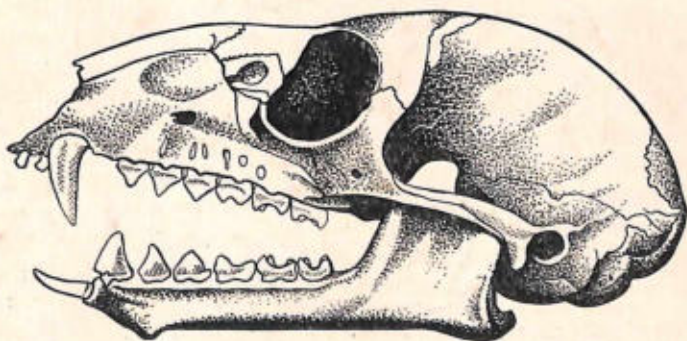
Beaver (Rodent)



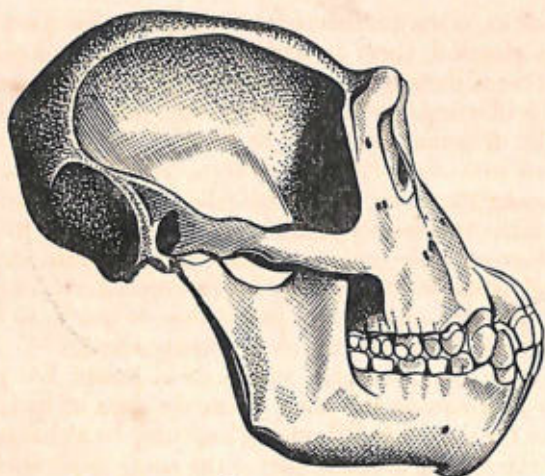
Horse (Herbivore)



Pig (Omnivore)



Ring-tailed lemur (Frugivore, but with specialisations)



Chimpanzee

are typically gnawing animals feeding on fibrous vegetable foods, needing to bite with the incisors on hard materials to keep them sharp, observation of their feeding habits suggests that many rodents are almost as omnivorous as pigs, and the analysis of stomach contents shows that many of the rodents are in the habit of eating insects to a greater degree than we normally suspect.

Habits: The summarised details of habits given in later pages in this book are the best that can be offered having regard to the space available. It has to be remembered, nevertheless, that there can be idiosyncrasies on the part of individuals—changes of habit with changes in the vegetation available and with the density of population. Sometimes these can be considerable and may affect the fortunes of a species, especially in the matter of birth-rates or survival of offspring. An outstanding example has been found in lions. When, some years ago, it was decided that the lions in the Kruger Park were too numerous for the game present they were thinned out by shooting. The balance of numbers was, however, soon restored. Now it is known that when, as is usual, several lionesses are in company, with their cubs, it is the mothers that feed first from a kill, and the first thing they take is the entrails containing vitamin-rich material. The cubs are, therefore, starved of vitamins and this leads to a low survival-rate. When a single lioness has cubs she allows them to feed first from the kill, with a consequent high survival-rate of the young. Thinning out the lionesses leads, therefore, to an increase in numbers. In other species other factors operate to produce changes in behaviour with consequent rises or falls in the population numbers.

Among rodents, as the numbers of the population rise food becomes relatively less plentiful, there are fewer opportunities for individuals to keep apart from their congeners for resting or breeding and there is a general rise in irritability. Fighting becomes more marked, mating falls below the optimum, litters fail to survive; and all these factors combined lead to a crash-fall in numbers. Together, these adverse factors help to explain the cyclic rises and falls in populations of rodents. Conversely, after systematic destruction of rodents, as in the Rat Weeks that were once the vogue and have now been abandoned, the decimated population in the area affected had more food, more living space, more successful mating and production of litters, so that in a short space of time the former numbers were restored.

There are other, more regular, variations in habits. For example, a species may hibernate in the more northerly parts of its range and fail to do so in the southerly latitudes. There may be a change of coat to white in winter in the northern part of the range of another species, while individuals living farther south may retain the same colour, or nearly the same colour, throughout the year.

There are sometimes noticeable changes in habits towards the edge of the range of a given species. One cause of this may be a greater frequency of mutation, which may express itself both in freak pelages and in unusual tricks of behaviour. These are not frequent or strongly marked, and more needs to be studied before we can speak with certainty in any given instance, but the possibility should not be overlooked.

Communications: One of the more striking discoveries in zoology in recent years has been that concerning the use of ultrasonics by bats, in finding food and in moving about, and probably also in communicating with each other. This has been dealt with so fully in *Listening in the Dark* (1958) by Donald S. Griffin, that there is no need to say more about it here. The more important point is that the use of ultrasonics has been demonstrated in other mammals or is suspected of being used. The work done on bats suggests a whole field of study yet to be explored, and apart from bats, and to a much lesser extent on porpoises and dolphins, the information is mainly fragmentary. There are two lines of approach to any species: *a.* to study the range of hearing; *b.* to detect ultrasonics actually in use.

The first is to study the range of hearing, and a simple example of the importance of this is found in the domestic cat. The upper limit of hearing of a cat is high and it has been demonstrated that a cat hears better those sounds within the upper reaches of its range of hearing. This may be why a cat seems to respond more readily to the voice of a mistress than to that of a master, and it may mean that a cat's hearing is geared to the detection of small mammals with high-pitched

voices, such as mice. The second line of approach is to look for the possibility of an animal using ultrasonics, but this demands special opportunities and the appropriate apparatus available at the same time. A start can be made, nevertheless, in the study of anatomy. For example, where the larynx is large or unusually strong there is ground for suspecting the use of ultrasonics. The giraffe has an enormous larynx, yet is, for most of its time, mute, at least to our ears. It is reasonable to suspect that giraffes are using some special form of communication, although their use of ultrasonics has yet to be proven.

Range of hearing: The human ear is sensitive to frequencies of 15 to 20,000 cycles per second, even to 30,000 in a young person. (Middle C = 256 c.p.s.) Others are:

American opossum	100 to 19,000	Deer mouse	500 to 95,000
Bat	30 to 98,000	Rat	up to 40,000
Monkey	up to 35,600	Guinea pig	up to 40,000
Chimpanzee	up to 35,500	Dog	up to 40,000
Harvest mouse	up to 17,500	Cat	30 to 45,000
Porpoise (<i>Tursiops</i>)	100 to 140,000		

Hybridisation: There is little evidence of hybridisation among wild animals because, as a rule, related species occupy separate habitats. There have, however, been instances in zoos, as in the lion \times tiger, and among domesticated animals there is the well-known mule from a horse \times ass cross, among others. Then there are the occasional reports in the Press of supposed freak crosses, but in all cases investigated these have been shown to be unfounded. One of the commonest is of the supposed cross between a rabbit and a cat or a hare and a cat. These are based on litters of kittens showing a tail-less (Manx) mutation while the parents had the complete tail. Another persistent story is of the dog \times fox cross. This has been neither proven nor disproven. There is little difference in the mating habits of dog and fox and there is the fact that occasionally a dog may be seen, of very mixed parentage, which has features recalling those of a fox (e.g. eye-colour, pointed muzzle, texture of coat) and may even have a voice resembling that of a fox. In the presence of such a mongrel it is not only easy to believe in an admixture of vulpine blood but is difficult to dismiss the idea out of hand. The argument against such a cross being possible—the one usually put forward—is that the chromosome number of the dog differs from that of the fox. This number is known for the dog but seems to be unknown for the fox, which tends to undermine the argument.

A few representative chromosome numbers are:

American opossum (<i>Didelphis virginiana</i>)	22
Bat (<i>Myotis myotis</i>)	44
Hedgehog (<i>Erinaceus europaeus</i>)	48
Mole (<i>Talpa europaea</i>)	34
Rabbit (<i>Oryctolagus cuniculus</i>)	44
Coypu (<i>Myocastor coypus</i>)	42
Cavy (<i>Cavia cobaya</i>)	64
Squirrel (<i>Sciurus vulgaris</i>)	40
Prairie dog (<i>Cynomys ludovicianus</i>)	52
Rat (<i>Rattus norvegicus</i>)	42
Mouse (<i>Mus musculus</i>)	40
Harvest mouse (<i>Micromys minutus</i>)	68
Deer mouse (<i>Peromyscus maniculatus</i>)	48
Field mouse (<i>Apodemus agrarius</i>)	48
Golden hamster (<i>Mesocricetus auratus</i>)	44
Dog (<i>Canis familiaris</i>)	78
Cat (<i>Felis catus</i>)	38
Porpoise (<i>Phocaena dallii</i>)	44
Cattle (<i>Bos taurus</i>)	60
Sheep (<i>Ovis aries</i>)	54
Pig (<i>Sus scrofa</i>)	40
Horse (<i>Equus caballus</i>)	66
Ass (<i>Equus asinus</i>)	66
Horse × ass mule	66
Monkey (<i>Macaca mulatta</i>)	48
Man (<i>Homo sapiens</i>)	48

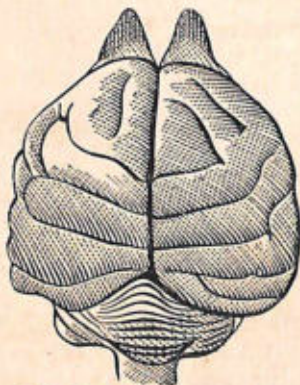
(A suitable reference for more comprehensive studies on chromosomes may be found in: Matthey, R., *Arch. Julius Klaus-Stift. Vererb. Forsch.*, 33, 1958 [1959]: 253-297.)

The mammalian brain: Among laymen and scientists alike there is an eagerness, at times somewhat disproportionate to its real value, to try some assessment of animal intelligence, and especially in regard to mammals. Such an assessment must be made on an amalgam of direct observation of animals free and unfettered, a process which requires great patience and can also be misleading; the experimental testing of the brain-capacity of laboratory animals (which too often tends to reflect more the mental level of the experimenter than of the animals subjected to experiments); and the examination of the brain itself. All three are specialist subjects as well as being wide fields of knowledge that cannot form part of the brief symposium represented by this book. The study of the structure of the brain more particularly is far beyond the reach of the average interested naturalist. There is, however, one single point alone which can be dealt with briefly here.

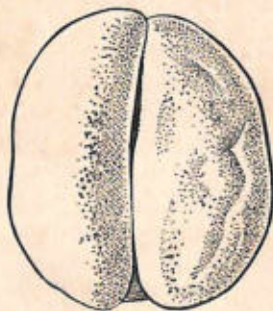
It is generally assumed that the convolutions of the brain are an index of mental capacity, or, to use the more popular term, of intelligence (a word which, incidentally, is extremely difficult to define). In general terms this is true, and a notable example is found in the Cetacea. It was long ago noted that the *brains* of dolphins and porpoises were heavily convoluted, and recent research, especially in the Marine Aquaria of the U.S.A., has revealed a high level of intelligence in these animals. But convolutions are not enough. They represent merely the superficial view of the brain, and the internal structure of the brain must be related to this to give a more correct picture.

Without going more closely into this topic, a few representative brains are shown here, for no more reason perhaps than to show that a study of the convolutions alone can be delusory, thus answering a question so often voiced by those uninstructed in academic zoology while being interested in the living animal as a subject for field observation.

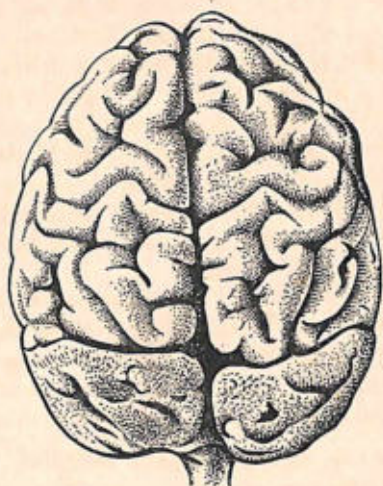
REPRESENTATIVE SERIES OF MAMMALIAN BRAINS



Echidna (Monotreme)



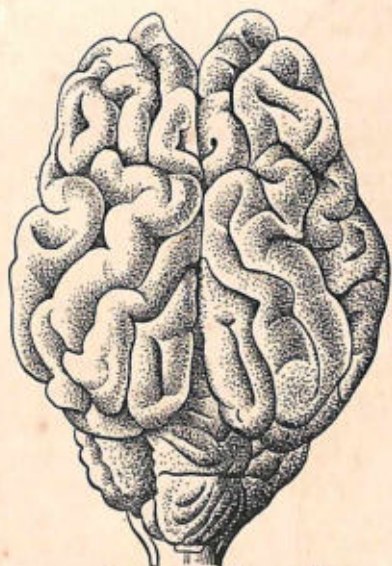
Marmoset (Primates)



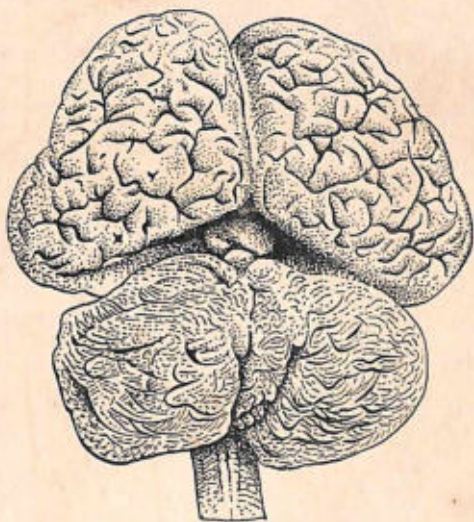
Chimpanzee (Primates)



Dog (Carnivora)



Sheep (Artiodactyla)



Elephant (Proboscidea)

CLASSIFICATION

<u>Class Mammalia</u>	
✓ <u>Subclass Prototheria</u>	23
<u>Order Monotremata</u> (Monotremes or Egg-laying Mammals)	23
Family Ornithorhynchidae (Platypus)	23
Family Tachyglossidae (Echidna or Spiny Anteater)	24
✓ <u>Infraclass Metatheria</u>	26
<u>Order Marsupialia</u> (Marsupials)	26
<u>Suborder Polyprotodontia</u>	26
Family Didelphidae (American Opossums)	26
Family Dasyuridae (Marsupial Rats, Marsupial Mice, Marsupial Jerboas, Native Cat, Tasmanian Devil, Thylacine)	27
Family Myrmecobiidae (Banded Anteater)	29
Family Notoryctidae (Marsupial Mole)	29
Family Peramelidae (Bandicoots)	30
Family Caenolestidae (Caenolestes)	31
<u>Suborder Diprotodontia</u>	31
Family Phalangeridae (Australian Opossums)	31
Family Vombatidae (or Phascologyidae) (Wombat)	34
Family Macropodidae (Kangaroos, Wallabies)	35
✓ <u>Infraclass Eutheria</u> (True or Placental Mammals)	38
<u>Order Insectivora</u>	38
Family Solenodontidae (Solenodon)	38
Family Tenrecidae (Tenrecs)	38
Family Potamogalidae (Otter Shrew)	39
Family Chrysochloridae (Golden Moles)	39
Family Erinaceidae (Hedgehogs, Rat Shrews)	41
Family Macroscelididae (Jumping or Elephant Shrews)	41
Family Soricidae (True Shrews)	41
Family Talpidae (Moles, Desmans)	45
✓ <u>Order Dermoptera</u> (Flying Lemur)	48
<u>Order Chiroptera</u> (Bats)	49
Suborder Megachiroptera (Fruit Bats) ✓	49
Suborder Microchiroptera (Insectivorous Bats) ✓	51
Family Emballonuridae (Tomb Bats)	51
Family Rhinopomatidae (Mouse-tailed Bats)	51
Family Noctilionidae (Bulldog Bat)	52
Family Megadermatidae (False Vampires)	52

Family Phyllostomatidae (American Leaf-nosed Bats)	52
Family Rhinolophidae (Horseshoe Bats)	52
Family Molossidae (Free-tailed Bats)	54
Family Desmodontidae (True Vampires)	54
Family Vespertilionidae	55
<u>Order Primates</u>	64
<u>Suborder Prosimii</u>	64
Family Tupaiidae (Tree Shrews)	64
Family Lemuridae (Lemurs)	64
Family Indridae (Indris, Sifakas)	66
Family Daubentoniidae (Aye-aye)	66
Family Lorisidae (Loris, Potto)	66
Family Tarsiidae (Tarsier)	69
<u>Suborder Anthropoidea (Monkeys, Apes)</u>	70
Family Cebidae (New World Monkeys)	70
Family Callithricidae (Marmosets, Tamarins)	72
Family Cercopithecidae (Old World Monkeys)	72
Family Pongidae (Apes)	78
<u>Order Edentata</u>	83
Family Myrmecophagidae (Anteaters)	83
Family Bradypodidae (Sloths)	84
Family Dasypodidae (Armadillos)	86
<u>Order Pholidota (Pangolins)</u>	88
<u>Order Lagomorpha (Pikas, Hares, Rabbits)</u>	90
Family Ochotonidae (Pikas or Mouse-hares)	90
Family Leporidae (Hares, Rabbits)	91
<u>Order Rodentia</u>	97
<u>Suborder Bathyergomorpha</u>	97
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Subclass **PROTOTHERIA**

Order **MONOTREMATA**

EGG-LAYING mammals with reptilian affinities seen especially in bones of limbs and limb-girdles. Rectum and urino-genital system open in a common cloaca. Teeth in young lost in adult (*Echidna*) or replaced by horny pads (*Platypus*). Eggs large, heavily yolked, in whitish shells. Young on hatching transferred to pouch, feed by lapping milk from specialised sweat-glands, on abdominal wall of female, that do not form nipples.

DUCKBILLED PLATYPUS, PLATYPUS, DUCKBILL (*Ornithorhynchus anatinus*)



General characters: Body rounded, barrel-shaped, nearly 2' long, of which flattened, hairy tail occupies 6". Weight up to 4 lb. Legs short, strongly clawed. Forefeet webbed, webbing extending well beyond toes, can be folded back to leave claws free for digging and for walking on land. Bill a beak-like muzzle, purple-black above, mottled yellow and black below, extremely sensitive. No external ear, eye small; eye and ear aperture lying in a furrow that can be closed under water. Fur thick, soft, with long crisp curly hairs and dark underfur. Colour sepia-brown on back, silvery tinged with yellow or pink below. Male has horny spur on inside of each hind-leg connected with a poison gland. Cheek-pouches for temporary storage of food. Young platypus has 2 or 3 pairs of teeth in upper jaw, 2 pairs in lower jaw, these being replaced in adult by hard horny plates.

Habits: Aquatic (formerly known as water mole), spends most of time in water. Mainly nocturnal. Burrows into banks. Energetic and restless.

Habitat: Icy mountain streams to warm lowland waters.

Food: Worms, crayfish and other small aquatic invertebrates. Like all restless animals, a heavy feeder, said to consume own weight of food each 24 hrs.

Breeding: Nesting burrow an elaborate system of tunnels, never more than 1' below surface but may be 24-60' long. Main tunnel to nesting chamber tortuous, blocked at intervals by barriers of soft earth 6-8" thick, tamped into position by female's tail. Burrow $3\frac{1}{2}$ " wide, $2\frac{1}{2}$ " high. Nest of grass and leaves, carried in by female using tail for transport. Usually 2 eggs, laid 15 days after mating, soft-shelled, dirty white, $\frac{3}{4}$ " diam. Female holds eggs on abdomen, stays in nest until they hatch. Young born naked, blind. Eyes open 11 weeks. Remain in nest until 15 weeks, take to water at 4 mths. when weaned. After hatching young suckled at milk-secreting slits on mother's abdomen (not teats).

Present status: Much reduced in numbers.

Range: Eastern and southern Australia, Tasmania.

Longevity: Up to 15 yrs.

Special comments: Used to be killed in large numbers for beaver-like fur. Now protected by law.

Other statistics: Temp. 87°F. (30.5°C.)

ECHIDNA OR SPINY ANTEATER (*Tachyglossus aculeatus*)



General characters: Rounded body, slightly flattened above, up to 2' long, upper parts clothed with mixture of spines and hair, underparts hairy. No tail or external ears. Muzzle long and beak-like, very sensitive, for probing for food. No teeth in jaws, but horny serrations on back of tongue work against hard ridges on palate to grind food. Legs short, feet with 5 toes, armed with stout claws.

Habits: Terrestrial. Digs out termites and other insects with claws and makes shallow burrows in which to rest. Burrows so quickly, seems to sink into ground. Rests under stones or in hollow logs; can move logs and stones in search for food.

Habitat: Wooded or open country.

Food: Termites mainly, ants and other small insects, caught with long extensile tongue.

Breeding: Female lays one egg, about May, placed in abdominal pouch with beak where it hatches. Young carried in pouch, suckled from milk-secreting slits (as in platypus). After some weeks, mother leaves young in safe place to rest and grow before making own way in world.

Present status: Little information.

Range: Tasmania, Australia, New Guinea.

Longevity: Up to 15 yrs.

Other statistics: Temp. 92.4°F . (33.6°C .)

Special comments: Not only has reptilian features in anatomy but can, like reptiles, fast without difficulty, for a month if necessary, and in cold weather will hibernate.

(A second species, Long-beaked Echidna (*Zaglossus bruijnii*), of north-western New Guinea, is larger, has longer snout. Its less numerous spines almost completely concealed by its black fur.)

Other statistics: Temp. 85°F . (29.5°C .)

Infraclass METATHERIA

Order MARSUPIALIA (Marsupials)

MAIN feature distinguishing Marsupials from other mammals is that young are born at early stage of development. Not all Marsupials have a pouch; in some, two flaps of skin serve in place of fully-formed pouch. In kangaroos and phalangers pouch opens forwards, in most other marsupials it opens backwards.

Usual custom is to divide Marsupials into two groups, distinguished by number and structure of incisors: Polyprotodontia with numerous small incisors (including those mainly carnivorous or insectivorous e.g. dasyures, thylacines and pouched mice of Australia and American opossums); Diprotodontia, with front teeth fewer, large, as in rodents (including herbivorous or fruit-eating marsupials, e.g. kangaroos, wallabies, Australian opossums, phalangers, koalas and wombats).

Suborder Polyprotodontia

Polyprotodontia include families Didelphidae, Dasyuridae, Myrmecobiidae, Notoryctidae, Peramelidae and Caenolestidae.

Family DIDELPHIDAE

AMERICAN or VIRGINIAN OPOSSUM (*Didelphis virginiana*)



General characters: Cat-sized but with superficial resemblance to a rat, 3' long, including 13" of tail. Male smaller than female. Wt. up to 14 lb. Ears and tail naked or sparsely haired. Coat mainly a coarse fur, greyish to white, feet black. 5 toes on each hind-foot, one opposable forming a kind of thumb.

Habits: Nocturnal, expert climber using prehensile tail to assist. Spends daytime in burrow or in hollow tree.

Habitat: Variable; generally where there are trees.

Food: Fruit, roots, birds, small mammals, crayfish and other small animals, eggs, carrion. Apt to raid poultry.

Breeding: 2 litters a year in southern part of range, one in northern. Gestation 8-13 days. Litters of up to 18; remain in pouch until 10 weeks, after which transported on mother's back. Become independent 14 weeks.

(No truth in story of young opossums twining tails round mother's tail when riding on her back.)

Present status: Numerous, range being extended northwards.

Range: U.S.A. (New England to Southern States, and west to southern California); Mexico.

Longevity: 8 yrs.

Special comments: When alarmed opossum may run away, hide, bare its teeth, fight or sham dead. The last is best-known, but recent information suggests that this death-feigning or playing 'possum is only rarely used.

Other statistics: Temp. 93-8°F. (34.2°C.); pulse, 120-240.

Other Didelphidae include:

South American species no larger than a squirrel, such as Woolly and Rat-tailed Opossums, and a great number of species no larger than rats and mice. These, mostly fawn in colour, are arboreal, living especially in forests, have short fur, feed on insects and fruit. Smallest of them are without a pouch. One group of short-tailed, shrew-like Marsupials, in Brazil, live on ground, including *Monodelphys domesticus*, living in native huts as house mouse lives in houses, and *Notodelphys halli*, of S. Patagonia, with a fat tail, living farthest south of all marsupials.

Family DASYURIDAE

General Remarks: Larger species carnivorous, smaller insectivorous. Smallest of all are Marsupial Mice common over most of Australia, ranging in size from that of small mouse to that of rat, with tapered shrew-like snouts.

Narrow-footed Marsupial Mice (*Sminthopsis*), terrestrial, live under logs and stones, eat more than own body-weight of food in one night, kill and eat house mice, insect grubs, lizards, also large quantities of grasshoppers.

Brush-tailed Marsupial Rat (*Phascogale penicillata*), squirrel-like, arboreal, coat grey, smooth, tail bushy, destructive to poultry.

Crest-tailed Marsupial Mouse (*Dasyercus cristicauda*), of desert

regions of S. and Central Australia, kills small mammals and birds, eats rat or mouse from head to tail, turning skin back, leaving empty skin turned inside out, has lizard-like habit of lying flat to bask in sun.

Jerboa-marsupials (*Antechinomys*), of E. and Central Australia, closely resemble jerboas of Africa, with long hind-legs and tufted tails, occupy same burrows as kangaroo-mice (Rodents). Pouch opens backwards. First recorded by Gould 1865, very rare, nocturnal, thought to be extinct until re-discovery in 1943. Two species: *A. laniger*, *A. spenceri*.

Native cat or Dasyure (*Dasyurus quoll*), of S.E. Australia and



Tasmania, size of small domestic cat, weasel-like, fawn or chocolate-brown with numerous bold white spots, nocturnal, lies up during day in caves, among rocks or in hollow logs; formerly persecuted for killing poultry, now appreciated for control of rats, mice and rabbits; left alone would probably increase in number; female has up to 24 young at birth, only 6 mammae.

Tiger Cat or Large Spotted-tailed Native Cat (*Dasyurops maculatus*) of E. and S.E. Australia, head and body 2', tail 19", both spotted; arboreal; feeds on smaller mammals, birds and young reptiles; 4-6 young born in May.

Tasmanian Devil (*Sarcophilus harrisii*), now restricted to Tasmania although may still be found in places in remoter parts of Australia



judging by bones found in aborigine middens, is bear-like, stockily built with heavy head and short legs, 3' long including foot-long tail; ears large, pinkish, eye small; coat black with white patches on throat, shoulder and rump; lives in woodlands; feeds on flesh and powerful enough to pull down animals larger than self; reputation for savagery probably exaggerated; mating March-April, 4 young born May, pouch opens backwards; voice a whining growl followed by a snarling cough or a low yell.

Thylacine or Tasmanian Wolf (*Thylacinus cynocephalus*), formerly



numerous in Australia, now confined to Tasmania (not seen for many years now, but tracks have been seen showing it is not yet extinct); head and body 3', tail 18"; head dog-like, rump and tail kangaroo-like; pouch opens backwards; general colour light brown, 16-18 dark chocolate bands across hind part of back; natural food wallabies, rats, birds; persecuted for killing sheep and poultry; legs of equal length but will bound kangaroo-like on hind-legs when pursued.

Family MYRMECOBIIDAE

Two species: South-eastern or Rusty Numbat (*Myrmecobius rufus*), of which little is known: and Banded Anteater or Numbat (*M. fasciatus*) of S. and S.W. Australia, rat-sized, tail bushy, snout tapering, chestnut head and shoulders grading to chocolate-coloured hinder part of body, marked with whitish transverse bars; long extensile tongue, feeds on termites dug out of rotten wood with strong claws; numbers now much reduced, fears for survival.

Family NOTORYCTIDAE

Two species: North-western Marsupial Mole (*Notoryctes caurinus*), of which little known, discovered 1920: and Marsupial Mole (*N. typhlops*), of S. and Central Australia, discovered 1888, lives in sandy



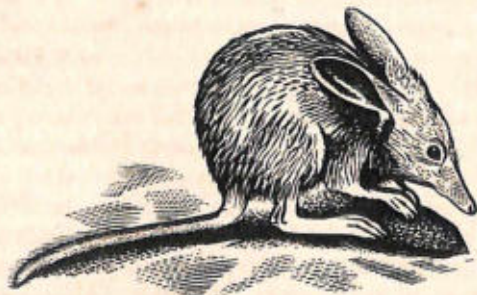
ground burrowing about 3" below surface without leaving permanent burrows; mole-like, without eyes, eyelids or external ears, snout protected by horny shield; pouch opens backwards; fur silky, white to rich golden-red; tail vestigial, covered with leathery skin; five toes on each foot, third and fourth on front feet bear enlarged claws for digging; restless disposition, enormous appetite.

Family PERAMELIDAE (Bandicoots)

Members of family combine polyprotodont dentition with diprotodont syndactylous foot; valuable destroyers of many insect pests, but becoming rare in some parts of Australia.

Long-nosed Bandicoot (*Perameles nasuta*) common especially in eastern Australia, size of small rabbit; coat of stiff fur, fawn with purplish tinge, white underparts, legs and tail; tail $\frac{3}{4}$ length of head and body; ears pointed, snout tapering; feeds on insect grubs and earthworms; accused of damaging gardens and lawns in search for grubs; passes earthworms through fingers to clean them before eating, will eat a mouse after pummeling it with forefeet into shapeless mass; 2-4 young at birth, 8 mammae.

Bilby or Rabbit Bandicoot (*Thylacomys lagotis*), formerly abundant over southern half of Australia, now found in semi-arid inland areas; similar to long-nosed bandicoot, more slate-blue in coat, longer ears,



can burrow as fast as a man can dig, one exit only to burrow; sleeps squatting on haunches with snout tucked between forelegs and ears folded.

Family CAENOLESTIDAE

Caenolestes, of humid forests of higher Andes, little-known, shrew-like, insectivorous, no common name, has diprotodont teeth and polyprotodont foot [possibly a survivor of stock ancestral to both Diprotodontia and Polyprotodontia].

Suborder Diprotodontia

The Diprotodontia include the families Phalangeridae, Phascolarctidae, Vombatidae and Macropodidae.

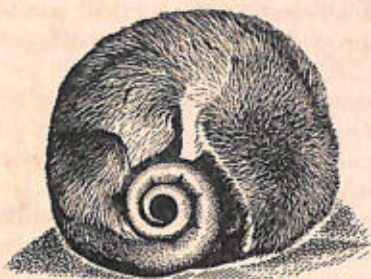
Apart from reduction in number of incisors, Diprotodontia are characterised by peculiar structure of hind-foot: first toe is missing, second and third are bound in a common skin looking like one small toe with two claws (syndactyly) used in combing fur, fourth and fifth may be short with curved claws for climbing and grasping, as in phalangers, or long, as in kangaroos and wallabies.

Family PHALANGERIDAE (Australian opossums and phalangers)

All members of family have pouch opening forwards, live in trees, have long tails, big toe opposable, like a thumb, for grasping, feed on leaves, fruit, flowers, honey, insects.

Honey Mouse, Honey Possum or Noolbenger (*Tarsipes spenserae*), of S.W. Australia, mouse-sized; chestnut head, legs and lower parts, back greyish marked with three lighter stripes; tail prehensile with naked area under tip; muzzle long, pointed, lips can overlap to form tube for sucking, tongue with brush-like bristles can be extended 1" beyond tip of muzzle to take nectar; nocturnal, seldom seen except when brought in by domestic cats; teeth small; food nectar, also insects, heads, legs and wings of which discarded.

Dormouse Phalangers, also known as pygmy opossums or opossum mice: two Tasmanian species investigated Hickman & Hickman (Proc. Zool. Soc. Lond. 135 (1960): 365). *Cercaetus nanus*, head and body 4", tail slightly less, prehensile, incrassate, fur dull grey above, white underparts and feet, eyes and ears large. *Eudromicia lepida* similar, head and body nearly 3" long, tail about same, fur brownish-grey above, white tinged with fawn below. Feed on insects, spiders, small lizards, consume per day 6-8% of own body-weight. Sleep in hollows excavated with fore-paws in decaying trees (*C. nanus*), in existing cavities in branches and roots of fallen trees (*E. lepida*). Alternate periods of



dormancy and activity throughout year, longest period of dormancy 12 days (*C. nanus*). When dormant body temp. falls from normal 32°C. to 17°C. Dormancy independent of ambient temp. Sleep curled in ball, muzzle on abdomen, eyes closed, ears folded and tail coiled in flat spiral at side of body. May take 4½ hrs. to become active from dormant state.

Pigmy Flying Phalanger or Feather-tail Glider (*Acrobates pygmaeus*), of eucalyptus forests of eastern Australia and New Guinea; mouse-sized, dark brown; ears and eyes large; nocturnal, seldom seen except when trees felled or brought in by domestic cats; nests in holes in trees, makes gliding flight from tree to tree; fringe of stiff hairs along side of body and tail feather-like; only 4 mammae but numerous young at a birth.

Striped Phalanger (*Dactylopsila picata*), of forests of Northern Queensland and New Guinea; whitish with black stripe down mid-line of back and one down each flank; ears and eyes large; nocturnal, sleeps during day in hollow log; emits nauseous fluid (but does not eject as in skunk); fourth toe of front foot long and thin used to hook insect grubs out of rotten wood, drums on bark then rips wood with powerful incisors (cf. aye-aye).

Short-headed Flying Phalanger or Sugar Glider (*Petaurus breviceps*), of coastal regions of eastern S. Australia, east coast north to Northern Territory, and Tasmania; fur soft, grey, face lighter, tail bushy; nocturnal, sleeps in hollow trees; takes leaps of up to 50 yd. from tree to tree; feeds on buds, blossoms, fruits, insects.

Great Glider (*Schoinobates volans*), of E. Australia; cat-sized, grey to dark brown with yellowish underparts; bushy tail 20" long; feeds on leaves only; recorded as travelling 590 yd. in 6 successive glides; slow and clumsy on ground.

Brush-tailed Opossum or Vulpine Opossum (*Trichosurus vulpecula*), of Australia and Tasmania; fox-sized, fox-like head, large ears; fur thick, woolly, silver-grey to dark brown or black, tail bushy, naked on underside at tip; feeds on buds, possibly also carrion; most at home

in trees but will live in low bush, even in rabbit burrows, also roofs of houses; successfully introduced into New Zealand, pelt in demand for fur trade. [Temp. 97.2°F. (36.1°C.)]

Ring-tailed Opossums (*Pseudochirus*), including several species in Australia and New Guinea; live in holes in trees, build nests like squirrels; nocturnal; tails long, prehensile, constantly coiled into a ring used in gripping branches. [Temp. 95.2°F. (35.1°C.)]

Cuscuses, largest of opossums, look very like monkeys, ears very small, half-hidden in fur, eyes large, cheeks rounded, coat woolly, tail prehensile, end half naked and scaly, spend most of day curled up in forks of trees, movements lethargic, food leaves only. 2 species in N. Australia, Spotted (*Spilocus nudicaudatus*) and Grey (*Phalanger orientalis*); several species in New Guinea, Celebes and Solomons, male of New Guinea Spotted Cuscus (*Spilocus maculatus*) heavily blotched and spotted with black and yellow, female quite unspotted.

Family PHASCOLARCTIDAE

KOALA (*Phascolarctos cinereus*)
(Australian Teddy Bear)



General characters: Small, bear-like, about 2' high, with tufted ears and prominent beak-like snout. Without tail. Fur thick, ash-grey with tinge of brown on upper parts, yellowish white on hindquarters, white underparts. First digit on all four feet opposable; 2nd and 3rd toes on hind-feet united. Cheek-pouches for food-storage. Brood-pouch opens backwards.

Habits: Arboreal.

Habitat: Eucalyptus (Gum) trees.

Food: Leaves of gum trees.

Breeding: Gestation about 35 days. One young at birth, $\frac{3}{4}$ " long. Fully furred at 6 months, but continues riding on mother's back until 1 yr. Mature at 4 yrs.

Present status: Numbers seriously reduced. Concern felt for survival. Hope of protecting it in special parks.

Range: E. Australia (Queensland to Victoria).

Longevity: 20 yrs.

Special comments: In spite of gentle disposition and charming appearance, heavy hand of fur trade has lamentably thinned its ranks, almost wiping it out in places. In 1924, over 2 million skins exported. Tied to a specialised diet, diminution in number of gum trees also having effect.

Other statistics: Temp. 97-8°F. (36.4°C.).

Family *VOMBATIDAE* (or *PHASCOLOMYIDAE*)

COMMON WOMBAT (*Vombatus hirsutus*)



General characters: Badger-like (often called 'badger' in Australia). Thick-set, tailless, legs short, stout and armed with strong digging claws. Hair coarse, dark brown. All 24 teeth are rootless, incisors resemble those of rodents in numbering 2 to each jaw.

Habits: Nocturnal, burrowing, some burrows said to be 100' long. Walk with shuffle. Voice a hiss or grunt. Shy, inoffensive.

Habitat: Varied types of country, wherever there is grass or other herbage.

Food: Exclusively vegetarian, herbage including roots.

Breeding: One young, born May-June.

Present status: Greatly reduced in numbers in face of human settlement.

Range: Australia.

Longevity: 30 yrs.

Special comments: Three other species, more localised, differing in size and colouring.

Family MACROPODIDAE (Kangaroos, Wallabies)

Rat-kangaroos (several genera and species), seldom larger than rabbits, live among low vegetation, sometimes in shallow holes; less



built for leaping than kangaroos and wallabies, at best hop, sit up on hindquarters to feed but move about on all fours; habit of wrapping tail around a bundle of herbage for nest-building to transport it.

Hare Wallabies are size of a hare, swift and agile.

Tree Kangaroos (*Dendrolagus*), of Northern Australia and New Guinea, 2-3' high, spend much of time on ground, ascending trees to feed and sleep; may leap 30-50' to ground if suddenly disturbed, otherwise descend tail first. Some species brightly coloured, orange or yellow. [Temp. 95°F. (35.0°C.)]

Rock Wallabies (*Petrogale*) like Tree Kangaroos but live in barren rock-strewn gullies, feed on leaves, sometimes fruit; soles of hind-feet padded and granulated to prevent slipping on smooth rock surfaces; inoffensive and mild disposition but defend themselves by grasping enemy with short front legs and striking with claws of hind-foot. Fur, as in Tree Kangaroos, often brightly coloured. Ring-tailed Rock Wallaby (*Petrogale xanthopus*) in danger of extinction because of valuable pelt. [Temp. 96.9°F. (36.4°C.); pulse, 125.]

Scrub or Pademelon Wallabies (*Thylogale*), small, hind-foot less than 6" long, tail short; use tunnel-like runways in the long grass or in the dense undergrowth; thump ground with the hind-feet as warning signal (cf. rabbit), habit found in other gregarious kangaroos.

GREAT GREY KANGAROO OF FORESTER (*Macropus major*)

General characters: Height up to 6' (exceptionally 7'), up to 200 lb. wt. Head small, ears large. Forelimbs small by comparison with powerful hind-legs, tail strong, 4' long. Grey with whitish underparts, white on legs and underside of tail (but colour variable). Muzzle hairy between nostrils.

Habits: Capable of 25 m.p.h. on flat over 300-yd. stretch. Leaps of 26' not uncommon, occasionally 9' fence cleared but more usually jumps not higher than 5'. Tail used as balancer when running and jumping, applied to ground as support when sitting.

Habitat: Open forest.

Food: Vegetation (browser rather than grazer).

Breeding: Male known as boomer, female as flier. 1 young born 30-40 days after mating, wt. 1 oz. Breeding season Sept.-early Jan., young suckled in and out of pouch for 14 mths., which means that young may be born while mother is still suckling young of previous year at heel.

Present status: Reduced numbers.

Range: E. Australia.

Longevity: 15 yrs. ✓

Other statistics: Temp. 96.9°F. (36.4°C.); pulse, 125.

Macropus rufus

RED KANGAROO (*Megaleia rufa*)

General characters: Similar in build and size to Great Grey and distinguished from it by generally reddish fur, but more especially by muzzle-tip being less hairy between nostrils.

Habits: Much as in Great Grey, but more gregarious, usually in "mobs" of a dozen.

Habitat: Open plains.

Food: Vegetation (grazer rather than browser).

Breeding: Similar to Great Grey.

Present status: Much reduced by natural habitat being fenced off for sheep-farming, but still commonest and most widespread of kangaroos.

Range: Over most of Australia.

Longevity: 16 yrs.

[Kangaroo, wallaby and wallaroo are terms used without precise definition, and usage varies from one locality to another. Generally "wallaby" is a small kangaroo, "kangaroo" is a large wallaby. "Wallaroo" is used especially for certain stockily-built Macropodidae, intermediate in size between typical wallaby and typical kangaroo.]

Infraclass EUTHERIA

Order INSECTIVORA

MAMMALS of small or medium size, most of them smaller than a rat, and one, Savi's white-toothed shrew, *Suncus etruscus*, only $2\frac{1}{2}$ " long, the smallest living mammal. All are long-snouted, with numerous sharp teeth divided into incisors, canines, pre-molars and molars. Teeth have pointed cusps suitable for catching, holding and cutting up insects, even although they may be used for softer foods. Fur soft, sometimes with spines intermingled or, as in hedgehogs, replacing the hair over upper part of body. Toes always clawed and, in burrowing moles, claws enormously enlarged for digging. None of toes opposable for grasping. Similarities of members of order more pronounced in internal anatomy: most of them have no cheek-bones, none has collar-bones, except otter shrew, and in all brain is smooth and entirely without convolutions seen in other mammals.

Family SOLENODONTIDAE (Solenodon)

2 species only: *Solenodon cubanus*, of Cuba (local name, *almique*), and *S. paradoxus*, of Haiti (local name, *agouta*). Both rat-like with long pointed snout, large ears, coarse hair, 1' head and body length, nearly naked tail 8" long. Nocturnal, resting among rocks and in hollow logs by day; feed on insects and other small animals. Relationships obscure. Fast disappearing because of low rate of reproduction (1-3 in litter, perhaps 2 litters a year) and killing by imported cats, dogs, mongooses.

Family TENRECIDAE (Tenrecs)

Found only in Madagascar; fall naturally into 2 groups: first represented by Common Tenrec (*Centetes ecaudatus*), hedgehog-like, 15"



head and body, covered with a stiff, bristly, yellowish-brown hair, among which are a few brownish spines, especially around neck, tailless, with long snout. Forages among dead leaves for insects, does not roll itself into a ball for defence. 12-16 longitudinally striped young at birth. Also Banded Tenrec (*Hemicentetes semispinosus*), with spines along middle of back, much smaller than Common Tenrec; and Hedgehog Tenrec (*Ericulus setosus*), spiny as a hedgehog but only $\frac{1}{3}$ its size.

Second group: Rice Tenrecs (*Oryzoryctes*), mole-like close short fur and short tails, often common enough to be a pest to crops through burrowing for insects, or even attacking rice-crops themselves; shrew-like long-tailed Tenrecs include *Microgale longicaudata*, reddish-brown, mouse-like, noteworthy for extraordinarily long 5" tail, $2\frac{1}{2}$ times as long as the head and body together; Water Shrew (*Limnogale mergulus*), 4" head and body, tail of same length, has close, velvety fur, webbed feet and a keeled tail.

Family POTAMOGALIDAE

OTTER SHREW (*Potamogale velox*)

One of more extraordinary members of insectivora. 18-24" long, strong superficial resemblance to a small otter. Fur smooth, sleek, chocolate-brown. Muzzle long, eyes and ears tiny, tail laterally flattened for use as efficient rudder or swimming organ. As with many aquatic mammals that probe among stones or mud under water for crustacea, etc., tactile area on muzzle greatly developed and swollen, with numerous long vibrissae (cf. Otter Civet, *Cynogale bennetti*, New Guinea Water Rat, *Parahydromys*, Desman *Desmana moschata*).

[*Potamogale* first described by French traveller Du Chaillu who also first made known zoologically Gorilla of same country, West Africa. Inhabits fast mountain streams as well as sluggish forest waters, but no first-hand accounts of its habits.]

Family CHRYSOCHLORIDAE

Golden Moles of S. and east-central Africa take place in Africa of true moles of Europe and Asia; superficially like true moles; wholly subterranean; fur has golden, sometimes greenish, iridescent sheen, never black; horny shield on muzzle; practically tailless. Eyes are small, hidden under skin, ears minute. Cape Golden Mole (*Chrysochloris asiatica*), of S. Africa, less than 4" long, is one of several species in S. Africa, largest of which, Sand Mole (*Chrysofalax villosus*), is 9" long, with coarse brown hair and front claws enormously enlarged, burrows in sand dunes of S. African coast.

Family ERINACEIDAE

HEDGEHOG or URCHIN (*Erinaceus europaeus*)

General characters: Round-bodied without visible neck. Body covered above with spines, below with coarse hair. Legs short, each with 5 clawed toes and 5 pads on sole of foot. Tail very short. Adult male $9\frac{1}{4}$ " long, up to $1\frac{1}{2}$ lb. wt., female slightly less. Spines $\frac{3}{4}$ " long, hard, longitudinally grooved, arranged in radiating groups, normally lying flat but erected when animal alarmed. Colour generally a dirty brown; spines brown ringed with one dark and two light bands. Snout somewhat pig-like, eyes small, ears small and largely hidden in fur.

Habits: Nocturnal, solitary. Climbs and swims well. Spines have spherical base and narrow neck sharply bent at base, so spines take impact of a fall. Rolls up for defence: at first alarm head lowered and spines on head raised, followed by complete rolling into ball of spines. Hibernation October to early April, in nest of leaves.

Habitat: Almost any type of country except marshes, even in towns.

Food: Snails, slugs, insects, worms: said to take mice, rats, frogs, lizards, snakes on occasion (including viper: hedgehog immune viper poison, and to all but a few other poisons). Takes eggs, but this habit sporadic.

Breeding: Peak of breeding May-June, second litters July-September. Gestation 30-48 days. Litters 3-7, young blind, naked, ears closed, spines protrude soon after birth, soft at first and pale.

Present status: Numbers undiminished.

Range: West central Europe (except northern Scandinavia) with related subspecies in rest of Europe and in S.W. Asia and northern Asia to Korea.

Longevity: 6 yrs.

Special comments: Unusual habit of self-anointing, licking variety of substances and placing saliva on spines (significance unknown).

Other statistics: Temp. 95.2°F . (35.1°C .); pulse, 189-320 (hibernating, 3-15).

Other species of Erinaceidae include:

Malayan Rat-shrew or *Gymnura* (*Echinosorex gymnurus*), head and body 1', naked tail 8", fur parti-coloured, black and white; Lesser or Short-tailed *Gymnura* (*Hylomys suillus*), head and body 4½", tail ½", rusty-brown. Both are in S.E. Asia to Indonesia, and both lack spines.

Family *MACROSCOLIDIDAE* (Jumping or Elephant Shrews)



Differ from all other insectivores in having very long legs (almost kangaroo-like) and resembling in size and appearance the Jerboas (q.v.). In Africa only, mainly in semi-arid areas particularly on the broken stony ground outside rain-forest belt. None bigger than a fair-sized rat, delicately built with long hind-legs, scaly tails and long sensitive snouts. Search by day for insects, seldom moving far from burrows. Normally move on all fours; if disturbed, retreat at great speed, leaping with the tail held up. Species differ little except in size; some have 4, others 5 toes on the hind-feet; fur usually uniformly coloured fawn or brown, but some spotted on back. Eyes very large, unusual in insectivores. Smallest belong to genus *Nasilio*, of S. and E. Africa, and *Elephantulus*, of both S. and N. Africa. Largest, genus *Rhynchocyon*, include two main types: Checkered Elephant Shrew (*R. cirnei*) of Congo forest to Nyasaland, fawn or buff, with black and white "draught board" marks on back; Black and Red Elephant Shrews (*R. petersi*), of coastal belt of Zanzibar and E. Africa, also in forests, search for insects among dried leaves; both about 11" head and body, 9" tail. Only longevity record is for *Elephantulus rozeti*, 3-4 yrs.

Family *SORICIDAE* (True Shrews)

World-wide distribution except Australasia and southern half of S. America. All much alike, mouse-sized, pointed muzzles, short legs, tails usually shorter than body, close fur and small eyes and ears hidden in fur. Distasteful to carnivorous mammals because of unpleasant odour secreted from scent glands, but birds-of-prey, especially owls, consume large numbers. High rate of activity, large appetite, cannibalism if no

other food is available. 2 distinct groups: red-toothed shrews, teeth tipped with red, species in Europe and northern Asia and N. America; and white-toothed shrews, of Africa and southern Asia.

COMMON SHREW (*Sorex araneus*)



General characters: Head and body 3", tail hairy, nearly $1\frac{1}{2}$ " long. Eyes small, ears hidden in fur, bilobed snout extending beyond mouth, abundantly whiskered. Fur close, silky, dark brown to almost black above, dirty yellowish-grey below. Musk-gland on flank midway between elbow and thigh.

Habits: Lives in runs through grass or leaf litter, or in tunnels just under surface. Will climb herbage, swims well. Active night and day in 3-hourly rhythm. Solitary except for mating. Quarrelsome in defence of territory: when 2 shrews meet, whiskers touch, they squeak; if intruder does not retreat both rear up on haunches and squeaking becomes more intense; if intruder still does not retreat both throw themselves on back, squeaking and wriggling, perhaps each holding other's tail in mouth; less a fight than a singing contest.

Habitat: Woods, fields, hedges.

Food: Insects mainly, other small animals, carrion, some seeds.

Breeding: Nest globular, of woven grass, leaves. Season May-September or October. Gestation 13-19 days (perhaps even 21 days). 2 litters a season of 4-10, young naked, pink, blind, ears unopened, wt. $\frac{1}{2}$ gm., increasing to 8 gm. in 11 days. Eyes open 18-21 days. Weaned 20-23 days.

Present status: Undiminished.

Range: Europe, Asia.

Longevity: 15 mths.

PYGMY SHREW (*Sorex minutus*)

General characters: Very like Common Shrew except size, head and body $2\frac{1}{4}$ ", and longer tail proportionately, $1\frac{1}{2}$ " long.

Habits, habitat, food, range, longevity as in Common Shrew.

Breeding habits similar but precise details not confirmed.

WATER SHREW (*Neomys fodiens*)

General characters: Head and body up to $3\frac{3}{4}$ " , tail about 3" , wt. $\frac{1}{2}$ oz. Otherwise similar to Common Shrew except that upper parts are darker slaty-black, and a sharper line of demarcation with ash-grey to dirty white of underparts. Snout short, broad. Toes fringed with hairs. Tail flattened from side-to-side with double fringe of hairs along underside.

Habits: Active night and day. Mainly aquatic but may be found miles from water. Characteristic appearance under water "like an animated air-bubble" due to air trapped in fur. Resting burrows in banks shallow, nursery burrows deeper.

Habitat: Streams and rivers.

Food: Aquatic insects, snails, worms, crustaceans, frogs, small fishes, also carrion.

Breeding: Round nest of woven grass or of leaves, or in burrow lined with moss and fine roots. Mating April-May. Gestation 24 days. Litters 5-8 young, naked, blind. Weaned 27 days.

Present status: No information.

Range: Britain (not Ireland), Europe, S.W. Asia, northern Asia eastwards to Sakhalin.

Longevity: Not known.

Special comments: Replaced in southern Europe by closely-related Mediterranean Water Shrew (*N. anomalus*), slightly smaller, upper parts slightly paler brown.

SHORT-TAILED SHREW, BLARINA, OR MOLE SHREW (*Blarina brevicauda*)

General characters: Head and body 5" , tail 1" , wt. 1 oz. Fur soft, dark silver-grey above, lighter beneath, summer coat lighter, tail black (moults March and October). Eyes and ears small, snout very pointed.

Habits: Similar to other shrews, offensive smell used defensively, bite said to be poisonous but not to humans.

Habitat: Woodlands, grasslands, also enters buildings.

Food: Insects (particularly destructive to larch sawflies), earthworms, small molluscs and variety of plants.

Breeding: Gestation 18-20 days, 3-8 young, pink, wrinkled $1\frac{1}{8}$ " long, weaned 4 weeks, mature 6 mths.

Present status: Numerous.

Range: Eastern U.S.A., S.E. Canada.

Longevity: 30 mths.

Other statistics: Temp. 96.4°F . (35.7°C .); pulse, 618-720.

Other North American shrews include:

Common or Masked Shrew (*Sorex cinereus*). Head and body $2\frac{3}{8}$ " ,

tail $1\frac{3}{4}$ " , wt. $\frac{1}{2}$ oz., brown above, grey below, North America (New England States, U.S.A., across Canada to Alaska), 4-8 in litter, breed in all months, otherwise similar to *S. araneus*. [Pulse, 588-1320.]

Smoky Shrew (*Sorex fumeus*). Head and body 3" , tail 2" , wt. $\frac{2}{3}$ oz., north-eastern U.S.A., S.E. Canada, damp woodlands, 4-7 in a litter, 2-3 litters a year, longevity up to 2 yrs.

Water Shrew (*Sorex palustris*). One of 2 N. American species; fur brownish-grey, frosted, underparts silvery white, 6 in a litter, 3 litters a year, gregarious in hollow log or tree, habits as in *Neomys fodiens* (q.v.).

Least Shrew, Little Shrew, or Lesser Short-tailed Shrew (*Cryptotis parva*). $3\frac{1}{2}$ " total length including $\frac{3}{8}$ " tail, wt. $\frac{1}{2}$ oz., fur short, close, uniform grey to slate or dark brown, ash-grey beneath, tail markedly lighter below, food mainly insects or other animal matter, nest of finely-shredded grass may be occupied by several adults, breeding starts March, several litters a year, 6 in a litter, weaned at 21-24 days, longevity 2 years.

Pigmy Shrew (*Microsorex hoyi*). Head and body $2\frac{3}{4}$ " , tail 1" , wt. 1 oz., greyish-brown above, paler grey below, ears and eyes small, food mainly insects and earthworms, several litters a year, 5-6 in a litter, U.S.A.

White-toothed Shrews. Differ little in general form from red-toothed, but more varied in size and colour, practically all have long, scattered, bristle-like hairs on tail. Smallest is Savi's Pygmy Shrew (*Suncus etruscus*), of Mediterranean area, eastwards to Malaya, $1\frac{1}{2}$ " head and body, tail 1". Palestine Pygmy Shrew (*Crocidura religiosa*) slightly larger. Largest is Goliath Shrew (*Praesorex goliath*), of Africa, $10\frac{1}{2}$ " long including 4" tail, body covered with long hair. Musk Shrew (*Suncus caeruleus*), of India, 6" head and body, 3" tail, carries musk-gland capable of emitting strong smell, lives in houses, feeding on cockroaches, has been introduced by trading vessels into Madagascar and E. Africa, where now well established.

HERO SHREW (*Scutisorex congicus*)

A normal large shrew in appearance, 8-9" total length, inhabiting limited area of Ituri Forest (N.E. Congo). Derives local name of Hero Shrew from native belief that its charred remains, worn as talisman, confer invincibility on wearer, who therefore enters dangerous elephant hunt or other hazards with confidence. Belief in magical powers based on its extraordinary strength, which natives demonstrate on captive animal. A 160 lb. man, barefoot, balances precariously on one foot on animal (taking care not to stand on its

head). Skeleton shows unique development of dorso-lumbar vertebrae, all very greatly enlarged, widened, deepened, and each beset with numerous projecting spinous processes interlocking with those of next vertebra. Also, instead of normal 5 lumbar vertebrae in all other shrews, *Scutisorex* has 11. Skull and limb bones not enlarged or strengthened notably. Extraordinary development of vertebrae accounts for animal's ability to withstand weights normally fatal. Field observations do not show any reason for this development; animal's food seems identical with that of normal shrews of approximately equal size, but has been seen to turn over flat stones, small dead branches, etc. by thrust of snout. Possible that skeletal development is connected with this method of finding food, giving tremendous strength for leverage. Movements sluggish, in contrast to hurried active movements of other shrews.

Family TALPIDAE

COMMON MOLE (*Talpa europaea*)



General characters: Body cylindrical, 6" long, muzzle blunt-pointed, tail short. Fore-limbs set forward opposite neck, only conspicuously broadened paws, armed with stout claws, showing beyond skin of body. Hind-limbs usually described as weak, but this only by comparison with greatly strengthened front limbs. Ears and eyes small and hidden in fur, blackish hairs of which move with equal ease in all directions, making it easy for animal to move backwards or forwards without difficulty in narrow tunnels.

Habitat: Underground.

Food: Mainly earthworms, especially large *Lumbricus terrestris*, although will eat insects and other animal matter, dead or alive. Distribution and vertical movements of moles and earthworms closely linked: in rich soil with earthworms abundant moles found in quantity; damp areas in a meadow will show more mole-hills than drier parts. A localised patch of ground covered by brushwood or branches, making soil beneath damp, likely to be visited by a mole and surface of the ground upheaved in a number of heaps of freshly excavated soil.

When brushwood or branches are removed, so that soil dries out, mole will move elsewhere, or will work at a deeper level, so that no fresh earth appears at surface.

Breeding: Nesting-site often marked by mound of earth 3' diameter and 1' high, but nest may be 2' or 3' down, when no mound is seen. Nest of grass, leaves or twigs in a chamber 8" across. Nests used for winter quarters, and some are used for nursery. Sow and boar come together for mating, otherwise solitary. Gestation 42 days. Litters 2-7 (average 3-4) young, born in May, blind, naked, pink. Eyes open 22 days; young leave nest 33-34 days after birth, but remain with mother or in vicinity of nest for 10 weeks after weaning.

Present status: Numerous.

Range: Britain (but not Ireland, Man, Outer Hebrides, Orkneys and Shetlands), through Europe (except parts of southern Europe, and northern Europe), Asia (south to Himalayas, north to Altai Mountains), and Japan.

Longevity: 3 yrs.

Special comments: Underground system of tunnels consists of a horizontal network of tunnels at a depth of 3-6", and a similar network at from 12-16". These connected by vertical or oblique shafts, and from upper network short vertical shafts run to surface. From lower horizontal network, zig-zag shafts run down into earth to a depth of 3', to end blindly. Also surface runs, made as mole travels just under surface forcing soil up in an arch. These are temporary runs.

A mole will work a tunnel system varying from 220-750 square yards in extent. Whether these represent territories in usual sense is not known. Some evidence of moles moving into adjacent areas, and of some tunnels being used as common highways. Evidence somewhat contradictory. Usually a field may show a dozen groups of mole-hills widely separated, as if each mole is keeping to a well-defined territory. Occasionally a small area of cultivated ground may show mole-hills so closely packed that it is difficult to walk between them.

NORTH AMERICAN COMMON MOLE (*Scalopus aquaticus*)

General characters: Similar to European Common Mole, males 9" total length including $1\frac{1}{2}$ " tail, wt. 2 oz., females slightly smaller. Colour of fur variable, grey to north becoming brown to copper in S.W. of range. No external ears, eyes covered by skin, snout naked with upwardly-directed nostrils, tail nearly naked.

Habits: Almost wholly subterranean, uses two sets of tunnels, one near surface, other 1-2' deep.

Habitat: Low-lying grassland, especially where soil moist.

Food: Insects, earthworms, some plant.

Breeding: Gestation 42 days, 2-6 in litter, naked, independent 1 mth., sexually mature 10 mths.

Present status: Numerous.

Range: Eastern U.S.A.

Longevity: No information.

Other statistics: Temp. 96.6°F. (35.8°C.)

Other North American Moles:

Hairy-tailed Mole or Brewer's Mole (*Parascalops breweri*). Restricted distribution U.S.A. and Canada, Appalachian Highlands northward to Ontario, up to 3,000' above sea-level; 7" total length, 1½" tail, wt. 3 oz., fur blackish, tail hairy, food insects and earthworms, mating March-Apr., gestation 28-42 days, 4-5 in a litter, naked, blind, wt. ¼ oz., weaned 4 weeks, longevity 4 yrs.

Star-nosed Mole (*Condylura cristata*). Head and body 5", tail 3¼",



wt. 3 oz., front feet relatively weak, eyes functional, food earthworms and insects, mating Autumn and Spring, 3-7 in a litter, born April-June, pink, hairless, leave nest at 3 weeks. Good swimmer, spends much time above ground. Tail contains reserve of fat, swollen in middle. Snout bearing 22 sensitive feelers in fleshy, star-shaped circlet.

Shrew Mole (*Neurotrichus gibbsii*). Pacific coast U.S.A., Canada; head and body 3", tail 1¾", wt. ½ oz., female slightly larger, external ears lacking, eyes usually skin-covered, snout long, flexible; gregarious; swims, climbs; habitat wooded marshes, feeds on any small animals, several litters a year of 1-4.

DESMANS

Little outward resemblance to moles, related by anatomical characters. Aquatic, feet webbed, appearance of over-plump shrews. 2 species, both have long, mobile, tubular snouts, probably used for foraging among stones for insects. Fur close, thick, eyes small, no external ears. Pyrenean Desman (*Galemys pyrenaica*), of mountain streams of S.W. France, Spain and Portugal, about 11" long, of which ½ is tail. Russian Desman (*Desmana moschata*) up to 17" long, very strong, compressed tail.

Order DERMOPTERA

FLYING LEMUR, COLÚGO OF CAGUAN (*Cynocephalus variegatus*)



General characters: Cat-sized, with sharp-pointed head and large eyes. A membrane extends from sides of chin down either side of body taking in forearm and all fingers, continuing in a broad web to take in hind-legs and toes right up to tip of tail. Fur mottled grey, fawn and buff. Teeth peculiar: upper incisors and canines have 2 roots; lower incisors comb-like, each divided into 10-12 fine points.

Habits: Best equipped for gliding of all mammals; does not fly in true sense. Rests on limbs of trees where fur harmonises with bark. When disturbed moves along branch to main trunk, climbs rapidly to a higher position, then takes a flying leap to next tree, a long smooth glide of up to 70 yd.

Habitat: Forests.

Food: Leaves and fruit.

Breeding: Little known; single young at a birth, clings to mother and enclosed in gliding membrane as in a hammock.

Present status: Not uncommon; formerly considered rare because so difficult to find.

Range: Indo-China through Malay Peninsula to Philippines.

Longevity: No information.

Special comments: 2 species, differing only in small details.

Order **CHIROPTERA** (Bats)

ONLY mammals capable of true flight. Forearm and 4 of fingers greatly elongated, supporting wing-membrane. 1st digit of hand, always free of membrane, bears a claw, mainly used for climbing. Wing-membrane carried along sides of the body to the hind-limbs and, usually, also encloses tail. Hind-toes always free and bear long, curved claws, used for combing fur as well as hanging from support during resting periods. Head may be short and broad, with powerful jaws and teeth or long and slender, with weak teeth and long tongue. Tail may be absent, short and free of wing-membrane, enclosed in inter-femoral membrane (i.e. skin linking up hind-legs), or long and mouse-like.

2 groups: Megachiroptera, or fruit bats, and Microchiroptera, or insectivorous bats; but some Microchiroptera of S. America have become partly fruit-eating, and others have long snouts, weak teeth and long tongues, and feed on nectar.

Suborder **Megachiroptera** or Fruit Bats

Mostly large, but some as small as insectivorous bats. Ears simple (i.e. lacking a tragus) and nose-leaves absent. Tail rudimentary or absent and tail-membrane incomplete or absent. 2nd finger of wing, in most cases, bears a claw, which is never found in Microchiroptera. Teeth small, poorly developed, since food is soft fruits or nectar. Confined to tropics, especially where heavy rainfall gives profuse growth of trees, in Africa, including Cyprus, in India, Malaysia, New Guinea and N. Australia. None in America. No hibernation, but many move considerable distances according to blossoming or fruiting seasons. Most hang in trees by day either exposed in clusters or under large leaves; where suitable trees are scarce, as in Arabia and Egypt, in caves or in the ruins of buildings.

Use echo-location, produced by clicking sounds from tongue.

Flying Foxes (*Pteropus*), largest of fruit bats, on most Pacific islands, N. Australia, India, Mauritius, Madagascar and island of Pemba, off E. African coast, roost in trees by day in large colonies, fly at sunset to feeding grounds, often causing great damage to fruit plantations, or may congregate in such numbers that trees killed by fouling of foliage.

Head fox-like, muzzle pointed, eyes large, body 12" long, usually



reddish-brown or yellowish, with black wings spanning 5', characteristic strong unpleasant odour. Mating Feb.-March, gestation 180 days, single young born Aug.-Sept. [Temp. 95.8°F. (35.4°C.)]

Short-eared Fruit Bat (*Cynopterus sphinx*), common bat of Oriental regions, wt. 1 oz., devours ripe banana twice its own weight in 3 hrs.

Straw-coloured Bat (*Eidolon helvum*), Senegal to Somaliland and south to the Cape, best-known of smaller fruit bats. Fur short, scanty, straw-coloured, wing-span 2½'. Nomadic, moving in groups of one thousand or more from one ripening fruit crop to another. No solid eaten, only juice. Arabian Straw-coloured Bat (*E. sabaenum*), slightly smaller, attacks dates, which have to be protected in bags when ripening.

Other Fruit Bats include:

Hammer-headed Fruit Bat (*Hypsignathus monstrosus*), of west and central Africa, largest fruit bat of Africa, head and body 10½", wing-span 3', head large with swollen face, pendulous upper lip and split lower lip. All fruit bats characteristically noisy, chattering at roosts: hammer-head noisiest of all, has bony larynx filling ⅓ body cavity pushing heart and lungs backwards and sideways. Males and females occupy separate roosts, young of both sexes mingle also in separate roost.

Epauletted Bats (*Epomops*, *Epomophorus*), of Africa, have large flabby lips and tufts of white hair on margins of ears. Males have fold of skin on shoulder which can be extruded to show a conspicuous tuft (epaulette) of white hair (function unknown).

Dobsonia, medium-sized fruit bat of S.E. Asia, has wing-membranes springing from middle of back instead of from sides of body.

Tube-nosed Bats, of Malaya and Australia, have nostrils at ends of

long tubes, tail is longer than in most fruit bats, conspicuous dark stripe down back, wing-membranes irregularly spotted with yellow. Nothing known of habits: one individual had stomach filled with remains of beetles and flies.

Pollen-eating Bats or Long-tongued Bats, one species in West Africa rest range S.E. Asia to Solomons, have long muzzles, long tongues and very small teeth. Mainly solitary, smallest of Megachiroptera, feed on pollen and nectar, hovering in front of night-flowering blossoms, clinging momentarily to insert slender heads and tongues, believed to assist pollination.

Suborder **Microchiroptera** or Insectivorous Bats

Mainly small, large complicated ears usually bear earlet or tragus. Many bear nose-leaves (i.e. elaborate skin folds on nose), used in echolocation. Index finger always without a claw, tail frequently long, usually included in tail-membrane. Extend from Tropics into the temperate regions of the whole world. Shelter by day in narrow crevices, holes in trees, or under roofs, particularly of churches, some coming out at sunset to hunt for an hour or two only at dusk and before dawn, others active all night. Quantities of insects eaten, mainly night-flying moths and beetles. Teeth broad, many-cusped, suited to hold and crush insects with hard cases. Large prey may be "pouched" in inter-femoral membrane and eaten at leisure, a litter of moths' wings and beetles' wing-cases showing where this has taken place.

In temperate regions hibernation in deep caves, recesses in buildings, hanging torpid until spring, breathing and circulation reduced to minimum. Few species migrate south. Most bats sociable at roosting places; sexes may be segregated during birth and rearing of young.

Family **EMBALLONURIDAE**

Tomb Bats (*Taphozous nudiventris* and *T. perforatus*), of Egypt, have a short tail penetrating upper surface of inter-femoral membrane, leathery ears and scantily-haired bodies. Roost in large numbers in pyramids and Ancient Egyptian tombs. One species of family, Ghost or White Bat (*Diclidurus albus*), of tropical America has fur, wings and membranes pure white.

Family **RHINOPOMATIDAE**

Mouse-tailed Bats (*Rhinopoma*) of deserts and semi-deserts of N.E. Africa and S. Asia, have long, slender tails projecting beyond tail

membrane. Remarkable for accumulating store of fat in rump during season of plenty against periods of drought and scarcity: live in build-ings or among rocks, clinging by all 4 feet instead of hanging by hind-feet.

Family NOCTILIONIDAE

Bulldog Bat or Fish-eating Bat (*Noctilio leporinus*), of Central America: fairly large, bulldog face, mouth with wide gape, numerous sharp teeth. Long ears and a nose-leaf. Especially long legs, toes and claws, skims low over coastal waters, river mouths, scooping small fry, surface crustacea into inter-femoral membrane.

Family MEGADERMATIDAE

False Vampires include *Megaderma spasma*, India to Philippines, *M. lyra*, S. China to Malaya, wrongly associated with true vampires because of large size, repellent appearance: ears large, united at bases, nose-leaves large, prominent, spear-like, canines large, prey on small vertebrates, birds, small bats, lizards, frogs, mice, occasionally small fish.

Family PHYLLOSTOMATIDAE

American Leaf-nosed Bats form a large and diverse family, mainly insectivorous, some eat insects or fruit indiscriminately, none has simple dentition of fruit bats of Old World. Nose-leaf usually simple, erect and pointed; may be absent, and in a few species forms grotesquely complex folds covering much of face. Family includes Great False Vampire (*Vampyrus spectrum*), head and body 6" long, wing-span 2½', and Javelin Bat (*Phyllostoma hastatum*), head and body 5" long. Both range from Mexico to Amazon, are black, tailless, with large ears, long muzzles and stout teeth, fearsome to look at. Feed partly on birds and other bats.

Family RHINOLOPHIDAE

GREATER HORSESHOE BAT (*Rhinolophus ferrum-equinum*)

General characters: Heavily built, head and body 2½", tail 1¼", wing-span 13". Wing-membrane broad, attached to ankle and to tail almost to tip. Fur on back thick, woolly, reddish-grey extending short distance on both surfaces of wing membrane, underparts pale grey, often with pinkish or yellowish tinge. Ears ½" broad narrowing to



sharp recurved tip, without tragus. Nose-leaves in form of horseshoe. Muzzle swollen, with stiff moustache. Mouth straight, broad.

Habits: Gregarious, daytime sleep in caves, dark buildings, roof-spaces, hollow trees. Sexes segregated at roosts. Hunting flight fluttering, usually few inches from ground, may pick insects off ground, even alight to seize prey. Active hour after sunset. Hibernation in caves, hanging from ceiling, October to end of March.

Food: Large and small insects, beetles especially.

Breeding: Gestation 70 days, single young born June-July, blind, naked on underparts, skin purple. Eyes open 10 days. Sexual maturity 3 years.

Range: England (S.W. and S.), Wales (S. and W.). Outside Britain: across Europe and Asia to Japan.

Longevity: 17 yrs.

Other statistics: Temp. 96.6°F. (35.8°C.)

LESSER HORSESHOE BAT (*Rhinolophus hipposideros*)

General characters: Resembles greater horseshoe except in size: forearm $1\frac{1}{2}$ " , wing-span less than $8\frac{1}{2}$ ". Fur long, silky, greyish-brown above, pale grey below.

Habits: Gregarious, daytime sleep in hollow trees and roofs. Sexes segregated at roosts. Hunting flight fluttering, few feet from ground, with frequent gliding. Active $\frac{1}{2}$ hr. after sunset and continue, with occasional rests, until nearly sunrise. Hibernation in caves, often low

down, hanging from undersides of overhanging ledges, October to early April.

Food: Smaller insects, moths especially, beetles, gnats, also spiders.

Breeding: Gestation not known. Single young June-July, naked, blind, pale grey at first.

Range: England (S. and W.), Wales and border counties. Outside Britain: Ireland, Europe south of Baltic, S.W. Asia to Himalayas, North Africa.

Longevity: $14\frac{1}{2}$ yrs.

Other statistics: Temp. 96.6°F. (35.9°C.)

Family MOLOSSIDAE

Free-tailed bats, usually highly gregarious, in buildings or caves. Best-known is Guano Bat (*Tadarida mexicana*) of Carlsbad Cavern, New Mexico, roosts in millions (estimated 8 million), when emerging ascend like a large plume of smoke. Guano on floor of cavern once measured $\frac{1}{4}$ mile long, 100 yd. breadth, 100 yd. deep, dug out for fertilizer, yielded thousands of tons, took 20 yrs. to remove at rate of 120 tons a day. Bats characterised by broad ears, united at base across top of head, and $\frac{1}{2}$ of tail free of inter-femoral membranec.

Family DESMODONTIDAE

TRUE VAMPIRE OF BLOOD-SUCKING BAT (*Desmodus rotundus*)

Most highly specialised of all bats: teeth, digestive system and external form all adapted to habit of living entirely on fresh blood lapped from incision made in skin of a living animal. 3" head and body; but has none of "Vampire" appearance of some larger but quite harmless bats. Confined to tropical South and Central America. Upper incisors reduced to two rodent-like razor-edged chisels with which skin is shaved away until blood flows. Cheek-teeth minute, functionless. Intestine reduced, simplified for assimilation of specialised diet. Since no need to pursue flying prey, like other bats, alights on or beside a sleeping or resting animal, from man to horse, goat or chicken. Mode of locomotion much more agile than in any other bat on ground. Runs and creeps comparatively swiftly on forearms and legs, raising body clear of ground. Can seriously weaken horses, mules and other domestic animals; can be pest to human beings, attacking great toe for preference, but can be kept away by a night-light. Dangerous animal; found to be carrier of paralytic rabies, tropical disease attacking cattle in some areas, and occasionally man. [Gestation 90-120 days.]

Family VESPERTILIONIDAE

DAUBENTON'S BAT OF WATER-BAT (*Myotis daubentonii*)

General characters: Head and body 2", tail $1\frac{1}{4}$ ", wing-span $10\frac{1}{2}$ ". Wing-membrane relatively short and broad, attached to middle of foot; inter-femoral membrane whitish below, leaves last 2 joints of tail free. Feet large, whitish hairs on toes. Fur short, dense, grizzled brown above, lighter brown or buffy grey below, sometimes distinct line of separation from angle of lips to thigh. Ear $\frac{1}{2}$ " long, rounded tip, shallow concavity on upper part of hind margin, tragus narrow, half as long as ear.

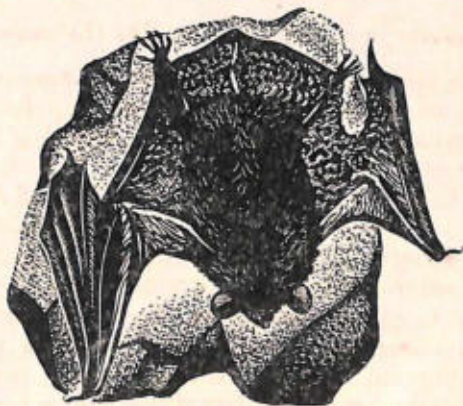
Habits: Gregarious, roosts in crevices in trees, walls, caves, roofs, but may hang in clusters. Flight slow, quivering, over water in circles, frequently dipping to pick insects off surface. Out soon after sunset, probably flies all night. Hibernation singly in caves late September to mid-April.

Food: Ephemeroidea and caddis-flies.

Breeding: Gestation not known. Single young born June-July.

Range: Southern England to Great Glen in Scotland. Outside Britain: Ireland to Asia, in Europe from Mediterranean to Central Norway.

Longevity: $12\frac{1}{2}$ yrs.

WHISKERED BAT (*Myotis mystacinus*)

General characters: Head and body $1\frac{1}{2}$ ", tail $1\frac{1}{2}$ ", wing-span $8\frac{1}{2}$ ". Wing-membrane narrow, hind margin continued to base of toes, spur reaches halfway from ankle to tail. Fur long, soft, upper parts dark or smoky brown or nearly black, hair extends slightly on to wing-membrane, underparts light with dark hairs tipped with white. Ear

long, narrow, tragus just over $\frac{1}{2}$ length of ear, pointed at tip. Face short, lips fringed with long hairs.

Habits: Usually solitary, occasionally in colonies of 100, daytime sleep in holes in buildings and in roofs. Hunting especially near trees and water, flight slow, steady, follows narrow beat. Insects picked off leaves and twigs and also caught in flight. Active at or before sunset, remains on wing most of night. Hibernation Nov.-March.

Food: Flies, beetles, moths.

Breeding: Gestation unknown. Single young born June-July, blind, naked.

Range: England, Wales (not Scotland). Outside Britain: Ireland, all Europe and Asia south of 60-65° lat.

Longevity: 15 $\frac{1}{2}$ + yrs.

Other statistics: Temp. 99°F. (37.2°C.)

NATTERER'S OR RED-GREY BAT (*Myotis nattereri*)

General characters: Head and body 1 $\frac{3}{4}$ " , tail 1 $\frac{1}{2}$ " , wing-span 11 $\frac{1}{4}$ " . Wing-membrane dusky, extends to base of outer toe and to tip of tail, inter-femoral membrane fringed with stiff hairs. Fur soft, dense, greyish-brown above, whitish underparts. Ear long, narrow, tragus long, narrow and $\frac{3}{8}$ length of ear. Head small, muzzle narrow, naked at tip, overhangs mouth, moustache and prominent gland above each lip.

Habits: Gregarious, daytime sleep in holes in walls, caverns, hollow trees. Sociable, with other species at roost. Hunting flight slow, steady with sudden twists, at moderate height among trees. Picks flies, small moths off leaves and twigs. Hibernation autumn (month not known) to March.

Food: Flies, small moths, beetles.

Breeding: Gestation not known. Single young born June.

Range: England, Wales, Ireland (rare Scotland). Outside Britain: temperate Europe and Asia eastwards to Japan.

Longevity: 13 $\frac{1}{2}$ + yrs.

BECHSTEIN'S BAT (*Myotis bechsteini*)

General characters: Head and body 2" , tail 1 $\frac{1}{2}$ " , wing-span 11" . Wings dark brown, narrow, pointed at tip, hind margin continued to base of toes, and encloses all but last joint of tail. Fur soft, woolly, greyish-brown on upper parts, buff-grey below. Ears $\frac{3}{4}$ " long, $\frac{1}{2}$ " broad, tragus long, narrow, curved outwards.

Habits: Gregarious, up to 20 in daytime roosts in holes in trees. Hunting flight slow, near ground. Active late in evening, near woods and orchards, but only in calm weather. Hibernation: details unknown.

Food: No information.

Breeding: Little information: young believed born in June.

Range: Sussex, Hampshire, Isle of Wight. Outside Britain: Europe generally, Caucasus and Transcaucasia.

LITTLE BROWN BAT OR AMERICAN MOUSE-EARED BAT (*Myotis lucifugus*)

General characters: Head and body 2", wing-span 10", tail 1½", wt. up to ½ oz. Wing-membrane relatively broad, hind-margin continued to base of toes and encloses all but tip of tail. Fur soft, dark brown above, lighter below. Ears ½" long, ¼" broad, tragus long and narrow.

Habits: Gregarious, 3-40 in a roost, in caves, hollow trees, crevices in rocks, caves. Emerge an hour before sunset, remain on wing until dawn or later. Well-developed homing instinct: banded individuals have returned to roost from 180 miles, others from 70 miles in 6 nights. Hibernation October (at critical temp. 8°F.) to March. Breathing during hibernation every 5 mins.

Food: Small insects, especially two-winged flies, eaten on wing, up to half own weight in a night. Larger prey carried to roost to be eaten.

Breeding: Mating autumn, delayed implantation, birth in following spring (May-June); after actual gestation of 56 days. 1 young, naked, blind, wt. ⅓ oz. Birth takes ½ hr. Weaned and first flight 3-4 weeks, full size 4 weeks, females mature 10 mths., males at 14 mths.

Range: Mexico, U.S.A., Canada north to tree-line.

Longevity: 10½ yrs.

Other statistics: Temp. 100°F. (37.7°C.)

SEROTINE BAT (*Eptesicus serotinus*)

General characters: Head and body 3", tail 2", wing-span 15". Wing-membrane broad, reaching to base of outer toe, tail projects well beyond interfemoral membrane. Fur dark brown on upper parts, lighter brown on underparts. Ear oval ¾" long, tragus ½ length of ear. Face swollen, almost hairless in front except for moustache.

Habits: Gregarious, roosts in roofs of houses. Flight heavy, fluttering, moth-like, at heights of 30-40' sometimes with frequent swooping to ground level. Emerges at sunset for ½ hr. only. Hibernation October to early April.

Food: Beetles and moths.

Breeding: Gestation unknown. Single young in May.

Range: England (southern half). Outside Britain: Central and Southern Europe, several subspecies in south-western and temperate Asia eastwards to Korea.

Other statistics: Temp. 100.6°F. (38.1°C.)

BIG BROWN BAT or HOUSE BAT (*Eptesicus fuscus*)

General characters: Head and body 3", tail 2", wing-span 12", wt. 1 oz. Otherwise similar to serotine except body fur yellowish-brown above.

Habits: Gregarious, roosts in houses. Emerges $\frac{1}{2}$ hr. after sunset for 1 hr. Hibernation late October to early April.

Food: Beetles especially, and moths.

Breeding: Mating in autumn, delayed implantation, 2 young born May (or end of June in northern parts of range), naked, blind, wt. $\frac{1}{10}$ oz., weaned 3 weeks, full size 2 mths.

Range: Mexico, U.S.A., S. Canada.

Longevity: 9 yrs.

Other statistics: Temp. 100-6°F. (38.1°C.)

RED BAT (*Lasiurus borealis*)

General characters: Head and body 2", tail 2", wing-span 14", $\frac{1}{3}$ oz. wt. Wing-membrane attached to ankle and to tail almost to tip. Fur fairly long, upper surface of wing-membrane well furred. Males rusty-red, frosted, females chestnut, both with lighter underparts. Ears rounded, $\frac{1}{2}$ " across, narrow pointed tragus.

Habits: Females gregarious when with young; daytime sleep hanging among leaves, usually of oak. Active before sunset, goes to drink before hunting. Migration in autumn to Central America and West Indies.

Food: Insects, especially beetles.

Breeding: Mating spring (females of previous year), late summer (older females). Gestation 240 days, 1-4 young but usually 2-3.

Range: S. Canada, U.S.A. (except Rockies and Florida).

HOARY BAT (*Lasiurus cinereus*)

General characters: Head and body 3", tail 2", wing-span 15", wt. 1 $\frac{1}{2}$ oz. Wing-membrane broad, pointed at tips, attached to ankle and almost to tip of tail, interfemoral membrane furred. Fur mahogany brown, frosted with greyish-white.

Habits: Solitary, summer roosts in evergreen trees on mountains. Active 2 hrs. after sunset and 2 hrs. before sunrise, flight high, swift, erratic. Migrates south in September.

Food: Large beetles and moths (including Luna and Cecropia moths).

Breeding: Mating in summer, up to 4 young (usually 2) born following May-June, furred at 3 weeks, independent flight 4 weeks.

Range: S. Canada, U.S.A., Mexico, northern S. America, Hawaii.

LUMP-NOSED BAT or RAFINESQUE BAT (*Corynorhinus rafinesquii*)

General characters: Head and body $2\frac{1}{2}$ " , tail 2" , wing-span 13" , wt. $\frac{1}{2}$ oz. Wing-membrane broad, attached to ankle and including all but tip of tail. Fur soft, brown above, slate-coloured underparts. Conspicuous protuberance on face, ear oval, $1\frac{1}{2}$ " long, tragus slender, pointed.

Habits: Solitary, hunts among foliage, much as Long-eared bat (q.v.).

Food: Mainly soft-bodied insects.

Breeding: Mating in autumn, gestation 56-100 days, delayed implantation, 1 young born May-June, pink, naked, blind, wt. $\frac{1}{10}$ oz., short hair appears and eyes open 4 days, independent but feeble flight 2-3 weeks, full flying and weaning 2 mths.

Range: N. Mexico, U.S.A., S.W. Canada.

Longevity: 10 yrs.

NOCTULE or GREAT BAT (*Nyctalus noctula*)

General characters: Head and body $3\frac{1}{4}$ " , tail $2\frac{1}{4}$ " , wing-span 15" . Wing-membrane narrow. Last joint of tail free of interfemoral membrane. Fur dense, soft, golden-brown, wing-membrane and ears blackish. Ear broader than long, inner surface hairy, short bow-shaped tragus. Muzzle broad, glandular swelling between eye and nostril. Nostrils project outward with concavity between.

Habits: Gregarious, sexes segregated, roosts in hollow trees or under eaves. Flight quick, like that of swifts with which noctules sometimes hunt. Emerges sunset for about 1 hr., and again at dawn.

Food: Flying insects, especially moths.

Breeding: Gestation 38-70 days. Single young, born end of June, naked, blind, eyes open 12 days, weaned at 1 mth. Hibernation October to end of March.

Range: England (few records Scotland: none Ireland). Outside Britain: typical form Europe and into western Asia; subspecies southern Asia.

LEISLER'S BAT, LESSER NOCTULE, HAIRY-ARMED BAT (*Nyctalus leisleri*)

General characters: (Like Noctule but smaller.) Head and body $2\frac{1}{2}$ " , tail $1\frac{1}{2}$ " , wing-span 12" . Wing-membrane narrow, last joint of tail free of interfemoral membrane. Fur long, soft, rusty-brown above, underparts lighter.

Habits: Gregarious, sometimes solitary, roosts high in decayed trees, also roofs and crevices in buildings. Flight strong, not swift as in noctule. Emerges just after sunset for 1 hr., 2nd flight just before sunrise.

Food: Flies, beetles, moths.

Breeding: Gestation unknown. Single young, born June.

Range: England (local), Ireland (not Wales, Scotland). Outside Britain: temperate Europe, Caucasus, Punjab (? also Madeira).

SILVER-HAIRED BAT (*Lasionycteris noctivagans*)

General characters: Head and body $2\frac{1}{2}$ " , tail $1\frac{3}{8}$ " , wing-span 13" , wt. $\frac{1}{2}$ oz. Wings narrow, pointed at tip, hind margin continued to ankle and enclosing whole of tail. Fur dark brown to chestnut, ends of hairs silver, fewer silver-tipped hairs on underside. Ears oval, $\frac{3}{8}$ " long, tragus short and broad.

Habits: Sexes in separate roosts. Emerge 1 hr. after sunset, hunting especially over water, 40' or less from ground. Flight erratic: gliding, fluttering, sudden dashes. Hibernation in caves, or migration south.

Food: Insects eaten on wing.

Breeding: Mating autumn, gestation 300 days, delayed implantation, 1-2 young born June-July, black, wrinkled, weaned and independent flight 3 weeks.

Range: U.S.A., Canada.

PIPISTRELLE OF COMMON BAT (*Pipistrellus pipistrellus*)

General characters: Head and body just over $1\frac{1}{2}$ " , tail 1" , wing-span $8\frac{1}{2}$ " . Wing-membrane blackish, narrow, attached to middle of sole of foot, and to tail leaving last joint free. Fur silky, light to dark reddish-brown on upper parts, slightly paler below. Ears broad, triangular. Head broad, muzzle blunt, mouth wide.

Habits: Solitary or gregarious, roosts in crevices in roofs, behind rainwater pipes and gutters, between brickwork and woodwork. Hunting flight fluttering, 12-15' high, usually following regular beat. Active dusk to hour or two before sunrise. Hibernation end of October to end of March.

Food: Flies, especially gnats, small beetles.

Breeding: Gestation 35-44 days, single young born July.

Range: Throughout British Isles. Outside Britain: Europe, S.W. Asia to Korea and Japan. Also Kashmir, Morocco.

AMERICAN EASTERN PIPISTRELLE (*Pipistrellus subflavus*)

General characters: Head and body 2" , tail $1\frac{1}{2}$ " , wing-span 6" , wt. $\frac{1}{4}$ oz. Wing-membrane blackish, fur yellow-brown above, lighter below. Otherwise characters as in *P. pipistrellus*.

Habits: Roosts in exposed places, often among loose rocks, clinging

by feet and wing-claws, upside-down. Flight fluttering, active at sunset and sunrise. Hibernation October-March, in caves.

Food: Flies, small beetles, eaten on wing, larger prey held in interfemoral membrane while eaten.

Breeding: Mating autumn and spring, 1 litter a year, 1-3 young born May in S., June-July in N., weaned and independent flight 3 weeks.

Range: U.S.A., east of Great Plains, except Maine and S. Florida.

Longevity: 6 yrs.

Other statistics: Temp. 89°F. (31.7°C.)

Special comments: Western Pipistrelle (*P. hesperus*) similar, but inhabits Rockies to Pacific coast.

BARBASTELLE (*Barbastella barbastellus*)

General characters: Head and body 2", tail $1\frac{3}{4}$ ", wing-span 10". Wing-membrane broad, reaches ankle, tail almost enclosed by interfemoral membrane. Fur long, soft, almost black but grizzled, lighter on underparts. Ears connected across head, broad as long, $\frac{2}{3}$ " broad, tragus lance-shaped, $\frac{1}{8}$ " long. Eyes appear to lie within ears.

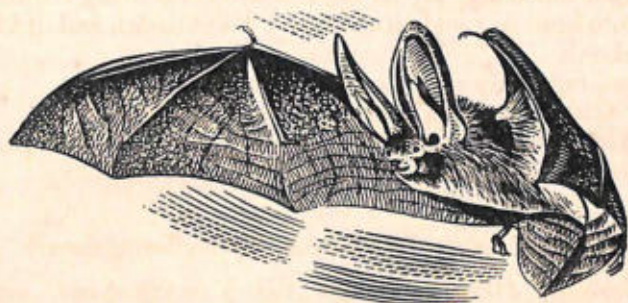
Habits: Solitary, rarely in small groups, roosts in thatch, crevices in walls and trees, between rafters and tiles. Flight slow, flapping, near ground but may fly high in warm weather. Emerges before sunset but duration unknown. Hibernation in caves, end of September to early April.

Food: Insects (but no more information).

Breeding: No information.

Range: England and Wales (not Scotland, Ireland). Outside Britain: Europe, Caucasus, Transcaucasia.

LONG-EARED BAT (*Plecotus auritus*)



General characters: Head and body 2", tail $1\frac{3}{4}$ ", wing-span 10". Wing-membrane broad, tip of tail free of interfemoral membrane.

Fur long, silky, brown on upper parts, light brown to dirty white on underparts. Ear oval, $1\frac{1}{2}$ " long, tragus narrow, pointed, $\frac{3}{4}$ " long, exposed when ear folded under arm at rest. Ears joined across head.

Habits: Gregarious, roosts in roofs, sexes segregated at least during nursing period. Flies among branches of trees, hovering to pick insects off foliage. Emerges $\frac{1}{2}$ hr. after sunset, continues until hour before sunrise. Hibernation, in caves, roofs, hollow trees, mid-October to early April.

Food: Small insects.

Breeding: Gestation unknown. Single young, born June-July.

Range: Common throughout British Isles. Outside Britain: temperate Europe and Asia to Japan, Northern India, Palestine, Egypt.

Longevity: $12\frac{1}{2}$ yrs.

Other statistics: Temp. 99°F. (36.6°C.); pulse, 100-970.*

SOME UNUSUAL BATS

North American Fish-eating Bat (*Pizonyx*), of Gulf of California, 6" total length including nearly 3" tail, wing-span 16", brown above, white below, skims surface of sea catching fish and small crustacea leaping out of water with enlarged hind-feet and interfemoral membrane. Roosts in crannies under rocks along shore.

Flat-headed Bat (*Tylonycteris pachypus*), of Malaya, able to squeeze into cracks in bamboo stems, has sucker-discs or pads on thumbs and toes of hind-feet, able to cling to undersurfaces of palm fronds and other large leaves.

Yellow-eared Bat (*Uroderma bilobatum*), of Central America, bites midrib of palm leaf, making it fold over, then roosts in concealed angle of leaf.

Euderma maculatum, of south-western U.S.A., is black with white blotches.

Butterfly Bat (*Glauconycteris papilio*), of Africa, fur soft, yellowish-brown, wing- and tail-membranes pale with dark veins. *G. superba*, jet-black with conspicuous white spots and stripes, known from two specimens only from Ituri Forest, Congo (1939) and Gold Coast (1947).

Naked Bat (*Cheiromeles torquatus*), of Malaya, almost hairless, black leathery skin.

* This wide range is unusual but may be a feature of all bats. Sleeping bats are in a torpid state comparable to that of hibernation, when their body-temperature is near that of the surrounding air. On awaking it takes 30-60 mins. for temperature to rise from $47-48^{\circ}\text{F.}$ to $98^{\circ}\pm$. While torpid, bat breathes 25-30 times a minute for 3 mins., then stops for 3-8 mins. without breathing. When active, breathes at 200 a min. without pauses.

NECTAR-EATING BATS

Some small bats of both suborders, Megachiroptera and Microchiroptera, have specialised in feeding on nectar obtained from certain tropical arboreal flowers opening only at night. All agree in having elongated slender muzzles (in some cases curving), very long extensile tongues usually equipped with recurved barbed tips for collection of nectar, and greatly reduced teeth which appear to be becoming functionless. Has been suggested that certain tropical flowers are fertilised by these bats. Among Megachiroptera, *Megaloglossus* of W. Africa and *Macroglossus* of Malay and Australasia, are best examples, and in Microchiroptera *Glossophaga* and related genera of S. America.

Order PRIMATES

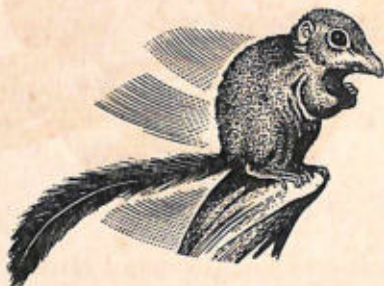
BRAIN-CASE usually large and brain well-developed. Orbit, or eye-socket, either enclosed by a ring of bone, or is separated from temporal region of skull by a complete plate of bone. Teeth of 4 types, clearly distinguished into incisors, canines, pre-molars, molars. Limbs usually long, hands and feet usually bear 5 digits, with thumb and big toe opposable for grasping (except for big toe in man). 2 mammae on breast, with 2 additional teats on abdomen in certain lemurs. [Tree shrews do not share these characters: see below.]

Suborder Prosimii

Diversified group: characters given under families.

Family TUPAIIDAE (Tree shrews)

Little known of habits of tree shrews except that they are diurnal, restless and active, living in low scrub or secondary forest, seldom foraging on ground. Formerly included in Insectivora, now supposed to be nearly related to lemurs, especially in structure of brain. They



are small rodent-like, with long snouts, bushy tails and clawed toes. Numerous species of *Tupaia* inhabit S. and S.E. Asia, and Philippines. Pen-tailed Tree Shrew (*Ptilocercus lowi*), of Malaya, Sumatra and Borneo, has nearly naked tail with feather-like fringe of hair at tip. [Gestation 56 days.]

Family LEMURIDAE

True lemurs are confined to Madagascar. Mostly cat-sized, a few mouse-sized, tail well-developed, fox-like muzzles. Mainly nocturnal, arboreal, food ranges from insects to small mammals and fruit. Incisors of lower jaw project horizontally forward with canines lying alongside forming comb-like teeth used for scooping out soft fruit, and for combing fur. Colour very variable, often sexual dichromatism, but much individual variation (as a result, numerous species recognised in past). Little known of ethology. [Only record of longevity is for Black Lemur (*Lemur macaco*) 21 yrs. A record for gestation period for same species is 146 days, which contrasts with 40 days for other species of Lemur.]

Ruffed Lemur (*Lemur varia*), largest of lemurs, over 3' long including tail, bright red or conspicuous black-and-white, prominent ruff of hair round face.

Ring-tailed Lemur (*L. catta*), nearly 4' long including tail, but



slender-bodied. Soft grey fur, tail ringed black and white. Habitat atypical; thinly wooded country, dry and rocky.

Mouse Lemurs form distinct group; 15" to 17" long including slender tail, sleek brownish fur, large eyes, nocturnal, sleep by day in nests in holes in trees. Among them are Fat-tailed Lemurs, able to store fat in tail, especially at root; aestivate in dry season. Smallest Mouse Lemur is Lesser Dwarf Lemur (*Microcebus murinus*), 10" to 12" total length, mainly insectivorous, nest bird-like high in trees.

Family INDRIDAE

Indri (*Indris brevicaudata*) 3' long including stumpy tail. Long hind-legs, tufted ears, very long muzzle. Normally blackish with lighter markings, but variable. Social, in troops; diurnal, spends day on ground travelling in leaps.

Woolly Lemur, Sifakas and Indri form third distinct group, with long hind-legs and thumbs reduced in size:

Woolly Lemur or Avahi (*Avahis laniger*), cat-sized, slender, 12" head and body, 16" tail, solitary, nocturnal, owl-like eyes.

Sifakas or Monkey Lemurs (*Propithecus*), monkey-like, spend day on ground leaping on long hind-legs with arms held over head. Tail very long. Colour all-black to creamy-white with chocolate markings on head and limbs. Fur silky.

Family DAUBENTONIIDAE

Aye-aye (from native name Haihay) (*Daubentonia madagascariensis*)



of forests of eastern Madagascar; cat-sized, long bushy tail, coat of coarse black hair, large ears and eyes. Incisors large, few, no canines. Slender toes, exceptionally long fingers, especially middle finger. Nocturnal, spends day in spherical nest. Taps rotten branches with slender middle finger, sounding for grubs; tears wood away with incisors, probes for grub with middle finger. Food: insects, fruit.

Family LORISIDAE

Diversified family, members related to each other mainly by skull characters; for differences in external form compare descriptions of species

SLOW LORIS (*Nycticebus coucang*)

General characters: Rat-sized, tailless, stocky build, up to 15" long. Coat of woolly hair, fawn, black stripe down mid-line of back. Face rounded, muzzle short, eyes large, ears small. Index finger a mere stump, nails on fingers and toes except 2nd toe which bears a long claw.

Habits: Nocturnal, arboreal, slow and deliberate in movement, stalks prey, captures with sudden grab. Tenacious grip on branches due to special muscles, sleeps rolled up by grasping with hands and feet.

Habitat: Jungle forest.

Food: Leaves, fruit, insects and any small animals it can capture.

Breeding: Gestation 90-180 days. 1 young at birth.

Present status: No information.

Range: S.E. Asia.

Longevity: 10 yrs.

SLENDER LORIS (*Loris tardigradus*)

Similar to Slow Loris but coat dark grey, body slender, 8" long.
Range: S. India, Ceylon.

POTTO or BOSMAN'S POTTO (*Perodicticus potto*)

General characters: Round-bodied, 1' long with tail 2-3", round face, small ears, large eyes. Woolly coat, khaki or fawn. Fingers and toes as in Lorises except index fingers vestigial and without nail or claw. (Discovered by Van Bosman, in 1705.)

Habits: Nocturnal, movements slow and deliberate. Extraordinary powers of grasping and sleeps clinging to a sloping branch. Spinous processes of cervical vertebrae project through skin, said to be used in

defence since potto when attacked rolls up and presents back of neck to enemy (idea probably fanciful).

Habitat: Tropical rain forest.

Food: Fruit, leaves (insects, small birds not confirmed).

Breeding: No information.

Present status: Unknown.

Range: W. Africa to W. Kenya.

Longevity: No information.

Other statistics: Temp. 98.6°F. (36.9°C.)

ANGWANTIBO (*Arctocebus calabarensis*)

Related to Potto but resembles Slow Loris in build. Details as for potto, but known to eat meat and pilfer birds' nests. Very rare, unknown until discovered by John Alexander Smith in 1860. Restricted to Cameroons.

BUSHBABY, NIGHT-APE, SENEGAL OR MOHOLI GALAGO (*Galago senegalensis*)



General characters: Round-bodied, 16" long including tail, which is bushy except at base. Head round, muzzle short, eyes large, ears large, flesh-coloured, and can be folded at will. Hind-legs long, front legs shorter. Fur brownish to yellowish grey, white on muzzle and throat varying with locality.

Habits: Nocturnal, active climber. Cries at night, with sound of human baby.

Habitat: Dry scrub or bush.

Food: Mainly insects.

Breeding: Gestation 4 mths. 1 young.

Present status: Numerous.

Range: Africa, south of Sahara, including Sudan and Somaliland.

Longevity: No information.

Other species of *Galago* are:

Demidoff's or the Dwarf Galago (*G. demidovi*): Tropical Africa (Senegal to Uganda and Tanganyika); 5" long, tail 8", fox-like muzzle, reddish-brown fur.

Thicktailed or Large Grey Bushbaby, or Great Galago (*G. crassicaudatus*): belongs to thinly-wooded country of S. and E. Africa outside the forests; 2½' long, about half of which is tail, fur dark brown.

Family TARSIIDAE

Includes one species placed in separate family because of peculiarities of anatomy.

TARSIER (*Tarsius spectrum*)



General characters: Round-bodied, 5" long, with tail 10" long. Face round, ears large, eyes unusually large with huge pupils that contract to pinpoints in daylight. Hind-legs long, 5 toes on fore- and hind-feet all slender and expanded at tips to form adhesive pads.

Habits: Nocturnal, moves through trees by flying leaps of up to 16' to land on vertical surface, all 4 feet being brought forward to cushion impact.

Habitat: Secondary jungle.

Food: Insects, especially grasshoppers, lizards, small birds, possibly fruit.

Breeding: No information.

Present status: Formerly believed rare, but when rewards offered for specimens natives clearing jungles for plantations brought in large numbers.

Range: Philippines, Sumatra, Borneo.

Longevity: No information.

Suborder **Anthropoidea** (Monkeys and Apes)

Eye-socket entirely separated from temporal region of skull by a plate of bone.

New World monkeys are grouped in two families: Cebidae and Callithricidae (Marmosets).

Family **CEBIDAE**

Includes Douroucoulis (Night Monkeys), Titis, Sakis, Uakaris, Howling Monkeys, Capuchins, Squirrel Monkeys, Spider Monkeys, Woolly Monkeys. All have 4 more teeth than Man, nails instead of claws, and some lack a thumb.

Douroucoulis or Night Monkeys (*Aotes*): Amazon forests to Central America; nocturnal, head and body 12", tail slightly longer. Face owl-like, eyes large, yellow, staring, ears small, fur long, coarse, usually mottled grey or brown, forehead whitish with 3 black stripes. Spend day in holes in trees. Live in troops. Omnivorous. [Temp. 100·8°F. (38·2°C.)]

Titis (*Callicebus*): forests of Brazil and northern S. America. Similar in size, etc., to Douroucoulis but diurnal and eyes not large.

Sakis (*Pithecia*, *Chiropotes*): Amazon forests; noted for profuse hair on head and body, tail long, bushy. Some species have fringe of hair over forehead, side-whiskers and square beard parted in middle, others covered all over with wiry black and grey hair.

Uakaris or Bald-headed monkeys (*Cacajao*): Amazon forests, in tree-tops near big rivers; bald faces and heads, stumpy tails. Three known species: Bald Uakari (*C. calvus*), scarlet face, red beard, coarse greyish-white hair on body and legs; Red Uakari (*C. rubicundus*), bright red face and head, long chestnut hair on body; Black-headed Uakari (*C. melanocephalus*), black except for reddish-brown body.

Howling Monkeys (*Alouatta*): Southern Brazil to Central America; large, thick-set, bearded, tail long, prehensile, naked below at tip, well-developed thumbs. Expanded lower jaw and swollen throat accommodate sound-box of enlarged hyoid bones at root of tongue. Voice



audible 2 to 3 miles, habitually raised in chorus especially at dusk and dawn. All howlers black except Red Howler (*A. seniculus*) which ranges from straw colour to dark purplish-red.

Capuchins (*Cebus*): Paraguay to Mexico; commonest monkeys of



S. America, numerous species. All gregarious, small, brownish, long prehensile tails. (Shares with Indian Macaque position of "organ-grinder's monkey": name from cowl-like hair on head, compared with long-pointed cowl or capuche of Franciscan monks.) *C. vellerosus* and *C. apella*, gestation 180 days.

Squirrel Monkeys (*Saimiri*): Tropical forests of S. America; squirrel-sized, nocturnal, brain-case markedly large and long, eyes large, tail not prehensile, fur brightly coloured. Common Squirrel Monkey (*S. sciurea*), of Brazil and Valley of Orinoco, grey with black mottling,

tinged with gold on back, outer forearms yellowish, paws white. Bolivian Squirrel Monkey (*S. boliviensis*) has body hairs yellow tipped with black giving golden hue, head black, other parts yellowish-grey.

Spider Monkeys (*Ateles, Brachyteles*): Amazon basin westwards to Pacific coast, northwards to Mexico; gregarious, alert, quick-moving. Slender bodies, long legs. Long prehensile tail naked below at tip, can be used for suspending body leaving all legs free, or for grasping leaves and fruit and conveying these to mouth. Black Spider Monkey (*Ateles ater*) of Peru is best-known. Brown Woolly Spider Monkey (*Brachyteles arachnoides*), of S.E. Brazil, yellowish-brown to ash-grey, has variation in thumb, e.g. some individuals have no thumb on one hand, but well-developed on other.

Woolly Monkeys (*Lagothrix*), Upper Amazon: Nearly related to Spider Monkeys but heavier build, slower moving. Legs shorter, thumbs well-developed. Coat woolly, uniformly grey. Tail long, naked tip, prehensile. Best-known species is Humboldt's Woolly Monkey (*L. humboldtii*), grizzled grey fur, only head and face black.

Family CALLITHRICIDAE (Marmosets and Tamarins)

Central and South America; none larger than Grey Squirrel, tail never prehensile. Diurnal, social, in large troops in tree-tops, feeding on insects and fruit. Digits bear claws instead of nails, except on 1st. toe, which is very small. With one exception 32 teeth.

Goeldi's Marmoset (*Callimico goeldii*): a link with Cebidae, for although a typical marmoset has 36 teeth instead of 32.

Common Marmoset (*Callithrix jacchus*): commonly kept as a pet, but seldom survives long in temperate climates. Fur grizzled with black bands on body, tail ringed black and grey, ears tufted. [Longevity, 16 yrs.]

Pigmy Marmoset (*Cebuella pygmaea*): 6" head and body is smallest of true monkeys.

Golden Marmoset or Lion Marmoset (*Leontocebus rosalia*): coat, including miniature mane, glossy golden-yellow.

Tamarins (*Midas*): distinguished from marmosets by large canine teeth, absence of ear-tufts. Most are blackish-brown, some creamy-white, hands and feet reddish or yellow.

(Marmosets have distinct vocabulary, some of calls being in ultrasonic range.)

Family CERCOPITHECIDAE

The Old World Monkeys are included in one family, the Cercopithecidae. They differ from the New World Monkeys in having

nostrils set close together, a non-prehensile tail or none at all, and 32 teeth, as in Man. When a thumb is present it is opposable.

There are two groups: Macaques, Mangabeys, Baboons and Guenons, with a tail, long or short, a simple stomach, 5 digits on the hand, and cheek-pouches; and Langurs and Geruezas (Colobus Monkeys) with a complex stomach and no cheek-pouches, always a long tail, except in the Snub-nosed Monkey, and thumb reduced or absent.

MACAQUES (*Macaca* spp.)

Commonest monkeys of India, Malaya, Indonesia, Philippines, parts of China, Japan. Social, noisy, often damaging crops, filling capacious cheek-pouches with food not eaten on spot. Majority of macaques are size of a large cat, with usually tawny or brown coat.

COMMON RHESUS, INDIAN MACAQUE OR BANDAR (*Macaca mulatta*)



General characters: Sturdily built, body 23", tail 10" long; male 24 lb., female 13 lb. wt. Rounded head, muzzle prominent, ears small, eyes oval. Coat yellow to brown, lighter underparts. Arms longer than legs. Buttocks flesh-coloured.

Habits: Social, living in troops with no recognizable leader but with a hierarchy within troop in which old males are dominant, especially sexually.

Habitat: Among trees, but equally at home on rocky hillsides and on ground, or living in and around buildings.

Food: Fruit and insects mainly.

Breeding: Gestation 130-180 days. 1 young at birth, weighing 1 lb. Nursed for 1 yr. Female sexually mature 3 yrs., male 4 yrs.

Present status: Abundant.

Range: Northern India, Assam, Burma, China, sea-level to 10,000'.

Longevity: 29 yrs.

Special comments: Sacred to Hindus therefore unmolested so that numbers have increased to nuisance proportions. Popular in zoos. Shared with Capuchins role of organ-grinder's monkey. Large numbers used in laboratories for experimental, especially medical, research; yet little known of habits in wild.

Other statistics: Temp. 101°F. (38.8°C.); pulse, 165-240.

Other Macaques include:

Lion-tailed Macaque (*M. silenus*), of mountain forests of W. coast of S. India: rare, shy, seldom seen; black with grey ruff and beard. (Sometimes called, erroneously, the Wanderoo, which is Cingalese for a langur).

Pig-tailed Macaque (*M. nemestrina*) of Burma and Sumatra; largest of macaques, heavy build, short tail, dog-like muzzle. Trained to climb palms and throw down ripe coconuts.

Crab-eating Macaque (*M. irus*) of Malaya: lives among mangroves, feeds on shellfish.

Japanese Macaque (*M. fuscata*) lives farther north than any other monkey: dense coat of long hair, dark-brown olive. (The monkey of Japanese art.)

Barbary Ape (*M. inua*) of Morocco and Gibraltar: tailless, probably introduced from S.E. Asia.

Mangabeys (*Cercocebus*) of Africa: live in large troops, feed on fruit. Slender-bodied, long muzzles, capacious cheek-pouches.

Black or Peaked Mangabey (*C. aterrimus*) of Congo: all black.

Peter's or Plain-headed Mangabey (*C. galeritus*) of Tana River forests of Kenya coast: pale ashy-brown.

Collared or Capped Mangabey (*C. torquatus*) of W. Africa: blackish with white neck and red cap.

Crested Mangabey (*C. albigena*) of W. Africa: smoky-grey to blackish, with crest of long erect hair rising from back of head.

GUENONS (*Cercopithecus*, *Erythrocebus*)

Found over most of Africa south of Sahara, especially tropical rain forests. Long hind-limbs, long tails, finely grizzled fur. Some strikingly coloured, most have white and coloured brow-bands, ruffs, whiskers, beards, nose-patches. Live in troops, often members of several species in one troop. Keen sight and hearing, able to travel through forest

canopy faster than man moves on ground. Adept at hiding in foliage. Rest on horizontal bough with four legs and tail dangling.

Vervet or Green Monkey (*Cercopithecus aethiops*) of West, East and South Africa: in secondary bush or scrub, or scattered acacia; coat grizzled greyish-green, face black framed in white.

Mona Monkey (*C. mona*) of West Africa to western Uganda: dark grizzled olive on back, pure white undersides, outer limb surfaces black, insides of limbs white. (Introduced: St. Kitts, Grenada in West Indies.)

Diana Monkey (*C. diana*) of W. Africa: body patterned black, red, creamy-white, silvery-grey, with goatee beard.

Blue Monkey (*C. mitis*) of E. Africa: grizzled grey, slate or chestnut. (Skins formerly used in commerce; monkey now protected to save from extinction.)

Moustached Monkey (*C. cephus*) of W. Africa: red moustachial stripes, red tufts on ears.

Talapoin (*C. talapoin*) of Congo: rare, body and head r' long, greenish fur.

Patas or Hussar Monkey (*Erythrocebus patas*) North Central Africa: inhabits grassy plains with occasional trees. Long legs, long tail, reddish coat.

BABOONS (*Papio* spp.)

Powerful, enormous canine teeth especially in old males. Highly sociable, varied language for communication. Food: fruit, grain, insects and other small animals.

CHACMA BABOON, KAAPSE BOBBEJAAN (*Papio ursinus*)

General characters: Powerfully built, size of a large dog, 4' long including 18" tail, nearly 2' at shoulder. Muzzle dog-like, with close-set eyes under heavy brows, ears large and naked, long canine teeth. Coat of coarse brownish-grey hair, face purple, upper eyelids white. Ischial callosities flesh-coloured.

Habits: Social, move about in troops of up to 80 in a circuit from one feeding ground to another, resting at night in trees. No fixed home and territory traversed in peregrinations which may occupy 3 to 6 sq. miles. When on move subordinate males are in van and rear, females and young and dominant males in centre. On meeting a predator troop halts and a group of subordinate males go out to confront it. Lion is only animal from which troop will flee, into trees. Injured and sick members of troop fall behind and may be killed. Intelligent, cunning, powerful, a pest to cultivated land. Typically move with tail erect but outer third drooping. Limbs of equal length, walk on all fours, palms and soles on ground.



Habitat: Rocky gorges and steep hillsides, rarely take to trees.

Food: Insects and other small invertebrates, including scorpions, fruit, grain, other vegetables. Damage to crops made worse by filling capacious cheek-pouches to carry off more than can be eaten on spot. Said to set sentries when feeding.

Breeding: Gestation 173-193 days (other baboons range 154-220 days). Sexually mature 4 yrs.

Present status: Numerous (to pest-proportions).

Range: South Africa (Nyasaland to Cape).

Longevity: Up to 10 yrs. (One report gives up to 45 yrs.)

Special comments: Baboons, including Mandrill and Gelada, are largest African Cercopithecidae.

Other baboons include:

Anubis Baboon (*P. anubis*): tropical Africa; resembles Chacma.

Yellow Baboon (*P. cynocephalus*): Central Africa.

Hamadryas, Arabian or Sacred Baboon (*P. hamadryas*): both sides of Red Sea; has ash-grey mantle, flesh-coloured face and scarlet ischial callosities. (Longevity, 24 yrs. Temp. 100.6°F. (38.1°C.))

Mandrill (*Mandrillus sphinx*): West Africa, especially G. of Guinea; tail stumpy, old males have swollen muzzle coloured red and blue, ischial callosities crimson and blue. Females and young males smaller, lack vivid colouring.

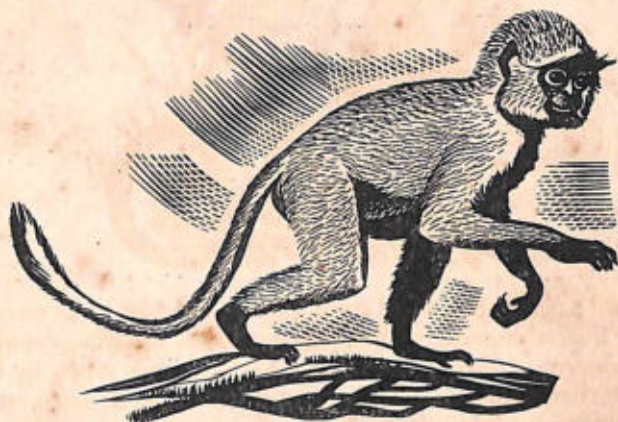
Gelada (*Theropithecus gelada*): Abyssinian highlands 8,000' or more; lives in large troops, has flying mane, muzzle short, nostrils just short of tip.

Langurs or Leaf-monkeys

Large, up to 40 lb. wt., soft-haired, without cheek-pouches, hands

and fingers long, thumb small. Arboreal, almost entirely vegetarian, complex stomach. Some species in Java and Borneo all-black, others all-red, or red and black. Leopards are chief enemy.

HANUMAN OR ENTELLUS MONKEY (*Presbytis entellus*)



General characters: Slender-bodied, long-limbed, 30" head and body length, tail up to 38". Hair greyish-brown, ears, hands and feet black, face black with overhanging brow of long stiff black hair.

Habits: Social, in large troops, but old males may sometimes be solitary. Voice a loud whoop, heard especially dawn and dusk, and a harsh guttural of alarm or anger.

Habitat: Wooded country, but under protection (it is held sacred by Hindus) invades villages.

Food: Leaves mainly, grain, fruit.

Breeding: Gestation (?) 200 days. 1 young at birth, carried by mother at first.

Present status: Very numerous.

Range: Ceylon, through Peninsular India to Sikkim and southern Tibet.

Longevity: 10-15 yrs.

(Himalayan Langur, a race of Hanuman, lives at 5,000-12,000', Kashmir to Bhutan, often seen on snow-covered branches.)

Other Langurs are:

Dooc Langur (*Pygathrix nemaea*) of Indo-China: grizzled silver-grey, pure white arms, rump and tail, black thighs and hands, chestnut-red lower hind-legs.

Snub-nosed Monkey (*Rhinopithecus roxellanae*) of high-altitude

forests, Tibet, W. China: large, heavy, thick coat, rich olive flecked with golden-yellow; diet bamboo shoots.

Proboscis Monkey (*Nasalis larvatus*) of Borneo: smooth-coated, tawny, 7" trunk-like proboscis on old males; lives especially near rivers, dives and swims well.

GUEREZAS (*Colobus* spp.)

Arboreal, in tall forests, speedy and sure in trees although lacking a thumb. Individuals follow each other, leaping spreadeagled to same point on next tree. Diet of fruit, leaves.

Two distinct groups: one black or black-and-white, other red.

Black Colobus (*C. satanas*): Cameroons; all-black.

Ursine Colobus (*C. polykomos*): Sierra Leone, Liberia; black face framed in long white hair extending to shoulders, tail white. (White-thighed guereza, a Gold Coast variety of this species, has white band on thighs.)

White-shouldered Guereza (*C. angolensis*): Angola, Congo, Nyasaland, Tanganyika; similar to *C. polykomos* but with white tufts on shoulders. (One race, on Ruwenzori, known only from skins collected by native hunters.)

Abyssinian Guereza (*C. abyssinicus*): E. Africa to Nigeria; long white flank fringe.

Red Guerezas or Colobus Monkeys (*C. badius*): West to East Africa; coloured in various combinations of rich rufous, bay, chestnut, maroon, blackish or grey.

Family PONGIDAE

Differ from all other Anthropoidea in absence of tail, greater brain capacity, longer arms, and (apart from langurs) in absence of cheek-pouches.

GIBBON OR HOOLOCK (*Hylobates hoolock*)

General characters: Tailless, 3' high, head and body 2', up to 15 lb. wt. Male black, female pale brown. Slender build, head small, muzzle short, ears small.

Habits: Social, move about tree-tops in noisy family parties or larger troops, swinging by long arms, take flying leaps as much as 40' from branch to branch. On ground, walk erect, arms held over head. Call loudly, probably to keep family in touch, but regular chorine dawn and dusk.

Habitat: Jungle forest.



Food: Mainly fruit.

Breeding: Gestation 210 days. 1 young, carried in female's arms, also clinging to her. Sexually mature 6 yrs.

Present status: Numerous.

Range: Yunnan, Assam, Burma.

Longevity: Up to 23 yrs.

Special comments: Three species of gibbon and one siamang, all essentially alike. These are:

Lar Gibbon (*Hylobates lar*): Sumatra, Malay States, S.W. Siam, Tenasserim, Cambodia.

Black Gibbon (*Hylobates concolor*): Hainan, Indo-China, Siam.

Siamang (*Symphalangus syndactylus*): Sumatra, Malay States, Tenasserim. This is largest of gibbons, with dilatable voice-box, giving increased power to voice.

ORANG-UTAN (*Pongo pygmaeus*)

General characters: Tailless, heavily built, 4½' high, 200 lb. wt. Slow, deliberate in movement, arms powerful, legs very weak. Movement over ground on arms with knuckles applied to ground, body swung between as on crutches. Hair long, coarse, reddish, especially on shoulders, back and arms. Head pear-shaped, high forehead, ears small

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Habitat: Jungle forest.



Food: Mainly fruit.

Breeding: Gestation 210 days. 1 young, carried in female's arms, also clinging to her. Sexually mature 6 yrs.

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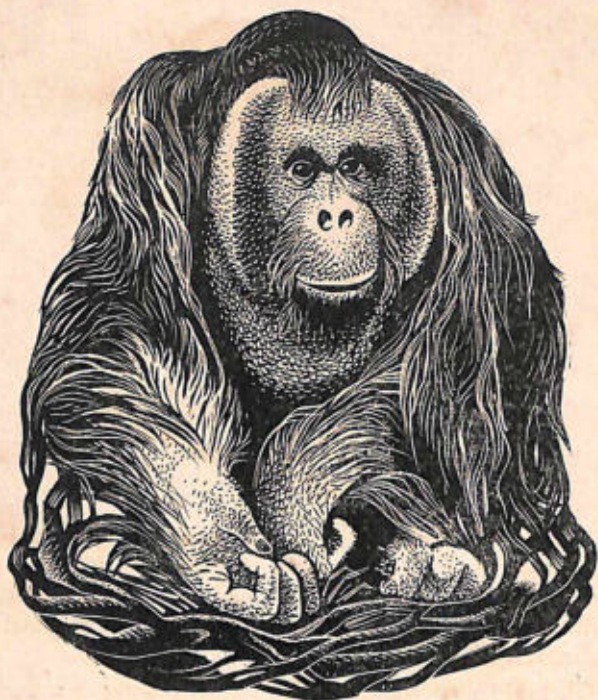
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and naked, large nostrils, mobile lips, face of old male flanked by crescentic wart-like swellings, goitre-like swelling on throat.

Habits: Keep mainly to trees, sleep on platforms of inter-laced branches lined with leaves. Old males solitary, otherwise family parties, females accompanied by young up to 2 yrs. age. Inoffensive except when cornered or wounded.

Habitat: Jungle forest.

Food: Fruit, especially durian (spiny husk first removed), occasionally marine shellfish.

Breeding: Gestation 210-270 days.

Present status: Unknown.

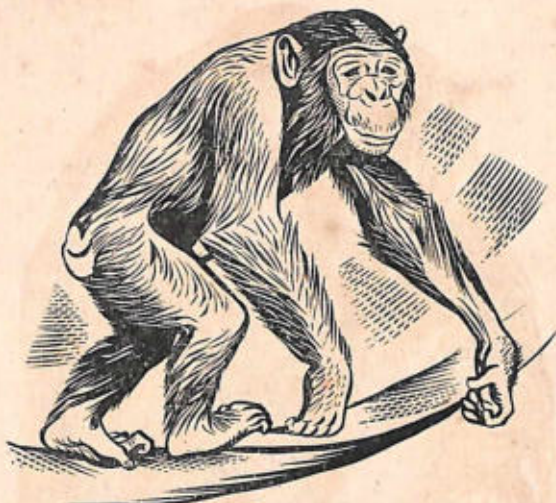
Range: Sumatra, Borneo.

Longevity: Up to 26 yrs.

Other statistics: Temp. 98.6°F. (37.0°C.)

CHIMPANZEE (*Pan satyrus*)

General characters: Tailless ape, up to 5' high, 150 lb. wt. Face mainly hairless, ears large, flesh-coloured (face of young also flesh-coloured). Hair of body short, black; hands and feet flesh-coloured.



Habits: Roam forests by day in family parties. Sleep at night in trees. Inoffensive unless molested. Normal locomotion on all fours, with knuckles placed on ground. Normal vocal sounds a hooting bark but 32 different sounds have been recognised, perhaps constituting a primitive language.

Habitat: Tropical forest.

Food: Fruit and succulent vegetables.

Breeding: Gestation 210–278 days. Breeding all times of year. 1 young at birth, 2 lb. wt. at 9 days. Females sexually mature $5\frac{1}{2}$ yrs., males 8–9 yrs.

Present status: Numbers not known.

Range: Tropical Africa (Sierra Leone through Congo to Uganda and mountain forests flanking east shore of Lake Tanganyika).

Longevity: Up to 37 yrs.

Special comments: One species with several local races. One race, a dwarf chimpanzee, to south of Congo River, regarded by some zoologists as distinct species, *Pan paniscus*.

Other statistics: Temp. 99°F. (37.2°C.)

GORILLA (*Gorilla gorilla*)

General characters: Tailless ape, body thick-set, legs weak, arms powerful. Head of old male has marked crest and heavy brow ridges, eyes small, nostrils large, ears small and set close to head, usually hairless. Old males 6' height, 450 lb. weight, arms spanning 9' (finger-tips to finger-tips), females smaller. Face black, hair black except for some pale grey across loins, chest naked in old males.



Habits: Roam forests by day in family parties, 1 male, several females and young. Sleep in trees at night, on platforms made of branches, except old male who sleeps at foot of tree. Inoffensive unless molested, when old male covers retreat of family. Able to move through undergrowth in complete silence. Eyesight keen, able to detect small movements at a distance. Normal locomotion is on all fours, with knuckles placed on ground.

Habitat: Tropical forest.

Food: Fruit and succulent vegetables.

Breeding: Gestation 9 months. 1 young at birth. Sexual maturity at 7 yrs.

Present status: Numbers not known. Continued survival precarious.

Range: Two races: coast gorilla of Cameroons and West coast of Africa; mountain gorilla of eastern Congo.

Longevity: Up to 28 yrs.

Special comments: Only enemy is man, but leopards may occasionally take young. Normally no menace to man, but may raid crops on occasion. Stories of laying villages waste and carrying off women lack foundation.

Order EDENTATA

FORMERLY included Sloths, Anteaters, Pangolins and the Aardvark; now Pangolins form order Pholidota and Aardvark is placed in order Tubulidentata.

Family MYRMECOPHAGIDAE (Anteaters)

Adapted for feeding on termites and other soft-bodied insects. Mouth tubular, opening at tip of long slender muzzle. Third toe of front foot armed with a large claw, for digging out insects. Tongue long, sticky. Salivary glands large. Teeth absent.

GREAT ANTEATER (*Myrmecophaga jubata*)



General characters: Head and body together measure 4', tail about same length. Muzzle unusually long and tapering. Eyes small, ears short. Hair short on head and front part of body becomes progressively longer towards tail, which bears a curtain-like fringe that can be brought forward to cover whole body. General colour steel-grey, with conspicuous black stripe running diagonally from chest, over shoulders, to root of tail. (An example of disruptive coloration.) Forelegs white with brown patches. Underparts and hind-legs brown. Claws black.

Habits: Terrestrial; non-burrowing although front feet are so adapted for digging they cannot be used normally, anteater being compelled to walk on sides of feet with large claws turned inwards. Inoffensive but large claws can be used in defence.

Habitat: Tropical forest and plains.

Food: Termites and ants; nests ripped open with powerful claws, insects taken with long extensile tongue.

Breeding: 1 young a year, stays with mother, sometimes riding on her back, for 1 yr.

Present status: No information.

Range: Central and S. America (Guatemala to Paraguay).

Longevity: Unknown.

Other anteaters are:

Tamandua (*Tamandua tetradactyla*) of Central America and Trinidad



southwards to northern Argentina: about 4' long, arboreal, tawny buff, often with black patches and markings. Hair relatively short. Tapering muzzle, long prehensile tail. Feeds on ants in trees, but claws for tearing open nests less developed than in great anteater. Single young at birth, carried clinging to mother's tail until able to fend for itself. [Temp. 92-8°F. (33-8°C.)]

Little or Two-toed Anteater (*Cyclops didactylus*), Mexico to Bolivia: arboreal, rat-sized, 15" total length, glossy fur golden or buff. Hind-feet with opposable four toes of equal length and a thumb-like opposable pad, highly efficient in grasping, tail highly prehensile, front feet with 2 functional toes each with large curved claw. Eyes very small. Feeds on termites. When disturbed holds branch by hind-feet, wraps tail round branch, extends body at right angles to branch, holds hooked front claws at sides of face. All movements sluggish. [Temp. 87-3°F. (30-7°C.)]

Family BRADYPODIDAE

THREE-TOED SLOTH or Ai (*Bradypus tridactylus*)

General characters: Long-armed, all 4 feet carry recurved hook-like claws, 3 on forefeet, 4 on hind-feet; toes themselves enclosed in a common skin (foot therefore resembles hairy pad armed with hooks).



Forelegs longer than hind-legs. Head short and broad, neck and limb-joints very mobile, giving versatility in attitude and posture. Coat of long crisp hair; each hair grooved, greyish or brown in hue but appearing green because grooves lined with microscopic green algae. Short-haired patch of black and orange between shoulders. Arrangement of hair contrary to that normal for mammals; set to shed rain-water from back and shoulders. Body-head length 20", tail a stump only; eyes and ears small.

Habits: Solitary. Very slow in movement. Limbs, with hook-like claws, used as suspensors and for collecting food. Although often hangs suspended by all 4 legs, careful observation shows that sloths spend three-quarters of time climbing or clinging to vertical stems, or asleep in a fork. Moves over ground occasionally, dragging body along with hooks, speed 1 mile in 6½ hrs. Will swim, if compelled, back- or breast-stroke according to way it falls into water; speed 1 mile in 3½ hrs. Voice, a shrill bleating cry, only rarely heard. Enemy, jaguar.

Habitat: Trees, especially Cecropia. (Always rests in tall, inaccessible, small-branched trees.)

Food: Leaves and fruit of Cecropia. Sight, taste and hearing poor: can smell favourite leaves in mixed vegetation.

Breeding: Gestation 120-180 days. Single young, carried clinging to mother. Fed at 1 mth. with semi-digested food regurgitated by mother.

Present status: More numerous than thought formerly.

Range: S. and Central America (from Amazon River northwards to Honduras).

Longevity: 11 yrs.

Special comments: Anatomical peculiarities: 9 cervical vertebrae instead of normal mammalian 7. No teeth in front of jaws.

Other statistics: Temp. 89.6°F. (32.1°C.)

TWO-TOED SLOTH OF UNAU

There are two species (*Choloepus didactylus* and *C. hoffmanni*)

Comparison with 3-toed sloth: 2 hooks on forefeet instead of 3. 1st cheek-teeth enlarged and resemble canines. Limbs of equal length, and is able to walk on all fours with body clear. Lacks a tail. More active, moves at twice speed of 3-toed. In captivity will eat variety of foods (fruit, vegetables, bread-and-milk) where 3-toed takes only leaves, stems and buds of Cecropia. Algae in hairs of different species.

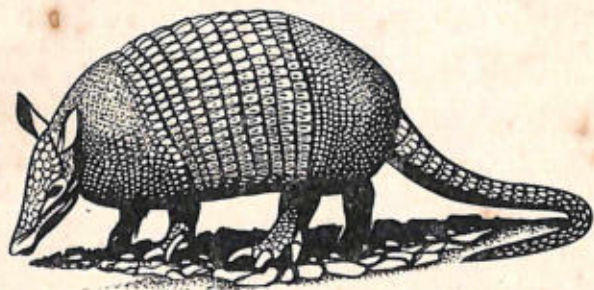
C. didactylus, confined to Brazil, has 7 cervical vertebrae. [Longevity 11 yrs.]

C. hoffmanni, from Ecuador to Costa Rica, has 6 cervical vertebrae. [Temp. 90·4°F. (34·5°C.)]

Family DASYPODIDAE

Body covered by hard bony plates

NINE-BANDED ARMADILLO OR PEBA (*Dasypus novemcinctus*)
(also called Texas Armadillo)



General characters: Round-bodied, short-legged, little sign of neck. long tapering tail. Total length up to 3' including 1' of tail. Armour includes shields on fore- and hind-quarters and 9 hinged bands between. Snout tapering, eyes small, ears donkey-like.

Habits: Mainly nocturnal, day spent in burrow, 2-12' below ground. Not able to curl up for protection. Sight weak, sense of smell acute. Swims well, said to be able to submerge for 6 minutes. In swimming, intestine blown up with air to give added buoyancy.

Habitat: Mainly semi-desert or arid grassland.

Food: Insects.

Breeding: July-September: ova fertilised but no cell-division for 120-126 days, young born 120-150 days later. Number in litter normally 4, all same sex and all from one ovum which divides repeat-

edly, but number may vary 1-10. Female has 4 teats, 2 pectoral, 2 inguinal, nurses for 2 mths. Young like parents but shell not hardened until nearly a year old, when sexually mature. Eyes open at birth; able to run in a few hours.

Present status: Increasing range northwards.

Range: Argentina to southern U.S.A. (Texas, Louisiana, Florida, Oklahoma).

Longevity: No information.

Special comments: Burrows a menace to horsemen. This, with its edible flesh, leads to persecution. Dogs, coyotes, peccaries also kill, and many killed on roads by motorised vehicles.

Other statistics: Temp. 90.4°F. (32.5°C.)

Other Armadillos are:

Giant Armadillo or Tatuasu (*Priodontes gigas*) of Brazilian forests: 3' long, tail 20" long. 12-13 bands along back, twice normal number of teeth, third toe bears unusually large claw. Feeds mainly on termites.

Eleven-banded or Broad-banded Armadillo, or Tatouay (*Cabassous unicinctus*) of Surinam, Brazil, Uruguay: near relative of giant armadillo.

Six-banded Armadillo (*Euphractus sexcinctus*) of Paraguay and Brazil: 18" long, short tail, small ears, broad head. [Temp. 91.8°F. (33.2°C.)]

Hairy Armadillo or Peludo (*Euphractus villosus*) of Argentina: similar to six-banded, but armour almost obscured by long hair. [Temp. 92.1°F. (33.4°C.)]

Three-banded Armadillo or Apara (*Tolypeutes tricinctus*) of Argentina and Brazil: 3 movable bands; only armadillo to roll into a ball. Does not burrow; runs quickly on tips of claws.

Fairy Armadillo or Pichiciago (*Chlamyphorus truncatus*) of W. Argentina: 6" long, mole-like, small tail. Armour of about 20 pink horny plates transversely arranged and attached only to the spine. Hind-end abruptly truncated and armoured. Silky white fur covers body even under horny plates. Eyes and ears small, hidden in fur. Lives underground.

Order PHOLIDOTA

Toothless; upper surface of body and tail covered with horny overlapping scales; large digging claws on forefeet. Terrestrial or arboreal. Roll into a ball for defence.

CAPE PANGOLIN, SCALY ANTEATER, TEMMINCK'S PANGOLIN,
IETERMAGOG (*Manis temmincki*)



General characters: Up to 4' long, including tail, up to 40 lb. wt. Tail relatively short.

Habits: Terrestrial, nocturnal, day spent in hole in ground. Rolls into tight ball for defence. May shuffle along with forefeet raised from ground using tail as counterpoise.

Habitat: Open country.

Food: Ants.

Breeding: No information.

Present status: Not common.

Range: S. Africa northwards to Uganda, Sudan, Kenya.

Special comments: Flesh favoured by Africans, who extract pangolin from burrow by ropes (boys sent into burrows to secure these).

GIANT PANGOLIN (*Manis gigantea*)

Similar to *M. temmincki*, but up to 5' long.

Other African Pangolins are:

Black-bellied Pangolin (*Manis longicaudatus*) and Small-scaled Tree Pangolin (*M. tricuspis*), of tropical Africa (W. coast to Uganda):

both over 3' long, including long tail. Arboreal, feeding on tree-ants. 1 young at birth, carried clinging to female's tail (as in Tamandua). Can press tail against trunk of tree, hold by hind-feet and lean body at right angles to tree.

Asiatic Pangolins are:

Indian Pangolin (*M. crassicaudata*): 26" long, tail 18", up to 21 lb. wt. Mainly terrestrial, can climb trees if compelled.

Chinese Pangolin (*M. pentadactyla*) of Nepal to China, Hainan and Formosa: 18-20" long, tail 10-13". Arboreal, naked pad of skin under tip of tail assists climbing; feeds on tree-ants. Scales valued by Chinese for medicine.

Malayan Pangolin (*M. javanica*) of India and Malaysia: similar in size and habits to Chinese Pangolin.

Order LAGOMORPHA

SMALL to medium-sized mammals, terrestrial and herbivorous, with two pairs of incisors in upper jaw (one pair vestigial and functionless, and lying behind functional pair), a single pair in lower jaw, and a wide gap, the diastema, between incisors and rootless cheek-teeth, of which there are six on each side of each jaw. Without canines. Palate incomplete and sides of skull incompletely ossified, leaving a characteristic network of bony strands.

[Incisors grow continually at root and are continually worn away at cutting edge. If one incisor is lost or broken, or gets out of line so that its tip does not work against tip of opposite tooth, growth of one or more of opposing incisors is unimpeded. Not uncommon for one or more unimpeded incisors to grow into a long curve, eventually locking both jaws, when owner dies of starvation.]

Remarks: Rabbits and hares, with pikas, were formerly classified with rats and mice as rodents, but in a distinct suborder, the Duplicidentata, because of doubling of incisors in upper jaw. Now they are placed in a distinct order, the Lagomorpha.

The most important difference is that incisors of rodents have enamel on front only, and in Lagomorphs it is found on backs of teeth as well. As a result rabbits and hares have inferior gnawing abilities to rats and mice.

Family OCHOTONIDAE

PIKAS, MOUSE-HARES, CALLING HARES (*Ochotona*)



General characters: Resemble small, short-eared tailless rabbits, but all four legs same length. Largest not more than 7" long. Soles of feet hairy, enabling pikas to run with ease over smooth rock surface.

Colour of coat varies with habitat: dark slate to dark brown in more humid upper valleys of Himalayas, pale sandy or ash colour in drier regions of central Asia.

Habits: Although winters severe at high altitudes where they live, do not hibernate. Feed by day, retire to holes among rocks at night. Call is ventriloquial (a bleating sound, hence name "Calling Hares"), animal difficult to locate. Chief enemies hawks and weasels.

Habitat: Mountain ranges, among rock and scree.

Food: Grasses and other vegetation. Store quantities of sun-dried grasses and plants under overhanging ledges of rock for winter use.

Breeding: Gestation 147 days, 3-5 in a litter, May to September.

Present status: Numerous locally.

Range: (See *Special comments.*)

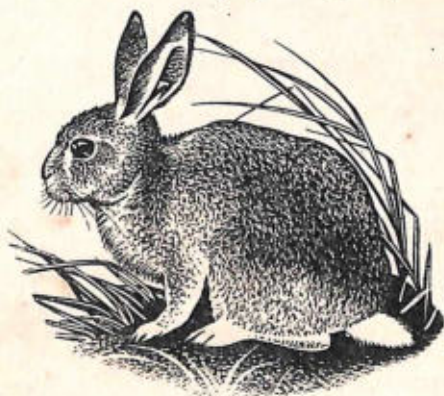
Longevity: Unknown.

Special comments: Curiously discontinuous distribution on mountains: 12 species Central Asia, 1 (*Ochotona pusilla*) extending into Russia (region of southern Urals) several species N. America (with several races). Only one genus, *Ochotona*. Best-known species in N. America is Rocky Mountain Pika (*O. princeps*) living 5,000-13,000', coming down in places (e.g. British Columbia and Oregon (U.S.A.)) to 900'. Of 12 Asiatic species, Mount Everest Pika (*O. wollastoni*) lives up to 17,500', highest altitude of any mammal.

Other statistics: Temp. 102.3°F. (39.0°C.)

Family LEPORIDAE

BROWN HARE (*Lepus europaeus*)



General characters: Jack-hare slightly smaller in body than doe, with shorter head and more red over shoulders. Length of head and body, in

doe, about 2', the tail just over $3\frac{1}{2}$ ", and average weight about 8 lb. Fur tawny with neck, shoulders and flanks slightly more reddish. Sides of face and outer surfaces of legs yellowish. Underparts white except at breast and loins. Tail black above, white below and on sides. Other characteristics are long hind-legs, black tips to ears, profusion of long whiskers and soft fur. [When running the stilt-like action of a hare distinguishes it from a rabbit when other features cannot be made out immediately.]

Habits: Mainly solitary except in breeding season, but occasionally a dozen or more may be seen together, sometimes moving in single file coming out in evening to feed. Does not burrow but lies in a form, a hollow in coarse grass or other herbage, which retains shape of animal that has rested in it.

Food: Wholly vegetarian, grass and low herbaceous plants.

Breeding: Mating, said to be promiscuous, takes place especially in spring. Leverets may be born at almost any time of year. Litters number 2-4, born with eyes open, a short coat of fur and able to use limbs. Soon make own forms where the mother visits to suckle them, and are independent at 1 month old.

Spring is marked by pre-mating antics of jack-hares which during March appear to go mad, when they box each other standing on hind-legs, buck, bound and kick, occasionally with fatal results.

Present status: Common, especially on arable land.

Range: From British Isles across Europe to eastern Asia, divided into many local forms.

Longevity: 12 yrs.

Special comments: Brown Hare in Britain is separate subspecies (*L. europaeus occidentalis*) of European Brown Hare, distinguished by darker and browner colour.

Varying Hare (*Lepus timidus scoticus*), also known as Blue Hare, Scottish Hare or Alpine Hare, changes to white in winter, except for the tips of the ears which remain black; has bluish tinge in spring and autumn, at change of coat, when hairs of summer coat are mingled with white hairs of winter. Found in Scotland, except where introduced into northern England and Wales, on high ground among rocks and stones. Slightly smaller in body than Brown Hare, but head is larger, legs longer and ears and tail shorter. [Temp. 101.7°F. (38.7°C.)]

Irish hare (*Lepus timidus hibernicus*) is smaller than Brown Hare, more graceful, has a longer and broader head, shorter ears and longer legs. Turns white in winter, but not with regularity of Varying Hare, and winter coat often white with russet patches.

Both Scottish and Irish hares are subspecies of Alpine Hare (*L. timidus*) of European Alps and Scandinavia.

CALIFORNIA JACK RABBIT (*Lepus californicus*)

General characters: 2' long, tail 4", hind-foot $5\frac{1}{2}$ " long, 7 lb. wt. Coat greyish-brown, white patches on forehead, around eyes, on backs of ears. Tail and ear-tips black.

Habits: Much as for European hare.

Habitat: Grassy plains.

Food: Grass and herbage generally.

Breeding: Polygamous, gestation 41-47 days, 1-6 in litter, born with eyes open, short ears, body fully furred, able to run soon after birth.

Present status: Numerous.

Range: Western U.S.A. (Nebraska to Texas, California, Washington).

Longevity: No information.

Numerous species of N. American Jack Rabbits include:

White-shouldered Jack Rabbits (ex. *L. alleni*): White shoulder and rump, no black on backs of ear-tips.

White-tailed Jack Rabbits (ex. *L. townsendi*): tail usually white.

Black-tailed Jack Rabbits (ex. *L. californicus*).

Arctic Hares (*L. arcticus*, *L. othus*, *L. groenlandicus*): found north of tree-line in Canada, Alaska, Greenland, change colour winter to summer, as in Varying Hares. Much larger than jack rabbits (*L. othus* 30" long, 11 lb. wt.), shorter ears, powerful claws and forwardly-projecting teeth enable them to dig through hard snow for food.

Local species and subspecies, similar to European Brown Hare and N. American Jack Rabbit are found across northern Asia and southwards to China and India, also in Africa from Egypt to Cape, always on grassland or where only scattered trees or scrub.

SNOWSHOE RABBIT (*Lepus americanus*)

(Also called Varying Hare, in N. America.)

General characters: Head and body 16" long, tail 2", hind-foot $5\frac{1}{2}$ " long, $2\frac{1}{2}$ - $4\frac{1}{2}$ lb. wt. Summer coat reddish-brown intermixed with black on back, light-brown legs, white underparts. Winter coat white with black ear-tips. Name from hairy mats on soles of feet, giving easy movement over soft snow. (Change of coat due to length of day and falling temperature: change to white can be prevented by exposure to artificial light for 18 hours a day, or white coat will change to brown even at low temperatures in winter if long exposure to light is given.)

Habits: Non-burrowing, essentially like European Hare and N. American Jack Rabbit.

Habitat: Well-timbered country.

Food: Bark and twigs mainly.

Breeding: March–August; males fight with teeth, both sexes promiscuous. Gestation 30–38 days, litter 3–4 (normal), may be 1–10. Young 3 oz. at birth, eyes open at birth, hearing at 4 hrs., erect ears 5 days, nibble vegetation 11 days, weaned 35 days.

Present status: Numerous. (Populations subject to cyclic rises and falls, in periods of 10 yrs. Numbers of martens, lynxes and foxes preying on Snowshoe Rabbit rise and fall with them.)

Range: Canada, U.S.A.

Longevity: No information.

Other statistics: Temp. 102.3°F. (39.0°C.)

African hares include races of European brown hare (in Egypt southwards to Cape) and indigenous species, distinguished by details of skull structure except Bushman's Hare with tail wholly brown and Red Hare with bushy tail. Differ little in habits except to prefer grass and scrubland to cultivated areas. Species:

Lepus capensis (Cape Hare, Kaapse Vlakhaas, Rooipootjie): whole of Africa, and also Asia (Palestine and Arabia to China and Mongolia).

Lepus atlanticus (Lesser Moroccan Hare): Morocco.

Lepus salai (Sala's Hare): S.W. Angola.

Lepus whytei (Whyte's Hare): Nyasaland, Tanganyika, N. Rhodesia, N. Portuguese E. Africa.

Lepus monticularis (Bushman's Hare, Vleihaas): Central Cape Province, S. Africa.

Lepus arabeus: (See below.)

Asiatic hares, other than *L. europaeus*, *L. timidus* and *L. capensis* (qq.v.) include:

Lepus peguensis (Burmese Hare): Annam, Burma, Indo-China.

Lepus arabeus (Arabian Hare): Palestine, Arabia, Baluchistan (also Libya).

Lepus nigricollis (Indian Hare, Black-naped Hare): Peninsular India, Ceylon. (Has taken to scavenging on outskirts of village: now avoided as article of food.)

Lepus oiostolus (Woolly Hare): Kashmir, Nepal, S. China.

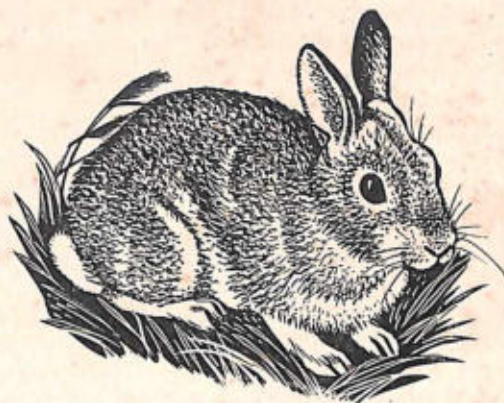
Lepus sinensis (E. Chinese Hare): S.E. China, Korea, Formosa.

Lepus brachyurus (Japanese Hare): E. Siberia to Korea, Japan.

Lepus yarkandensis (Yarkand Hare): Chinese Turkestan.

EUROPEAN RABBIT (*Oryctolagus cuniculus*)

General characters: Bucks and does not markedly different in size, but head of buck blunt. Head and body 18", weight up to 5 lb. (average 3½ lb.). Fur composed of dense woolly underfur, longer guard-hairs and second set of long hairs. Colour, on upper parts, a mixture of dusky and buff, grizzled, white underparts. Tail short, white below.



Habits: Gregarious mainly, sometimes solitary, living in burrows which may form extensive underground system. Mainly active at night.

Habitat: Grasslands or open woodlands.

Food: Grass and herbaceous plants, bark in winter. (Habit of refecation: two forms of droppings, one eaten again, other discarded at latrines.)

Breeding: Polygamous (but not promiscuous as formerly thought), one buck mating with several does, each doe keeping to own territory. Mating, peak January to June. Gestation 30-40 days. Litters 2-8, young blind, deaf, almost naked. Nest in stab or stop; burrow 2' long just under surface, away from main burrow, lined with mother's fur at blind end. Ears open 9 days, eyes 10 days. Weaned at less than 1 mth.

Present status: Reduced numbers due to epidemic myxomatosis.

Range: Native of south-west Europe, spread over central and western Europe, including British Isles, North Africa. Introduced Azores, Madeira, Australia, New Zealand.

Longevity: 13 yrs. (average 5-6).

Other statistics: Temp. 101.8°F. (38.8°C.); pulse, 123-304.

COTTONTAIL, MOLLY or BRIAR RABBIT (*Sylvilagus floridanus*)

General characters: Head and body 13", tail 2", 2½-3 lb. wt. Fur dark-brown above, tail brown above, white cottony underneath.

Habits: Owing to short hind-limbs relies on dodging into cover instead of on speed to escape enemies.

Food: Grass and herbage. (A pest to crops.)

Breeding: Promiscuous; gestation 30 days, 4-7 in litter, blind, helpless, 4" long, 3 oz. wt., born in a depression in ground lined with doe's fur. Eyes open at 10 days, leave nest at 14 days.

Present status: Numerous.

Range: U.S.A., Mexico, south to Costa Rica.

Longevity: Up to 8 yrs.

Special comments: Five distinct forms: Mountain, Eastern, Desert, Brush and New England Cottontails. Related species in S. America. In recent years an infectious disease, tularemia (rabbit fever) traced to cottontails, can be contracted by man.

Other statistics: Temp. 103°F. (39.4°C.)

Marsh Hare (or Marsh Rabbit) (*Sylvilagus palustris*) of marshy places, North Carolina to Florida: 18" long, ears 2" long, feet more slender and less hairy than in cottontails. When walking or running moves legs alternately, but will also hop.

Swamp Rabbit (also called Marsh Hare) (*Sylvilagus aquaticus*) of Mississippi Valley (Illinois southwards): 22" long, ears 2½" long, differs from *S. palustris* in having tail pure white below. Habitat wet marshes: swims with ease.

Other rabbits and hares worthy of brief mention:

Red Rock Hares (*Pronolagus*) of South Africa have a rich red fur and tail like a pompon. Species are: Natal Red Hare (*P. crassicaudatus*), Rand Red Hare (*P. randensis*), Smith's Red Hare (*P. rupestris*).

Hispid Hare (*Caprolagus hispidus*) of Nepal (at foot of Himalayas): short, stiff, brush-like hair.

Riu-Kiu Rabbit (*Pentalagus furnessi*) of Riu-Kiu Islands, Japan: dark sepia woolly coat, small tail, very small ears.

Sumatran Hare (*Nesolagus netscheri*) of Sumatra: jungle-dwelling, fur blotched brown, black, chestnut, pale grey.

Idaho Pygmy Rabbit (*Brachylagus idahoensis*) of the U.S.A. (Idaho, Nevada, Oregon): no more than 1' long, short ears (1¾") and tail (½"); lies up in sagebrush on plains.

Nelson Hare or Mexican Pygmy Rabbit (*Romerolagus nelsoni*) found only on slopes of 2 volcanoes, Popocatepetl and Iztaccihuatl, in Mexico, 10,000-12,000' up: little larger than Idaho Pygmy, small ears, no tail; makes tunnels and runs in long grass.

[Cottontails and Marsh Rabbits (or Hares) are equivalent in America of European rabbit.]

Order **RODENTIA** (Rodents, or gnawing animals)

SINGLE pair of chisel-like incisors, in both upper and lower jaws, grow continuously at roots and are kept in check by continual use wearing them away. (As in rabbits and hares, it is not uncommon to find, where one tooth is broken or lost, or gets out of line, that opposite tooth grows out in long curve eventually locking jaws so that animal dies of starvation.) Enamel on front of teeth only, wearing down of softer body of tooth results in a sharp cutting edge in front, producing a powerful cutting tool. (A rat can gnaw through lead pipe, plaster, tin cans or hardest woods. A grey squirrel, in captivity, has been known to gnaw habitually at an aluminium water-pot, day by day, until it had consumed the greater part of it, apparently swallowing metal fragments.)

Canines absent and in gap, or diastema, between incisors and cheek-teeth is a special fold of hairy lips that can be drawn into mouth on either side cutting off incisors from the rest of the mouth. When gnawing lead piping, tin or hard wood, chips need not be taken into mouth.

Remarks: Shape of jaws and structure of the skull, as well as muscles actuating jaws, all combine to give strength to cutting movements. Teeth used largely in excavating burrows, the feet and claws not always being suitable. Rats frequently gnaw bones, carrying them away to their burrows, and these, later excavated, have sometimes been mistaken by archaeologists for work of prehistoric man owing to patterns made by tooth-marks.

Outstanding feature of all rodents is their teeth, particularly the incisors. Cheek-teeth differ in a sufficiently marked degree that it is possible to recognise species by them.

More species in Rodentia than in any other order of mammals: about 350 genera and 6,400 species and subspecies.

Suborder **Bathyergomorpha**

Family **BATHYERGIDAE** (African Mole Rats)

Includes 6 genera (*Georychus*, *Cryptomys*, *Bathyergus*, etc.), mole-like in shape and habits, widely distributed in Africa (outside equatorial forests) wherever loose sand. Size of body and claws and colour of fur

vary considerably. *Bathyergus* is up to 10" long, with immense foreclaws, lives among coastal dunes of S. Africa, where known as Sand Mole. In all species eyes minute, tails very short, enlarged digging claws on forefeet and powerful projecting incisors used in excavating long tunnels. Food: roots and bulbs found among loose sand. Fur slaty to drab or fawn, often with a white spot or patch on crown. Store large quantities of bulbs and roots in tunnels; very destructive in gardens.

Naked Mole Rat (*Heterocephalus glaber*), of N. Kenya and Somaliland, 4" long excluding the 1' tail, entirely naked except for a few scattered hairs, least known and most extraordinary member of Bathyergidae, lives in sandy soil of one of the hottest regions in Africa.

Suborder Hystricomorpha

Includes porcupines, and large S. American rodents (agutis, coypu, paca, etc.), but some members are rat-sized. Mainly terrestrial, a few climb, some smaller forms burrowing.

Family ECHIMYIDAE

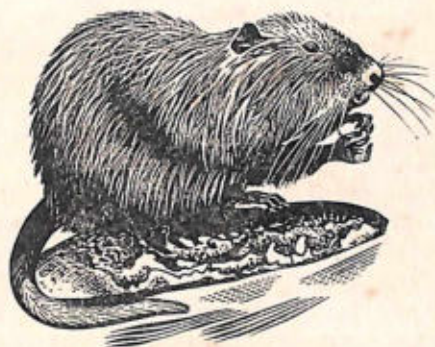
Contains mainly S. American, and a few African, rodents of aberrant form related to porcupines mainly in characters of skull. Some are rat-like with bushy tails, others have cylindrical bodies, small eyes and ears, large digging claws, a very small tail and powerful projecting incisors, closely resembling in habits and appearance gophers of N. America and the mole-rats of Old World.

Tuco-tucos (*Ctenomys*), name derived from their call-note, small rodents, particularly numerous in Argentine and Chile, making extensive burrows in open country.

Hutias (*Geocapromys*), restricted to W. Indies, with one species in Venezuela, primitive rodents, terrestrial, fairly large. Continued survival in restricted island habitats threatened by man, dog, cat and mongoose. [One species in Jamaica, another in Bahamas, a third Little Swan Island 400 miles W. of Jamaica and 150 miles from nearest point on mainland.] Hutia-Conga (*Capromys pilorides*), of forests and dense thickets of Cuba, nocturnal, arboreal, 18" long exclusive of the hairy, prehensile tail, scarce due to hunting for food. Related dwarf species (*C. nana*), first described from fossil skulls, subsequently found to be still surviving. *Plagiodontia*, of Santo Domingo, related to the Hutias, also surviving relic of past, is heavily built, short-tailed, terrestrial, nocturnal, fur dark brown. [First species, *P. aedium*, described 1836 by Cuvier. Second species, *P. hylaeum*, discovered 1926, also San Domingo. 1948 a fresh specimen of *P. aedium*, and further specimens of

P. hylaeum.] Slow-moving, inoffensive, feeds on fruit and vegetables, able to climb well. Slow rate of reproduction, one young at a birth, and being largely eaten, judging from the quantities of remains found in caves and native kitchen middens, has brought near-extirmination. Cane Rat (*Thryonomys swinderianus*), known as Grass-cutter in W. Africa, thick body, 20" exclusive of 7" tail. Coat brown, harsh bristly hair. Inhabits thick vegetation in many parts of Africa, always near water, can swim and dive well. Often causes great damage to crops particularly sugar-cane. Rock Rat (*Petromus typicus*), of S.W. Africa, rat-like in size and colour, bushy tail. Flattened skull and flexible ribs enable it to squeeze through narrow crevices in rocks.

COYPU (*Myocastor coypus*)



General characters: Stout-bodied, 3½' long including 16" of scaly rat-like tail, weight up to 20 lb. Coat reddish-brown with long coarse guard-hairs and dense yellowish underfur. Muzzle squarish in front. Eyes and ears small. Hind-feet webbed.

Habits: Aquatic, burrows freely into banks. Beaver-like habits.

Breeding: At all times of year. Gestation 100-132 days. Litters of 3-12 young, well-furred, eyes open, able to swim few hours after birth. Teats high up on sides of abdomen and young suckled as they swim. May be 3 litters a yr. Females sexually mature 6 mths.

Present status: Common in native haunts: spreading in countries where introduced.

Range: Native range temperate S. America (south of Peru, both sides of Andes).

Longevity: Females 3 yrs., males 6 yrs.

Special comments: Coypu, whose fur is marketed under name of nutria, have been imported into Europe (1929) and U.S.A. (1930). In

both areas farm-escapes have become acclimatised and have spread. Also deliberately introduced into U.S.A. Southern states of U.S.A., particularly Louisiana, provide extensive swamps and ideal conditions, and there up to 50,000 skins have been marketed in a year. Main centre in Britain is Norfolk Broads. Coypu exhibited at fairs as giant sewer rat.

Other statistics: Temp. 100.4°F. (38.0°C.)

Family *DASYPROCTIDAE*

AGUTI or AGOUTI (*Dasyprocta*) numerous species



General characters: Stout-bodied, up to 20" head and body with long slender legs, and very little tail. 5 toes on front feet, 3 toes on hind-feet with hoof-like claws. Head rat-like, with tapering muzzle, prominent ears and moderately large eyes. Colour variable, tawny to blackish-brown, according to species, with lighter underparts, but most have bright orange or golden rump. Hair coarse, longer on hindquarters than elsewhere.

Habits: Nocturnal, sleeping by day in holes in trees or in the ground, but may come out evening or early morning. (A hunter's trick is to toss stones into air; these falling to ground sound like falling fruit to agutis, which come out to feed.) Graceful, active, trot slowly or run in series of rapid jumps giving appearance of a gallop. Takes to water if pursued: swims well but cannot dive.

Habitat: Thick cover, forests or wooded areas.

Food: Vegetable matter, leaves, roots of ferns and, especially, fruit.

Breeding: In May and again in October. Gestation 64 days. Female gives birth in a squatting position. Litters of 5-6 young, which can eat vegetable food an hour after birth. Remain with parents some weeks. Female keeps male from young until several days old.

Present status: Common (or Golden) Aguti abundant in forests of Guiana, Brazil and northern Peru.

Range (of genus): Mexico, Central America, S. America as far south as Peru, with *D. cristata* extending into W. Indian region.

Longevity: 10 yrs.

Special comments: Killed for flesh. Can be pest to crops in settled areas, especially of sugar-cane and bananas.

Other statistics: Temp. 102°F. (38.8°C.)

Family ERETHIZONTIDAE

New World porcupines. Mainly arboreal, hind-feet adapted for climbing, some species have prehensile tail.

CANADIAN PORCUPINE (*Erethizon dorsatum*)



General characters: 3½' total length of which 6" tail, wt. up to 40 lb. (average 15 lb.). Long brownish-black fur, sprinkled with long white hairs concealing short barbed spines, yellowish-white tipped with black. Tail short, stout, spiny. Hind-foot with well-developed big toe.

Habits: Arboreal, slow moving, no hibernation.

Habitat: Woods.

Food: Feeds mainly dusk and dawn or moonlit nights, on bark, buds and leaves of deciduous trees. [Also searches out salt: will gnaw handle of axe or pick (where tainted with human sweat), or glass bottles (presumably for alkali in glass).]

Breeding: Mating November, gestation 113-217 days, young well developed at birth, wt. 20 oz., 10" long, eyes open. Climb trees at 2 days, weaned 10 days.

Present status: No information.

Range: N. America (Alaska to Central California and New Mexico, eastwards to Virginia).

Longevity: 20 yrs.

Other statistics: Temp. 99.6°F. (37.4°C.); pulse, 280-320.

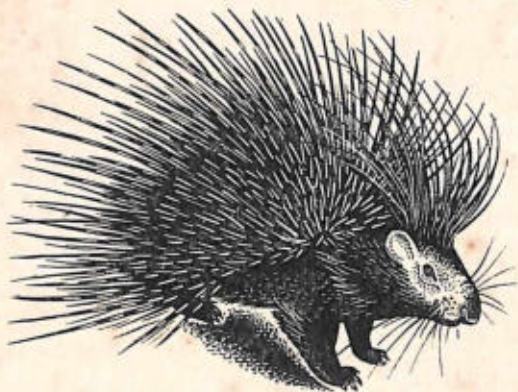
S. AMERICAN PORCUPINES

Echinoprocta rufescens of Colombia is very like Canadian Porcupine.

Coendou prehensilis is typical of S. American Porcupines: arboreal, long prehensile tail, stiff bristles at root to assist in gripping smooth tree-trunks, hind-foot with broad fleshy pad, opposable to four toes, used in gripping. Little known of habits. [Temp. 98.4°F. (36.8°C.)]

Family HYSTRICIDAE

Old World porcupines, largest genus *Hystrix*. Tail never prehensile.

COMMON OR CRESTED PORCUPINE (*Hystrix cristata*)

General characters: Up to 28" long exclusive of tail, 60 lb. wt., brownish-black with white band under neck and halfway up sides. Head and neck with crest of long bristles, brown below, white above. Body-quills of two kinds: long and slender, short and stout, banded black and white. Quills on rump black, on tail white.

Habits: Mainly nocturnal, solitary or in pairs, spend day in holes in ground or among rocks. Defence by erecting quills and rushing backwards. Quills loose, easily detached, become embedded in enemy.

Habitat: Rocky hills with vegetation cover.

Food: Roots, fruit (near cultivated ground become a pest to crops).

Breeding: Gestation 63-112 days, 2-3 young born spring or early summer, eyes open and soft flexible quills which harden within 10 days. Nest of leaves, grass, roots.

Present status: No information.

Range: Italy, Sicily, N. Africa (Morocco to S. Egypt, Sudan), Senegal, tropical E. Africa.

Longevity: 8-12 (max. 20) yrs.

Special comments: Most powerful incisors, habitually gnaws bones, elephant ivory, even glass bottles.

Asiatic Species of *Hystrix*

H. brachyura (Malayan Porcupine): Malay Peninsula, Borneo, Sumatra.

H. hodgsoni (Crestless Himalayan or Chinese Porcupine): Eastern Himalayas. Lacks crest.

H. indica (Indian Crested Porcupine): Ceylon and Peninsular India, S.W. Asia. Up to 3½' long, 25-40 lb. weight, hairy muzzle, crest of long white bristles on neck and shoulders, profuse armature of black-and-white quills on back.

African Species of *Hystrix*

H. africae australis (S. African or Cape Porcupine or Ystervark): S. Africa northwards to Tanganyika. Dorsal covering of long black-and-white quills. Gestation 42-56 days. Lies up in warrens by day; travels long distances at night to feed; pest to melon, pumpkin and maize crops.

Related Species (genus *Atherurus*)

A. macrourus (Malayan Brush-tailed Porcupine): Sumatra to Assam. Indo-China, China (Szechwan). Long effective spines, spiny tail with terminal cluster of bristles.

A. africanus (African Brush-tailed Porcupine): Forest zone of Africa. Size of rabbit. Quills mixed with flattened, spiny bristles on back.

Family CUNICULIDAE

Paca (*Cuniculus paca*): Mexico to Brazil, heavily built, tailless, 28" long, short legs, rows of white spots on harsh brown fur. Heavy head due to large cheek-bones forming outer walls to capacious cheek-pouches.

Mountain *Paca* (*C. taczanowskii*): forests of Andes, in cold humid climate, fur thick and soft.

Family DINOMYIDAE

Pacarana (*Dinomys branickii*): mountain forests of Andes, similar to *Paca*, heavily built, blackish with white spots, well-developed tail.

Family CHINCHILLIDAE
CHINCHILLA (*Chinchilla laniger*)



General characters: Squirrel-like, head and body 10" long, with bushy tail of same length, large eyes, delicate ears. Fur silvery-grey, soft, silky, with more fibres to sq. in. than any other known animal.

Habits: Little known. In captivity chinchillas regularly take baths of dry sand, which seem essential to keep fur clean and in good condition.

Habitat: Semi-desert, rocky mountainsides.

Food: Vegetable (but little information).

Breeding: Said to mate for life. Gestation 105-114 days. Litters of 1-4, up to 3 litters a year. Young run within 1 hr., eyes open at birth. Suckled 45 days. Leave parents 10 weeks. Sexual maturity 5-8 mths.

Present status: Trapped in large numbers beginning of century, brought to verge of extinction in wild. Protective laws to save remnant.

Range: Peruvian Andes.

Longevity: Said to be 10 yrs.

Special comments: Many local races of Mountain Chinchillas or Mountain Viscachas (*Lagidium*) found from Peru and Bolivia southwards to the Argentine, along Andes and foothills. Larger than true chinchilla, poor fur, greyish or fawn, often black stripe down back, ridge or crest of stiff hairs on tail. Colonies in rocky places, feed on grass and herbage. Up to 17,000'. Diurnal, watchful for enemies, warning whistle of danger. Bushy tail carried with end third curled upwards.

Viscacha or Plains Viscacha (*Lagostomus maximus*) in warrens on pampas of Argentina. Larger than Mountain Viscacha, up to 20" long, hairy tail. Fur coarse, dark grey above, whitish underparts. Head broad, flat, prominent whiskers. Front feet bear large digging claws. Sharp claws on 3 toes of hind-foot. [Gestation 90 days.]

Spiny Rats (*Proechimys*): large number of genera and species in tropical S. America, rat-like, terrestrial, burrowing or climbing, back more or less spiny. (Temp. 100.3°F. (37.9°C.))

Family CAVIIDAE

GUINEA PIG (*Cavia porcellus*)

General characters: 11" long, tailless, 1 lb. wt., 4 toes on front feet, 3 toes on hind-feet. Best known from domesticated forms derived from Brazilian Cavy (*Cavia aperea*), one of a score of wild species, dull fawn, greyish-buff or drab with short smooth hair.

Habits: Wild cavies burrow in sandy districts otherwise live among grass especially in marshy districts.

Habitat: See under *Habits*.

Food: Soft vegetation.

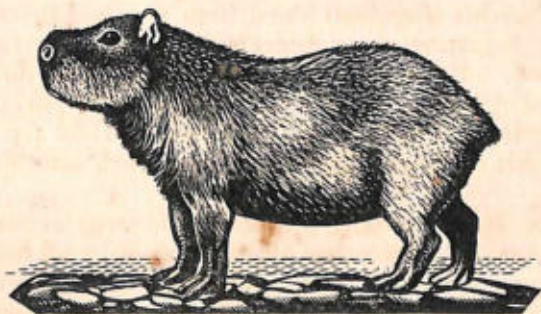
Breeding: Prolific, gestation 63-71 days, 4-12 in a litter (wild cavies 1-2), eyes open and fully furred at birth, run within a few hours, weaned 21 days

Longevity: 6 yrs.

Special comments: Although domesticated Guinea Pigs (i.e. Guiana Pigs) have been taken all over the world, little is known of the habits of the wild cavies from which they were derived. When Europeans first went to S. America, Guinea Pigs, derived from Brazilian cavy, were already domesticated by Incas of Peru, and 3 colour phases—reddish-brown, white and piebald—were already dominant.

Patagonian Cavy (*Dolichotis patagona*), also called Patagonian Hare because large and hare-like with long hind-legs, bearing 3 toes, ending in hoof-like claws, 18" long, 2" tail, lives on pampas.

Other statistics: Temp. 101.3°F. (38.5°C.); pulse, 260-400.

CAPYBARA (WATER PIG OR WATER CAVY) (*Hydrochoerus hydrochoeris*)

General characters: Largest living rodent, heavily-built capybara is pig-sized, 4' long, up to 21" at shoulder, tailless or only negligible tail, and wt. up to 120 lb. Hind-legs slightly longer than front legs, toes 4

on front feet, 3 on hind-feet, all webbed and bearing short nails. Fur thin, long and harsh, dark brown above, yellowish-brown on underparts. Head broad, muzzle heavy, squarish. Eyes and ears small.

Habits: Diurnal, living mainly in troops or family groups. Can run rapidly on land and readily take to water when alarmed, principally by jaguars, sometimes swimming long distances under water.

Habitat: By river, lakes or marshes.

Breeding: Litters of 2-8 young, well-developed at birth and weighing 2-3 lb. Gestation period 119-126 days. Young soon independent but remain with parents a long time.

Food: Vegetable matter.

Present status: Numerous.

Range: Panama to Paraguay, east of Andes.

Longevity: 10 yrs.

Special comments: Flesh palatable; hunted on land and by canoe. Inoffensive, tameable, but do not thrive under domestication. Conspicuous feature is a large gland, of unknown function, on top of head just in front of eyes.

Suborder Sciuromorpha

Squirrels and squirrel-like animals, including marmots (i.e. large terrestrial squirrels with small tail), beavers, gophers, etc. In most, skull has post-orbital process and, usually, 4 cheek teeth in each half of upper and lower jaw. Distributed throughout world except Madagascar, Australasia and polar regions.

Family SCIURIDAE (Typical Squirrels)

Mainly of small size (9-10" long, tail equal length), but some mouse-sized, others cat-sized. Diurnal. Food: nuts, seeds, also insects, eggs, young birds. Nest in trees or holes in trees. Few hibernate completely.

RED SQUIRREL (*Sciurus vulgaris*)

General characters: Total length nearly 16" including 7" or more of feathered tail (usually described as bushy), wt. $\frac{2}{3}$ lb. (maximum 1 $\frac{1}{2}$ lb.). Ears large, pointed, tufted. Hind-limbs, with 5 toes, longer than fore-legs, with 4 toes and vestigial thumb bearing a flattened claw. Claws needle-sharp. Upper parts and tail brownish-red, underparts white. Winter coat softer and thicker than summer coat, with grey on flanks,



and ear-tufts longer. In west-central and south-west Europe a dark winter phase may occur.

Habits: Diurnal, arboreal, can swim if compelled. No hibernation. Uses four kinds of drey: principal or nursery nest, refuge nest, emergency nests and larder nests. Tail used to express mood.

Habitat: Woodlands, especially coniferous.

Food: Beech-mast, seeds of pine, nuts, wild fruits, young shoots, bark, fungi, some insects (especially larvae of pine tortrix moth). Also takes eggs and small birds. Nuts, etc., buried one at a time, well spaced out, seldom in a hoard.

Breeding: Nursery nest huge ball of sticks and leaves in fork, but may be in hollow tree. Mating April. Gestation 28-42 days. Litters of 3-4 blind, naked young born May. Sometimes 2nd litter in summer in southern parts of range.

Present status: Abundant except in parts of British Isles (where replaced by introduced grey squirrel).

Range: Europe (south of tree line to Mediterranean), Asia (to Korea, Japan).

Longevity: Average 5-6, maximum 12 yrs.

Special comments: Numerous subspecies. In British Isles *S. vulgaris leucourus* (white-tailed squirrel) notable for bleaching of tail in summer.

Other statistics: Pulse, 320-372.

CHICKAREE OR NORTH AMERICAN RED SQUIRREL
(*Tamiasciurus*, typical species *hudsonicus*)



General characters: Total length up to 14", including 6" tail, tawny fringe, bushy. Ears tufted seasonally. Winter coat olive-grey, rust-red band down back, white underparts; summer coat has black stripe along flanks.

Habits: Similar to European red or Carolina grey.

Habitat: Pine woods.

Food: Seeds of pine and spruce cones, toadstools, birds' eggs and young.

Breeding: Mating March—early April. Gestation 40 days. Bulky nest on branches, or nest in hollow tree. 2-6 young, $\frac{1}{4}$ oz. wt., naked, blind. Fur begins to show in few days, eyes open 27 days, weaning at 35 days.

Present status: Numerous.

Range: Canada, U.S.A. except Southern States.

Longevity: 10 yrs.

Special comments: 27 subspecies (belonging to 1 or several species according to author). Name "chickaree," derived from call, reserved by some for those squirrels west of Rockies distinguished by reddish-brown instead of white underparts. Fremont's Pine Squirrel, of S. Wyoming and southern Rockies, has white underparts and white fringe to tail.

Other statistics: Temp. 103.2°F. (39.6°C.)

GREY SQUIRREL (*Sciurus carolinensis*)

General characters: Total length $1\frac{1}{2}$ ' of which nearly half is feathered tail. Ears medium-sized, not tufted. Hind-limbs, with 5 toes, longer



than forelegs, with 4 toes and rudimentary thumb. Claws needle-sharp. Fur speckled grey above, with white underparts, hairs of grey parts being black, buff or grey with white tips. Summer coat shows splashes of chestnut over ribs and on paws.

Habits: Diurnal, arboreal. Nests in large dreys, of branches and leaves, in forks of branches, or makes nest in hollow tree. More aggressive than red squirrel.

Habitat: Mixed woodland, open parkland.

Food: Beech mast, nuts, berries, fungi, eggs, small birds, some carrion.

Breeding: Mating December to August (end of January to August in British Isles). Gestation 30-44 days. Litters of 1-6 (average 4) young, born naked and blind. Eyes open 37 days. Leave nest at 6 weeks. Two peaks of breeding: April and June-July.

Present status: Abundant, reaching pest proportions at times.

Range: In U.S.A., Maine to Dakota and south to Texas and Gulf States: Britain (introduced) Midlands and southern England, southern Scotland.

Longevity: 15 yrs.

Special comments: Introduced into Britain in 19th century as a pet. Made no spectacular progress until end of last century, when explosive eruption occurred, mainly with Woburn Park, Beds, as centre. Replaced, but did not displace, red squirrel, which was already reduced in numbers, in parts of England, by disease.

FOX SQUIRREL (*Sciurus niger*)

General characters: Head and body 2', tail 1' long, up to 3 lb. wt. Coat orange to brown, grizzled. 4 cheek-teeth either side.

Habits: Diurnal, arboreal, nests in hollow trees or in nests, made in branches, of leaves and twigs. Enemies: hawks, owls, foxes, raccoons.

Habitat: Open groves of oak, hickory, beech, also long-leaf pines and cypress swamps.

Food: Nuts, seeds, berries, bark, sap, buds, insects, birds' eggs and young.

Breeding: Said to mate for life. Gestation 45 days, 1st litter mid-February, possibly 2 litters a year, 2-4 young, blind, naked, helpless, $\frac{3}{8}$ oz. at birth. Coat starts to grow at 2 weeks, weaned at 5-8 weeks, leave nest 6-10 weeks, leave parents $2\frac{1}{2}$ -3 mths.

Present status: Scarce.

Range: U.S.A. (Scattered localities in eastern half).

Longevity: 7 yrs.

TUFTED-EARED OR TASSEL-EARED SQUIRREL (*Sciurus aberti*)

General characters: Total length 20", about half of this is tail, 2 lb. wt. Coat lead-grey, reddish-brown on back, black on flanks, white underparts, but colour varies much and three distinct forms are recognized: Abert, Kaibab, Durango. Kaibab, north of Grand Canyon, ear-tufts brownish-black, underparts black, tail white; Abert, ear-tufts black, underparts white, tail white or black, grey or combination of these. Durango, underparts and tail grey. Ear-tufts lost in 2nd half of year.

Habits: Similar to Red Squirrels.

Habitat: Pine forests.

Food: Seeds of yellow and other pine, nuts, roots, bark, birds' eggs and young.

Breeding: Bulky nest of twigs, grass, leaves, lined with shredded bark, high up in trees. Gestation not known: 1st litter June (possibly 2nd litter September), 3-4 young.

Present status: Protected in part of range (Grand Canyon National Park), hunted elsewhere.

Range: Restricted to strip along Rockies from southern U.S.A. to northern Mexico.

Longevity: No information.

Special comment: One of most colourful N. American squirrels; favourite of tourists to Grand Canyon.

Other tree squirrels are:

S. American squirrels, similar in type to those of N. America but more brightly coloured.

Greatest variety of squirrels, with most brilliant coloration, is found in southern and south-east Asia, including Indonesia.

Prevost's Squirrel (*Sciurus prevosti*) of Malaya, Borneo: probably most colourful, back and tail glossy black, belly and legs bright chestnut red, with white band on sides from nose to base of tail. (Other species in this area all black, all white or all red.)

Dwarf squirrels (*Namosciurus*) of Malaya and Borneo; about mouse-size.

(Other dwarf squirrels in W. Africa and S. America.)

Giant Malabar Squirrel (*Ratufa bicolor*), of India, Burma and Malaya: 3' or more long, of which about half is tail. It is only one of a number of races of giant squirrels found all over India, Burma and Malaya.

AMERICAN FLYING SQUIRREL (*Glaucomys volans*)



General characters: Total length about 1', tail 4", broad, flattened, feather-like. Coat brownish above, white to cream below. Eyes large, ears smallish.

Habits: Nocturnal, day spent in hollow trees or in buildings. Can be tamed. Often caught in traps set for fur-bearers. No hibernation.

Habitat: Woodlands.

Food: Nuts, fruits, leaves, insects, small animals of various kinds.

Breeding: Mating February to early March. Gestation 40 days, 2-6 in litter, eyes open 26-28 days, weaned at 5 weeks, light-sensitive at 15 weeks, adult coat at 12 weeks, but may remain with mother till following spring.

Present status: No information.

Range: Alaska, Canada, U.S.A.

Longevity: 10 yrs.

Special comments: Some authors recognise 2 species: Greater or Northern (*G. sabrinus*) and Lesser or Southern Flying Squirrel (*G. volans*), latter found mainly in southern half of U.S.A., and extending south from S. California to Honduras.

Other statistics: Temp. 98.7°F. (37.0°C.)

EUROPEAN FLYING SQUIRREL (*Pteromys volans*)

Similar in size and appearance to N. American species, but little known of its habits. Range: N. Sweden across to Siberia to N. China and Japan.

Other Flying Squirrels are:

Pygmy Flying Squirrel (*Petaurillus emiliae*) of Borneo: 5½" total length, dark slate or sepia, feather-like tail, stiff fur fringing narrow gliding membrane.

Kashmir Giant Flying Squirrel (*Eupetaurus cinereus*): nearly 3' total length, fur greyish-fawn, thick, soft, woolly, tail bushy.

Numerous other Asiatic species mainly cat-sized, richly coloured, especially rufous to creamy-white, commonest being Common Giant Flying Squirrel (*Petaurista petaurista*) of India to Indonesia, northwards to China, Formosa.

ROCK GROUND SQUIRREL OR ROCK SQUIRREL (*Citellus variegatus*)

General characters: 21" total length, including 10½" of bushy tail. Coat blackish over head and forequarters becoming brown over hinder body and tail, underparts buffish to grey.

Habits: Gregarious, diurnal, occasionally in trees, non-hibernating.

Habitat: Rocky slopes and canyons.

Food: Vegetable matter, insects.

Breeding: Gestation 30 days (?). Maybe 2 litters a year, May-June, August-September, of 5-7.

Present status: Not uncommon.

Range: U.S.A. (western states).

Longevity: 10 yrs.

FRANKLIN'S GROUND SQUIRREL (*Citellus franklinii*)

General characters: 16" total length, including 5½" of bushy tail. Coat uniformly dusky above, nearly as dark below, with faint suggestion of stripes and spots (the Thirteen-striped Ground Squirrel is its nearest relative). Tail black with white markings.

Habits: Much time spent underground and individuals seldom range more than 100 yd. from burrow, but mass migrations may occur. Cyclic rises and falls of populations noted. Hibernation September (?) to April.

Habitat: Open grasslands, waste ground (even in towns), especially at edges of woodlands.

Food: Mainly vegetable but also insects, toads, frogs, mice, rabbits, birds.

Breeding: Mating in April, gestation 30 days, 1 litter a year, 4-8 young, blind, naked, $3\frac{3}{4}$ " long, weaned at 6 weeks.

Present status: Common.

Range: U.S.A. (area to W. of Great Lakes) and northwards into Canada.

Longevity: No information.

Other statistics: Temp. 97-9°F. (36.6°C.); pulse 96-378.

GOLDEN-MANTLED GROUND SQUIRREL (*Citellus lateralis*)

General characters: 1' total length, including $4\frac{1}{2}$ " tail, 10 oz. wt. Coat rusty chestnut, head and neck golden, with stripes of white bordered with black from neck to root of tail along flank.

Habits: Burrowing, diurnal, hibernating in northern parts of range. Wide vocabulary of chirps and grunts.

Habitat: Open woods, especially among brush, fallen timber and rock rubble.

Food: Similar to other spp. of *Citellus*.

Breeding: Similar to *C. franklinii*.

Present status: Common.

Range: W. North America, 6,000-13,000' above sea-level.

Longevity: No information.

THIRTEEN-STRIPED GROUND SQUIRREL OR SPERMOPHILE

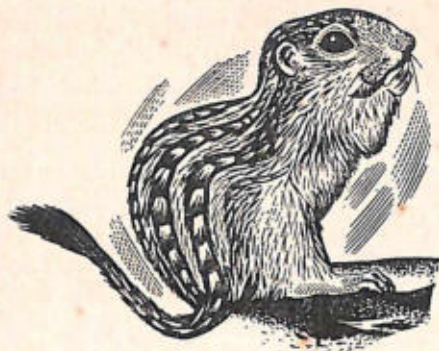
(*Citellus tridecemlineatus*)

(Also named Federation Squirrel; and, erroneously, Striped Gopher.)

General characters: 1' total length, including 5" slightly bushy tail. Coat marked with 13-15 alternating stripes, buff or white stripes and dark brown stripes with lines of spots ("stars"). Ears small.

Habits: Solitary, burrowing, diurnal, hibernating (body wt. may fall to $\frac{1}{3}$ during hibernation). Habit of sitting erect, nose pointed upwards.

Habitat: Prairies.



Food: Insects, especially grasshoppers, mice, frogs, small birds' eggs, some vegetable matter.

Breeding: Mating April, gestation 28 days, 5-13 young in underground nest, blind, naked, toothless, $2\frac{1}{4}$ " long. Eyes open at 26-28 days. Leave nest soon after.

Present status: Probably spreading.

Range: U.S.A. (Middle West).

Longevity: No information.

Other statistics: Temp. 98.6°F. (36.9°C.)

EASTERN CHIPMUNK OR HACKER (*Tamias striatus*)



General characters: 11" total length, bushy tail 4", wt. 5 oz. Coat greyish, fawn underparts, back marked with 5 heavy black stripes, alternating with grey or brown, running from shoulders to root of tail. White stripes above and below eyes. Cheek-pouches.

Habits: Gregarious, burrowing, shaft of burrow slopes to 3' depth, excavated earth scattered, not heaped at entrance, which is often plugged with earth to exclude predators.

Habitat: Among bushes and tall grass, especially where ground rocky or with fallen logs.

Food: Seeds, grain, nuts, berries. Stores made in burrows (but some individuals may hibernate).

Breeding: Mating February-March, gestation 35 days, may be second litter in autumn, 3-5 young, naked, blind, $\frac{1}{8}$ oz. at birth, $\frac{1}{2}$ oz. at 8 days, $\frac{3}{8}$ oz. at 2 weeks, sexually mature 2 $\frac{1}{2}$ -3 mths.

Present status: Common.

Range: Eastern U.S.A.

Longevity: 7 yrs.

Other statistics: Temp. 101°F. (38.5°C.); pulse, 660-702.

WESTERN OR LEAST CHIPMUNK (*Eutamias minimus*)

Related to Eastern Chipmunk, more slender, relatively longer tail, 5 blackish and 4 white stripes of nearly equal width. N. America (Alaska to Mexico, west of Great Plains).

BLACK-TAILED PRAIRIE DOG (*Cynomys ludovicianus*)



General characters: Heavy build, short legs, short tail, 12" head and body, 3" tail, 3 lb. wt. Fur grizzled cinnamon, black tip to tail.

Habits: Burrowing, diurnal, gregarious. Form "towns", one of which estimated in 1901 to contain 400 million, covered area of 100 × 240 miles. Said to post sentries which sit bolt upright and utter piercing calls when alarmed. Now suggested no system of sentries but alarm

call of any one individual conveys information to which rest respond.

Habitat: Prairies.

Food: Grass and other herbage. (32 prairie dogs eat as much as 1 sheep, 256 as much as 1 cow.)

Breeding: Breeding March–April, gestation 27–33 days, 1 litter a year of 2–10, blind, naked ($\frac{1}{2}$ oz., 2 $\frac{3}{4}$ " long at birth), eyes open 33–37 days, weaned 50 days, mature at 2 yrs.

Present status: Much reduced numbers.

Range: U.S.A. (western plains), Mexico.

Longevity: 8 years.

Special comments: Burrows, often 16' long, entrance a bowl-like crater, a menace to horsemen. Competitive grazing with domestic stock also led to persecution as human settlement encroached on prairies. White-tailed Prairie Dog smaller and has white tip to tail, lives especially on high ground, up to 6,000'.

HOARY MARMOT (*Marmota caligata*)



General characters: Large, stout-bodied, squirrel-like, up to 31" long of which 10" is tail. Weight up to 14 lb. Coat coarse, black and white, giving grizzled appearance. Feet black. Face black, white on cheeks and forehead. Underparts white.

Habits: Live in colonies. Remain within reach of piles of rock for ready escape from enemies. Alarm note a loud whistle.

Habitat: Mountainous country.

Food: Wholly vegetable: grasses and small herbaceous plants.

Breeding: Mating in spring. Gestation 35–42 days. Litters of 2–5 young, which may remain with mother during first winter.

Present status: No information.

Range: N. America (confined to Rockies, from New Mexico and California north to Alaska).

Longevity: Up to 13 yrs.

Other statistics: Temp. 97.7°F. (36.4°C.)

WOODCHUCK OR GROUNDHOG (*Marmota monax*)



General characters: Thick-set, 24-27" head and body, 6" tail, wt. in March 5 lb. 10 oz., in September 10 lb. Coat grizzled reddish-brown.

Habits: Solitary, diurnal, burrowing with several exits to burrow. Hibernating (temp. then 40-57°F. against 94.8-104°F. normal, respiration 14 against 262 normal).

Habitat: Especially under wood-piles or in stone walls near grassland.

Food: Grass and herbage (esp. cultivated crops, including clover), also insects, rodents, small birds.

Breeding: Mating March-April (immediately after hibernation), gestation 28-32 days, 2-8 in litter, blind, naked, 4½" long, 1-1½ oz. wt., eyes open 1 mth, weaned at 35 days.

Present status: Common.

Range: Most of Canada, eastern U.S.A.

Longevity: 9 yrs.

Special comments: February 2 is Groundhog Day, from belief that if on that day Woodchuck emerges from burrow and sees its shadow it returns to hibernation for further 6 weeks. Peculiar feature of Woodchuck is way it nearly doubles weight by hibernation time.

Other statistics: Temp. 98.4°F. (36.8°C.); respiration rate (in c.c. of oxygen per kgm. of body-wt. per hr.) awake, 262, hibernating, 14.

Family APLODONTIIDAE

MOUNTAIN BEAVER OR SEWELLEL (*Aplodontia rufa*)

General characters: Stout-bodied, with blunt muzzle, small eyes,

short ears and only 1" of tail, 18" total length, 3 lb. wt. Coat cinnamon to brown sprinkled with black, white spot at base of ear.

Habits: Burrowing near water, in moist localities subject to partial flooding. Swims well but not from choice. Nocturnal, secretive, presence often unsuspected. Dries vegetation and stores this in special sealed chambers in burrows.

Habitat: (See *Habits*).

Food: Grass and herbage. (Pest to plantations, soft fruits, garden crops.)

Breeding: February–March, gestation 42–48 days, 2–6 in a litter, born blind but well furred.

Present status: No information.

Range: Rocky Mountains (in Washington, California, Oregon).

Longevity: No information.

Special comments: Not related to true beaver. Pelt useless commercially.

Family CASTORIDAE

CANADIAN BEAVER (*Castor canadensis*)



General characters: Stout-bodied, 42" total length, including 12" tail, 36–60 lb. wt., muzzle blunt, ears small, tail broad, flat, scaly, 5 toes on each foot, front toes clawed for digging, hind-toes strongly webbed. Coat dark brown.

Habits: Live in "colonies", each "colony" a family unit of up to 12 (parents mate for life). Burrowing in a bank, with underwater entrance; or building dams and a lodge. Main dam, of branches, mud and stones, causes overflow of river banks, forming a beaver-pond. In centre of pond, often by a clump of young trees, a lodge is built of sticks and

mud, with underwater entrances, a central chamber above water-level, and a ventilating chimney from chamber to top of lodge. Secondary dams built upstream of lodge, and, usually, one secondary dam downstream of main dam. Young trees felled, dismembered and transported to sites of dams and lodge. If necessary, canals dug to float logs to pond.

Habitat: Rivers in wooded country.

Food: Bark, of aspen and willow especially, from smaller twigs and branches dismembered for dam-building, some of which are stored around base of lodge for winter use.

Breeding: Mating January–February. Gestation 60–128 days, 1 litter a year of 1–8 (average 4), young start solid food at 30 days, weaned 40 days, stay with parents 1 yr., mature 2–3 yrs. old.

Present status: Gone from much of former range, increasing in numbers in places where given protection after reaching dangerously low level.

Range: Canada and some northern parts of U.S.A.

Longevity: 19 yrs.

Other statistics: Pulse, 140.

EUROPEAN BEAVER (*Castor fiber*)

So similar to Canadian species that doubtful if the two are more than races of one species. European Beaver, once widespread over Europe and northern half of Asia, now one of rarest mammals (Norway, France, Germany, Eastern Europe, Siberia). Habits as in *C. canadensis*, but where numbers sparse tend to live in banks instead of building dams and lodges.

Family GEOMYIDAE

POCKET GOPHER (*Geomys bursarius*)



General characters: Mole-like, body cylindrical, legs short, forefeet with large claws, 10" head and body, tail $4\frac{1}{2}$ ", almost naked, highly sensitive with which to feel way backwards. Eyes and ears very small.

Pelage soft, allowing rapid movement backwards or forwards in tunnels. Colour brown to nearly black. External fur-lined cheek-pouches enable animal to carry away quantities of food.

Habits: Active, energetic, burrowing and honeycombing soil with tunnels just below surface (gopher = French *gause* or honeycomb) and throwing up heaps of soil. Active day and night, no hibernation. Food stored in special chambers. Special latrines, periodically closed and fresh ones dug.

Habitat: Fertile plains.

Food: Bulbs and roots just below surface, but some vegetation taken at surface, gopher keeping hindquarters in burrow ready to dart back at first danger.

Breeding: Gestation 40-50 days, 1-9 in litter, young born naked, blind, without cheek-pouches, $\frac{1}{2}$ oz. wt., 2 litters Feb.-Aug. in S., 1 litter Apr.-May in N.

Present status: No information.

Range: U.S.A. (W. of Mississippi).

Longevity: No information.

Other statistics: Temp. 94.6°F. (34.8°C.)

Family HETEROMYIDAE

SPINY POCKET MOUSE (*Perognathus spinatus*)

General characters: Long hind-legs, weak forelegs, long tail, $3\frac{1}{2}$ " head and body, tail crested, $4\frac{1}{2}$ " long, external fur-lined cheek-pouches. Coat of bristles with spine-like hairs intermingled, especially on hindquarters, colour brown, dusky on top of head and over fore-part of back.

Habits: Nocturnal, solitary, burrowing, each burrow ending in a grass-lined nest.

Habitat: Desert or semi-desert.

Food: Seeds, especially of grasses.

Breeding: Litters 1-8.

Present status: No information.

Range: Arid regions of S.W. U.S.A.

Longevity: 5 yrs.

Special comment: Sometimes called Kangaroo Mouse, not to be confused with Kangaroo Rat.

Other statistics: Temp. for *P. hispidus* 97.7°F. (36.5°C.)

KANGAROO RAT (*Dipodomys deserti*)

General characters: Jerboa-like, with relatively large head, hind-legs long, forelegs small, 15" total length, of which $8\frac{1}{2}$ " is tufted tail. Hind-

feet bear 4 toes, soles hairy. Eyes large, external cheek-pouches fur-lined. Fur long, soft, pale brown, white underparts.

Habits: Nocturnal, solitary, burrowing. Hops about on hind-legs, leaps up to 8' registered. No hibernation. Burrows may go 3' below surface.

Habitat: Deserts.

Food: Grass, herbage, seeds.

Breeding: Gestation 38-42 days, 2-4 young, born April.

Present status: No information.

Range: Deserts of S.W. U.S.A.

Longevity: No information.

Suborder Myomopha

Largest suborder of Rodentia. Diagnostic features: skull without post-orbital process, tibia and fibula fused, rarely more than 3 cheek-teeth in each half of upper and lower jaw.

Family ANOMALURIDAE (Scaly-tailed Flying Squirrels)

Squirrel-like, but skull structure suggests not related to true squirrels. Most species have flaps of skin joining fore- and hind-limbs, also enclosing base of tail, used in gliding (as in true Flying Squirrels and Flying Phalangers). Tail more or less bushy, underside at base of tail scaly (forming "climbing irons"), pressed against tree-trunk to give support in climbing. Total length from 1' to 2½'. Considerable variation in colour. Claws sharp, curved. Rest in hollow trees by day, feed at night, taking gliding leaps of up to 60' from tree to tree. Confined to equatorial forests of W. Africa and a few mountain forests of E. Africa. (Uganda, Kenya, Tanganyika, Nyasaland.)

Pel's Flying Squirrel (*Anomalurus peli*), of Gold Coast, is black above, white below.

Beccroft's Scaly-tail (*Anomalurops beccrofti*), Sierra Leone to Congo (Ituri), is mottled green and grey on back, rich reddish-orange on under surface.

Pygmy Scaly-tail (*Idiurus sp.*), mouse-sized, in tall trees in dense forests of Cameroons, Gold Coast, and Congo (east to Lake Kivu), fur in shades of buff and cinnamon, tail long, feathered, rasp-like under-surface, large eyes, bat-like ears, enormous whiskers. Live in colonies.

Flightless Scaly-tail (*Zenkerella insignis*), of Cameroons; only 6 specimens known. Very like Pygmy Scaly-tail but lacks gliding membrane. Short grey fur, and tuft of black, bristle-like hairs on each hind-foot.

Family *PEDETIDAE* (Cape Jumping Hare)

Single species (*Pedetes capensis*), known also as Spring Hare or Springhaas, ranges from Tanganyika, Kenya, Rhodesia to S. and S.W. Africa. No relationship with any other group of rodents. Kangaroo-like in build and movements, hare-sized, long hind-legs, long tail, large eyes and ears, hoof-like claws on each of 4 hind-toes. Sand-coloured, lives in colonies, burrowing in loose sandy soil. Nocturnal. Does much damage to crops (and because flesh edible, much hunted).

Family *CTENODACTYLIDAE*

Gundis of N. and N.E. Africa, include 4 genera of little-known rodents of which exact position in order Rodentia uncertain, but now included near Dipodidae. Very like guinea-pigs in size and form, they have plump bodies, short legs, stumpy tails, live among rocks in dry country of N. Africa (*Massoutiera*, *Ctenodactylus*), Somaliland (*Pectinator*), Senegal (*Felovia*), claws on toes covered with stiff bristles [? assist in brushing away sand when digging burrows in stony and sandy soil]. In addition 2 inner toes of hind-feet have horny combs and stiff bristles, used for combing the fur.

Family *DIPODIDAE* (Jerboas)

Hind-legs long, front legs typically short and used only for holding food. Tail long, used as a 3rd support, tufted at tip. Usually 3 toes on hind-foot and metatarsals form a single cannon bone. Jerboas move



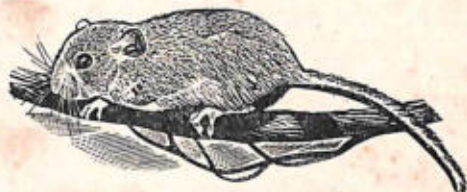
about by leaps. Fur sandy above, white underneath. Eyes large, ears large. Mainly desert dwellers, nocturnal, feeding on seeds, able to go without water. Examples: Egyptian Jerboa (*Jaculus jaculus*); Russian Jerboa (*Allactaga major*); Mongolian Jerboa (*Euchoreutes naso*), ears half as long as head and body.

In addition, family contains small, less-specialised, mouse-like rodents. These include Birch Mice (*Sicista*), of N. and E. Europe and Siberia, mouse-like, linked with jerboas mainly by skull characters; Jumping Mice (*Zapus*), N. America (Arctic to S. U.S.A.), with related species in China, long hind-legs, very long tails with bushy tip, 8" long, tawny with white underparts, dark line down middle of back, active jumpers, living in grass in forests and bush, hibernate after putting on thick layer of fat.

Dwarf Jerboas (*Salpingotus*), mouse-sized, delicate, enormous whiskers, very small ears, thick tufts of stiff hair on hind-feet. *S. kozlovi* has tail $2\frac{1}{2}$ times length of head and body, feathered with long, scattered hairs.

Family MUSCARDINIDAE

DORMOUSE (*Muscardinus avellanarius*)



General characters: Appearance of miniature squirrel but anatomy mouse-like. Total length $5\frac{1}{2}$ ", of which nearly half is tail. Fur light tawny above, underparts yellowish-white, throat white. Head large, muzzle blunt, eyes prominent, ears short, rounded, whiskers long. Fore-limbs shorter than hind-legs, 4 toes and rudimentary thumb on fore-limb, 5 toes on hind-limb but 1st toe short, clawless. All claws short. 6 pads on each foot.

Habits: Almost wholly nocturnal. During daily sleep steep fall in temperature and breathing. Sleeping nest globular, 3" diam., of bark of honeysuckle, twigs, moss, grass, typically high in bushes but may be nearer ground. Hibernation September to April, in nest typically under leaf litter.

Habitat: Woods, copses, hedgerows.

Food: Nuts, especially hazel, haws, some insects, occasionally eggs, nestlings.

Breeding: Gestation 21 days. Young born May onwards, several litters a year, of 3-4 (max. 7) naked, blind young.

Present status: Less common than formerly.

Range: England and Wales. Outside Britain: Europe, Asia Minor.

Longevity: 3 yrs.

Other statistics: Temp. 94°F. (34.5°C.); respiration rate (in c.c. per kgm. body wt. per hr) awake, 852, hibernating, 15; pulse, 580-780.

Other dormice include:

Garden or Oak Dormouse (*Eliomys quercinus*), France to European Russia, south to Mediterranean and N. Africa; 8" long of which half is tail, bushy at tip, fur greyish-white above, white below, conspicuous black patches on face, large ears. (Longevity, up to 5 yrs.)

Fat or Edible Dormouse (*Glis glis*), Central and Southern Europe, squirrel-like, 7" head and body, bushy tail about same length, fur uniformly grey. Fattened by Romans as a table delicacy. A pest in orchards and gardens. Introduced into England, but so far has not spread extensively. [Temp. 96°F. (35.5°C.)]

Cape Dormouse (*Graphiurus ocularis*), 6" head and body, tail slightly less, fur thick, soft, silvery grey, conspicuous black and white patches on back and neck, tail nearly all white. Usual food nuts and seeds, but includes numbers of earwigs.

(Similar species of *Graphiurus* inhabit Africa, south of the Sahara. Some use abandoned birds' nests, others live in thatch of native huts, one group living among rocks has flattened skull, can squeeze into shallow crevices.)

Spiny Dormouse (*Platacanthomys lasiurus*), of S. India, hill regions, rocky or wooded, has harsh fur interspersed with flat, sharp bristles, ears large and naked, tail bushy. Pest to pepper and other crops.

Blind Dormouse (*Typhlomys cinereus*), of S. China and Indo-China, size of House Mouse, soft grey fur, long tail, almost naked, except for brush at tip. Appears to live in rotting logs in total darkness, eyes very small and scent and touch mainly used. Food mainly insects.

Several species in Madagascar live in holes in trees, have tufted tails and are called Dormice, but are not related to true dormice.

Family LOPHIOMYIDAE

This family is reserved for the crested rat, formerly regarded as a cricetine. It is characterised by a highly specialised skull in which the temporal fossae are roofed in by plates of bone rising from the frontals, parietals and jugals. There is one species.

CRESTED RAT (*Lophiomys imhausi*)

General characters: Stout body 1' long, tail slightly less than 1', whole body and tail clothed in long, grizzled, black-and-white hair. Hair along mid-line of back, which can be erected to form a crest, is flanked either side by a naked line. Great toe opposable.

Habits: Little known except that it is nocturnal, slow-moving, climbs well.

Habitat: Among rocks in ravines.

Food: Vegetable.

Breeding: No information.

Range: Ethiopia, N. Kenya.

Longevity: No information.

Family SPALACIDAE

European Mole Rat (*Spalax microphthalmus*): range Europe, S.W. Asia, N. Africa; burrowing, mole-like but uses teeth rather than claws, body rounded, short-haired, legs short, tailless, head wedge-shaped and flattened, eyes covered with skin, line of stiff hairs from muzzle to vestigial ear form edge of shovel when head used to move soil. Feeds largely on roots and bulbs.

Family RHIZOMYIDAE

Bamboo Rats (*Rhizomys*): N. India, Malaya, China; thick-set body, 14" long, strongly-built head, prominent orange incisors. Burrowing.

Family MURIDAE

Subfamily MURINAE

Including Old World rats and mice. Diagnostic feature: cheek-teeth have three longitudinal rows of cusps or tubercles.

BLACK RAT OR OLD ENGLISH RAT (*Rattus rattus*)



General characters: 7" head and body, scale-ringed almost hairless tail 8-9", wt. 10 oz. Fur glossy blue-black with sprinkling of grey. 5 toes

on all feet, but 1st toe on forefoot reduced to a tubercle. Eyes medium-sized, ears large, naked, about half length of head.

Habits: Highly adaptable, gregarious, burrowing, climbs well, mainly nocturnal but also active by day.

Habitat: Almost any situation except desert, human habitations particularly colonised.

Food: Omnivorous.

Breeding: Gestation 21-30 days, 5-6 litters a year, 5-8 in a litter, born blind, naked, sexually mature at 11 weeks.

Present status: Abundant.

Range: Cosmopolitan except absent from colder latitudes.

Longevity: 4 yrs.

Other statistics: Temp. 95.2°F. (35.1°C.); pulse, 261-600.

BROWN RAT, NORWAY RAT or HANOVERIAN RAT (*Rattus norvegicus*)



General characters: Stout-bodied, 8-9" head and body, scale-ringed tail about same or slightly less, wt. 14 oz. but may be up to 32 oz. Fur greyish-brown, underparts dirty white. Ears, feet and tail flesh-coloured. Muzzle blunter than in Black Rat, ears smaller, eyes smaller but more prominent.

Habits: Adaptable, gregarious, burrowing, does not climb well, mainly nocturnal but also active by day. Expert swimmer, uses river and canal banks, and river and canals for dispersion.

Habitat: Almost any situation except desert, human habitations especially.

Food: Omnivorous.

Breeding: Gestation 20-26 days, 6 litters a year, 5-8 in a litter (or even up to 23), blind, naked, ears open 3 days, eyes open 14-17 days, sexually mature 2 mths.

Present status: Abundant.

Range: Cosmopolitan, except in polar regions.

Longevity: 4 yrs.

Other statistics: Temp. 99.2°F. (37.3°C.)

Special comments on R. rattus and R. norvegicus.

Both species originated in Asia, possibly *R. rattus* in S.E. Asia, *R. norvegicus* in Central Asia. Today, *R. rattus* more at home in warm latitudes, *R. norvegicus* able to live better than *R. rattus* in higher latitudes.

Spread of *R. rattus* first noticed in Middle Ages, reached Britain 13th century. *R. norvegicus* spread later, reached Britain 1729. Both since carried over world by human agency.

"Black Rat" and "Brown Rat" are misleading names: Alexandrine Rat (*R. rattus alexandrinus*) brown, dingy underparts, is coloured like "Brown Rat"; melanic forms of "Brown Rat" look like "Black Rat." Roof or Tree-rat (*R. rattus frugivorus*), of Mediterranean and warmer regions, is reddish-brown on back with pure white or lemon-coloured underparts.

HOUSE MOUSE (*Mus musculus*)



General characters: 3-4" head and body, scale-ringed, sparsely-haired tail of about same length. Fur brownish-grey, slightly paler underparts. Muzzle pointed, ears and eyes large.

Habits: Generally commensal in human habitations and storehouses, but also in fields, woods and a wide range of wild environments. Mainly nocturnal, burrowing. No hibernation.

Habitat: See under *Habits*.

Food: Omnivorous, but especially cereals and stored foods. (Hoarding habit strong.)

Breeding: Gestation 13-21 days, 6-7 litters a year, 6-7 (exceptionally 1-12) in a litter, naked, blind. Weaned at 3 weeks.

Present status: Abundant (pest proportions in suitable places).

Range: World-wide.

Longevity: Up to 3 yrs.

Special comments: Originally from Central Asia, House Mouse has travelled wherever man has spread, but earlier than Black and Brown

Rat. (House Mouse known to early Greeks.) When living in fields coat lighter, usually tawny, and throughout world are many subspecies and races differing slightly in colour and other details. In refrigerated meat-stores resident mice grow thicker coat.

Other statistics: Temp. 98°F. (36.5°C.); pulse, 328-780.

LONG-TAILED FIELD-MOUSE OF WOOD MOUSE (*Apodemus sylvaticus*)



General characters: 3½" head and body, tail of equal length, fur bright fawn, pure white underparts and feet, eyes large, ears prominent, translucent. Hind-legs markedly longer than front legs.

Habits: Nocturnal mainly, gregarious, burrowing just below surface or under leaf-litter or brushwood. May cover ground in kangaroo-like leaps, take jumps of 2-3', and climb bushes and trees with ease.

Habitat: Woodlands especially, also gardens and cultivated land.

Food: Nuts, acorns, grain, berries, fruit, root-crops. Habit of making hoards very marked.

Breeding: Gestation 23-26 days. Several litters a year, 5-9 in a litter, in a globular nest of dry grass 5-6" diameter. Female mates again within a few hours of giving birth. Helpless young carried in mouth, half-grown transported holding mother's teats.

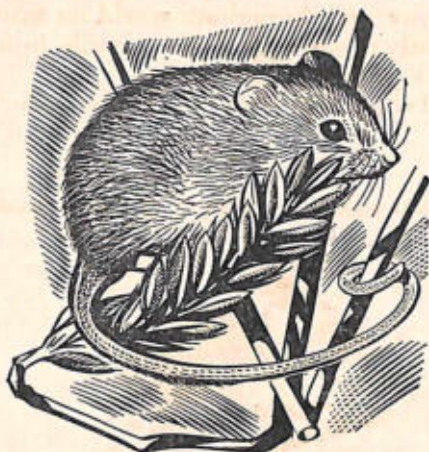
Present status: Very numerous.

Range: Europe, N. Africa, most of Asia except S.E.

Longevity: No information.

Yellow-necked Mouse (*Apodemus flavicollis*).

There is some doubt whether this is a separate species or only a form of *A. sylvaticus*, but individuals, which have distinguishing yellow patch on the chest, are larger, more active and more vigorous than the Wood Mouse, and more readily come into houses. Otherwise the two are much alike.

EUROPEAN HARVEST MOUSE (*Micromys minutus*)

General characters: Slightly less than $2\frac{1}{2}$ " head and body, scaly, prehensile tail about same length. Fur yellowish-red, white underparts. Muzzle blunt, eyes medium-sized, ears rounded, 5 toes on hind-feet, 4 toes and a fleshy pad for grasping on forefeet.

Habits: Active day and night (3-hourly rhythm), climbing among grass, corn and coarse herbage.

Habitat: Cornfields, verges, rough pasture land, commons.

Food: Seeds and grain, some insects.

Breeding: Several litters a year, gestation 21 days, 4-9 in a litter, naked, blind, in a ball of interwoven grass 3" diameter suspended between stems. Young at first mouse-coloured, later reddish tinge starts on hindquarters and grows forward.

Present status: Diminished numbers.

Range: Europe (British Isles, not Ireland; S. on Continent to N. Italy); Siberia, China, Formosa.

Longevity: Up to $4\frac{1}{2}$ yrs. (in captivity).

A few outstanding species of Murinae are:

Bandicoot Rat or Indian Mole-rat (*Bandicota bengalensis*), 6-9" head and body, tail 5-7", resembles Brown Rat but muzzle more blunt, ears smaller, fur longer with some bristles intermingled. Burrows in ground marked by mound-like heaps; hoards food in burrows.

Giant Rats (*Mallomys*, *Hyomys*), of New Guinea, up to $2\frac{1}{2}$ ' total length, dense blackish fur, coarse-scaled hairless tails.

Jerboa Rat (*Notomys*), of Central Australian deserts, long hind-legs, brush at tip of tail (resemble jerboas).

Stick-nest Rat (*Leporillus conditor*), of Australia, builds large nests of sticks with stones on top to make secure in windy areas.

Cloud Rat (*Phloeomys cumingi*) of Philippines is up to 3' long.

Giant Philippines Rat (*Crateromys schadenbergi*), up to 3' long, is only true rat with a squirrel-like bushy tail.

There is an enormous number of wild mice and rats but except for the house rats and mice none is world-wide, and many are locally distributed. A few outstanding types have been given for areas outside Africa, and the more remarkable African species are briefly summarised:

Gambian Pouched Rat (*Cricetomys gambianus*) like the Common Rat but 32" total length, one-half of which is a bicoloured tail. Found throughout tropical Africa; has enormous cheek-pouches.

Multimammate Rat (*Mastomys coucha*), most numerous, 24 mammae and a high rate of reproduction.

Striped or Zebra Mice (*Lemniscomys*), found over most of Africa, marked with rows of spots or with longitudinal stripes in buff on dark ground. (Also Four-striped Mice and Three-striped Mice.)

Spiny Mouse (*Acomys*), Arabia through Egypt, E. Africa to S. Africa, coat of stiff bristles, tail brittle, easily lost.

Subfamily CRICETINAE

Including rats and mice of New World. Diagnostic feature: cheek-teeth have two longitudinal rows of cusps or tubercles.

DEER MOUSE or WHITE-FOOTED MOUSE (*Peromyscus leucopus*)



General characters: Head and body 4", tail 4", reddish-brown to grey above, underside of body and feet white. Legs long and slender, eyes large, ears large, naked.

Habits: Gregarious, making runs in leaf litter or just below surface.

Most of them settle within 500 yd. of birthplace (research shows that up to 10% are inbred—brother \times sister, parent \times offspring).

Habitat: Garden, farmland, woodland, wherever food and natural cover are found.

Food: Vegetable matter, especially nuts, fruit, berries.

Breeding: Gestation 22–37 days, 1–9 in a litter, $1\frac{1}{2}$ " long at birth, blind, naked, eyes open 15 days, weaned 23–37 days, females mature 29 days, may mate at 46 days, males mature 39 days. Several litters a year. Nest built by both parents, male assists in transporting young, female defends territory. Also, female transports young hanging on to her nipples, running and jumping in time with her.

Present status: Numerous.

Range: Most of N. America east of Rockies.

Longevity: $5\frac{1}{2}$ yrs.

Special comments: 178 different forms belonging to 14 species of deer mice from Arctic Circle to Panama. Colour varies from sandy-brown to sepia, otherwise all much alike, and all strongly resemble Long-tailed Field-mouse of Old World in appearance, habits and habitat.

Other statistics: Temp. 99–6°F. (37–4°C.); pulse, 324–858.

AMERICAN HARVEST MOUSE (*Reithrodontomys humulis*)

General characters: Head and body up to $5\frac{1}{2}$ " long, tail up to $2\frac{1}{2}$ ". Coat dark brown, buff on underside, with a buff to orange line along flanks. Ears large, $\frac{1}{2}$ " long.

Habits: Active day and night, using runways through grass, climbing grass stems, skilfully acrobatic. Nests spherical, of interwoven grass, one entrance; either slung between grass stems, or high up in shrubs, or on ground.

Habitat: Damp grasslands, but almost anywhere with low cover.

Food: Seeds, grass.

Breeding: Mating March–Dec. (peak April–Oct.), gestation 23–24 days, 1–7 in a litter, blind, naked, first hair 5 days, eyes open and teeth erupt 8 days, weaned 2 weeks, leave nest 10 days after weaning. Sexually mature 3 mths.

Present status: Numerous.

Range: U.S.A. (S.E. States and Middle West).

Longevity: 1 yr.

Special comments: 70 subspecies ranged over U.S.A., Mexico, Central America southwards to Ecuador. In U.S.A. *R. albescens* has similar range to *R. humulis*; *R. montanus*, *R. megalotis* and *R. catalinae* are to W. of Mississippi.

COMMON HAMSTER (*Cricetus cricetus*)

General characters: Thick-bodied, 10-11" long with a rudimentary tail, short legs, reddish-brown above, black below, with white on flanks, ear small, capacious cheek-pouches.

Habits: Makes complicated system of tunnels, some for summer use, including breeding, others for winter use, where hoards of food (esp. roots, tubers) laid by. Carries surplus food in cheek-pouches to hoard. No complete hibernation but somnolent in winter.

Habitat: Plains (esp. cultivated land).

Food: Vegetable, succulent roots, bulbs, grain, fruit, small rodents, small birds.

Breeding: Several litters a year, gestation 20-22 days, 5-18 in a litter, blind, naked, independent at 2 weeks.

Present status: No information.

Range: Western Europe to Siberia in north and Iraq in south.

Longevity: Up to 2½ yrs.

GOLDEN HAMSTER (*Mesocricetus auratus*)

Smaller than Common Hamster and less belligerent. Range: Syria. Other Old World hamsters have 8 mammae, golden hamster has 14-22. Gestation 15-16 days. Sexual maturity at 11 weeks. First known from one specimen caught 1839, second caught early 1900's. 1 female and 12 young dug out from 8' depth in 1930. Progeny sent to England 1931, from which millions of pets and laboratory animals derived. [Longevity, 1-8 yrs.; Temp. 97°F. (36.0°C.); respiration rate (in c.c. of oxygen per kgm. body wt. per hr.) awake, 2,900, hibernating, 70; pulse, 300-600.]

Other hamsters, similar to Common Hamster, usually greyish, range across European Russia and Northern Asia, some only mouse-sized, Miller's Hamster (Siberia) turns white for winter. Also mole-like hamsters with very small ears and eyes.

EASTERN or FLORIDA PACK RAT, WOOD RAT or TRADE RAT

(Neotoma floridana)

General characters: 16" head and body, about a half of which is tail, $\frac{3}{4}$ lb. wt. Coat dark brown, lighter underside. Ears large, eyes medium-sized.

Habits: Best-known for habit of collecting and hoarding miscellaneous objects, especially bright, metallic or coloured, and of leaving something in their place (e.g. classic story of Pack Rat stealing worthless trinkets from gold prospector's cabin and leaving nuggets in their place). Living quarters are houses of sticks, with one or more chambers. Tail-rattling and foot-thumping used as means of communication between individuals.

Habitat: Varied: swamp, woodland, rocky ground.

Food: Nuts, berries, herbage.

Breeding: Males court by drumming with feet, probably monogamous, breed throughout year, gestation 33-39 days, 2-6 in a litter, $\frac{1}{2}$ oz. wt., naked, sparsely furred at 4 days, fully furred 2 weeks, weaned 3 weeks when female leaves house for young to occupy. Male's presence tolerated by female even when she has young.

Present status: Numerous.

Range: S.E. States of U.S.A.

Longevity: No information.

Special comments: Pack Rats are found through U.S.A., southwards to Nicaragua. Dusky-footed Wood Rat (*N. fuscipes*), west of Rockies, 18" long including 8" tail, builds enormous houses of sticks. Bushy-tailed Wood Rat (*N. cinerea*) 17 $\frac{1}{2}$ " long, including 7 $\frac{1}{2}$ " tail, California to British Columbia and eastwards to Dakotas.

COTTON RAT (*Sigmodon hispidus*)

General characters: 13" total length, including 5 $\frac{1}{4}$ " tail, $\frac{1}{2}$ lb. wt., loose coat of coarse black hair brown-tipped, paler on underside, ears black, feet grey to dark brown, tail scaly or finely haired.

Habits: Diurnal, sleeps in shallow depression or underground tunnel lined with grass, roots or cotton fibres. Belligerent, much fighting, cannibalism frequent, female may kill and eat mate.

Habitat: Varied (cultivated ground, damp meadows, salt marshes, mountainsides).

Food: Grass, sedges, succulent roots, seeds, also birds' eggs and young, insects, fish, crabs.

Breeding: All year round, gestation 27 days, 2-10 in a litter, young leave nest and independent 15-25 days, sexually mature 1 mth. Female born with coat of short hair with adult pattern, eyes open 18-36 hrs.,

mates 2-8 hrs. after giving birth. Much inbreeding (cf. Deer Mouse). Sometimes several generations of young occupy one nest.

Present status: Abundant (may be 500 to acre), often to pest proportions (attacking cotton seeds, sweet potato, sugar-cane). Cyclic (4-5 yrs.) decimation by fungal disease.

Range: Southern U.S.A. (Virginia to Florida, west to Tennessee and Arizona).

Longevity: Probably less than 1 yr.

Special comments: Other species southwards through Central America to Venezuela and Peru. Cotton rats now used as laboratory animals because of high rate of reproduction.

RICE RAT (*Oryzomys palustris*)

General characters: Rat-sized, 1' total length of which about half is tail, 3 oz. wt., grey or brown above, lighter underparts, tail scaly, dark brown to black, paler below.

Habits: Nocturnal, spends day in shallow burrow or under vegetation. Swims and dives well.

Habitat: Marshy areas along coast, but some individuals on mountains.

Food: Grass, grains, including rice.

Breeding: Mating Feb.-Nov., gestation 25 days, 1-7 in a litter (average 4-5), blind, eyes open 8 days, weaned 11-13 days, sexually mature 7 weeks. 8-10 litters a year. Female mates few hrs. after litter born, drives male away as soon as mating complete.

Present status: Abundant, often to pest proportions.

Range: U.S.A. (south-eastern States).

Longevity: 3 yrs.

Special comments: About 180 species and subspecies of Rice Rat from S.E. U.S.A. to Patagonia. Rice Rats on separate islands of Galapagos have been distinguished as insular species (see Darwin's *Origin of Species*). Pygmy Rice Rat (*Oligoryzomys*), north-eastern S. America, is size of House Mouse. "Muskrat" (*Megalomys*), of Lesser Antilles, over 30" total length.

GRASSHOPPER MOUSE (*Onychomys leucogaster*)

General characters: 7" total length, including 2½" tail, white-tipped, muzzle sharp, ears and eyes medium-sized, 5 toes on hind-foot, 4 on fore-feet.

Habits: Solitary, nocturnal, burrowing, follows prey by scent, often leaping on victims, but will dig out insects. No hibernation.

Habitat: Varied, where suitable food and cover available.

Food: Grasshoppers, beetles, scorpions, lizards, mice, some grass and seeds.

Breeding: Breeding March-April, gestation 32-47 days, 2-6 in a litter, naked, blind, $\frac{1}{10}$ oz. at birth, furred by 12 days, eyes open 19 days, solid food 10 days, females mature 3 mths. Maybe more than 1 litter a year.

Present status: No information.

Range: Western plains U.S.A., some penetration northwards into Canada.

Longevity: 3 yrs.

Special comments: A second species, Southern Grasshopper Mouse or Scorpion Mouse (*O. torridus*), of deserts of S.W. U.S.A., 4" total length, tail 2", bright tawny coat.

Other Cricetines include:

Banana Mouse (*Nyctomys sumichrasti*), of Central America, arboreal, with modified hind-feet and hairy tail, about size of dormouse. Sometimes reaches Europe on banana boats.

Fishing Rats (*Ichthyomys*), of South America, 7" head and body, 7" tail, live in mountain streams, have flattened skulls and hook-like incisors, soft, close fur, toes partly webbed and fringed with hairs, tails hairy, feed on fish and small aquatic animals.

(Cricetines particularly abundant in S. America; some mole-like, small ears, short tails, loose fur; dwarf mice, sandy-coloured, on high-altitude deserts; large aquatic rats, shaggy coats, broad feet; soft-furred Rock Mice of Andes, like small chinchillas; etc.)

Only one Cricetine in Africa: White-tailed Mouse (*Mystromys albicaudatus*), of S. Africa, which has no cheek-pouches.

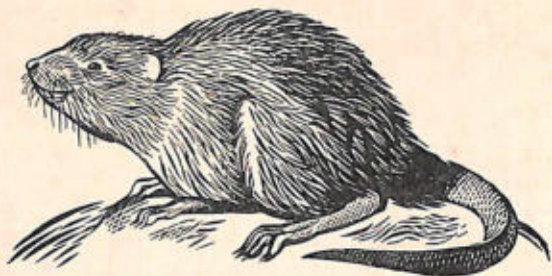
Subfamily MICROTINAE

Diagnostic feature: cheek-teeth prismatic in pattern.

[Lemmings and voles (subfamily Microtinae) are widespread in temperate and subarctic regions of the Northern Hemisphere, but there is none south of Guatemala in America, northern Burma and Himalayas in Asia, and in Africa there is a single species in Cyrenaica, *Microtus mustersi*.]

MUSKRAT OF MUSQUASH (*Ondatra zibethica*)

General characters: Largest of voles, 25" total length, tail scaly, sparsely haired, 10" long, wt. 2 lb. Coat dark brown, composed of thick waterproof underfur overlaid with long glistening guard-hairs. Feet broad and flat, hind-feet webbed, tail laterally flattened, rudder-like.



Habits: Aquatic, lives among water plants in summer, builds winter house of vegetation (stems, etc.) projecting above water-line.

Habitat: Marshes, freshwater or salt, by streams and rivers.

Food: Mainly water plants, also fish, frogs, freshwater mussels.

Breeding: Mating in water, gestation 19-42 days, 3-5 litters a year, 4-11 (average 6-8) in a litter.

Present status: Numerous.

Range: N. America, wherever suitable habitat.

Longevity: No information.

Special comments: Introduced into Europe where damage caused to river banks: into U.S.S.R. where extensive marshes give natural home to add to fur resources.

Other statistics: Temp. 100.5°F. (38.0°C.)

Round-tailed Muskrat or Florida Water Rat (*Neofiber alleni*) is about half size of musquash, bog-living, no special modifications for aquatic life. Builds nests with a central chamber above water-level in Everglades, or swamps, of Florida.

BANK VOLE (*Clethrionomys glareolus*)

General characters: 5½" total length including tail 1¾" which ends in a pencil of hairs, wt. ¾ oz., fur chestnut-red on back shading to white or yellowish underparts, tail black above, white below, with terminal pencil of hairs, ears and eyes small, muzzle blunt, lips pink, feet grey.

Habits: Active night and day using shallow runs in earth. Climbs bushes.

Habitat: Dry sunny banks.

Food: Mainly vegetable (grass, roots, bulbs, fruits, seeds), also insects, snails and small carrion.

Breeding: Mating throughout year, mainly April-Sept., gestation 17-19 days, 4-5 litters a year of 3-6 young, naked, blind, in nests of grass, moss, wool or feathers, usually above ground, sometimes in disused bird's nest.

Present status: Abundant (pest in larch plantations gnawing shoots and bark). In Norway enters houses.

Range: British Isles, not Ireland, Isle of Man, Hebrides; Europe except extreme north, extending south to northern Italy (not Spain, Balkans); central Asia.

Longevity: No information.

RED-BACKED MOUSE (*Clethrionomys gapperi*)

General characters: 6" total length, including $1\frac{1}{2}$ " tail, $1\frac{1}{4}$ oz. wt., fur long, loose, reddish-brown on back shading to pale underparts.

Habits: Active night and day, in leaf litter. May climb trees.

Habitat: Woodlands.

Food: Vegetable, also insects. Hoards food.

Breeding: Mating Feb.-Sept., gestation 17-19 days, 2-8 in a litter, in nests of shredded grass under logs, rocks, etc. $\frac{1}{4}$ oz. wt., eyes open 14-15 days, weaned 17-21 days.

Present status: Abundant (pests in plantations, ringing trees, but eat insect pests of trees).

Range: Northern U.S.A., Canada.

Longevity: No information.

Other statistics: Temp. 99.4°F. (37.3°C.)

SHORT-TAILED VOLE OR MEADOW VOLE (*Microtus agrestis*)



General characters: Stumpy build, $5\frac{1}{4}$ " long of which stiff tail $1\frac{1}{4}$ " wt. 1 oz., fur greyish-brown on back, greyish-white below, ears and eyes small, muzzle blunt.

Habits: Active day and night, 2-3 hourly rhythm, in runs in grass, also network of burrows beneath surface.

Habitat: Meadows, damp pastures.

Food: Vegetable, mainly grass: hoards food in burrows in earth.

Breeding: Feb.-Sept., several litters a year, of 5-7 young born naked, blind, in domed nest of grass above ground.

Present status: Abundant (pest in pastures, arable land, plantations). Populations subject to cyclic rises and falls.

Range: British Isles (not Ireland); central and northern Europe, also N.W. corner of Iberian Peninsula.

N. AMERICAN MEADOW MOUSE, FIELD MOUSE OR VOLE
(*Microtus pennsylvanicus*)

General characters: Round-bodied, 5" length, including $2\frac{3}{8}$ " tail, 4 oz. wt., fur long, soft, dark brown, eyes and ears small, muzzle blunt, legs short.

Habits: Active day and night.

Habitat: Varied types of grassland.

Food: Grass, fresh or dried (3 million tons of hay destroyed in U.S.A. annually by meadow mice). Said to eat own weight per day.

Breeding: Mating throughout year, gestation 21 days, up to 17 litters a year each of 4-9 (-13), born naked, blind, in woven nest of grass in hollow log or below surface of ground. Weaned 10-15 days, sexual maturity reached 25 days females, 45 days males. Mating recurs soon after litter born.

Present status: Abundant, 300 per acre, but 12,000 per acre recorded for related species.

Range: U.S.A. (north-eastern).

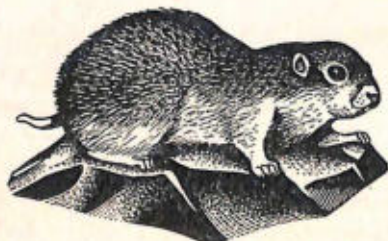
Longevity: 18 mths.

Special comment: Numerous subspecies over Canada and northern half of U.S.A.

Other statistics: Temp. 103°F. (39.3°C.)

[European and Asiatic voles belonging to *Clethrionomys* and *Microtus* abundant, very similar in appearance and habits to those of North America.]

NORWEGIAN LEMMING (*Lemmus lemmus*)



General characters: Round-bodied, short legs, stumpy tail, 5" total length. Coat thick, yellowish-brown and darker above, spotted and

streaked with blackish-brown. Ears and eyes small, claws on front toes strong.

Habits: Active by day and night, burrows just beneath surface. Gregarious, and individuals alarmed raise themselves on hindquarters, squeaking and grunting, giving general alarm. Do not wander far from burrows. No hibernation, runs made in snow radiating from a nest, which is exposed to view when snow melts.

Habitat: Dry areas in birch and juniper swamp.

Food: Grass, roots, lichen, catkins.

Breeding: 5-6 in a litter, born in a nest of grass lined with hair. Probably more than 1 litter a year. Little else known.

Present status: Numerous, subject to cyclic rises in populations, when excess numbers move down into valleys and outwards, eventually some reaching sea and drowning. Predators, disease and deaths from other causes bring steep fall in numbers, back to normal.

Range: Mountains of Scandinavia.

Longevity: No information.

Special comments: Traditional stories of migrations in columns to commit mass-suicide in rivers and sea unfounded. Migration outward from normal habitat, under pressure of population, does take place but is not directional. This is true of all lemmings.

Other lemmings are:

Brown Lemming (*Lemmus trimucronatus*) of N. America (Alaska south to British Columbia and Hudson Bay): fur brown, total length 6½" with tail ¾", ½ lb. wt., several litters a year April-Sept., 3-11 (average 4-5) in a litter.

Collared or Snow Lemming (*Dicrostonyx torquatus*) of Arctic Asia (Siberia) and N. America (S. to Labrador): summer coat brown, winter white; also claws change, in summer 2 centre toes of heavily-haired front feet are large, in winter claws have grown in length and curvature, bulbous base grows larger and each claw appears double. [Temp. 101°F. (38.3°C.)]

PINE MOUSE OF PINE VOLE (*Pitymys pinetorum*)

General characters: Round-bodied, short-legged, 6" total length, tail 1", 2 oz. wt., coat brown, paler on underside, feet grey, eyes and ears small.

Habits: Live in tunnels in soft earth or leaf litter just below surface. Nests a few inches underground, of dried grass and leaves.

Habitat: Pinewoods, meadows, pastureland.

Food: Roots, succulent or otherwise, tubers.

Breeding: Mating Mar.-Nov., 2-4 in a litter, blind, naked, eyes open 9 days.

Present status: Numerous: pest in potato fields.
Range: U.S.A. (eastern States).
Longevity: No information.

WATER VOLE (*Arvicola amphibius*)



General characters: $7\frac{1}{2}$ " head and body, tail hairy $4\frac{1}{2}$ " long, female slightly smaller than male. Fur reddish-brown tinged with grey in male, greyish-brown in female, paler underparts. (A melanistic form (subsp. *reta*) in Scotland and East Anglia.) Muzzle blunt, eyes and ears small. Hind-toes have slight fringe of hairs, not webbed.

Habits: 4-hourly rhythm of activity. Burrows in river banks, capable swimmer and diver. Myopic, keen hearing, dives immediately when alarmed. No hibernation.

Habitat: River and canals.

Food: Water plants, also insects, dead fish, earthworms, carrion, frogs, but carnivorous traits vary with individuals.

Breeding: 3-4 litters a year, 2-7 in a litter, naked, blind, in a globular nest in burrow, hollow tree or, occasionally, disused birds' nest.

Present status: Common.

Range: British Isles except Ireland and Scottish Highlands.

Longevity: No information.

Special comments: Over much of Europe is replaced by *A. terrestris*, entirely terrestrial and mole-like habit of burrowing, but otherwise similar to *A. amphibius*.

Subfamily TACHYORYCTINAE

Mole-rat (*Tachyoryctes*): once placed near Bamboo Rats, now with true rats. 9" long, silky long fur, bright tawny or rich chestnut. Burrowing. East Africa, as far up Mount Kenya as bamboo-zone.

Subfamily GERBILLINAE

Gerbils or Sand Rats, of drier parts of Africa and Asia, are nocturnal, burrowing, feeding on seeds and grain. Rat- or mouse-like, sandy or pale buff above, white underparts and feet, long hind-feet, long tail often tufted. Carriers of fleas bearing sylvatic plague.

Gerbil usually applied to genera *Gerbillus*, *Tatera*, etc. Hoard grain in burrows.

Jird applied to genus *Meriones*, of N. Africa and S.W. Asia.

Fat-tailed Gerbil (*Pachyuromys duprasi*) of N. Africa, heavier build, club-shaped tail, has fat-reserve in tail, does not hoard seeds. Gestation 20 days.

Subfamily HYDROMYINAE

New Guinea Water Rat (*Crossomys moncktoni*) has large webbed hind-feet, small forefeet, ears vestigial, tail with fringe of hairs for use in swimming.

Subfamily RHYNCHOMYINAE

Shrew-like Rat (*Rhynchomys soricoides*), of Philippines, long narrow head, minute teeth, probably feeds on soft-bodied insects.

Subfamily DENDROMYINAE

Banana or Tree Mice (*Dendromus*), delicate build, long prehensile tail, 3 toes on forefoot, light fawn-buff, with dark stripe down back, hides in folds of banana leaves or among fruit.

South African Fat Mice (*Steatomys*), very fat bodies, short tails, lethargic, live in sandy burrows, hibernate.

Order CARNIVORA

DIFFER widely in form, size and habits but having a close agreement in characters of teeth. Typically these include three small incisors, one large canine and a varying number of pre-molars and molars on each side of both upper and lower jaws. In most Carnivora one cheek-tooth on each side in both lower and upper jaws is much enlarged and has a prominent cutting edge. It is known as a carnassial, or flesh-tooth. Feet never with less than 4 toes each. Claws may or may not be retractile, and there is never an opposable thumb. Typically flesh-eaters, but some members of order are entirely insectivorous and others are mainly herbivorous.

Suborder Fissipeda

Carnivora with normal limbs and digits.

Family CANIDAE

Long-legged, terrestrial, with long muzzles, tail bushy and shorter than head-body length, usually 5 toes on forefeet, 4 on hind-feet, cheek-teeth 6-7 on each side of each jaw include a well-developed carnassial.

COMMON WOLF (*Canis lupus*)



General characters: Large, dog-like, with drooping tail. Size variable with region: typical dimensions could be given for male as head and body $4\frac{1}{2}'$, tail 16", height at shoulder $31\frac{1}{2}"$, weight up to 110 lb. Bitch is smaller. Typical colour yellowish- or brownish-grey brindled with black (Wolves of Arctic tundra often white, on N. American plains generally grey, in Florida often black, but colour phases not completely separated geographically, so black and white wolves may occur in same locality).

Habits: In pairs or solitary, working over a fixed itinerary, hunting by day, denning up by night in rocky chamber, under roots or trunk of fallen tree, or in holes dug in ground. In summer a family party will remain together, in winter several parties will combine for hunting, well-known howl being used to call members of a party or troop together. Stories of large packs probably refer to troops made up of family parties brought together by hunger.

Habitat: Open country and forests.

Food: Typically large herbivores: e.g. caribou, musk-oxen (in former days, bison), deer, horses.

Breeding: Mating January-March. Gestation 60-63 days. Litters 5-9, young born blind in den among rocks, in burrows or in dense cover. Eyes open 9 days. Weaned 8 weeks.

Present status: Much reduced in numbers. Wiped out over most of Europe except wilder parts of Scandinavia, Germany, France, Spain. N. America, cleared from Eastern States but survive in wilder parts of western U.S.A. Still survive Florida, Mexico.

Range: Europe, Asia (including China, Japan, India, Arabia), N. America.

Longevity: 15 yrs.

Special comments: Throughout range are numerous local races, differing in size and colour.

Other statistics: Temp. 105°F. (40-5°C.)

COYOTE OR PRAIRIE WOLF (*Canis latrans*)

General characters: Wolf-like in appearance. Total length 4' of which $\frac{1}{3}$ is tail. Weight up to 40 lb. Ears larger than in wolf.

Habits: Jackal-like. Normally in pairs or solitary; may hunt prey in relays, seldom in troops.

Habitat: Plains.

Food: Small rodents, rabbits, carrion, some vegetable and fruit, occasionally young of domestic stock.

Breeding: Mate Jan.-Feb. Gestation 60-64 days. Litters 5-6 (maximum 10), young blind. Weaned at 2 weeks.

Present status: Reduced in numbers.

Range: Central America to Alaska.

Longevity: 14 yrs.

Special comments: Smaller size and ability to make use of cover have saved coyote where wolf exterminated. Opinion swinging in coyote's favour because now realized it feeds mainly on farm vermin.

INDIAN JACKAL (*Canis aureus*)



General characters: Wolf-like, 2' to 2½' head and body length, tail relatively shorter than in wolves.

Habits: Mainly nocturnal. In pairs or solitary, but often associates in large packs. Cry an eerie, yapping howl.

Habitat: Flat or hilly country up to 4,000', forests or plains, or large cities.

Food: Any small animals they can overpower. Carrion, especially the "kills" of lions and tigers.

Breeding: Gestation 60-63 days. Litters 3-5, young blind. Eyes open 9 days.

Present status: No information.

Range: Palestine and Arabia, through Peninsular India to Ceylon and Burma. Also closely related forms in S.E. Europe, North and East Africa.

Longevity: 16 yrs.

Special comments: Jackals replace wolves in warmer parts of world. Most species little larger than foxes; also have characteristic odour, from tail-glands. Other jackals are found in Africa:

Other statistics: Temp. 101°F. (38.3°C.)

Wolf-like Jackal (*C. lupaster*), in Egypt, 52" total length, 16" at shoulder.

Side-striped Jackal (*C. adustus*), in open country over most of Africa, has a blackish band on flanks.

Blackbacked Jackal (*C. mesomelas*), in E. to S. Africa, marked by conspicuous "saddle", black with white flecks, contrasting with reddish flanks and limbs. [Longevity, 13 yrs.] Karosses used by Africans made from skin of black-backed jackal.

RED FOX (COMMON FOX) (*Vulpes vulpes*)



General characters: Two or more feet head and body length, brush $1\frac{1}{2}$ ' long with tag usually white but may be black. A foot or more high at shoulder. Fur sandy to red-brown, underparts white, legs and backs of ears black. Muzzle sharp-pointed. Ears large, erect. Eyes large with vertical pupil.

Habits: Mainly nocturnal but may be out by day, especially in fine weather, sunbathing or asleep. Solitary except at breeding season. Sleeping quarters known as an earth, usually a natural cavity or a burrow taken over from another animal. Can dig own earth; said to have one opening but some observers report two openings.

Habitat: Almost any type of country, including gardens in centre of small towns, but woodlands preferred.

Food: Mainly rats, mice and voles, but all flesh, even carrion, taken. Diet may include poultry, game-birds and lambs in vicinity of farms. Elsewhere any birds or mammals that can be taken are eaten. Large amount of vegetable food, including grass and fruit, taken.

Breeding: Mating mainly January, may extend into February. Gestation 51-63 days. Average litter 4, in April (or May). Cubs open eyes at 10 days, leave earth for first time about a month old, then

covered with soft downy fur, chocolate-coloured. Tail not yet a brush, has usual tag. Muzzle blunt and ears small. Vixen fed by dog-fox as soon as cubs born, and dog may continue bringing food and helping feed cubs for some weeks. Vixen later takes cubs foraging. Cubs leave parents in August.

Present status: Numerous.

Range: Europe; Asia except for northern Siberia, southern India and Malaya, but including Japan; N. Africa; N. America except extreme south.

Longevity: Unknown. (Said to be 12 yrs.)

Special comments: Buries surplus food to return to it later. Keeps fur well-groomed, but uses no special latrine. General foxy odour may be from a gland on top of tail 2-3" from root of tail. More repulsive odour from anal glands in moments of high excitement, especially from fear. Said to "charm" rabbits or birds by playing, gradually drawing near enough to pounce. Believed to use intelligence in stratagems for breaking scent trail.

Other statistics: Temp. 101.2°F. (37.8°C.)

Other foxes include:

Frequent colour phases or mutations of Red Fox (*Vulpes fulva*) occur in wild, particularly in N. America. Cross Fox is red with black band across shoulders and blackish underparts. More valuable for trappers in past was Silver Fox, lustrous black coat relieved on back by white tips of guard hairs. Such skins highly valued: experimental breeding started in 1894, at Prince Edward Island, Gulf of St. Lawrence. More recently, selective breeding from sports or mutants with white face-blazes has given rise to white-face and platinum foxes for the luxury fur trade. [Longevity, 12 yrs.]

Kit Fox or Swift Fox (*Vulpes velox*), related to the Red Fox but smaller, total length seldom more than 3'. Fur of little value, generally yellowish-brown, sprinkled with black-tipped hairs and the tail has a black tip, lives on open plains of western U.S.A., more a burrower than Red Fox, burrow may be 5' below surface and 9' long. (Sometimes distinction made: Kit Fox = *V. macrotis*, Swift Fox = *V. velox*.)

Arctic or White Fox (*Alopex lagopus*), Scandinavia to Kamtchatka, Kuriles, Alaska, Arctic Canada, has colour phase known as Blue Fox, farmed but to less extent than Silver Fox, etc. (see above), but on small uninhabited islands of coast of Alaska breeding stocks put down and allowed to multiply naturally, except that food is provided. More valuable Blue Fox represents less than 5% of White Fox population of most of Arctic Canada, as much as 50% in Alaska and Greenland and is typical form in Iceland. Feeds summer on rocky coasts largely on nesting-birds and eggs, as well as stranded fish and other carrion. No hibernation, winter feed on lemmings stored in crevices in rocks, or

following polar bears for remains of seals. [Longevity, 14 yrs.; Temp. 101-6°F. (38-6°C.)]

Grey Fox (*Urocyon cinereoargenteus*), mainly eastern and Pacific U.S.A. Fur of little value, grizzled grey and black. 44" total length, including 14" tail, wt. 7-13 lb. Range overlaps that of Red Fox, but Grey Fox favours warmer regions. Climbs trees, omnivorous. Mating January, gestation 55-63 days, 1-7 in a litter.

Bat-eared Fox or Delalande's Fox (*Otocyon megalotis*), of S. and E. Africa, very large erect ears, lives in colonies on sandy plains, largely insectivorous (especially termites).

Sand Fox (*Vulpes ruppelli*), semi-desert regions N. Africa and Arabia.

Fennec (*Fennecus zerda*), of true deserts of Africa and Arabia, smallest known fox, 2' total length, pale sandy buff, slender build, enormous ears, hairy soles of its feet enable it to run on loose sand. Avoids heat of day underground, feeds at night on small rodents and insects, including locusts.

Corsac (*Vulpes corsac*), of steppes of Transcaspia and elsewhere in Central Asia, 22" head and body, tail 14" long, fur soft, fawn.

Indian Wild Dog, Red Dog or Dhole (*Cuon alpinus*), widely distributed Asia, S. of approx. 50° lat., 38" head and body, 18" tail, short-haired, reddish, hunts in small packs, powerful build, great stamina, reputation for persistence in running down deer, on which it largely feeds, scouring forests and jungles, scaring away game for miles around, has been known to force tigers and leopards to give up kills. [A variety of the Dhole is found in Malaya, Sumatra and Java, and the Siberian Wild Dog, of Central Asia, is a representative of same species, with longer hair.]

CAPE HUNTING DOG (*Lycan pictus*)

General characters: 44" head and body, tail 16", 2' high at shoulder, legs unusually long, head broad and hyena-like, 4 toes on each foot. Coat blotched black, white and yellow. Ears erect, large and rounded.

Habits: Hunt in packs, travel great distances, may not reappear in same area for some time. Strong sense of curiosity, pack will stand gazing at an intruder for a long time. Voice a soft hooting, used to keep members of pack in touch with each other.

Habitat: Savannah.

Food: Flesh, any game pack can overpower.

Breeding: Gestation 60-80 days, number in litter up to 10.

Present status: No information.

Range: Africa, S. of Sahara.

Longevity: No information.



Raccoon-like Dog (*Nyctereutes procyonoides*), of Japan, China and Korea, undog-like appearance, $2\frac{1}{2}'$ total length, short legs, short bushy tail. Fur dark brown, pale ash-colour on head and neck, dark patches around eyes, resembling N. American raccoon. Fur traded as Japanese Fox. Habitat: river valleys and grassy and willow-studded plains. Solitary, omnivorous, partial to fish. Up to 7 young at a birth. Introduced into several parts of the U.S.S.R., for the sake of its fur.

Bush Dog (*Speothos venaticus*), tropical forests of S. America (Brazil, Guianas), size of small badger, short legs, badger-like in colour, grey above and blackish below. Little known of habits.

SOUTH AMERICAN CANIDAE

Name "fox" has been used for some of S. American Canidae but they are rather specialised wild dogs. They include: Crab-eating Fox (*Dusicyon azarae*), of Argentine and Paraguay, fox-like, short legs, bushy tail; and Maned Wolf (*Chrysocyon jubatus*), of Argentine and Brazil, like giant fox on stilts, shaggy reddish coat, fox-like head, large erect ears, $51''$ head and body, tail $16''$ long, extraordinarily long legs for size of body.

Family URSIDAE (Bears)

Heavy build, practically tailless, broad flat feet, each bearing 5 toes with non-retractile claws. Sight poor, senses of smell and hearing acute. Cheek-teeth weak, flattened.

Diet omnivorous, berries and wild fruits, small animals living under

logs and stones. [In one species only does animal matter form any considerable part of diet, although both Brown and Black Bears will eat other animals when opportunity offers, and on rare occasions a rogue individual has been known to take to stock-killing. Attacks on man rare, then usually only under provocation or in defence of cubs.] Inhabit wild and mountainous country, as well as forests, singly or in family parties. In autumn berries eaten in large quantities. Often diet varied with fish, as in salmon runs of western N. America, scooped out of shallows with flipping actions of paws. Particularly fond of wild honey, from nests of wasps and wild bees, grubs, comb also eaten. In autumn in northern regions fat accumulated in preparation for hibernation, in holes among rocks, in caves, in large hollow logs, or under the roots of fallen trees. Then (normally) two young born, adults emerging in spring thin and hungry. Gestation 180-250 days. Young born very small, 1½ lb. wt., 8" long, helpless. Climb trees tolerably well, but slowly and deliberately and larger bears (e.g. Grizzly) said not to climb in normal course.

BROWN BEARS



Brown Bears are confined to the Northern Hemisphere, and several species have been recognised, such as Syrian, European, Grizzly, etc., all are closely related and some zoologists regard them all as constituting a single species. By contrast some zoologists divide them into several subspecies; numerous subspecies of Grizzly Bear alone have been recognized. The probability is that no real distinction can be made between them but the better-known species or subspecies are dealt with in summarised form below:

European Brown Bear (*Ursus arctos*): formerly common in Europe and Asia from British Isles to Japan, now in small numbers in wilder parts of Pyrenees, Carpathians, a few places in Swiss Alps, Balkans, Scandinavia, Finland, more plentiful in U.S.S.R., with local forms in

Siberia and Eastern Asia, one being on Hokkaido, Japan. Average length 6', maximum 7', 450-550 lb. wt., coat typically shaggy, brown, varying in shade. Longevity, 34 yrs.

Subspecies of *U. arctos*: Syrian Bear (*U. arctos syriacus*), Syria, Asia Minor, small ashy-brown mountain race; Red or Isabelline Bear (*U. arctos isabellinus*), Kashmir and W. Himalayas, coat pale. Blue or Snow Bear (*U. arctos pruinosus*), W. China and Tibet, dense coat, blackish-brown hairs frosted with silver or slate-grey.

Grizzly (*U. horribilis*): Western N. America, up to 8½' long, and 880 lb. wt.; now gone from most of western U.S.A. and Southern Rockies. Longevity, 31 yrs.

Kenai Bear (*U. kenaiensis*) and Kodiak Bear (*U. middendorffi*): 9' or more long and 1,650 lb. wt.

BLACK BEARS

American Black Bear (*U. americanus*): formerly throughout most of N. America except some Western States of U.S.A., now much reduced in numbers everywhere. Natural habitat in wooded regions but also found in settled areas. Length 5', 200-500 lb. wt. [Temp. 101°F. (38.3°C.)]

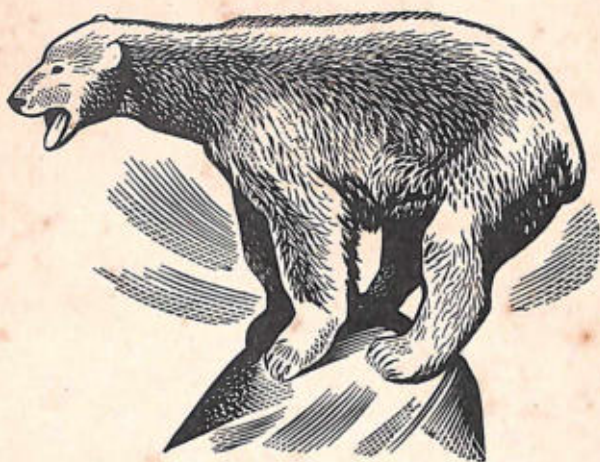
Kermode's Bear (*U. kermodei*): British Columbia, pure white except for slight buff on head and in middle of back (possibly a partial albino of Black Bear).

Spectacled Bear (*Tremarctos ornatus*): of higher altitudes, Venezuela to Chili; not closely related to any other bear; only member of family in S. America; very little known of habits.

Himalayan Black Bear (*Selenarctos thibetanus*): largest of 3 types of S. Asian bears, Himalayas westwards to N. Persia and east to China, with a race on the South Island, Japan; 6½' long, 3" tail, wt. up to 265 lb.; coat fairly thick, prominent V-shaped white patch on neck; in summer retires to 12,000' up, in winter either hibernates or returns to the lower altitudes; has reputation of being less afraid of men than most bears; when alarmed, apt to roll downhill in a ball.

Sloth Bear (*Melursus ursinus*): India and Ceylon, slightly smaller than Himalayan Bear, and shorter legs; coat shaggy, white patch on the chest, long, mane-like hair on the neck; feeds on termites dug out with its long claws; two central upper incisors lost, rest of the teeth ill-developed; after digging out termites blows away the dust and sucks termites up with mobile lips; no hibernation; young ride on the mother's back and can retain seats at a high speed.

Malayan or Sun Bear (*Helarctos malayanus*): Burma, Siam, Malay, Sumatra and Borneo; smallest of all bears, little more than 4' long, very short smooth fur, yellowish patch on chest; very fond of honey and syrup.

POLAR BEAR (*Thalarctos maritimus*)

General characters: One of largest bears and most carnivorous. Males average 7'-8', maximum 9', height at shoulders up to 5', weight average 900 lb., maximum 1,600 lb. Stump of tail only. Female average weight 700 lb. Coat a uniform white with yellow tinge. Head long, with "roman" nose, long neck, powerful limbs and broad feet with hairy soles.

Habits: Solitary. Moving freely over ice by reason of hairy soles, Polar Bear swings head from side to side in characteristic manner, as if searching or smelling out prey. Expert divers and swimmers, have often been seen swimming strongly as much as 200 miles from land. Do not hibernate, but female gives birth in polar winter in a hole deep in snow.

Habitat: Ice-bound polar regions.

Food: Seals, favourite prey, stalked by taking advantage of cover afforded by hummocks of snow. A seal sleeping at edge of ice may be approached by water. A dead whale will attract polar bears from miles around. Although carnivorous, known to fill paunch with grass on occasion.

Breeding: Gestation 240 days. Cubs, born December, 1-4 at birth, 1' long, 1½ lb. weight, with covering of short, sparse hair. Eyes open 33 days. Ears open 26 days, imperfect hearing until 69 days. Start to walk 47 days. Weaned April, but cubs remain with mother until 10 months old. Sexually mature 2½-4 yrs.

Present status: Reduced in numbers.

Range: Arctic.

Longevity: Up to 33 yrs.

Special comments: Apparently no instinctive fear of man, will visit camps or ice-bound ships out of curiosity or impelled by hunger. Formerly hunted by Eskimos with dogs and lances; against modern firearms have little chance.

Other statistics: Temp. 99.6°F. (37.5°C.)

Family *PROCYONIDAE*

Mostly small-sized, they have long tails mostly ringed, except for giant panda, teeth of carnivore-type but modified by broadening and flattening of crowns.

RACCOON (*Procyon lotor*)



General characters: Medium-sized, total length 2½' including 10" bushy tail, weight up to 25 lb., average 15 lb. Fur greyish-brown, tail ringed, conspicuous dark band across face and eyes.

Habits: Playful, agile, skilful climbers. Seldom swim. Nocturnal. Hibernate in colder parts of range.

Habitat: Typically wooded country, near streams.

Food: Vegetable, including cereals, but mainly aquatic animals: frogs, fish, crayfish, shellfish, even freshwater turtles, caught with long slender fingers. All food, picked up in forefeet, is "washed" or "dunked" before being eaten.

Breeding: Mating January to June (according to whether hibernate or not). Gestation 63-70 days. Litters of 3-6 young, eyes open at 10 days, remain with parents for 1 yr.

Present status: Numerous.

Range: N. America (from 50° North south to northern S. America).

Longevity: Up to 13 yrs.

Special comments: Although hunted for fur and flesh ("coon" hunting by moonlight with trained dogs is popular sport especially in Southern U.S.A.), will live on in settled areas, foraging in gardens, even in garbage pails in cities. Fur known in trade as "Alaska bear" or "Alaska sable".

Other statistics: Temp. 101°F. (38.3°C.)

CACOMISTLE or RING-TAILED CAT (*Bassariscus astutus*)

General characters: Raccoon-like, slender, lithe: although total length 2½', of which tail occupies 17", weighs only 2½ lb. Coat grey-buff, lighter underparts, with black patches on face. Ears large. Tail long, slender, ringed black and white. Feet well-furred, claws semi-retractile.

Habits: Nocturnal, sleep by day in dens among rocks or in holes in trees. Preyed upon by horned owls.

Habitat: Wooded, rocky country.

Food: Small mammals, small birds, insects, fruit.

Breeding: Mating time and gestation unknown. Litters of 3-4 born. May or June, wt. at birth 1 oz., white downy hair, blind, ears closed, eyes open 4 weeks. Weaned at 4 mths., but taking some solid food at 3 weeks and taken on hunting trips by mother at 2 mths. Sub-adult 4½ mths.

Present status: No precise information.

Range: South-western U.S.A. and adjacent areas in Mexico.

Longevity: Up to 8 yrs.

Special comments: Fur, known in trade as "civet cat" or "California mink", valuable. Persecuted also for reputation for raiding poultry. Yet so seldom seen that it is unknown to most people even in areas where it lives.

Other statistics: Temp. 100°F. (37.6°C.)

COATI or COATIMUNDI (*Nasua narica*)

General characters: Raccoon-like, with front legs noticeably shorter than hind-legs, long slender tail held erect but curled at tip. Long mobile snout. Coat reddish-brown, legs blackish, tail ringed with dark bands, bands sometimes confluent. Face with black and grey markings. Males, much larger than females, 50" long including 2' tail, 1' high at shoulder, weight 25 lb.

Habits: Skilful climbers, using tail as balancer. Active day and night, sleep-periods noon and midnight. Males solitary, females accompanied by young are gregarious.

Habitat: Forests.



Food: Vegetable, including fruit, insects, worms, small mammals, small birds.

Breeding: Gestation 71-77 days, young born spring or early summer, 4-6 in a litter, practically hairless and remain so for long time.

Present status: Not uncommon.

Range: U.S.A. (Arizona, New Mexico, Texas).

Longevity: Unknown.

Special comments: Snout so mobile as to be almost trunk-like. Animal appears to be long-sighted, using sensitive nose at short range.

Other statistics: Temp. 101°F. (38.2°C.)

(Several species, similar to *N. narica*, are found from Mexico to Peru.)

KINKAJOU (*Potos caudivolvulus*)

General characters: Long-bodied, short-legged, forelegs shorter than hind-legs. Head and body just over 1' long, tail 1½', height at shoulder 10". Coat dark gold to brown, fur soft, woolly. Eyes large, ears small. Tail prehensile (most unusual in carnivores).

Habits: Nocturnal. Agile climber—using tail monkey-like to grasp branches. Front feet used to carry food to mouth.

Habitat: Forests, in tree-tops.

Food: Mainly soft fruit, using mobile tongue to scoop out pulp. Also insects, small mammals, small birds.

Breeding: Mating time, gestation and time of litters unknown. Young, 2-4 at birth, covered with soft black fur, blind. Eyes open 10 days. At 7 weeks can hang by tail.

Present status: No information.

Range: Mexico southwards into S. America.

Longevity: Up to 19 years.

Special comments: Popular demonstration in zoos is to show kinkajou, with end of tail wrapped round keeper's arm, turning and climbing up own tail.

Other statistics: Temp. 98.4°F. (36.8°C.)

↳ PANDA (*Ailurus fulgens*)



General characters: Cat-like, 2' head and body length with rich chestnut woolly fur, black limbs and underside, white markings on face, with dark stripe from eyes to corners of mouth, and long brush-like ringed tail 16-22" long. Long claws, semi-retractile.

Habits and habitat: Arboreal, lives mainly in trees, resting in holes in trees in mountain forests 7,000 to 12,000' up. Slow and awkward on ground. Hiss and spit like a cat.

Food: Leaves and fruit-eating, but also takes eggs but whether, as sometimes stated, it takes insects, small mammals and small birds is highly doubtful.

Breeding: Gestation 90 days. Two young, born in spring, long period of helplessness.

Present status: Not uncommon locally.

Range: Nepal, Sikkim, Yunnan, Szechwan, Upper Burma.

Longevity: Unknown.

Special comments: Sometimes called Red Cat-Bear, also Lesser Panda, to avoid confusion with Giant Panda, it is one of most richly-coloured and attractive mammals, friendly, a favourite in zoos.

GIANT PANDA (*Ailuropoda melanoleuca*)

General characters: Bear-like, 6' long, with mere stump of a tail, 300 lb. weight. Fur thick, dense. Coat white, with black legs and shoulders, black ears and black round eyes. Forefoot has small pad which acts as a thumb for grasping. Cheek-teeth very broad. Skull deep with prominent ridges for attachment of powerful muscles needed in masticating fibrous shoots.

Habits: Little known.

Habitat: Bamboo forests on open hillsides.

Food: Mainly vegetarian, chiefly bamboo shoots, but will take small mammals (e.g. rodents), small birds, fish (flipped out of stream with paw).

Breeding: Mating probably in spring. One or two cubs in January (but gestation period unknown), weighing about 3 lb.

Present status: Little known because of secretive habits.

Range: Eastern Tibet and Szechwan, south-western China.

Longevity: Unknown.

Special comments: Known to the Chinese as *Beishung* (White Bear), the Giant Panda was made known to science in 1869 by Père David. Observation about eating some flesh made within last 10 yrs.

Family *MUSTELIDAE*

Legs short, teeth of carnivore-type with well-developed carnassial, usually anal scent glands.

STOAT (*Mustela erminea*)

General characters: Long-bodied, with short legs, male little over 1 long, including $4\frac{1}{2}$ " furry but not bushy tail, female much smaller. Fur reddish-brown, with white to whitish-yellow underparts, including throat. Tail same colour as back except for black tip. On mountains, in northerly latitudes, turns white in winter, but the end of tail remains black (condition known as ermine). Exceptionally a white stoat may be seen in southerly parts of range.

Habits: Mainly solitary, largely nocturnal but not infrequently seen by day moving over ground in series of low bounds; when alarmed runs with body low to ground and neck outstretched, speedy, agile in leaping, climbing trees or going to earth in a rat or mole burrow. Sight poor, acute sense of smell, hearing also acute. Family parties may remain together, which may account for packs occasionally reported, but columns of pairs moving across country also reported. Anal glands. used in moments of high excitement, as in sudden alarm, to secrete fluid with obnoxious smell. [Suggested hypnotising of prey may be due to immobility through paralysis of fear on part of prey. "Charming" tactics also used.]

Habitat: Very varied (mountains, hills, downs, plains, woodlands, moors, or cultivated land).

Food: Mainly rats, mice and voles, also rabbits and birds. (Will hunt rivers and brooks taking aquatic animals, including fish.) Will take eggs either eating on spot or rolling them away (also reported carrying them in forepaws and under chin, progressing by leaps on hind-legs).

Breeding: Mating Feb.-July, delayed implantation, birth in April or May of following year, 4-5 in a litter, blind, naked; female mates again immediately after birth of litter and young females of litter reach maturity about 2 mths. of age, mating in June or July, but not giving birth until following Spring.

Present status: Numbers reduced everywhere.

Range: Europe (S. to Pyrenees and Alps), S.W. and N. Asia (to Japan), N. Africa, N. America.

Longevity: No information.

Special comments: Species known in N. America as Bonaparte Weasel, Short-tailed Weasel or Ermine, and said to have litters of 6-13, young weighing $\frac{1}{4}$ oz. at birth.

Other statistics: Pulse, 300-420.

POLECAT, FITCHEW, FOU MART or FOUL-MARTEN (*Putorius putorius*)



General characters: Long-bodied with short legs, up to 2' 4" long including 8" of bushy tail, weight up to 2½ lb. Fur of long black guard hairs with a cream-buff underfur. Legs black and a black band along underside of body. Head broad, black with white markings on muzzle and between ears and eyes, both of which are small.

Habits: Mainly nocturnal, poor climber. In hunting takes advantage of low cover or depressions in ground. Defence lies in ejecting nauseous fluid from anal glands (hence foul-marten or fougart).

Habitat: Wooded and rocky country.

Food: Voles, rabbits, frogs especially, also rats, mice, lizards, fish, snakes (including viper), birds, eggs.

Breeding: Mating in February. Gestation 40-60 days. Litters of 3-8, mostly 5-6, blind young in April or May. Second litter may occur. Eyes open at 14 days.

Present status: Still common in most parts of range. Exterminated, except for certain Welsh valleys, from British Isles.

Range: Europe (north to central Scandinavia), northern Asia.

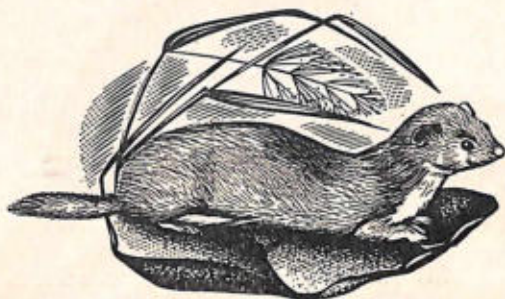
Longevity: 13 yrs.

Other statistics: Temp. 103°F. (39.3°C.)

Domestic Ferret or Fitchet (*Mustela furo*), similar dimensions to

Polecat but slightly smaller, and in its pure form completely albino. Although sometimes given species name *furo*, should preferably be named *P. putorius*. Origins of Domestic Ferret obscure, may be from Asiatic Polecat, certainly was domesticated by Roman times. In many parts ferrets have gone feral, have bred with wild Polecats, their offspring being known as Polecat-ferrets showing intermediate stages between albinism and full colour of Polecat.

WEASEL (*Mustela nivalis*)



General characters: Smaller edition of stoat, male about $8\frac{1}{2}$ " head and body, $2\frac{3}{4}$ " tail. Main differences from stoat are: no black on tail, fur redder and underparts whiter. Female much smaller than male and known in some parts of Britain as Cane Weasel (formerly believed to represent a distinct species).

Habits: Swift and agile, good climber, relentless killer, hunting mainly by scent. More diurnal than stoat, but both probably active by day and by night, alternating spells of activity with periods of rest.

Habitat: Varied, as in stoat, but more in lowlands.

Food: Rats, mice and voles, moles, small birds and frogs, also rabbits, and will take carrion. (Will swim after water voles, climb bushes and trees for eggs and nestlings of song-birds. Above all, small size and ease with which it can travel through their tunnels makes weasel main enemy of voles and mice.)

Breeding: Similar to those of stoat. Little known of extent to which the male assists in upbringing of the young. Breeding season March-August, gestation 35 days, 2 litters a year, second mating taking place soon after the first litter is born, suggests male is in close attendance on female during the breeding season. 4-6 in a litter, in a nest in a bank or hollow tree, lined with dried leaves or grass.

Present status: Numbers reduced by persecution on settled land.

Range: Europe, N. Asia (to Japan) and N. Africa.

Longevity: 7 yrs.

Other stoat-like members of *Mustelidae*:

Least Weasel (*Mustela rixosa*), of Europe (excluding British Isles), N. Asia and N. America. Male 7-9" long including 1½" tail, wt. 1-2½ oz., female slightly smaller, fur brown, underparts and feet white in summer, with black hairs at tip of tail, winter coat all white in northern parts of range. 3-10 young in underground nest lined with mouse fur. [Temp. 104-8°F. (40-4°C.)]

Long-tailed Weasel (*Mustela frenata*), of North America, differs from stoat mainly in longer tail, 23" total length, 7" tail, wt. 14 oz. Details of breeding: mating July-Aug., 4-9 young, born 220-337 days later, ½ oz. wt., blind, practically naked, take solid food at 3 weeks, eyes open 37 days, weaned almost immediately after; male helps feed young. [Pulse, 172-192.]

Black-footed Ferret (*Mustela nigripes*), 2' total length, including 6" tail, wt. 1½ lb., female slightly smaller, fur yellow-buff with lighter underparts, black feet, black tipped tail and black patch around eyes. Feeds mainly on Prairie Dogs and numbers have dropped with those of its prey. Range: U.S.A., northwards into Canada. Little known of breeding or habits.

MINK (*Lutreola vison*)

General characters: Similar in form to stoat, 28" total length of which 8" is tail, wt. 3½ lb., female ½ to ¾ size of male. Fur uniformly dark brown, with white throat patch.

Habits: Similar to those of stoat, but more given to swimming.

Habitat: Wooded marshlands.

Food: Small mammals, birds, frogs, snakes, fish, other small aquatic animals.

Breeding: Mating Feb.-March, male assists in care and feeding of young, gestation 40-76 days, litters of 3-10, finely haired, eyes open 24-35 days, weaned 5 weeks, leave parents 6-8 weeks, sexual maturity at 1 yr.

Present status: Numbers reduced in wild but widely farmed for fur.

Range: Europe, N. Asia, N. America.

Longevity: 10 yrs.

Special comments: Fur highly valued and under domestication numerous colour mutations produced [synthetic products tend to spoil market for furs].

Other statistics: Pulse, 216-242.

PINE MARTEN OF SWEET MART (*Martes martes*)

General characters: 2½' total length, including 6-9" of slightly bushy tail. Fur rich dark brown except on throat and chest where creamy-white, yellow or orange. Legs slightly longer than those of polecat, head broader with more sharply-pointed muzzle, eyes larger, also broadly-rounded ears. 5 toes on each foot bear long sharp claws, used in climbing.

Habits: Solitary, arboreal but also hunts on ground. Agile and acrobatic as a squirrel, can climb to the tops of even slender shoots almost giving under its weight, sure-footed in leaping from one branch to another.

Habitat: Pine woods mainly.

Food: Squirrels, rats, mice and voles, rabbits and hares, and birds, especially ground birds (also accused of taking poultry, even of attacking lambs), wild soft fruits.

Breeding: Little known except that female makes nest of grass among rocks or in a hollow tree, but may use an old crow's nest, relining it with grass. 4-6 in a litter, said to be 2 litters a yr. Gestation 8-9 weeks.

Present status: Reduced numbers from persecution.

Range: Britain, Europe.

Longevity: 13½ yrs.

Special comments: Abundant in Middle Ages, trapped and hunted for fur, later for ravages on poultry, now presence desirable to protect re-afforested areas from vermin.

Other species of marten include:

Beech Marten (*Martes foina*), of Europe (excluding British Isles and Scandinavia), most of Asia except extreme N. and S.E., similar to

Pine Marten in size and habits, but fur generally greyish-brown with limbs and tail darker and light area on throat and chest variable in extent, total length $2\frac{1}{2}'$.

American Marten (*Martes americana*), known in fur trade as American Sable, similar to Pine Marten but fur richer. Details of breeding: mating July-Aug., 1-5 young born 255-285 days later in grass-lined hollow tree or burrow, eyes open 39 days, weaned 6 weeks, leave parents 3 mths. Longevity: 17 yrs.

Fisher or Pekan (*Martes pennanti*), largest of martens, not known to live on fish but hunts in trees for squirrels. Larger and darker than Pine Marten and 1' longer, one of most valuable fur bearers of N. America, fur almost black. Breeding: Mating in April, 1-5 young born 350 days later, eyes open 35 days, leave nest at 3 mths.

Sable (*Martes zibellina*), from Urals to Japan, similar to Pine Marten but fur longer and finer, head more cone-shaped, ears larger, limbs longer and stouter. Owing to persecution for valuable fur now found only in isolated areas.

Himalayan Marten (*Martes flavigula*), of S. China, India, Burma and Malay, $2\frac{1}{2}'$ head and body, 18" slender tail, short sleek fur, dark brown above and orange on throat and chest.

African members of Mustelidae include Zorille (*Ictonyx striatus*), of whole of Africa, size of a ferret, longitudinally striped black and white, gestation 42-44 days, and Striped Weasel or Muishond (*Poecilogale albinucha*), both terrestrial, feeding on mice.

WOLVERINE OR GLUTTON (*Gulo luscus*)
(also known as Skunk bear or Carcajou)



General characters: Thick-bodied, short-legged, with shaggy coat 4' total length, including foot-long bushy tail, 14" at shoulder. Wt. up to 36 lb. Fur thick, loose, dark brown above, pale brown on sides, dark brown underparts. Ears small. Powerful claws.

Habits: Solitary; lacking speed it hunts by stealth. Climbs trees.

Reputation for destructiveness to hunters' food caches as well as to animals caught in traps. Fools all it fails to eat. Said to fear nothing it may meet. Powerful, will drag carcass 3 times own weight over rough ground.

Food: Kills almost anything it meets, especially deer. Even bear and puma said to be not safe from attack. Credited with eating more than any other carnivore, but also may fast for week or two.

Breeding: Mating February–April. Gestation 60–120 days (also record of 183 days, suggesting delayed implantation). 2–3 young born with thick woolly fur, in den in hollow tree or among rocks. Weaned 8–9 weeks.

Present status: Numbers reduced everywhere, but still not uncommon in parts of range.

Range: North America (from northern U.S.A. to Arctic), Arctic and sub-arctic regions of Europe and Asia.

Longevity: Up to 13 yrs.

Special comments: Fur in demand because will not freeze, but persecuted also for its gross destructiveness.

STRIPED SKUNK (*Mephitis mephitis*)



General characters: Cat-sized, 30" long including $7\frac{1}{2}$ " of tail. Fur long, harsh, with soft underfur, black with white on face and neck, and a white stripe diagonally along sides of body. Legs short, hind-feet plantigrade, soles nearly naked, claws strong, curved. Tail bushy. Male and female alike.

Habits: Well-known method of defence is by ejecting nauseous fluid from anal glands. This is preceded by 3-stage warning movements: (a) stamping forefeet on ground, (b) erecting tail, with tip hanging down, and (c) raising tip. Fluid amber-coloured, jet may travel 12', most disagreeable and lasting odour may spread over radius of $\frac{1}{2}$ -mile. Can cause blindness if fluid in eyes; burns skin and hair. Not used against another skunk.

Habitat: Woods, plains.

Food: Mainly insects, small rodents, some fruit, eggs, small birds, frogs, snakes, crayfish.

Breeding: Gestation 42-63 days. Litters 4-10 young, born blind, finely haired. Eyes open 21 days. Weaned 6-7 weeks, but taken on hunting trips by mother towards end of period.

Present status: Trapped for fur, but protected in some places for killing vermin. Heavy mortality on roads from motor vehicles.

Range: U.S.A. (except for Florida and other parts of south), southern Canada.

Longevity: 6 yrs.

Special comments: Mortality on roads because it stands ground and relies on nauseous fluid to resist attack instead of running from danger.

Other statistics: Pulse, 144-192.

Other skunks include:

Spotted Skunk (*Spilogale putorius*), of most of U.S.A., 22" total length of which 9" tail, body marked with wavy white stripes, and some spots, tail white underneath and on outer half, 3 lb. wt., female smaller than male. Breeding: mating Feb., 2-10 young, $\frac{1}{8}$ oz. wt., 4" long, eyes open 32 days, weaned 56 days. Fur of little value but this species valuable in destroying rats and mice. Sometimes kills poultry, also carries rabies, rarely transmitted to humans. Occasionally known as "Civet", not to be confused with Civets of Old World.

Hog-nosed Skunk (*Conepatus mesoleucus*), of S. U.S.A., total length 33" including 14" tail, wt. 10 lb., top of head, back and tail white (also called White-backed Skunk), pig-like snout for rooting out insects. Related species southwards to Argentine.

Hooded Skunk (*Mephitis macroura*), deserts of S.W. U.S.A. and Mexico, similar to Hog-nosed Skunk, but tail longer than head and body, and back striped black and white.

TAYRA (*Tayra barbara*)

General characters: Otter-like, 3½' total length, of which half is tail. Fur dark brown with lighter spot on chest, head and neck grey (but coloration variable).

Habits: Nocturnal mainly, but may be active up to midday, then rests in hollow tree, among rocks or in Armadillo burrow. May hunt in packs of 15-20.

Habitat: Forest and grassland.

Food: Rodents, birds, eggs.

Breeding: Little information: 2 young, blind but furred.

Present status: No information.

Range: Mexico, through Central America to Argentine.

Longevity: No information.

BADGER (*Meles meles*)

General characters: 3' head and body, 4-6" tail, less than 1' at shoulder. Fur greyish, black underparts and legs. Head white, black band running from each ear, through the eye and nearly to tip of muzzle. Stout-bodied, eyes and ears small, sense of smell dominant, eyesight probably little use, legs short, 5 toes on each foot bearing long claws, those on front feet longer

Habits: Nocturnal but may be inclined to remain underground when moonlight strong. Normally moves with an ambling trot, pausing frequently to sample air with nostrils or to listen; when disturbed can move rapidly over ground; clean habits, hole dug and used as latrine, bedding renewed in autumn and again just before cubs are born, also records of badgers burying their dead. Scent-glands come into operation in moments of fear or excitement, as in play which precedes mating (smell of musk). Often said to hibernate, but no evidence of this in Britain, although hibernation does take place in colder parts of Europe. [Burrow, known as set (or sett), may have one entrance leading into a large chamber about 2' high, but usually more than one entrance, as many as 50, whole set then occupying an acre. May be many chambers and connecting tunnels, sometimes occupying three storeys. Some well-established sets are believed to be hundreds of years old. Extent of the tunnelling indicated partly by the large amount of earth thrown out and partly by length of some tunnels, which may be 60 or even 100 yd. long.]

Habitat: Wooded country, particularly on slope of a hill, or in a sunken road or other high bank into which they can burrow, such as old quarries or sandpits, but may be in treeless localities.

Food: Animal and vegetable matter: insects and grubs, slugs, snails and earthworms, small mammals, especially young rabbits, fruits and

grass, bulbs and roots. Occasionally a badger will kill poultry but apparently no evidence of lamb-killing.

Breeding: Mating July to early August, may extend into Sept., 2-3 cubs born Feb.-April, cubbing being earlier in southern parts of range; cubs remain with parents, which probably mate for life, until September or early October. Delayed implantation accounts for apparently long gestation period. That is, after fertilisation ovum develops to blastocyst which does not become embedded in wall of uterus for 5 mths. Little further growth until blastocyst implanted, after which growth is rapid. Cubs born blind, nearly 5" long, with a short dirty white fur, facial markings not very conspicuous, eyes open at 10 days, cubs first come above ground at 6-8 weeks.

Present status: No indication of marked reduction in numbers.

Range: Europe and northern half of Asia (British Isles to Japan).

Longevity: 12 yrs.

Hog-Badger (*Arctonyx collaris*) replaces *Meles meles* in S.E. Asia; hog-like snout, roots in ground like a pig.

AMERICAN BADGER (*Taxidea taxus*)

General characters: Similar to European badger but smaller and less conspicuous pattern on head, 30" total length including 6" tail, average wt. 12-24, fur grizzled grey and black, strong claws on front feet.

Habits: Terrestrial, burrowing, but can swim and climb, cleanly habits. When surprised in open, burrows so rapidly that earth thrown up as if a geyser.

Habitat: Chiefly open plains and prairies.

Food: Squirrels, prairie dogs and other burrowing rodents, birds, eggs, lizards, snails, insects, carrion.

Breeding: Mating Sept.-Oct., 1-5 young, born March-April, blind, furred, eyes open 4-6 weeks, weaned 6 weeks, leave parents Aug. [Gestation 183-365 days, delayed implantation.]

Present status: Numbers greatly reduced.

Range: S.E. Canada southwards through U.S.A. to Mexico.

Longevity: 13 yrs.

Other statistics: Pulse, 128-144.

RATEL or HONEY BADGER (*Mellivora capensis*)

General characters: Superficially like European badger without white stripes on head. Head and body 30" long, tail 10". Light grey, sometimes white, above, underside black. Legs short, stout claws for digging. Can eject offensive secretion from anal glands.

Habits: Terrestrial, nocturnal, noted for courage and tenacity. Usually in pairs. Powerful teeth and claws, thick coat, tough loose skin enable it to defy most enemies. Thick skin gives immunity to wasp stings. Burrows with great speed, climbs trees well. Rolls head over heels for no obvious reason.

Habitat: Varied, but especially wooded hillsides or high banks of rivers.

Food: Small animals of many kinds (rats, birds, frogs, insects), carrion, honey. (Evidence for exhuming human remains, hence Indian name of "grave-digger". Said to be guided to honey by bird, honey-guide.)

Breeding: Gestation 150 days. 2 young born in holes in ground or among rocks.

Present status: No information.

Range: Most of Africa, Arabia, India.

Longevity: No information.

COMMON OTTER (*Lutra lutra*)



General characters: Long-bodied with short legs, tail long, thick at root, flattened horizontally, then tapering. Head and body $2\frac{1}{2}$ ' long, tail $1\frac{1}{2}$ '. Wt. of dog-otter 20-25 lb., of bitch 15-18 lb. Height at shoulder 7-8". Fur sleek, dark brown, paler underparts, often with white or light-coloured patch on throat. Coat consists of close under-fur, fawn-coloured and waterproof, and outer layer of long stiff guard-hairs grey at base and brown at tips. Feet webbed, 5 toes on each

bearing small claws. Head wide and flat, muzzle broad. Eyes small, ears small and largely hidden in fur.

Habits: Solitary except at mating, nocturnal, secretive. A single otter will fish about 6 miles of river or wander overland, perhaps 15 miles in a night. Sleeps in a holt, which may be a hollow in a bank, overhung by exposed roots of trees, in disused drain or hollow tree. Usually bare earth but may be lined with reeds or grass. Holt may also be pollarded willow or old rabbit burrow.

Habitat: Especially in small rivers running direct to sea: polluted rivers or those cleaned of weed, and those disturbed by human activity, tend to be avoided. There may be seasonal or sporadic migrations to sea-shore, usually when food is scarce inland, and in some parts otters are permanently resident on shore (these sometimes called erroneously "sea-otters").

Food: Mainly fish, but includes small invertebrates, birds and mammals, frogs, some vegetable matter. Fish taken mainly eels or slow-moving fish, but will take salmon and trout. Small invertebrates mainly crayfish and swan mussels. Young of water-birds taken as well as some small land-birds. Vegetable matter (recorded from tame otters) includes fungi, carrot and fruit.

Breeding: Mating takes place in water, in any month of year, with a peak in spring or early summer. Gestation probably 61 days. Dog has little to do with upbringing of cubs, but may exceptionally help bitch, who chooses a secluded spot, by a tarn, reservoir, in a wood, or even under a pile of brushwood to have her litter. Cubs 2-3 (maximum 5) in litter, born blind and toothless, with a silky coat of dark hair. Eyes open at 35 days (much disagreement on this, but only reliable record gives 35 days). Cubs remain in nest for (probably) 8 weeks. Must be forced or coaxed by bitch into taking first swim. Remain with mother until she mates again. Only one litter a year, as a rule.

Present status: Numerous.

Range: Europe and Asia, to Japan and Kuriles, but absent from northern Siberia, Crimea and plains of Central Asia.

Longevity: 15 yrs.

Special comments: No hibernation: tracks seen in snow and fishing takes place under ice, with periodical visits to "fishing hole" to breathe. Readily tameable if taken young, otters are very playful, sliding down muddy banks, in snow or over ice. Indulge in play on land and water, rolling and tumbling, often use plaything such as pebble. Pair of scent glands under tail.

Canadian Otter (*Lutra canadensis*), of Alaska, Canada and U.S.A., similar to European Otter except reaching slightly greater size. Also known as River Otter in contrast with N. American Sea Otter (q.v.).

Indian Small-clawed Otter (*Amblonyx cinerea*), of S.E. Asia, generally much smaller than European Otter and with functionless claws.

Clawless Otter (*Aonyx capensis*), not uncommon in S.E. and W. Africa, larger than European Otter, a marsh-dweller, feeding on frogs and molluscs.

Giant Brazilian Otter (*Pteronura brasiliensis*), of Amazon basin, 6½' total length, tail laterally compressed.

SEA OTTER (*Enhydra lutris*)

General characters: Specialised otter, 4' long including foot-long tail, wt. up to 80 lb. Hind-feet long, broad, flipper-like. Forefeet comparatively small. Fur dense, thick, glossy, brownish-black sprinkled with white-tipped hairs. Ears almost hidden in fur. Eyes small. Teeth number 32, against 36 of river otters. Chief enemy is Killer Whale.

Habits: Spends much of time floating on back in kelp-beds. Seldom comes on land.

Habitat: Kelp-beds just offshore. Entirely marine.

Food: Chiefly shellfish and sea-urchins, crushed with powerful teeth. Known to dive 300' for food. Sometimes brings up flat stone as well, turns on back at surface, places stone on chest and smashes sea-urchin on it.

Breeding: Elaborate courtship. Mating throughout year. Gestation 240-270 days. Usually 1 young, occasionally 2, born at sea, furred, eyes open, fully-developed teeth and able to swim. Nursed for 1 yr, mother holding young in arms to sleep as she swims on back.

Present status: Wholly protected 1912 and now recovering, particularly along coast of California.

Range: Formerly Kuriles, Bering Sea, Alaska, Pacific coast of Canada, California.

Longevity: Unknown (but not mature until 4 yrs).

Special comments: Carries most valuable of all furs, known in trade as Kamchatka Beaver. Once abundant it was hunted to brink of extinction by 1900 in American waters.

Other statistics: Temp. 101-2°F. (38.5°C.)

Family VIVERRIDAE (Civets, Genets, Mongooses)

Frequently striped or spotted, active hunters of small vertebrates; slender muzzle, long tail and, usually, non-retractile claws. Anal scent glands often well developed. Distinguished from Felidae by presence of 5th toe on hind-feet.

Remarks: Varied family which largely replaces in Africa and tropical Asia the Mustelidae of cooler regions. No Viverridae has value as a fur-bearer, but some have been much hunted for valuable musk from scent glands.

CIVETS

Details of habits not extensively known and species therefore summarised:

African Civet (*Civettictis civetta*), of Africa, S. of Sahara. Thick body $2\frac{1}{2}'$ long, tail $1\frac{1}{2}'$ long. Fur ash-grey with black spots and stripes, tail ringed, black and white. Nocturnal, keeps to cover, seldom seen, preys on poultry, young domestic animals and maize crops.

Large Indian Civet (*Viverra zibetha*), of India, Burma and S. China about same size, appearance and habits as African Civet. [Longevity, up to 15 yrs.]

Small Indian Civet (*Viverricula indica*), S. China southwards to Ceylon and S.E. to Bali, smaller than Large Indian Civet, was introduced into Madagascar by Malayan trading vessels on which it was kept to hunt rats.

Binturong (*Arctictis binturong*), of Assam to Borneo, 4' total length, long-haired and long hairy tail, short broad head, tufted ears, fur black. Slow moving, arboreal, fruit eating, has prehensile tail.

Common Indian Palm Civet (*Paradoxurus hermaphroditus*), also known as Toddy Cat from habit of sampling palm wine fermenting in cups attached to tapped trees. Has related races in S. China, Ceylon, Malaya and the Philippines. Slender 2' head and body, tail of equal length. Fur



dark grey or brown, with spots. Nests in holes in trees and in rocks where its 3 to 4 young are born. Often lives in or near human dwellings, as under roofs of bungalows, feeding on rats and stored food of all kinds, including coffee berries. Nauseous secretion from an anal gland used for defence, as in skunk.

Masked Palm Civet (*Paguma larvata*), of S.E. Asia, has rich unspotted ochreous fur with head striped black and white.

African Palm Civet (*Nandinia binotata*), Cameroons to Kenya and Nyasaland, although has numerous black spots all over rich brown body, also known as Two-spotted Palm Civet, because of two pale, indistinct spots on shoulders. Tail long, ringed. Never found away from forests. Soles of feet flesh-pink, naked, probably assist in climbing.

Banded Palm Civet (*Hemigalus derbyanus*), of Tenasserim, Malaya and Borneo, 20" head and body, tail 15" long, long slender muzzle and broad light bands across back.

Owston's Banded Civet (*Chrotogale owstoni*), Indo-China, rare, fur short, pale grey-buff with broad transverse black bands. Food: fruit and earthworms.

Otter Civet (*Cynogale bennetti*), from Malaya, Sumatra and Borneo, rare, very like an otter, 2½' total length, legs short, tail cylindrical, head flat with large white whiskers and sleek brown fur. Food largely fish and frogs.

Fossa (*Cryptoprocta ferox*), largest carnivore in Madagascar, related to civets, 5' total length, resembles tawny, short-legged, long-tailed cat with a long body. Has reputation of ferocious killer of animals of all kinds, but recent observations suggest this is undeserved.

FELINE OF SMALL-SPOTTED GENET (*Genetta genetta*)



General characters: Cat-like but more slender, elegant. Head and body 22" long, tail 18" long. Head tapering to pointed muzzle. Ear oval, whiskers long. Legs short, toes with retractile claws. Fur soft, spotted with black on light ground, tail ringed with dark and light bands, dorsal crest of black erectile hairs.

Habits: Solitary or in pairs, nocturnal, terrestrial but readily climbs bushes and trees. Stalks prey, moves snake-like through grass with tail extended, body lowered. Aggressive display includes crest erected, tail fluffed like bottle-brush, and loud purr (like kettle boiling).

Habitat: Bushland generally.

Food: Small mammals and birds, insects, some grass.

Breeding: No information.

Present status: Common.

Range: Europe (Spain, S. France), Africa (generally over most of continent).

Longevity: Not known (but Tigrine Genet 7 (max. 13 yrs.).)

Blotched or Tigrine Genet (*Genetta tigrina*): Most abundant genet throughout Africa. Similar to *G. genetta* in form and habits, but larger spots, more yellow ground colour, no dorsal crest.

Rusty-spotted Genet, Rooikolmuskejaatkat (*G. rubiginosa*): Africa (Nyasaland southwards). Very similar to *G. tigrina*, and considered by some authorities to be a colour-phase of it.

Abyssinian Genet (*Genetta abyssinica*): Abyssinian highlands. Small, fur pale ash-coloured with longitudinal black stripes. Very rare.

Victorian Genet (*Genetta victoriae*): Ituri Forest, Congo. Similar to *G. genetta* in markings but richer colours and $3\frac{1}{2}'$ total length. First skin sent to London in 1911 from Lake Victoria (hence name) by Sir Harry Johnston, but not found there. Little known of it except for skins obtained by Ituri African hunters.

Water Genet (*Osbornictis piscivora*): Related to true genets. Little known except from 3 skins: size of domestic cat, rich unspotted chestnut fur, white markings on face, black bushy tail. Lives near streams in depths of Ituri Forest, Congo. First made known to science in 1919.

BANDED LINSANG (*Prionodon linsang*)

General characters: Similar to a genet, $2\frac{1}{2}'$ total length, of which half is tail. Fur short, thick, velvety. Ground colour greyish, marked with 6 broad irregular transverse brownish-black bands. Tail marked with dark and light rings. Claws retractile.

Habits: Solitary, nocturnal, arboreal.

Habitat: Wooded country.

Food: Mainly small birds, some small mammals, insects.

Breeding: 2 young at birth (no other information).

Present status: No information.

Range: S.E. Asia (Tenasserim to Sumatra).

Longevity: No information.

SPOTTED LINSANG (*P. pardicolor*)

Similar in size and habits to Banded Linsang, but coat orange-buff marked with regular rows of dark spots. Asia (Nepal to Indo-China).

✓ INDIAN GREY MONGOOSE (*Herpestes edwardsi*)
(better known under *H. mungo*)



General characters: Uniformly grey or rufous. Head and body 15-18", tail 14-15".

Habits: Terrestrial, solitary or in pairs, resting in holes dug by itself, mainly diurnal.

Habitat: Thickets, hedgerows, cultivated ground, among trees but not commonly in dense forest.

Food: Rats, mice, lizards, snakes, birds, eggs, insects, fruit, especially noted for killing venomous snakes.

Breeding: Little information; 3-4 young in spring.

Present status: Still numerous (introduced Malay States).

Range: Arabia to Nepal, Assam, Peninsular India, Ceylon.

Longevity: Average 5 (max. 8) years.

Egyptian Mongoose or Ichneumon (*Herpestes ichneumon*)

Southern Europe, Africa (from Egypt to Cape). Grizzled iron-grey, head and body 24", tail black-tipped, 18" long. Frequents reed-beds. (Sacred to Ancient Egyptians.)

Small Indian Mongoose (*Herpestes auropunctatus*)

Persia to Nepal, northern India, Assam, Burma, Siam, Malay States. Introduced W. Indies, Hawaii. Similar to Indian Grey but head and body 12", tail 12".

Javan Mongoose (*Herpestes javanicus*)

Siam, Malay States, Java. Similar in size to Indian Grey.

Ruddy Mongoose (*Herpestes smithi*)

Rajputana and Bengal southwards to Ceylon. Tail black-tipped.

Indian Brown Mongoose (*Herpestes fuscus*)

S. India, Ceylon, in hills, 3,000–6,000'.

Stripe-necked Mongoose (*Herpestes vitticollis*)

S. India, Ceylon. Largest Asiatic species, black stripe each side of neck, black tip to tail.

Crab-eating Mongoose (*Herpestes urva*)

S. China, Nepal, Burma, Malaya. Nearly 4' long, including tail, feeds on shellfish, crabs, will dive for fish.

White-tailed Mongoose (*Ichneumia albicauda*)

S. Arabia, Africa (S. of Sahara).

Marsh or Water Mongoose or Kommetjiegatmuishond (*Atilax paludinosus*)

Africa (S. of Sahara): solitary, shy, lives among thick vegetation on riversides, feeds on insects, crabs, frogs, freshwater mussels, lizards, small birds, rodents. Remarkable for cracking open mussels: carries mussel to rock, holds it in front paws, lifts it as high as possible, throws mussel with force on to rock.

Banded or Zebra Mongoose, Gebande Muishond (*Mungos mungo*)

Africa (S. of Sahara). [Longevity, up to 8 yrs.]

Dwarf Mongoose, Dwergmuishond (*Helogale parvula*)

Africa (S. of Sahara). Lives in tunnels and galleries of disused termite nests. Feeds on insects and small mammals.

Grey or Slender-tailed Meerkat, Suricate, Graatjiemcerkat,
Stokstertmeerkat (*Suricata suricatta*)

S. Africa. Gestation 21 days.

Angolan Kusimanse (*Mungos ansorgei*)

N.W. Angola, Belgian Congo.

Meller's Mongoose, Mellerse Muishond (*Rhynchogale melleri*)

Africa (Transvaal to Tanganyika).

Bushy-tailed or Four-toed Mongoose, Dikstertmuishond:
(*Bdeogale crassicauda*)

Portugese E. Africa to Kenya.

Sclous' Meerkat, Kleinwitstertmuishond
(*Paracynictis selousi*)

Africa S. of Congo.

Red or Bushy-tailed Meerkat, Yellow Mongoose, Geelmeerkat,
Rooimeerkat (*Cynictis penicillata*)

Africa S. of Southern Angola.

Family HYAENIDAE (Hyenas, Aardwolf)

Typically with massive heads, shoulders markedly higher than hindquarters, powerful jaws and teeth, ears large, tail and hind-legs short, 4 toes on each foot (Aardwolf has 5 toes on forefeet, 4 on hind-feet).

STRIPED HYENA (*Hyaena hyaena*)

General characters: 5' total length, including 18" tail, male 30" at shoulder and 85 lb. wt., female slightly smaller. Coat, grey with blackish stripes, and mane or crest of longer hairs, thin in southern parts of range, more woolly to north.

Habits: Nocturnal, lie up in old porcupine burrows or among rocks by day, forage at night in pairs or family parties. Voice a chattering



laugh, or like wind howling. Sight poor, sense of smell keen. Has been observed to "sham dead".

Habitat: Almost any country except thick forest.

Food: Mainly carrion.

Breeding: Gestation 90 days, 2-4 in litter, eyes and ears closed, born in holes in ground or under rocks.

Present status: Numbers reduced in parts of range.

Range: N.E. Africa, Arabia, India.

Longevity: 24 yrs.

Other statistics: Pulse, 55-58.

Other hyenas include:

Spotted Hyena (*Crocuta crocuta*), of E. Africa, abundant where game plentiful, shares lions' kills but will attack sheep, goats, cattle, rarely humans, slightly larger than Striped Hyena, fur yellowish-buff to tawny or greyish with numerous brown spots, 1-2 young have thick woolly coat. Credited with imitating man's voice or of calling men by name. [Longevity, 25 yrs.]

Brown Hyena or Strandwolf (*Hyena brunnea*), of S. Africa, intermediate in size between Striped and Brown Hyenas, long hair, no dorsal crest, fur dark brown with indistinct stripes, feeds on marine carrion in coastal regions.

Aardwolf (*Proteles cristatus*), of E. and S. Africa, resembles Striped Hyena but much smaller and has relatively larger ears and pointed muzzle, seldom seen, jaws weak, teeth small, feeds on termites, defence in ejection of obnoxious fluid from anal glands.

Family FELIDAE

5 toes on forefeet, 4 on hind-feet, all except Cheetah bear sharp

claws capable of being retracted into sheaths, canine teeth large, check-teeth few, only the large carnassial well-developed, eyes have contractile pupils.

EUROPEAN WILD CAT (*Felis sylvestris*)

General characters: Resembles domesticated tabby but more heavily built. 2' long, with tail adding another foot, wt. 10-15 lb. Fur richer than in domesticated tabby, yellowish-grey with black bands over flanks and black stripe running down mid-line of back. Tail shorter in proportion than in domesticated cat, marked with black rings and black tip; ends bluntly.

Habits: Solitary, male and female together only for mating. Hunts mainly at night, using stealth.

Habitat: In rocky or wooded places, usually with a safe retreat among rocks.

Food: Hares, rabbits and grouse, and any other small mammals and birds it can overpower. Raids on poultry and killing lambs main reason why it has been wiped out in much of its range. Welcomed in deer forests because it keeps down hares which spoil a stalker's approach; and in plantations as a check on rabbits and other "vermin" which damage young trees.

Breeding: Gestation 68 days. 4-5 kittens born in a nest in a cleft in rocks, in hollow tree or in fork in tree, guarded securely by ferocity of mother. Almost unapproachable while still in nest; even kittens will spit and fight if handled. Very few taken alive; all proved untameable.

Present status: Two centuries ago Wild Cat still found in parts of England and Wales, and over much wider areas in Europe, but records show same complaint against it, of damage to poultry, lambs and kids. Numbers now much reduced everywhere.

Range: In Britain only Scottish Highlands (but numbers on increase and cat moving south). In Continental Europe chief strongholds in mountains, especially Balkans, and also found in eastern Europe and Asia Minor.

Longevity: 16 yrs.

Special comments: So-called Wild Cats sometimes reported are feral domesticated cats. Although these do no attack human beings unless molested, will fight with fury anyone who tries to take them, as do true Wild Cats. Domesticated tabby not derived from European Wild Cat in spite of likeness, but from an African species, although from which one is still in doubt.

Other wild cats of similar size to *F. sylvestris*, include:

African Wild Cat, Caffer Cat or Bush Cat (*F. lybica*), widely distributed over Africa, also Sardinia, Corsica, Majorca, S.W. Asia

(Arabia to Pakistan): closely related to *F. sylvestris*, and marked like it, terrestrial and keeps to cover.

Jungle Cat (*F. chaus*), of N.E. Africa and S. Asia: similar in size and habits to *F. lybica* but fur a uniform drab or yellowish-grey.

Sand Cat (*F. margarita*), of deserts in W. Sahara, Arabia, Transcaucasia: fur soft, sand-coloured, black marks on legs and tail, soles of feet hairy enabling movement over soft sand.

Marbled Cat (*Pardofelis marmorata*), of S.E. Asia: nocturnal, lives in forests, fur thick, soft, blotched and marbled.

African Tiger Cat (*Profelis aurata*), of equatorial rain forests: remarkable for its 2 colour phases, red and grey; phases not permanent, a red individual may be grey after a moult, or vice versa.

Golden Cat or Temminck's Cat (*Profelis temminckii*), of S.E. Asia: slightly larger than *F. sylvestris*, also has 2 colour phases, red or grey and either may be spotted or unspotted.

Pallas' Cat (*Otocolobus manul*), of Central Asia, Tibet, Kashmir: size of domestic cat, soft pale fur, lives among rocks, has head broad and flattened, ears set low and eyes set high on head enabling it to peer over edges of rocks without exposing itself. Food mainly pikas.

Medium-sized cats include:

Clouded Leopard (*Neofelis nebulosa*), Nepal and S. China southwards through Malaya to Borneo: lives in forests, preys on deer, 6' total length, mottled coat, remarkable for length of upper canines. Habits almost unknown.

Serval (*Leptailurus serval*), of Africa S. of Sahara: long-legged, short-tailed, yellowish with bold black stripes and spots, 20" at shoulder, noted for large ears. Has 2nd colour phase in which stripes replaced by fine powdering of specks; known then as Servaline Cat. Gestation 68-74 days.

Caracal or Desert Lynx (*Caracal caracal*); over most of Africa outside the equatorial forest belt, Palestine, Arabia, Persia to N. India: Lynx-like ear-tufts, short tail, long legs and short-haired coat, but nearly related to Serval. 27" head and body, tail 10", coat a uniform reddish-fawn, ears large and black with tufts. Typical habitat open savannah and semi-desert. Caracals now extinct or very scarce in many parts of former range. Food: Mammals and birds.

OCELOT, TIGER-CAT, PAINTED LEOPARD OF LABBA-TIGER (*Leopardus pardalis*)

General characters: Medium-sized, with long legs. Total length up to 4', tail 15". Wt. up to 35 lb. Coat short-haired, buff or clear grey, marked with bold pattern of black or dark-brown spots and blotches. Ears black, upper cheeks white. Tail ringed.



Habits: Mainly nocturnal, often hunting in pairs, keeping in touch with a mewling call. Climbs trees.

Habitat: Densely-wooded country.

Food: Small mammals, birds, reptiles, frogs, also young of domestic stock, poultry.

Breeding: Mating June and July. Gestation about 90 days. Nest of grass and other soft materials, in hollow log or among rocks. Litters of 2 young well-furred but blind.

Present status: No precise information.

Range: South America (Paraguay northwards), Central America, North America (north to southern U.S.A. border).

Longevity: Not known.

JAGUARUNDI, EYRA OR OTTER-CAT (*Herpailurus jaguarundi*)

General characters: Medium-sized, short legs, long otter-like body. Total length 50", tail 21", height at shoulder 12", weight up to 20 lb. Fur rusty-red or iron-grey (two distinct colour phases), unspotted.

Habits: Spends much of time in or near water.

Habitat: Dense brushland, especially near water.

Food: Small mammals, birds, reptiles, frogs, insects, fish.

Breeding: Little recorded.

Present status: Not known: probable that animal is more numerous, and ranges farther than is recorded, because difficult to find in dense cover.

Range: S. America (Paraguay northwards), Central America, N. America (to southern U.S.A. border).

Longevity: Unknown.

Special comments: 2 colour phases do not represent distinct species, since a litter may contain young of both colours.

LION (*Panthera leo*)

General characters: Male up to 9' total length, tail up to 3', height at shoulder $3\frac{1}{2}'$, wt. 400-550 lb. Coat tawny. Mane variable, tawny to black, well-developed or thin, and in some districts lions may be maneless. Lioness smaller than lion. (Measurements are taken from dead lions and can vary as skin is stretched in curing: records of lions more than 9' long are suspect.)

Habits: Live mainly in groups, or prides, of 10 to 20; co-operate in hunting and in defence. Ambush or stalk prey: said to reach 60 m.p.h. in short bursts, leap 12' high or 40' on level.

Habitat: Open country with scrub thickets, spreading trees or reed beds.

Food: Zebra and antelope (mainly, in Africa, other large or medium-sized herbivores); seldom touch domestic stock unless wild prey scarce.

Breeding: At prime at 5 yrs., breed at 2 yrs. Males polygamous. Gestation 105-112 days. Litter of 2-5 cubs, spotted fur, blind, and eyes open at 6 days. Weaned at 3 mths., kill for themselves at 1 yr.

Present status: Formerly widespread over southern Asia, Asiatic Lion now found only in Gir Forest, Kathiawar, India (about 300 in a reserve). Much reduced numbers in Africa: Cape Lion and Barbary Lion extinct, and lions generally face extinction in many settled areas.

Range: Gir Forest, India. Much of Africa south of Sahara.

Longevity: Up to 30 yrs.

Special comments: Age, injury or pressing hunger may drive lions to prey on livestock or humans. Most outstanding man-killing by

Man-eaters of Tsavo, when small number of lions held up building of Uganda Railway. "Claw" on end of tail due to injury to end of vertebral column: no truth in story of lion lashing with tail to spur itself to attack.

Other statistics: Pulse, 40.

TIGER (*Felis tigris*)



General characters: Little difference in size between tigers and lions (q.v.). Average length of male 9-9½', wt. 400-500 lb. Tigress a foot or so less and weighing 100 lb. less. Ground colour fawn but varies from yellowish-brown to rufous-fawn, rarely whitish, with white underparts, stripes black to blackish-brown. Indian tigers short-haired, richly coloured, in Malaya smaller, in Siberia and Manchuria larger with thick shaggy coats. Voice a short roar when angry or charging, growl or loud whoof when surprised, and a "belling" said, probably erroneously, to be used to call up Sambar Deer.

Habits: Intolerant of great heat, probably indicating northern ancestry. Seeks dense shade to escape heat of day, or lies in water. Good swimmer. Normally does not climb, but has been seen to climb trees occasionally. Usually avoids encounter with man.

Habitat: In dense cover, especially in reedy swamps by big rivers; will swim long distances to hunt on estuarine islands.

Food: Small game to large animals, such as buffalo. (Zoo animals take 10 lb. meat a day.)

Breeding: Males polygamous. Gestation 105-113 days. Litters usually 2-3 cubs, but may be 6. Young striped at birth, blind, 2-3 lb. wt., eyes open 14 days, weaned at 6 weeks, kill for themselves at 7 mths., stay with parents 2 years, mature at 3 yrs.

Present status: Plentiful in India and Malaya, less so in Siberia, Manchuria.

Range: Asia, Siberia to India (not Ceylon) and Malaya: discontinuous distribution because not found in desert or arid country. Fossils in Northern Siberia, coupled with habits, suggest migration southward within recent geological time.

Longevity: Up to 25 yrs.

Special comments: Age, injury may turn tiger to cattle-killing or man-eating. Man-eating tiger more destructive of human life than any other carnivore.

Other statistics: Pulse, 64.

LEOPARD (*Felis pardus*)
(= Panther of sportsmen)



General characters: Size variable from one part of range to another. Males average total length 7', exceptionally may measure 8'. Tail up to 38". Wt. up to 150 lb. Females smaller. Colour and length of fur varies with locality and climate: richest furs from China. Ground colour tawny-yellow, whitish on underpart, with black spots mainly arranged in rosettes. Melanism not infrequent, especially in areas of heavy rainfall. Black panther is a melanistic leopard.

Habits: Mainly solitary, except at breeding season. Swims well, powerful leaper (up to 10'), good climber of trees, amazingly powerful for size. Its wariness, keen senses and ability to hide make it a great pest to villagers: more troublesome to track down and kill than larger Felidae. Voice a harsh coughing or a sawing roar.

Habitat: Forest, bush, scrub, rocky hillsides: anywhere where cover is available.

Food: Great variety of small game: porcupines, pigs, monkeys, deer, antelope, young domestic livestock. Especially fond of dogs: will

enter a bungalow to carry off dog. Will scare monkeys out of tree-tops to ground, where they are easily caught. Known to drag a carcass larger than self into tree, away from jackal and hyena.

Breeding: Gestation period 90-95 days. Litters of 2-3 cubs, rarely 5.

Family remain together until cubs sub-adult.

Present status: Not uncommon, but much reduced in settled areas.

Range: Asia (especially Southern Asia), Africa.

Longevity: Up to 23 yrs.

Special comments: As enemies of pigs and baboons, which ravage crops, leopards confer direct benefit on cultivators. Man-killing leopards not frequent, but are scourge because of difficulty of dealing with them. One man-killer reported to have killed 200 people in 2 years.

JAGUAR (*Felis onca*)



General characters: About same size as a leopard but heavier build. Length up to 7' including 2' of tail, 28" at shoulder. Wt. up to 300 lb. Female slightly smaller than male. Ground colour yellow, becoming whitish on underparts, marked with black spots up to 1" diam. and mainly arranged in rosettes of 4 to 5 around a central spot. Black (melanistic) jaguars not uncommon.

Habits: Fond of water, good swimmers, will climb trees in pursuit of prey. Favourite trick to lie along a tree or rock overhanging water and scoop fish out with paws.

Habitat: Forests, preference for thick cover, especially near rivers or swamps, but in open country where food plentiful.

Food: Favourite food is capybara, but will take sloths, possibly

domestic stock when available, also tapir, fish, freshwater turtle, alligator.

Breeding: Little precise information about breeding season or mating habits. *Gestation* 100 days. Litter of 2-4 cubs (or kittens), born well furred but with eyes closed. Female mainly responsible for care of young, which remain with her for 2 years.

Present status: No precise information. Probably still common, especially in inaccessible areas.

Range: S. America (Paraguay northwards), Central America, N. America (north to southern U.S.A. border).

Longevity: Up to 22 yrs.

Special comments: Hunted for pelts, also sport, and to protect domestic stock in settled areas.

PUMA, COUGAR, MOUNTAIN LION (*Puma concolor*)
(Formerly also known as Painter or Catamount)



General characters: About size of a leopard. Total length up to 8', tail up to 3'. Wt. up to 260 lb. Females smaller than males. Coat of short close fur, yellowish-brown, whitish underparts.

Habits: Powerful, athletic: will cover 20' in one bound, and 40' recorded, will leap up 15' and jump down from 60' height. Can drag carcass 3 times own weight over snow. Ranges 30 to 50 miles from den when hunting. Voice a weird caterwauling yell or scream (hence: "to yell like a painter").

Habitat: Mountains, plains, desert, forest.

Food: Deer and other small or medium-sized herbivores.

Breeding: Breed year round. *Gestation* 90-93 days. Litter of 1-4 young, spotted at birth, blind, eyes opening 10-14 days, weaned at 3 mths., stay with parents up to 2 yrs.

Present status: Much reduced in parts of range.

Range: From Western Canada southwards to Patagonia.

Longevity: Up to 20 yrs.

Special comments: Hair-raising stories, from early settlers, of ferocity

not borne out. Lively curiosity about man, will investigate his activities, but almost unknown to attack man. Potentially dangerous when cornered, but often found when brought to bay by dogs puts up no fight. Serves as check on increase of deer that damage crops: should therefore be conserved.

Other statistics: Temp. 100·8°F. (38·1°C.); pulse, 40.

SNOW LEOPARD OR OUNCE (*Uncia uncia*)

General characters: Total length up to 7' or more, tail 3'. Fur long, thick, almost woolly. Ground colour pale whitish-grey to bronzy-olive, underparts pure white, black streak mid-line of back, rest spotted, spots mainly in large irregular rosettes.

Habits: Practically unknown.

Habitat: Treeless mountainous areas, ranges to 18,000' in summer, down to 6,000' in winter.

Food: Marmots and other rodents, wild sheep and goats.

Breeding: Gestation 93 days.

Present status: No precise information.

Range: Central Asia, from Altai in north to Himalayas in south.

Longevity: Not known.

Special comments: Little is known of this animal in the wild. A few have been kept in zoos.

LYNX (*Lynx lynx*)



General characters: Medium-sized, cat-like but with very short tail, tufted ears, cheek-ruffs, powerful limbs and very broad feet. Total

length up to $3\frac{1}{2}'$, tail up to 8", wt. up to 40 lb. Fur varies from pale sandy-grey to rusty-red, underparts white. Summer coat thin and poor with black spots, which may be lacking in dense and soft winter coat. Voice a caterwauling, similar to but louder than that of domestic cat.

Habits: Hunts by lying in wait or by following scent trails. Good swimmer, poor runner, tireless walker. Broad feet give advantage in moving across snow.

Habitat: Forests, particularly coniferous.

Food: Largely rabbits, hares, ground birds, small deer.

Breeding: Mating in March. Gestation 63 days. Litters of 2-4 kittens, well-furred but blind. Eyes open 10 days. Weaned at 2 mths. Kittens remain with mother until following spring. Females mature at 1 yr.

Present status: Formerly widespread in western Europe, as far as Alps and Pyrenees, has been largely wiped out as result of raids on sheep, goats and other livestock. Now scarce in most parts of Europe and cannot hope to persist in face of human settlement.

Range: Wooded parts of Europe (south to line of Pyrenees-Alps) and Asia (south to Himalayas and east to Pacific coast of Siberia).

Longevity: Up to 11 yrs.

Other species of Lynx:

Spanish Lynx (*L. pardellus*): smaller than typical lynx, shorter fur, more heavily spotted.

Canada Lynx (*L. canadensis*): larger than typical lynx, long-haired and almost unspotted. [Gestation 60 days.]

Bobcat, Wildcat or Bay Lynx (*L. rufus*): smaller than typical lynx, with shorter hair, reddish-brown with black spots. More southern parts of U.S.A. Bobcat is more adaptable than Canada Lynx, which is disappearing in face of human settlement, whereas Bobcat, being smaller, can more easily find cover and live on smaller prey. [Gestation 40 days.]

CHEETAH or HUNTING LEOPARD (*Acinonyx jubatus*)



General characters: Cat-like but with long legs, and blunt non-retractile claws. Total length $7\frac{1}{2}'$, tail $2\frac{1}{2}'$, height at shoulder $2\frac{1}{2}'$, wt. 100 lb. Coat of short hair, yellow, heavily spotted with small, close black spots.

Habits: Hunt by sheer speed, cover $\frac{1}{4}$ mile at average 45 m.p.h., top speed 70 m.p.h. If first rush fails, cheetah abandons prey. Climbs trees. Purrs when stroked, also tree-scratching habit like cat. Practically defenceless. Move about by day in pairs or family parties.

Habitat: Open grassland or scrub.

Food: Small and medium-sized mammals, also birds, struck down on or when leaving ground.

Breeding: Gestation 90-95 days. Little else known.

Present status: Rare in Asia, disappearing in Africa. (Ironic that shortage in Asia has led to importation, for sport in India, from E. Africa.)

Range: Southern Asia, from Arabia to India (rare). Africa south of Sahara (Sudan, E. Africa, Senegal, Rhodesia, Bechuanaland, Transvaal).

Longevity: Up to 16 yrs.

Special comments: Easily tamed. In India used for centuries for hunting blackbuck: hooded, taken in bullock cart near to herd of blackbuck, hood removed, cheetah released makes terrific rush at blackbuck. If no kill in first $\frac{1}{4}$ mile cheetah gives up.

(The King Cheetah, in which spots are merged into longitudinal stripes, formerly thought to be a distinct species, is now regarded as a recurrent mutation of the typical form.)

Suborder Pinnipedia (Seals, Sea-lions, Walrus)

Believed to be related to land Carnivora, have become modified for aquatic life. Limbs converted into flippers, digits enclosed in skin; tail short, body covered with short hair, some species having a dense under-fur valuable in commerce. Incisors usually reduced in number, cheek-teeth almost uniform, usually pointed and recurved. On land move clumsily, and except for breeding on land fully aquatic.

Family PHOCIDAE (True Seals)

Most specialised for aquatic life: external ears reduced to minute proportions (therefore virtually earless), hind-flippers cannot be used for movement on land. Widespread in northern waters and in Antarctic with a few species in tropics. Fur harsh in adults, therefore also known as Hair Seals, young of some Arctic species taken in large numbers for sake of soft woolly coats.

SOUTHERN SEA ELEPHANT OR ELEPHANT SEAL (*Mirounga leonina*)

General characters: Bulls up to 18' long, girth 18', 5,000 lb. or more wt., cows 10' long, coat light brown to grey, lighter below, cows uniformly grey, bull has snout (proboscis) inflatable to length of 2'.

Food: Squid, fish.

Breeding: Harems of 12-20 (or even 50) cows Dec.-March, 1-2 pups born Feb.-June, 2½' long, black coat, weaned at 6 weeks, may remain with mother more than a year.

Range: Islands of Southern Ocean.

Economics: Almost exterminated for first quality oil; killing now regulated and stocks increasing.

NORTHERN SEA ELEPHANT (*Mirounga angustirostris*)

Maximum length of 22', distinguished from Southern sea elephant mainly by size, formerly abundant on coasts of California, almost exterminated by 1870, remnant on island of Guadalupe protected, numbers now increasing and animal overflowing to neighbouring islands and coast of California.

COMMON SEAL OR HARBOUR SEAL (*Phoca vitulina*)

General characteristics: Bulls up to 6' long, up to 300 lb. wt., cows smaller, yellow-grey to dark brown with blackish or brown spots.

Food: Mainly fish. About 10 lb. a day.

Breeding: Mating on land Sept., gestation 245-350 days, 1-2 pups

born June-July, white coat shed early (may be shed before birth), $2\frac{1}{2}$ -3' at birth, weaned at 6 weeks, sexually mature 2-3 yrs. [Delayed implantation recorded.]

Range: Coasts of N.W. and N. Europe, Atlantic coast of N. America (Florida northwards), Pacific (California to Alaska).

Economics: Little value.

Longevity: Up to 19 yrs.

Other Statistics: Pulse, 10-140; speed under water up to 10 m.p.h., on land 3 m.p.h., dive to 240', surface every 5-6 mins. for breathing, sleep under water up to 15 mins., surfacing to breathe without waking.

HARP SEAL, SADDLE-BACKED SEAL, GREENLAND SEAL (*Phoca groenlandica*)

General characteristics: Up to 7' long, bulls up to 400 lb. wt., cows up to 5', up to 300 lb. wt., coat light grey to yellowish-white with black face and brown "saddle", cows dull white with faint dark markings.

Food: Mainly fish.

Breeding: Mating in water or on land, cow sexually mature 3 yrs., bull at 4 yrs., 1-2 pups born March, 9-12 lb. wt., white coat, dark muzzle, wt. at 5 days up to 24 lb., at 2 weeks 80 lb. when cow deserts to mate again, pup (now known as a "beater") begins to swim 3-4 weeks.

Range: Throughout Arctic: breeding grounds, White Sea, Novaya Zemlya, Spitzbergen, Jan Mayen, E. Greenland, E. of Newfoundland, G. of St. Lawrence.

Economics: Herds may number $\frac{1}{2}$ million, fur no value, 100,000 seals harvested each year for oil and hides.

BEARDED SEAL (*Erignathus barbatus*)

General characters: Bulls up to 12' long, 1,000 lb. wt., cows 8' long, coat grey to yellow, blotched with black, coarse flattened bristles each side of mouth.

Food: Mainly molluscs.

Breeding: Mating on land(?) June-July, 1 pup born May-June, $4\frac{1}{2}$ ' long, curly grey coat, high-pitched whistling cry. Cow has 4 mammae instead of usual 2.

Range: Arctic (Alaska to Newfoundland): Atlantic and Pacific subspecies show slight differences in skull characters.

Economics: Solitary or in family groups, killed for hide only.

Other statistics: Temp. 99°F. (37.2°C.)

GREY OR ATLANTIC SEAL (*Halichoerus grypus*)

General characters: Bulls up to 12' long, 780 lb. wt., cows up to 7', light to dark grey with variable amount of dark spots, head longish, especially in bull.

Food: Fish, molluscs.

Breeding: Mating on land Nov.-Dec., gestation about 11 mths., 1 pup, born Sept.-Nov., up to 3½' long, 34 lb. wt., 100 lb. at 3 weeks when 1st (white) coat shed, pup weaned and deserted.

Range: Both sides of Atlantic (British Isles, Baltic, Norway, Greenland, Nova Scotia).

Economics: Killed for alleged damage to salmon fisheries.

Special comments: Breeding seasons and behaviour of pups vary from one part of range to another. Details given here are broadly those for British Isles. Breeding season for Baltic and for western Atlantic is Jan.-Feb.

HOODED SEAL OR BLADDERNOSE (*Cystophora cristata*)

General characters: Bulls up to 8½' long, 850 lb. wt., cows up to 7' up to 400 lb., dark grey to black above, lighter on sides and below, with scattered light spots, muzzle black, fore-part of head inflatable. Cows lighter in colour.

Food: Fish mainly.

Breeding: Mating on land (?) April-June, gestation about 11 mths., 1 pup ("grayback") born March-May, 30 lb. wt., 60 lb. at 1 week, deserted at 3 weeks.

Range: N. Norway, Bear Is., Spitzbergen, Davis Str., Newfoundland, Labrador, S. to New England, occasionally Florida. General northerly migration following breeding period.

Economics: Killed for oil and hides.

Other Phocidae are:

Ribbon Seal (*Phoca fasciata*), of Bering Sea, dark brown with broad bands of yellow circling neck, shoulders and rump.

Baikal Seal (*Phoca hispida*), of Lake Baikal, lives more than thousand miles from nearest coast.

Leopard Seal (*Hydrurga leptonyx*), of Antarctic, 12' long, feeds on cuttlefish, penguins, sea-birds generally.

Crab-eating Seal (*Lobodon carcinophaga*), of Antarctic, greyish-brown in summer, white in winter (also known as White Seal), feeds on small crustaceans sieved from water with peculiar lobed teeth.

Monk Seals (*Monachus*), 8-9' long, coat blackish, now in restricted numbers: 3 species: *M. monachus* of Black Sea, Mediterranean and adjacent Atlantic; *M. tropicalis* of W. Indies and *M. schauinslandi* of Hawaiian Islands.

Family OTARIIDAE (Eared Seals; or Sea-lions and Fur Seals)

More at home on land than are the True Seals, can use hind-flippers in locomotion on land, have noticeable external ears. Also necks longer. Mostly dark and uniformly coloured, none spotted or banded.

ALASKA FUR SEAL OR SEA-BEAR (*Callorhinus ursinus*)



General characters: Bulls 7' long, up to 700 lb. wt., cows 5', coat black with grey cape covering swollen neck, cows grey, tail 2" long, ears 1-2".

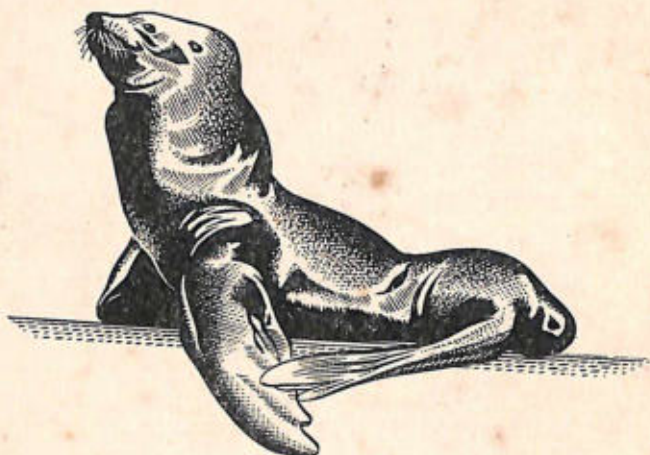
Food: Fish, squid.

Breeding: April–May bulls come ashore on Pribiloff Islands, having been out at sea in non-breeding season, mark out territories 75–250 sq. ft., cows follow later, give birth to 1 pup, gestation 340–350 days. Pups weaned 3–4 mths., swim by 6–8 weeks. Bulls mature at 3 yrs., cows at 2 yrs.

Range: Northern Pacific.

Economics: Formerly almost exterminated, now protected, numbers back to normal and 30,000 skins harvested a year under licence.

STELLER'S SEA-LION (*Eumetopias jubatus*)



General characters: Bulls up to 13' long, 1,800 lb. wt., cows 8' long, 600 lb. wt., coat brown.

Food: Crustacea, cuttlefish, small fishes.

Breeding: Harems of 10–15 cows formed June, 1 pup at birth, 43" long, 35–50 lb. wt., chocolate-brown coat, 100 lb. wt., at 2 mths., learns to swim at 1 week, mature at 3 yrs.

Range: Pacific coast of N. America (California to Alaska).

Economics: Formerly killed for blubber and intestines, now protected (population in 1947: 5,666).

Californian Sea-lion (*Zalophus californianus*), bull up to 8' long, 500 lb. wt., common on rocky coasts of California, life-history as for Alaskan fur seal, easily tamed, popular in zoos and circuses. Gestation 342 days. [Longevity, 19 yrs.]

Cape Fur Seal (*Arctocephalus pusillus*), bulls 450–800 lb., cows 200–300 lb., feed on 50% fish, 37% squid, 13% crustaceans.

Southern Fur Seals, also Australia, S. America, Pacific coast of Mexico.

Other sea-lions on coasts of S. America, Japan, Australia and Auckland Islands (S. of New Zealand).

Family *ODOBENIDAE* (Walrus)

Coat of short hair, almost lost with age, heavy build, broad muzzle, numerous stout whiskers, cheek-teeth few and of simple structure, upper canines form tusks.

WALRUS (*Odobenus rosmarus*)



General characters: Skin wrinkled, fur short, brownish-grey, becoming scanty after middle age, old males may be almost hairless with hide thrown into deep folds. Males 10-11' long (maximum 16'), wt. up to 3,000 lb., tail 3" long; cows 8' long, 1 ton wt. Muzzle blunt, broad, with incisors lengthened to ivory tusks, up to 2' long, in both sexes. External ear lacking. Cheek-teeth few and simple in structure.

Habits: In herds, up to 100. Inoffensive but can defend themselves with tusks, especially when cows have young. May inflate neck to sleep vertically in water. Enemies: Polar Bear, Killer Whale, man. Migrates north May-July, south in autumn.

Habitat: Formerly shelving coastal beaches. Now, result of persecution by man, rest on ice-floes.

Food: Mainly crabs, molluscs and sea-urchins swallowed whole, grubbed from sea-bed with tusks, commonly at 50 fathoms depth. Pebbles also swallowed, presumably for crushing food in stomach (by contraction of stomach muscles).

Breeding: Mating May-June. Gestation 260-365 days. One calf, born May, 4' long, coat of short grey hair. Weaned at 2 years.

Present status: Diminished numbers: hunted by Eskimos for flesh, ivory, oil.

Range: Arctic (circumpolar).

Longevity: Not known (but cows mature 4-5 yrs., bulls 5-6 yrs).

Special comments: Some authors recognise 2 species: *O. rosmarus* (Atlantic Arctic) and *O. divergens* (Pacific Arctic). Difference in tusks, those of Atlantic Walrus straight, of Pacific Walrus divergent at tips. Probably only 2 races of one species.

Other statistics: Temp. 97°F. (36.1°C.)

Order TUBULIDENTATA

Family ORYCTEROPIDAE

SINGLE representative the Aardvark, often included in Edentata because of absence of front teeth (incisors and canines). Exact relations obscure: now placed in separate order, Tubulidentata, because teeth made up of tiny tubes radiating from a central area. Teeth are rootless and without enamel, therefore presumed primitive. Aardvark regarded as sole surviving representative of a primitive stock from which ungulates generally have sprung.

AARDVARK, EARTH-PIG, ANT-BEAR (*Orycteropus afer*)



General characters: Bulky pig-like body, 6' long, of which 2' is tail, 2' high at shoulder, wt. up to 140 lb. Head long, narrow, with pig-like snout and small mouth. Long slender ears erect. Grey body often so thinly haired as to appear naked, hair thickest on limbs and hind-quarters. Tail tapering, springing from thick root. Feet bear strong digging claws, 4 on front feet, 5 on hind-feet. Tongue 18" long extruded from small, tubular mouth to sweep up termites exposed when nest is broken open by powerful front claws. Nostrils can be opened and shut at will, their edges set with short stiff bristles, to keep insects out. Unlike pangolins, which live on true ants, and have gizzard-like stomach complete with grit for crushing hard-skinned insects,

Aardvark has a normal stomach, without grit, capable of dealing with soft-bodied termites only—but also eats wild cucumbers.

Habits: Nocturnal, solitary, burrowing, seldom seen. Alert, and if surprised away from holes will make for shelter at a clumsy gallop. When suspicious will often sit up on hindquarters, supported by stout kangaroo-like tail, the better to see or scent intruder. Shows great caution in avoiding traps; will dig new exit to burrow rather than use trapped entrance. Burrows large enough for small man to enter (are regularly used as retreat by wart-hogs). Can burrow faster than gang of men can dig.

Habitat: Wherever termites abundant.

Breeding: Single young, born May-July.

Present status: Not uncommon.

Range: Africa (Ethiopia and Sudan southwards to Cape Province, S. Africa).

Longevity: Up to 10 yrs.

Order PROBOSCIDEA (Elephants)

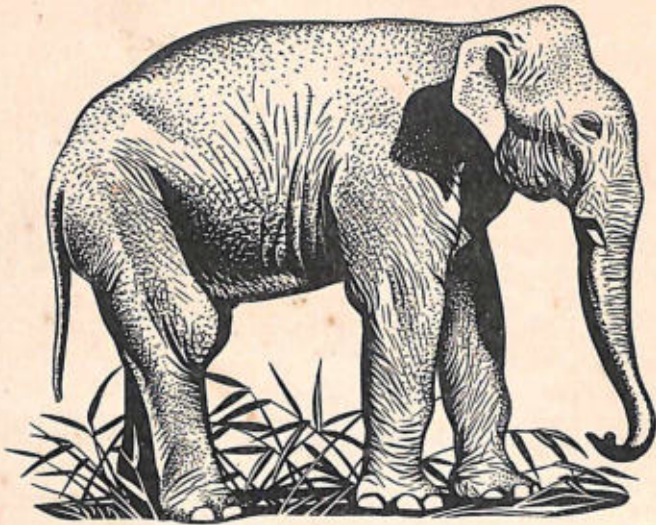
General characters: Apart from great size, most striking feature is trunk (elongated nose) used for seizing food, taking up water for drinking and bathing, blowing dust over body, testing air for danger, food, etc. Tusks, only incisors present, grow forward from upper jaw, used in defence, for levering up small trees, digging up roots, boring for water; grow continuously from roots, composed entirely of dentine (ivory), have no enamel except at tip when young. Canines absent. Molars (cheek-teeth) composed of vertical plates of dentine covered with enamel and separated from each other by layers of cement; each molar large, broad, flat-crowned, with transverse ridges, moves forward continuously; as front tooth moves forward it is increasingly worn and finally drops out, and next molar in succession comes into use. Although 6 teeth appear in each half of upper and lower jaw during lifetime never more than 2 teeth, or parts of teeth, in use at one time. Longevity controlled by tooth-wear, when last tooth worn tough, fibrous food can no longer be masticated. Longevity: 70 yrs. Indian, 50 yrs. African elephant.

Ears large, mobile; skin loose, almost naked; feet flat, broadly rounded; eye very small, sight poor; senses of smell and hearing acute. Diet leaves, young branches, fruit; wander in search of food mainly at night, also by day if food scarce (only 2-4 hrs. sleep taken in every 24 hrs.). Usually hottest hours of day spent in thick cover. Typical herd 300-400, composed of cows, calves and young bulls, readily breaks up into groups of half-dozen if disturbed. Old bulls solitary or in small groups. Favourite habitat scrub or forest, resort to swamps for security. Travel long distances for fruit in season; also wander up to 12,000' on equatorial mountains.

Data on breeding mainly from Indian Elephant in captivity: gestation 21 mths., 1 calf at birth, rarely twins, able to keep up with cow in few days, suckles with mouth, weaned at about 2 yrs. Cow sexually mature at 12 yrs. goes on breeding at 2 yr. intervals rest of life. Mammae pectoral.

Walking speed 6-8 m.p.h., walk when alarmed 10 m.p.h., charges at 20-25 m.p.h.

Most elephants use right tusk, which is consequently worn shorter than left. 4-tusked elephants result from abnormality of twin tusks in each socket. One individual had 7 tusks from one socket.

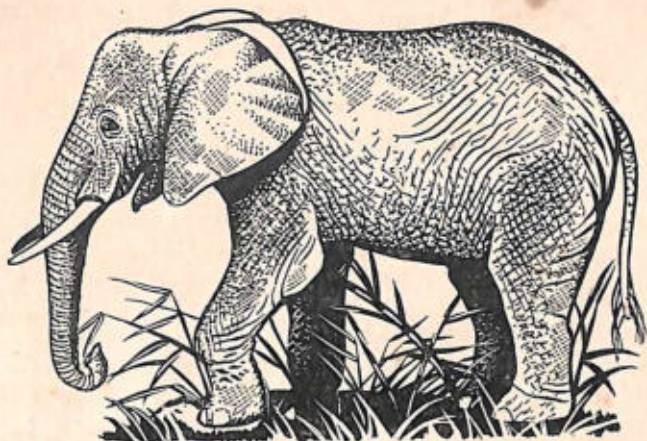
INDIAN ELEPHANT (*Elephas maximus*)

General characters: Average height of bulls 9', occasionally reach 10', cows 2' shorter. Maximum wt. 4 tons. Large tusks in bulls only, record length 8' 9", wt. 160 lb. Ceylon elephants, cows tuskless. Trunk smooth, only one "lip". Ears $\frac{1}{2}$ size of African elephant. Forehead high, domed, back convex, ridged. 5 nails on front feet, 4 on hind-feet. Brain weighs 10 lb. Colour slate-grey, rare albinos—skin paler than usual—are sacred white elephants of Siam (may not be put to work). No enemies, but tiger, or family of tigers, may occasionally kill a calf. At birth calf is 3' at shoulder, 200 lb. wt. Range: India, Ceylon, Burma, Thailand, Indo-China, Malaya, Sumatra. [Temp. 97.2°F. (36.2°C.); pulse, 22-53.]

Gestation period:— 20 months.

AFRICAN BUSH ELEPHANT (*Loxodonta africana*)

General characters: Average height 10½', seldom more than 11' (reports of 12' to be treated with reserve). Maximum wt. 6 tons. Both sexes bear tusks, those of cow more slender; records: for bull, 11' 5½" length, 226½ lb. wt., for cow, 6' 7" length, 52 lb. wt. Trunk "ringed", double "lip". Ears up to 5' height, 4' across. Forehead sloping, back hollow. 4 nails on front feet, 3 on hind-feet. Colour dark slate.



FOREST ELEPHANT (*Loxodonta africana cyclotis*)

2' shorter than Bush Elephant, differs slightly in shape of ears and other details.

Range: Equatorial rain forests.

Order HYRACOIDEA (Hyraxes or Dassies)

Rabbit-sized, terrestrial or arboreal, with blunt heads, short ears, short legs, practically no tail. Forefeet with 4 toes bearing blunt, hoof-like nails. Hind-feet with 3 toes, 2 bearing nails, 3rd toe with curved claw. Soles of feet naked, clammy. Single pair of upper incisors strong, triangular in section, sharp-pointed. Four lower incisors broad, flat. Canines absent. Wide gap between incisors and cheek-teeth; latter patterned as in rhinoceroses.

Although rodent-like appearance, affinities are with elephants and rhinoceroses.

ROCK HYRAX, DASSIE, ROCK-RABBIT OF CONEY, KLIPDAS (*Procavia capensis*)



General characters: Fur soft, brown, white or yellow patch of hairs marking a gland in middle of back.

Habits: Colonies 50-60, spend much of day basking in sun, keeping sharp watch for leopards, eagles, large hawks; alarm note whistling or chattering. Scale rocks with ease.

Habitat: Rocky cliffs, boulders on hill-tops.

Food: Leaves, fruit; regular feeding early morning, late afternoon.

Breeding: Gestation 225 days. Litters 2-3, young advanced at birth, soon active.

Present status: Very common.

Range: Africa (Algeria, Libya, southern Egypt to S. Africa Cape Province); southern Arabia to Syria.

Longevity: No information.

Special comments: Leave excrement in one spot, usually under rocks, continued over long period. These deposits, dried and hardened in sun, contain hyraceum, used in perfumery.

Syrian Hyrax (*Procavia syriaca*).

Similar to *P. capensis*, is the "coney" of Scriptures.

TREE HYRAXES OR TREE BEARS (*Dendrohyrax*)

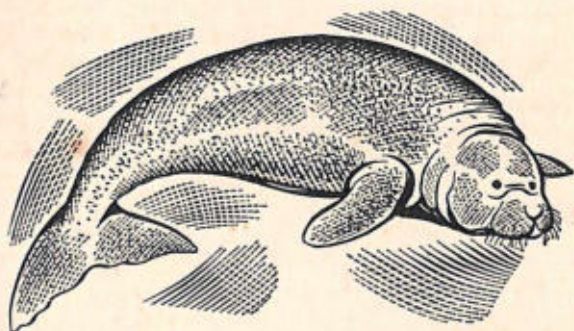
Like Rock Hyrax but fur usually longer. Colour often variable, sepia-brown to hoary grey. Nocturnal, resting in holes in trees. Naked soles cling to smooth surfaces, give remarkable climbing ability. Cry starts as series of groans, works up to wailing scream.

Tree Dassic or Bosdas (*D. arboreus*), S. Africa northwards to Belgian Congo, Tanganyika, Kenya. Another species (*D. dorsalis*) in West Africa.

Order **SIRENIA** or **SEA-COWS**
(Manatees and Dugongs)

ENTIRELY aquatic, superficial resemblance to Cetacea in fish-like form, hairless skin, paddle-shaped forelimbs and expanded horizontal tail. Live in warm coastal waters or large tropical rivers, browsing sea-grass or seaweeds. Head rounded, with separate nostrils on muzzle. Distinct neck, no dorsal fin, very mobile forelimbs bear remnants of nails. Mammae pectoral. Mouth furnished with horny plates on palate and lower jaws; teeth, when present, consist of incisors (sometimes vestigial) and grinding cheek-teeth which succeed each other like teeth of elephant. Male Dugong has short, well-formed tusks in upper jaw. Slow-moving, harmless and unsuspecting animals.

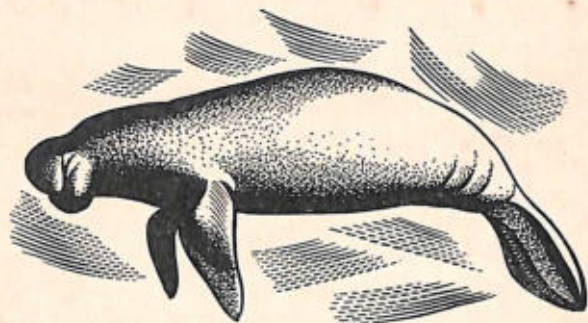
Dugong (*Dugong dugon*), of Red Sea and coasts of Indian Ocean,



from E. Africa to E. Australia, Formosa and the Solomon Islands, up to 10' long, bluish-grey, lighter below. Eyes small, ear a minute pore. Turned-down muzzle incipiently trunk-like, mobile, used for grasping waving fronds of seaweeds in feeding. Tail, notched in centre, has two pointed flukes. Solitary or in small family parties, but may associate in numbers. Flesh highly esteemed and as a result, and owing to lack of means of defence, dependence upon narrow strips of coastal waters and slow rate of breeding, numbers everywhere reduced [usual method of capture is in nets]. Gestation 1 yr., 1 young at a birth.

NOTE. 2 species of Dugong have been recognised (*D. dugon* and *D. australis*). Now generally agreed latter is not distinct.

Manatees (*Trichechus*), of which 3 species: *T. senegalensis* of W. Africa, *T. manatus*, of Caribbean, *T. inunguis* of S. America live in coastal waters and ascend large rivers (e.g. Niger, Orinoco and Amazon) to considerable distances. Manatee similar to Dugong, up to 15' long, tail broadly rounded, shovel-like, not divided into 2 lobes,



flippers more mobile and used as hands. Colour dark grey to blackish. No front teeth, bristly upper lip divided and mobile, 2 opposing halves being used as grasping organ for plucking underwater vegetation. Can stay under water 4 mins. Gestation 365 days, 1-2 calves, 40-60 lb. wt. at birth, weaned at 18 mths. (Pulse, 50-60.)

Florida Manatee, most northerly form, enters river-mouths and lagoons; sensitive to temperature changes, drop of 20°F. may kill entire local population. In captivity eats 100 lb. green food a day.

Order PERISSODACTYLA
(Odd-toed Ungulates: Horses, Rhinoceroses, Tapirs)

Toes on forefeet either 4, 3 or 1, on hind-feet 3 or 1; stomach simple; horns, when present, on muzzle centrally.

Family EQUIDAE

MONGOLIAN WILD HORSE or PRZEWALSKI'S HORSE
(*Equus caballus przewalskii*)



General characters: Colour isabelline brown, with blackish mane and long-haired black tail. Mane stiff and erect, no forelock. In summer coat there is a dark stripe down middle of back, inconspicuous shoulder stripe, and lower legs showing distinct bars up to knees. Stocky, pony-like. $4\frac{1}{2}'$ at shoulder.

Habitat: Grassy plains (so far as is known).

Breeding: Nothing known.

Food: Presumably as in domestic horse.

Present status: Range bounded by 44° to 46° N. and 90° to 95° E. on border between Mongolia and Sinkiang, and a small herd along Takhin Shara-Nuru range. Illicit hunting still going on, drastic legislation being suggested to combat it.

Range: As above.

Longevity: Unknown.

Special comments: Discovered in 1881. Probably now verging on

extinction, partly from being hunted for meat and partly from dilution with domestic ponies. Probably never numerous within historic times.

Other statistics: Temp. (of domestic horse) 100°F. (37.7°C.); pulse, 23-70 (new-born, 100-120).

Wild Asses, 3-4' at shoulder, inhabit more desolate regions of central and S.W. Asia, and N. Africa. All have short, erect mane, large ears, tufted tail, and sandy-fawn colour, with a dark stripe down back, usually a shoulder stripe, and sometimes stripes on lower legs. Gestation 330-365 days, 1 foal at birth, able to run within few hours. Longevity 19 yrs. Nubian Wild Ass (*A. asinus africanus*), still in fair numbers in regions between Upper Nile, Ethiopia and Red Sea, flesh eaten by local tribes whenever opportunity occurs. Wary, prefer open plains where approach difficult. [Reports of Wild Asses in Sahara frequent, but these probably feral domestic asses. Another race of African Wild Ass (*A. asinus somalicus*) still fairly numerous in Somaliland.]

Asiatic Wild Asses (various subspecies of *Asinus hemionus*: habits very similar) formerly ranged from Syria and Arabia, where now extinct, through Persia (*Onager*) to the deserts of Cutch, in N.W. India (Indian Wild Ass or Ghorkar), of Transcaspia and Mongolia (Kiang, Kulan or Chigetai). Everywhere numbers reduced by modern firearms: meat and hides being always in demand; also, horsemen ride down new-born foals for sale as domestic animals. [Temp. 99.6°F. (37.4°C.), pulse, 40-56.]

COMMON ZEBRA, BURCHELL'S ZEBRA OF BONTKWAGGA (*Equus burchelli*)

General characters: Striped horses, 4' 2" at shoulder, short erect mane, large head, large ears, hoofs narrower than in horse, broader than in ass.

Habits: In herds, sometimes associating with wildebeestes. Never far from water, visiting waterholes mainly at dawn or dusk led by an old stallion who goes ahead to reconnoitre for lion in ambush. Eyesight and olfactory sense acute. Migrate to breeding grounds in large numbers.

Habitat: Grasslands, especially those with scattered trees.

Food: Grass.

Breeding: Gestation 300-375 days, one young, able to run soon after birth.

Present status: Numbers reduced.

Range: Africa south of Sahara (except rain forests: in Union of S. Africa mainly in national parks).

Longevity: 25 yrs.

Special comments: Several alternative classifications have been proposed for subspecies, latest is given here:

Chapman's Zebra (*E. burchelli antiquorum*): from Benguela and Damaraland across Bechuanaland to Transvaal and Zululand.

Grant's Zebra or Boehm's Zebra (*E. burchelli boehmi*): N. Rhodesia, Nyasaland to S. Ethiopia, Somaliland, S. Sudan.

Selous's Zebra (*E. burchelli selousi*): Zambezi Basin, from Victoria Falls; S. Rhodesia, Mozambique, northwards to S. Nyasaland.



E. burchelli antiquorum



E. burchelli antiquorum



E. burchelli boehmi



E. burchelli boehmi



E. burchelli selousii



E. burchelli selousi

Examples of the three subspecies of Burchell's zebra (*Equus burchelli*) to show how the patterns of the stripes vary even within the subspecies. (Adapted from Angel Cabrera: *J. Mammalogy*, vol. 16, 1936.)

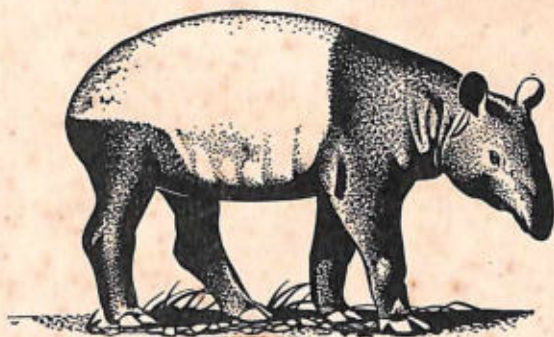
GREVY'S ZEBRA (*Equus grevyi*)

Largest and most northerly up to 5' at shoulder, 500-700 lb. wt., Ethiopia, Somaliland, N. Kenya. Stripes narrow, close, no shadow stripes, sometimes associates with oryx. [Gestation 390 days.]

MOUNTAIN ZEBRA OF BERGWAGGA (*Equus zebra*)

Smallest of all zebras, characterised by gridiron pattern on rump; 2 subspecies: *E. zebra zebra* few in number, protected on private property near Cradock and near Oudtshoorn, Cape Province, S. Africa; *E. zebra hartmannae* in mountains of S.W. Africa, including Angola and Namaqualand. [Longevity, 25 yrs.]

Family TAPIRIDAE

MALAYAN TAPIR (*Tapirus indicus*)

General characters: Donkey-sized, stout build, almost tailless, short-legged, with snout prolonged into short trunk. 4 toes on forefeet, 3 on hind-feet. Up to 8' long, 3½' at shoulder, up to 500 lb. wt. Foreparts and limbs black, rest white. (All black tapirs recorded S.E. Sumatra may be melanistic or a distinct race.)

Habits: Shy, solitary, seldom seen. Defenceless, but tiger only enemy. When disturbed make for nearest water. Can swim under water.

Habitat: Evergreen jungle, near water or marsh.

Food: Vegetation (grass, leaves, etc.).

Breeding: Gestation 390-395 days. Single young at birth, marked with spots and stripes.

Present status: Little risk of becoming rare except as jungle replaced by commercial plantations.

Range: Tenasserim and southern Siam through Malaya to Sumatra.

Longevity: 10 yrs.

Other statistics: Pulse, 44.

Special comments: Several species of S. American Tapirs, dark brown or black all over, with greyish tinge on head and chest. Young like those of Malayan Tapir. Habits similar to Malayan Tapir.

S. American Tapirs:

All blackish-brown, 6' long, 3' at shoulder: Common species is Brazilian Tapir (*Tapirus terrestris*), habits and habitat similar to Malayan Tapir but more water-loving, chief enemies jaguar, alligators; Mountain Tapir (*T. roulini*), of Andes of Colombia, Ecuador, Peru, at 14,000'; Baird's Tapir (*T. bairdi*), Mexico to Panama, up to 6,000', has white on chest, throat, face; Dow's Tapir (*T. dowi*), of Guatemala, Nicaragua, Costa Rica. [Longevity, 9 yrs.]

Family RHINOCEROTIDAE

GREAT INDIAN RHINOCEROS (*Rhinoceros unicornis*)



General characters: 14' long, 6' 4" at shoulder, tail 2' 5", one horn up to 2', up to 4 tons wt., blackish-grey, skin granular, thrown into heavy folds, pair of broad incisors in upper jaw, pair of sharp-edged tusks in lower jaw.

Habits: Inoffensive, retiring, in spite of bulk. Largely solitary. Habitually visits mud wallows.

Habitat: Dense jungle or long grass.

Food: Vegetation, especially grass.

Breeding: Gestation 510-548 days, 1 young at birth, 2' at shoulder, 75-120 lb. wt.

Present status: Much reduced in numbers, protected.

Range: Nepal, N. Bengal, Assam.

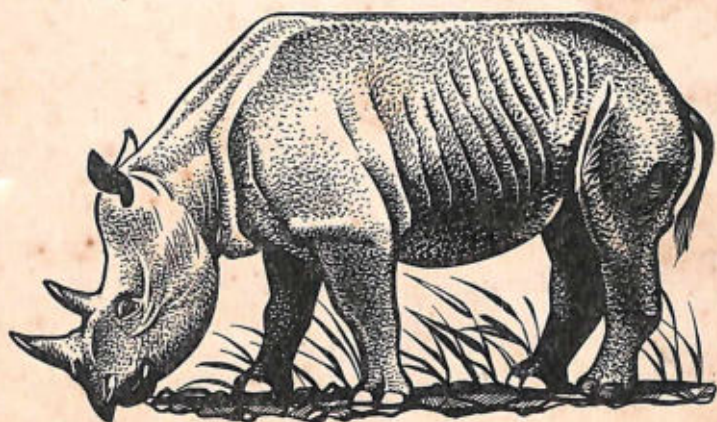
Longevity: 47 yrs.

Other statistics: Temp. 100°F. (37.6°C.)

Javan Rhinoceros (*R. sondaicus*): formerly ranged from Bengal, Burma, Siam, Indo-China to Sumatra and Java, now extinct over most of range, last census (1937) showed 66 individuals; smaller than Indian Rhinoceros, single horn (in males only) 5 $\frac{3}{4}$ " long, skin smooth, deep folds, 5 $\frac{1}{2}$ ' at shoulder, ton or more wt.

Sumatran Rhinoceros (*R. sumatrensis*): in small numbers Assam, Burma, Malaya, Sumatra, Borneo, becoming rarer, in hilly jungles, 4 $\frac{1}{2}$ ' at shoulder, 1 ton wt., short hairy coat, 2 horns, anterior horn larger, up to 20" long. [Gestation 510-550 days.]

BLACK OR HOOK-LIPPED RHINOCEROS, SWARTRENOSTER
(*Diceros bicornis*)



General characters: 12' long, 5 $\frac{1}{2}$ ' at shoulder, 2 tons wt., 2 horns anterior horn up to 53 $\frac{1}{2}$ " (average 20"), muzzle pointed, upper lip prehensile, hide dark grey, lacks incisors in both jaws.

Habits: Solitary, aggressive, when alarmed charges upwind.

Habitat: Thickly-bushed country.

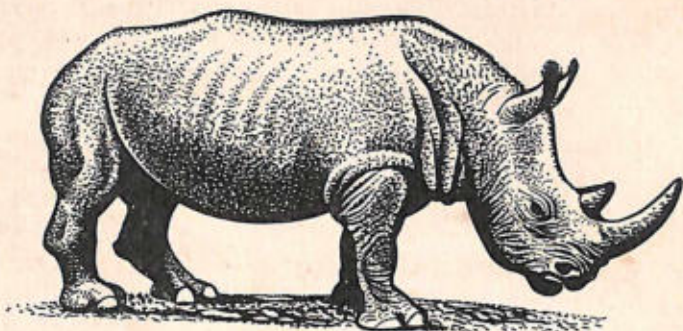
Food: Leaves, twigs, herbage generally.

Breeding: Mating at any time of year, gestation 485-548 days, 1 young, 75 lb. wt., weaned at 2 yrs.

Present status: Numbers reduced but still common in parts of range.

Range: From L. Chad and W. of Nile southwards, but becoming rare S. Africa.

Longevity: 50 yrs.

WHITE OR SQUARE-LIPPED RHINOCEROS, WITRENOSTER (*Diceros simus*)

General characters: 14½' long, 6½' at shoulder, 3-4 tons wt., 2-horned, anterior horn up to 62½", muzzle square, hide slate-grey, lacks incisors in both jaws.

Habits: Solitary, inoffensive unless provoked.

Habitat: Open plains.

Food: Grass.

Breeding: Gestation 548-578 days, 1 young at birth, mature 5 yrs., may be 3 young with cow (i.e. nearly mature, ½-grown, newly born).

Present status and range: Typical race now only in reserves in Zululand; subspecies *cottoni* more numerous Uganda, S. Sudan, parts of Congo.

Longevity: No information.

Order ARTIODACTYLA

(Pigs, Camels, Deer, Antelopes, Cattle, etc.)

Toes 2 or 4, paired; stomach often complicated; horns, when present, on crown.

Suborder **Suiformes** (Pigs and Hippopotamuses)

Family **SUIDAE** (Pigs)

Least specialised of Artiodactyla, moderate size, short legs, body covered with coarse hair, muzzle long, ends in mobile snout, omnivorous, therefore complete set of teeth, canines curved outwards and project as defensive tusks, cheek-teeth have numerous tubercles on crowns, differ from all other Artiodactyla in prolific breeding, up to 12 in a litter in some wild species. True Pigs found wild in the Old World only, except Australasia, but descendants of Domestic Pigs found feral in many other parts of world, particularly on islands of S. Pacific. S. American Pigs or Peccaries (*Tayassuidae*) restricted to S. and Central America.

True Pigs (*Sus*) represented in western Europe to China, Japan and India, Malaya and New Guinea, with one race in N. Africa. All have hairy coats, some of Chinese forms living where winters severe have thick hair. Tusks, although sharp and dangerous, not so enlarged as to be conspicuous externally. No warts on face, young striped. All keep to thick cover, forests, long grass, scrub or dense reed-beds, coming out at night in family parties, or "sounders", to root for bulbs, roots, insects or any small animals they may find, or to browse on green foliage, which may include cultivated crops. In cultivated areas they can be a pest, wary and difficult to destroy.

EUROPEAN WILD BOAR (*Sus scrofa*)

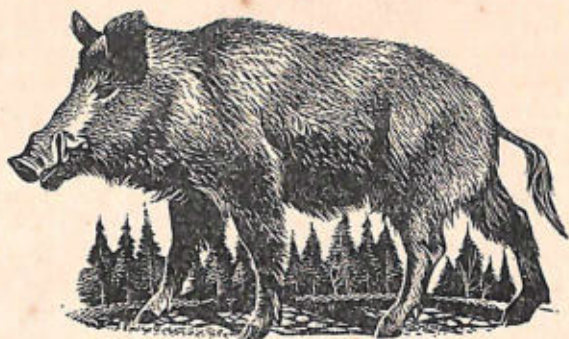
General characters: Head and body 4', tail 6", 3' at shoulder, 350 lb. wt. Tusks may be a foot long. Colour pale grey to blackish.

Habits: Very little known except that they spend much of their time rooting in the earth, and will turn with ferocity on anyone disturbing their labours.

Habitat: Open woodlands.

Food: Anything, animal or plant, that comes their way.

Breeding: Gestation 112-115 days, 3-12 in a litter, piglets with dark



stripes and spots longitudinally, able to run soon after born. [Sow and piglets known as a sounder.]

Present status: Much reduced in numbers.

Range: Western Europe to as far east as Tian Shan in Central Asia.

Longevity: 27 yrs.

Other statistics: Temp. 103°F. (39.3°C.); pulse, 55-86.

WARTHOG, VLAKVARK (*Phachochoerus aethiopicus*)

General characters: Hideously grotesque long-legged pig 5' long, exclusive of 18" tufted tail, 2' 6" at shoulder, 200 lb. wt. Skin slate- or clay-coloured, naked except for few bristly hairs. Mane of long bristly hairs on head continued along mid-line of back. Head long, broad, with long blunt warts (excrescences strengthened with gristle: no obvious function). Muzzle broad with upward-curving tusks. Record for upper tusks 2' on curve. Lower tusks triangular in section, sharp-edged, seldom more than 6" long.

Habits: In family parties: run fast when alarmed, tail held erect. Shelter in old ant-bear burrows, enter these tail-first, presenting tusks to enemy. Often go down on knees and shuffle along when feeding.

Habitat: Open country, avoids forest.

Food: Omnivorous: grasses, roots, anything to be found.

Breeding: Gestation 125-175 days. No other information

Present status: Now extinct in some southern parts of former range.

Range: Orange Free State to Senegal, and Ethiopia.

Longevity: No information.

BUSHPIG, RED RIVER HOG (W. AFRICA), BOSVARK (S. AFRICA) (*Potamochoerus porcus*)

General characters: Slightly smaller than warthog. Coat of short hair, reddish, but may be black in old males, white face patches and

white or black line along back. Head narrow, face warty (but less than in warthog). Ears long, pointed, ending in white tufts. Tusks small.

Habits: Nocturnal, keeps to thick cover, seldom seen. In small herds, defend themselves stubbornly even against leopards.

Habitat: Thick cover with water, especially reed-beds.

Food: Grass, roots, fallen fruits. (Pest to cultivated crops.)

Breeding: Gestation 120-175 days. Litters of 6-8 young, striped brown and yellow.

Present status: No information.

Range: Africa south of Sahara.

Longevity: No information.

[A race of Bush Pig, found in Madagascar, is only wild pig on that island.]

Other African pigs include:

Giant Forest Hog (*Hylchoerus meinertzhageni*), rarest and least



known. Large male up to 5' long, tail 13", no higher at the shoulder than larger Asiatic Boars, but body thick-set and the head broad and stout, giving impression of greater size. Like warthog face is broad with large warts, and large, outgrowing, upper tusks. Skin clay-coloured, sparsely covered with bristle-like black hairs, ears not tufted. Has been known to science since 1904 only, when pieces of skin and a skull were obtained from natives in Kakamega Forest, W. Kenya; has been found in many parts of Kenya since, in Aberdare Mountains and Mount Kenya, as well as in mountain forests of N. Tanganyika and Uganda, westwards to forest region of Congo Basin and as far west as Liberia. Forest-dweller in family parties in dense undergrowth, normally shy and retiring; old boars wounded or brought to bay by dogs are dangerous antagonists.

Other pigs include:

Indian or Crested Wild Boar, or Soor (*Sus cristatus*): common wild pig of India, 3' at shoulder, 250 lb. wt., forest-dwelling, crest of long

black bristles from back of head to shoulders, formidable in defence even against a tiger.

Pygmy Hog (*Porcula salvania*), of Nepal, stands less than 1' at shoulder.

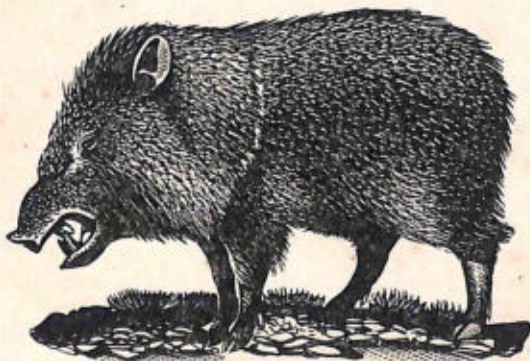
Babirusa (*Babirusa babyrussa*), of Celebes and adjacent islands, skin nearly hairless, up to 3½' long, 2½' at shoulder, legs longer and more deer-like than those of any other pig. Upper canines curving backwards do not enter mouth but grow upward through bone to form an arc in front of eyes; solitary or in small herds, in swampy forests, only 1 or 2 young at birth.

Family TAYASSUIDAE

SOUTH AMERICAN WILD PIGS or PECCARIES

Differ in many details from true pigs, of comparatively small size, have strong odour from a scent-gland on the rump, only 3 toes on the hind-feet, fewer teeth than true pigs, upper canines never growing outward or upwards, very small tails and complex stomachs, 2 young at a birth.

COLLARED PECCARY, JAVELINA, or MUSK HOG (*Tayassu angulatus*)



General characters: Head and body 3', tail 1', 20" at shoulder, wt. 45 to 50 lb. Coat of stiffish black-brown hair, white band on shoulders, erectile crest from crown to rump.

Habits: Lives in small herds, 10-12 at most, readily takes to holes in ground if these available, but brought to bay will defend itself.

Habitat: Plains with thick scrub or cactus, also hillsides.

Food: Almost anything animal or vegetable, but mainly roots, fruits, grain.

Breeding: Gestation 112-116 days, 1-2 young, reddish with black dorsal stripe when born, able to run in a few hours.

Present status: No information.

Range: Southern Brazil and Paraguay northwards to U.S.A. (Arizona, Texas and New Mexico).

Longevity: Up to 15 yrs.

Other statistics: Temp. 101.6°F. (38.7°C.)

White-lipped Peccary (*T. pecari*), of Paraguay to Mexico, up to 33 $\frac{3}{8}$ " long, 24" at shoulder, greyish-black with white lips, more forest-dweller than *T. angulatus*; when brought to bay herds (up to 200) described as standing in close formation, champing tusks and making determined charges, reputed that if one of herd attacked rest comes to its aid.

Family HIPPOPOTAMIDAE

HIPPOPOTAMUS or RIVER HORSE

Distantly related to pigs, feet have 4 well-developed toes, all supporting the animal's weight; muzzle without terminal disc-like snout, lower jaw greatly enlarged, enormous tusk-like canines, long and straight incisors are also weapons; in feeding vegetation is gripped by great square lips. Body supported on short, column-like legs, placed well apart, hippo trail in swamps usually shows two separate deep ruts made by the feet, with a central ridge.

HIPPOPOTAMUS (*Hippopotamus amphibius*)



General characters: Up to 14' long, 4' 10" at shoulder, 4 tons wt., enormous head, mouth 2' wide. Eyes raised on top of flat head, ears

small, slit-like nostrils on top of muzzle. Body hairless except for a few hairs on muzzle, inside ears and on tip of short tail. Large canine tusks exceptionally to 5' 4½" long (average 30") including root.

Habits: Aquatic but comes on land to feed, mainly at night. Can remain submerged for 4½ mins. Lethargic, basking in sun either half-submerged or on sand-bar: where persecuted, keeps to reed-beds. "Yawning" is aggressive gesture, preliminary challenge to fight. Combat may be bloody, wounds quickly heal, but aim of contestants is to break fore-leg of opponent, an injury which is fatal. Typical community includes central area or crèche for females and young, with males in separate territories around its perimeter.

Habitat: Large rivers.

Food: Herbage, especially grass.

Breeding: Gestation 210-255 days, 1 young 3' long, 1½' high, 60 lb. wt., walks and swims 5 mins. after birth.

Present status: Much reduced.

Range: Africa, formerly from Nile Delta to Cape. Now, extinct north of Khartoum, and south of Zambezi (except in protected areas, e.g. Kruger National Park).

Longevity: Over 49 yrs.

Other statistics: Temp. 81.4°F. (25.0°C.) [This was the temperature of the skin, not of the body, as in all other instances quoted.]

Pygmy Hippopotamus (*Choeropsis liberiensis*), of Liberia, Sierra Leone and part of S. Nigeria: forest streams, singly or in pairs, 5' length, 2' 8" at shoulder, 600 lb. wt., head relatively less bulky than in Common Hippo, only two lower incisors.

Suborder Tylopoda

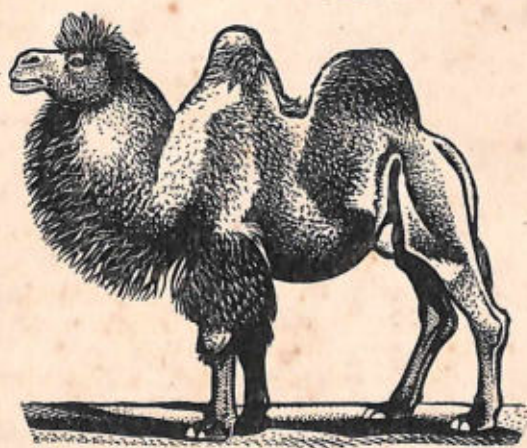
Family CAMELIDAE (Camels and Llamas)

Feet 2-toed with nails and tough padded soles, neck long, stomach complex, three-chambered, teeth include incisors above and below, small canines, grinding cheek-teeth. Apart from greater size and possession of 1 hump or 2, camels differ from llamas in having sole of 2 toes united, coarse hair and tufted tails, and are found in Old World only, while llamas are restricted to New World. [Longevity of Bactrian camel, 25 yrs., of domesticated llama, 20 yrs.]

One-humped or Arabian Camel (*Camelus dromedarius*), of which dromedary is special breed used in riding, not known wild, indis-



pensable domestic animal from N. Africa to India. Two-humped Bactrian Camel (*Camelus bactrianus*), of Central Asia, larger and more



hairy, still found in small numbers, in Gobi Desert, is widely domesticated. Ability of camels to live on minimum of food and water while travelling with loads make them valuable in desert and semi-desert country. Llamas are humpless, smaller, short-tailed and woolly, but share the camel's complex stomach [name llama applies particularly to Peruvian white or black transport animals]. Alpaca is another domestic

form bred for its fine wool. Wild species of Camelidae are guañaco and vicuña.

Guañaco (*Lama huanacos*), of southern plains of S. America, 4' at



shoulder, 5' to top of head, woolly coat, tawny to brown, head grey, in herds of 100, readily take to water. Mating Aug.-Sept., gestation 10-11 mths., 1 young, runs swiftly soon after birth, weaned 6-12 weeks.

Vicuña (*Lama vicugna*), of northern Andes 2½-3' at shoulder, in



parties of 1 male, up to 15 females, coat light brown, yellowish-red bib. Gestation 300 days, 1 young (details as for guanaco).

Other statistics: Temp. (of Bactrian camel) 99.6°F. (37.5°C.); pulse, 25-32.

Suborder **Ruminantia** (or Ruminants)

Deer, Giraffe, Okapi, Cattle, Sheep, Goats, Antelopes. Largest and most important suborder of Artiodactyla.

Stomach complicated; horns, when present, paired on crown.

Family **TRAGULIDAE** (Chevrotains or Mouse-deer)

Chevrotains are among smallest ruminants, seldom more than 1' at shoulder. Limb-bones less specialised than in other Ruminantia, 3 divisions of stomach instead of 4, without horns but males have tusk-like canines. Solitary, except in breeding season; 2 young at a birth. Numerous species, best-known being *Tragulus javanicus*, of Indo-China, Malaya and Indonesia.

Meminna (*T. meminna*), of southern India, coat spotted brown and white, an adept at hiding in holes among rocks or in hollow logs. African Water Chevrotain (*Hyemoschus aquaticus*), of Sierra Leone



through Cameroons to Eastern Congo, lives in and by heavily-forested streams. Slightly larger than Meminna, 14" at shoulder, dark brown with conspicuous pattern of white spots and stripes, nocturnal and solitary, takes to water at first sign of danger (excellent swimmer and diver), so although known for 100 years or more, little is known of its habits, but folk-lore credits it with extreme cunning and the use of stratagems.

All remaining families of Ruminantia agree in having four-sectioned stomach, chewing cud, and having front of upper jaw toothless, lower jaw with 6 incisors, and 2 canines, not distinguished from incisors and projecting forwards, cheek-teeth with ridges and hollows, and jaws working with a lateral movement.

Family *CERVIDAE* (True Deer)

Most carry bony antlers (usually males only) which are shed and renewed annually throughout life.

Musk Deer (*Moschus moschiferus*), of Asia (Siberia, Korea and island of Sakhalin southwards to Himalayas). Small, solitary, 2' or less at shoulder, living dense cover in mountainous regions up to 14,000', is one of few species of Cervidae entirely lacking antlers, but has 3" canine tusks. Limbs thick, coat brownish, dense, formed of unusually stiff, brittle pithy hair, lightly speckled reddish or yellowish, for centuries hunted for its abdominal "musk-pod," found in males only, used in China for perfumery and medicine. For this, animals usually taken in snares or shot after being driven out of cover. Now a synthetic substitute has been produced. [No other deer have this abdominal gland, but most have either a pair of glands in face, lodged in special hollows in the skull in front of the eyes, or in feet, or both.]

Muntjacs, Rib-faced Deer or Barking Deer (*Muntiacus*), of S.E.



Asia, small, reddish coat, low at shoulder, which is 22" high, have tusk-like canines and also short two-tined antlers at ends of long, bony, skin-covered pedicles.

[Alternative names: Rib-faced, from long, dark slit opening of prominent face-gland; Barking, from loud, sharp and sudden alarm note.] Habitat bushy ravines with thick cover. Solitary or in pairs, and although common in many parts of India, China and Indonesia, are seldom seen. Muntjacs introduced into England, escaped from parks, have become feral in some wooded parts. [Temp. 101.4°F. (38.6°C.)]

Tufted-Deer (*Elaphodus cephalophus*), of western China, closely related to the Muntjac, has unbranched antlers, scarcely visible.

Sambar (*Rusa unicolor*), of which many races ranging from India, through Siam, Malaya, Borneo and the Philippines to Formosa, eastern races being much smaller and having shorter antlers, largest being Indian, 5' 4" at shoulder, and bearing thick 3-tined antlers up to 50" long. Lives in forests, feeding by night in open glades, at the edge of forest or on adjoining cultivated land. Dark brown in colour, is one of darkest of all deer. Its alarm call, *pook*, also known as "the bell", is often surest sign of presence of a tiger or leopard about.

Hog Deer (*Hyelaphus porcinus*), of India, reddish- or yellowish-brown, spotted in summer, little more than 2' 3" at shoulder and with short antlers, averaging 12 to 16". Skulks in grass on open plains, never associating in herds, probably derives name from small size and habit of carrying head low.

Axis, Chital or Indian Spotted Deer (*Axis axis*), a common deer of India and Ceylon, up to 37" at shoulder, slender antlers up to 38" long; coat bright reddish-brown spotted with white, underparts white; lives in a variety of habitats, feeding by day as well as by night; alarm call a shrill whistle. Gestation 210-238 days.

Schomburgk's Deer (*Rucervus schomburgki*), of Siam, one of several species having 1st or brow tine growing forward over face, known only from skulls bought in Siamese markets, never seen alive by Europeans, probably now extinct. Thamin or Brow-antlered Deer (*R. thamin*), with simpler antlers, has also been much reduced in numbers by poaching for its antlers in velvet, said to have medicinal value.

Barasingh or Swamp Deer (*R. duvauceli*), of India, still plentiful, up to 4½' at shoulder, antlers up to 41" long, coat reddish-brown with row of white spots either side of a dark line down middle of back.

Sika or Japanese Deer (*Cervus nippon*), up to 3½' at shoulder, 4-tined antlers up to 31" long; coat dark blackish-brown in winter, prominent white tail-patch. [Also found in China and known as Manchurian Sika and Pekin Sika; introduced Southern England, now feral.]

Père David's Deer (*Elaphurus davidianus*), of China, recalls a donkey with long antlers, the posterior prong being as long as main beam. Antlers sometimes shed twice a year. Coat reddish-tawny, 45" at shoulder, antlers 28 to 35" along the curve. Tail tufted and longer than that of any other deer. Young boldly spotted. [No records of Père David's as a wild animal. Probably lived in swampy plains of China until cultivation of the land wiped it out except for some kept by the Emperors in hunting parks. Discovered 1865 by Père Armand David, French missionary and naturalist, who obtained sight of deer over wall of Imperial Hunting Park near Peking. Specimens sent to Paris, living animals later brought to Europe and placed in zoos. Rest subsequently killed for meat by soldiers during war period. Of animals



brought to Europe, large herd built up in Woburn Park, in Bedfordshire, by Duke of Bedford. After Second World War, breeding stock from this herd distributed to zoos in America and elsewhere. 1960, breeding pairs sent to China.]

FALLOW DEER (*Dama dama*)

General characters: Buck 3' at shoulder, doe slightly less. Summer coat typically reddish-fawn with white spots, spotted area bounded by white line along flanks. Winter coat darker and spots lost. [In some herds dark unspotted coloration persists at all seasons.] Underside of tail white, with white area margined black on buttocks. When alarmed fallow deer bounds away with tail raised, white area acting as signal or flag to those following. Chief distinguishing feature is palmated antlers, worn by male only, with numerous short points, known as spillers or snags, along edge of broad flat expansion. Pattern of antlers variable, and size up to 30" on outer curve, 2' from tip to tip. No sign of antlers during 1st year. 2nd-year fawn grows short unbranched prongs and then known as a pricket. Antlers shed in April of each year. 3rd year simple prong replaced by a beam with two forward tines. 4th-year antler more pronouncedly palmate and margins more regularly toothed or snagged. Both characters more marked still in 5th year, when beast is known as "buck of the first head". Thereafter number of



spillers or snags increases without marked increase in size of antlers as whole.

Habitat: Typically woodland, or grassland near woods.

Breeding: Rut takes place in autumn: buck then uses voice, a hoarse, grunting roar. Fawns dropped in May or June, in bracken. Usually 1 at birth, but may be 2 or 3. Fawn able to run within few hours of birth, but habitually rests in cover unless disturbed.

Present status: and range: Numerous as park and feral deer, truly wild only in Mediterranean countries.

Longevity: Average 10 yrs. maximum 15 (doe).

Special comments: Commonest park deer in Britain and many parts of western Europe; in places has become feral.

Persian Fallow Deer (*Dama mesopotamica*), closely related to *D. dama* once believed extinct, recently re-discovered.

RED DEER (*Cervus elaphus*)

General characters: Adult stag 4' or more at shoulder, with 10- or 12-tined antlers up to 43" long, dropped in March; hinds slightly smaller and carry no antlers. Summer coat reddish-brown, change to brownish-grey in winter, buff patch around short tail.

Male calf few months old grows a pair of bossets or knobs on head and is known as a knobber. 2nd year these become longer and are pointed, young deer being then a brocket. Names in succeeding years



are: 3rd yr. with a forward branch to antler, a spayad; 4th yr. a 2nd forward tine, bez-tine or bay, appears, about $\frac{2}{3}$ up main branch, to indicate a staggard; 5th yr., with a tray or royal antler near summit of antler, he becomes a hart; 6th yr. a crown of tines forms at head of antler and male deer becomes a stag.

Habits: During spring and summer while in velvet (i.e. fresh antlers are growing), stags live apart from hinds; in autumn when velvet shed and antlers are hard, stags grow restless and begin to bell. Neck and shoulders then clad in mantle of long hair.

Habitat: Woodlands and forest (in Britain loss of forests drives deer on to moorlands; change of diet reflected in small size). Red Deer of continent of Europe tend to be markedly larger than British Red Deer.

Food: Grass, herbage, foliage, green twigs.

Breeding: Harems formed in November rut. Gestation 225-270 days, 1 calf, rarely 2, born May to June, dappled with white, able to run within few hours, keeps well to cover and on signal from mother remains immobile in undergrowth.

Present status: Much reduced as compared with former times and mainly living under protection.

Range: Europe with related species N. Africa and Asia.

Longevity: 17 yrs.

Special comments: As Barbary Stag, found in Atlas Mountains, N. Africa. Some related species are, in Asia: Hangul (*C. cashmiriensis*), Shou (*C. affinis*) (both regarded by some authors as subspecies of *C. elaphus*); in N. America, Wapiti (*C. canadensis*).

Asiatic and American Wapiti very similar in general features, differ mainly in size, small details of colour and shape of antlers. Antlers of Tian Shan Wapiti indistinguishable from those of American Wapiti.

American Wapiti or Elk (*Cervus canadensis*), head and body 9', 5½' at shoulder, stags 750 lb. wt., hinds 500 lb. wt., antlers up to 5'. Coat greyish-brown, dark chestnut on back, grey rump-patch. Breeding as for Red Deer except gestation 210-262 days, 1-3 calves, 30 lb. wt. at birth, spotted coat. Sexual maturity 3 yrs. Longevity 22 yrs.

WHITE-TAILED OR VIRGINIAN DEER (*Odocoileus virginianus*)

General characters: Most abundant deer of U.S.A. and most typical of New World. Medium-sized, with fairly short branching antlers, curving forwards. 3½' at shoulder. Wt. up to 300 lb. Reddish-brown in summer, greyish-brown in winter. Speed 40 m.p.h. Jump 8' high, 30' horizontal. Prominent white tail-patch displayed in flight.

Habits: Not gregarious but, as with moose, combine in winter to form a "yard".

Habitat: (See under special comments).

Food: Leaves, mainly, but herbs and grass taken.

Breeding: November rut, polygamous (1 buck to 2-3 does). Gestation 210-250 days. Normally 2, occasionally 3, fawns, each 3-5 lb., suckled every 4 hrs., follow dam when 4-6 weeks. Lose spots at time of weaning (4 mths.). Young bucks leave dam in a few months, young does not until well into 2nd year.

Present status: Abundant, more numerous than formerly.

Range: U.S.A. east of Great Plains (south of St. Lawrence and James Bay, westwards to Rockies and parts of Oregon and north-east California).

Longevity: 20 yrs.

Special comments: A browser by preference, Virginian deer not numerous in primeval forest of U.S.A., which had little bushy undergrowth. Even so, was widespread over all the U.S.A., east of the Great Plains. At first, mainstay of Red Indians, then of pioneer settlers, then excessive hunting reduced it to low ebb. With stricter game laws and close seasons, however, there was rapid recovery and population of White-tailed Deer probably greater now than before white settlement of America. Two other things helped. Puma, wolf and lynx, which would have kept deer population within limits, have been wiped out. Then clearing of vast forests, formerly covering much of eastern States, has produced far more congenial habitat. Now White-tailed Deer is target of scores of thousands of licensed gunners who take to backwoods each season and blaze away at every movement in bushes. Result: hunting is said to be most dangerous to those taking

part. 2 young at a birth, occasionally 3, ensures more rapid repopulation than is case in most deer.

(Forms related to white-tailed deer are found through Mexico and Central America, to Brazil and Peru.)

Other statistics: Temp. 100-8°F. (38-2°C.)

MULE DEER (*Odocoileus hemionus hemionus*)

General characters: Head and body 5', tail 8", 300 lb. wt., does about 1/3rd smaller than bucks; ears unusually large. Coat tawny or yellowish-brown in summer with whitish rump patch, winter coat longer and greyer, tail black tipped.

Habits: Herds follow regular routes from summer grounds in mountains to sheltered valleys in autumn.

Habitat: Woodlands and bush.

Food: Grass and other herbage, also browse evergreen foliage and twigs.

Breeding: Harems formed in November, Gestation 180-210 days, 1-3 fawns (usually 2).

Present status: Numerous.

Range: Western U.S.A., into Mexico in south and British Columbia in north.

Longevity: 7 yrs.

Special comments: Black-tailed deer (*Odocoileus hemionus columbianus*), of British Columbia and Pacific States of U.S.A., similar to mule deer but slightly smaller, tail black below instead of black tipped and shorter scent-gland on side of leg.

MOOSE (*Alces americana*)

General characters: Largest living deer, up to 7' 9" at shoulder, wt. up to 1,800 lb. Antlers, in male only, span up to 78" forming great flattened surfaces armed with numerous tines or snags. Head long, bearing a broad, pendulous upper lip, large ears and a tassel of skin and hair at throat. Rump noticeably lower than shoulders. Tail small. Legs long, powerful. Coat uniformly blackish-brown.

Habits: Not gregarious but in winter a number may combine to form a "yard", an area of trampled snow, with plentiful supply of brushwood for feeding. Here they remain until all available food is exhausted. In deep snow would be at a disadvantage, at mercy of wolves, bears and pumas. Adults protect themselves against enemies with powerful front legs and hoofs.

Habitat: Well-watered forests.



Food: Spend much of time in summer in lakes and rivers, where long legs enable them to wade out for water-lilies and other aquatic vegetation, and escape flies and mosquitoes. Winter, browse on shoots and branches of saplings, great height enabling them to reach such food easily. Will straddle a sapling, bending it over, so reaching tender shoots.

Breeding: Polygamous. Mating season autumn: bull bellows and on hearing cow respond smashes his way noisily through thick brushwood to find her. (Indian hunters call up bull moose at such times by imitating call of the cow with a birch-bark trumpet.) Gestation 240-270 days, 1-3 calves per birth, uniform reddish-brown. Run with cow at 10 days, when 3' high. Remain with mother 2 yrs., then sexually mature.

Present status: Still numerous, but have disappeared from much of southern part of range.

Range: Alaska, Canada, northern U.S.A.

Longevity: 20 yrs.

Special comments: Some writers distinguish between Alaskan Moose (*A. gigas*) and Common or American Moose (*A. americana*) in southern part of range. Latter smaller, 6' 6" at shoulder.

European Elk (*A. alces*) smaller than American relative, and has smaller antlers, but habits much the same. Inhabits forests and marshes of northern Europe and Asia.

Other statistics: Temp. 102·6°F. (39·4°C.)

CARIBOU (*Rangifer arcticus*)

General characters: Differs from all other deer, except reindeer, in that females also wear antlers. Highly specialised for arctic conditions. Coat thick. Muzzle hairy instead of naked as in most deer. Ears and tail short, so reducing surface through which body-heat can be lost. Hoofs broad, flat, deeply cleft, so that whole foot splays out for support on snow. On hard ground hoofs clatter like castanets. Antlers of females far less developed than in male, often merely forked spikes. Male $6\frac{1}{2}'$ long, $3\frac{1}{2}'$ at shoulder, wt. 400 lb. Females smaller, wt. 275 lb.

Habits and habitat: Woodland caribou inhabit tree-clad country south of arctic tundra, do not form large herds. Barren Ground caribou, of far north, more gregarious, make seasonal migrations over many hundreds of miles to and from winter and summer feeding grounds, along well-defined routes, where Eskimos and Indians, as well as Arctic wolf, lie in wait to kill.

Food: Woodland caribou feeds on leaves, grass, aquatic plants and lichens. Barren Ground caribou feeds same in summer, lichens in winter, scraping away snow to find these. Said to use flattened brow-tine for shovelling snow; this difficult to confirm. Against this, males

drop antlers December, females February: both seen pawing snow away with hoofs.

Breeding: Bulls build harems 30-40 cows. Rut, Sept.-Oct., lasts 2 weeks. Gestation 230-246 days. 1-2 calves per birth. Young walk in a few hrs. Weaned at 2 mths.

Present status: Much reduced in numbers: in need of protection if species is to survive in wild.

Range: Northern Canada.

Longevity: 15 yrs.

Special comments: Although caribou and reindeer (*Rangifer tarandus*) here treated as separate species some authorities regard them as varieties of one species. Reindeer, of Arctic Europe and Asia, domesticated, smaller than caribou, breed slightly earlier. Otherwise little difference between them.

Other statistics: Temp. 102°F. (38.8°C.)

ROE DEER (*Capreolus capreolus*)



General characters: Adult bucks 26 to 30" at shoulder, have short, erect 3-tined antlers, seldom more than 12" long, which are dropped at the end of year and completely renewed by February. Summer coat short, bright fox-red without a white tail-patch. Winter coat long and thick, a dark, speckled greyish-fawn with a very conspicuous white tail-patch.

1st-year fawns have no antlers. These appear in 2nd year as unbranched prongs. In 3rd year antlers are forked, and in 4th year have a backwardly-directed tine in addition. This pattern is maintained in succeeding years, but antlers increase in size until they reach about 9" in length.

Habits: Solitary or in pairs, in large woods adjoining grassland or

fields, roe deer usually hide by day, coming out at night to feed. Action when moving is an active bounding. This is seldom seen as they are difficult to drive from cover.

Habitat: Most common in wooded valleys and in large woods adjoining grassland or fields.

Food: Grass, leaves of many kinds, especially growing tips of young shoots.

Breeding: One sign that roe deer are in a district is the finding of roe rings, but these are even more difficult to come upon than animals that make them. Best seen from May to August, either circular or figure-of-eight tracks worn in ground or in herbage, usually with a bush or shrub at centre of each ring. A single ring may be from a few feet to twenty feet in diameter.

Use of rings for play seems to end by July, and in middle of that month rutting season begins. Doe catches attention of a buck, who follows her nose-to-tail as she dashes off on a winding course which periodically ends in her running in a circle, around a tree or bush, the buck hard behind her. After a while she may lead him away, only to return and start another circle neighbouring the first, the two circles then forming a figure-of-eight.

In spring does drop their spotted fawns in deep covert, usually 1-2, rarely 3 at a birth. When a fortnight old fawns led by doe into more open parts and, apparently as part of their training, incites them to follow her as she dashes round in a circle, every now and then suddenly wheeling and doubling back on her tracks. It seems to be a form of play, but it probably increases their speed in manoeuvre; and it takes place more particularly just after dawn.

Present status: Numerous away from built-up or well-settled areas.

Range: Northern Europe and Northern Asia. (Siberian roe like European roe but larger and no white on muzzle.)

Longevity: No information.

Special comments: More widespread today in Britain than red deer, although practically extinct except in Scottish highlands during 18th and 19th centuries. At beginning of 19th century, introduced into Ayrshire by Marquis of Ailsea and spread rapidly from his estate at Culzean Castle to surrounding countryside to become a menace to forestry. These, together with the few that had still remained, eventually spread right across southern Scotland. In England, was probably never entirely extinct in north. Has become re-established in Norfolk and parts of Suffolk following introduction of some from Germany to woods near Thetford in about 1884. Has become widespread over southern counties, from Sussex and Surrey to Devon, Somerset and Wiltshire as result of introductions at various points during 1800 to 1825.

Chinese Water Deer (*Hydropotes inermis*), of eastern China, without antlers, but males have long tusk-like canines. Lives in river valleys, in long grass, scuttling away like a rabbit when disturbed and dropping



flat in grass when at safe distance. Unique among deer in having normally 4-5 young, sometimes 6-7; has 4 mammae instead of 2 usually found in deer. Summer coat light reddish-brown, winter coat dark brown. [Introduced and feral in southern England.]

South American deer include:

Marsh Deer (*Blastocerus dichotomus*), about the size of red deer, fox-red with black legs, males with doubly forked antlers up to 2' long, lives in small parties, in dense cover by rivers and swamps. Chilian Pudu (*Pudu pudu*), 15" high, smallest of all deer, with very small spikes for antlers. Pampas Deer (*Blastocerus bezoarticus*), about the size of roe deer, antlers small and 3-tined, lives on pampas from Brazil to northern Patagonia, bucks usually solitary, have strong, disagreeable odour said to be perceptible up to a mile. Guemals (*Hippocamelus*), medium-sized, simple, short, 2-pronged antlers and curiously brittle, coarse, yellowish-brown coat. [One species (*H. antisensis*) found at 10,000-16,000' only in the Andes.] Brockets (*Mazama*), small, fox-red, 2' high at shoulder, antlers consist of a pair of short, unbranched spikes, mainly in forests, warmer parts of Brazil and Guianas. [Some species live at high altitudes in Andes.]

Family GIRAFFIDAE

Unique in having as horns bony knobs covered with skin: lower canines incisiform and bilobed.

GIRAFFE (*Giraffa camelopardalis*)

General characters: Remarkable for long neck, tapering head with mobile hairy lips and extensile tongue, long legs, sloping back and long tufted tail. Height up to 18' to top of head in old bulls. Eye large and lustrous. Horns 2-5, a pair on forehead, often a 3rd boss in front and, in some races, another small pair farther back. Coat boldly spotted and blotched but pattern variable: most races have large irregular blotches of chestnut or dark brown on a pale buff ground but the most northern Somali or reticulated giraffe appears liver-coloured with a network of fine white lines.

Habits: Although appearing ungainly, giraffe is adapted to browsing leaves on tall trees. Great height of head coupled with large eyes give commanding view of possible predators. Long legs give good turn of speed with curious galloping action, in which legs of each side move simultaneously. To drink, must straddle and bend forelegs to reach water, but capable of going long periods without drink. Long legs and

heavy forehoofs can be used with deadly effect in self-defence or defence of young. Often said to be mute, but now known to use various grunts and cries. Some evidence for using ultrasonics.

Habitat: Dry savannah, semi-desert.

Food: Leaves, especially of acacia and thorn scrub.

Breeding: Gestation 420-468 days. Single calf born March-April, able to walk within hour of birth. Suckled for 9 mths.

Present status: Wiped out in parts of former range for sake of hides, now protected by game laws. These, aided by favourable sentiment of white populations, make survival in remaining haunts probable.

Range: Africa (Sudan and Somaliland to S. Africa, westwards to Northern Nigeria).

Longevity: 28 yrs.

Special comments: Number of species and geographical races have been recognised, differing in detail of colour, horns, etc., but so much variation in these that current practice is to treat all giraffes as one species.

Other statistics: Pulse, 66.

OKAPI (*Okapia johnstoni*)



General characters: Build like that of giraffe with legs and neck foreshortened, and proportions somewhat of a racehorse. Muzzle long with mobile lips and long tongue for seizing foliage. Coat sleek, rich purple, legs and thighs banded with white.

Habits: Solitary, or at most in pairs. (No white man has observed okapi undisturbed in native haunts).

Habitat: Depths of tropical rain forest.

Food: Leaves.

Breeding: Gestation 426 days.

Present status: No information, but total protection given, except for specimens intended for zoos.

Range: Congo, forests on both sides of Congo River system.

Longevity: Unknown.

Special comments: Unknown to science until 1900.

Family ANTILOCAPRIDAE

Only antelope with branched horns, outer horny sheath of which is shed and renewed annually.

PRONGHORN ANTELOPE (*Antilocapra americana*)

General characters: Head and body $4\frac{1}{2}'$, tail $4''$, $3\frac{1}{2}'$ at shoulder, buck 140 lb., doe 105 lb. wt., both sexes bear horns up to 20" (average 15"), branched, outer horny sheath shed annually, in October. Hair coarse, brittle, rich reddish-brown with black on neck, muzzle and in patch on throat, prominent white patches on cheeks and throat, white flanks and undersides and white rump patch, eyes very large, sight keen.

Habits: Depend on speed, reach 50 m.p.h., leap 20'. Hairs of rump patch erectile in fear or excitement, form conspicuous mark visible at great distance, probably used as signal to others. Acute sense of curiosity. Gregarious in small bands in summer, large troops in winter.

Habitat: Scrub and desert grasslands of west and mid-west U.S.A.

Food: Vegetable.

Breeding: Polygamous, harems of does early autumn, gestation 240 days, 2 kids born June, walk in few hours, out-run a man at 4 days, mature at 5 years.

Present status: Formerly 40,000,000 (estimated), then heavy reduction end of 19th century, until only 30,000 head in 1925. Now conserved and in recent years numbers have risen to about 400,000.

Range: Plains from Mexico to Canada.

Longevity: 15 yrs.

Family BOVIDAE

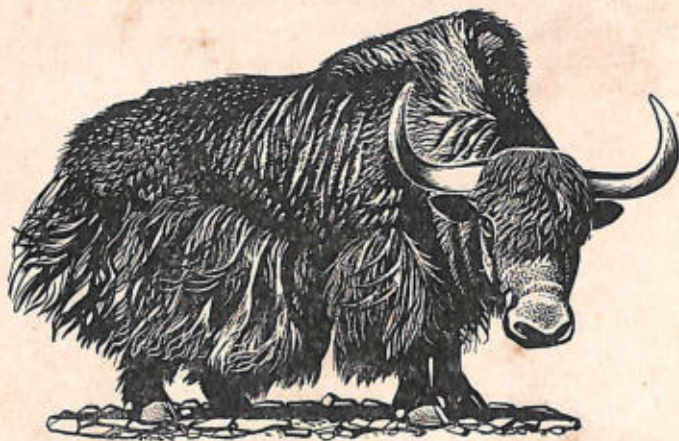
Horns (sometimes on males only) permanent, hollow, unbranched, supported on bony cores: cheek-teeth high-crowned.

Indian Buffalo, Arna, Carabao, Water Buffalo (*Bubalus bubalis*), found wild in a few places in India, Assam, Indo-China, Borneo, domesticated and used as draught animals in India, China, Iraq,



Hungary, Italy, Spain, N. Africa, and elsewhere, feral in Ceylon, N. Australia. Powerful, black, short-haired, wide-spreading, flat-fronted horns, swept back, up to 77" along curve, habitat swampy ground or near rivers; wallows in mud-holes; herd combines for defence trampling enemy (e.g. tiger) into ground. Gestation 300-328 days, 1-2 calves.

Gaur (*Bibos gaurus*), of Nepal, Peninsular India south to Travancore, Assam, Burma, Indo-China, Malay States; 6' 4" at shoulder, heavy build, pronounced dorsal ridge or hump ending abruptly behind shoulders, brown to black, short hair, white stockings on lower legs, horns flattened, broad at base and strongly curved inwards at tips, up to 34" outer curve and 44" tip-to-tip. Habitat forested hilly tracts, in small family parties, grazing in open glades and retiring to depths of forest if disturbed. Old bulls sufficiently powerful that seldom attacked, but tigers and wild dogs attack young or aged. Liable to outbreaks of rinderpest and foot-and-mouth disease from domestic cattle grazing in forests. 1 young at a birth. [Seladang of Malaya is a race of Gaur.] Banteng (*Bibos sondaicus*) of Java, smaller and less massive, sometimes domesticated, thought by some authorities to be original stock of Zebu, Oriental domestic cattle.

YAK (*Poephagus grunniens*)

General characters: Solidly built, powerful, larger than domestic cattle, with long fringe of black hair hanging from flanks, conspicuous growth of hair on chest and very bushy tail (used as a flywhisk in India). Average $5\frac{1}{2}'$ at shoulder, maximum 6'. Wt. up to 1,200 lb. Wide-spreading horns up to 38" length. Coat blackish-brown (domesticated variety smaller and with smaller horns, variable in colour: red, black, brown, piebald, white).

Habits: Feed morning and evening, rest and chew cud between. Form phalanx, with calves inside, for defence against enemies.

Habitat: Mountain country, barren to all appearance, up to 20,000'. Cannot survive in warm lowlands.

Food: Sparse vegetation (thrive in regions seeming almost barren).

Breeding: Gestation 255-304 days. Calves born in autumn. (Cross freely with domestic cattle).

Range: Tibet, but used for transport in other parts of Asia.

Longevity: 32 yrs.

Special comments: Used as beast of burden, sure-footed, slow, but with powers of endurance.

ANOVA (*Anoa depressicornis*)

General characters: Smallest wild member of Bovidae. Short, stockily built, 3' 3" at shoulder, hindquarters slightly higher. Skin blackish, almost hairless, two white spots on head below each eye. Horns straight, short, ringed and triangular at base, up to 15" long, lying back in plane of face.

Habits: Fondness for water and shade. Shy, difficult to detect. In pairs, except at calving time, when cows keep apart.

Habitat: Remote wooded mountains.

Food: Vegetarian.

Breeding: Gestation 276-315 days.

Present status: No information.

Range: Celebes.

Longevity: No information.

Special comments: Seldom seen except by local hunters. Has reputation of being dangerous to meet at close quarters.

CAPE BUFFALO (*Syncerus caffer*)

General characters: Powerfully built, black, short-haired, 7' head and body, 5' at shoulder, 1,500 (to 3,000) lb. wt., large ears, broad-based horns meet almost at centre forming a thick boss over forehead, maximum span 56", each horn curves down, out and in again, 3' along curve.

Habits: In herds of up to 1,000, near water, drink in evening, graze during night, lie up by day in swampy reed-beds or thick bush. Aggressive, especially when harassed or injured, match for a lion. Probably most feared of African game.

Habitat: Long grass to equatorial forest (colour of coat and shape of horns vary with habitat; horns swept back in forest-dwellers).

Food: Grass and foliage.

Breeding: Mating January, gestation 330 days, 1 calf, well-haired, reddish, changing to black at 3 yrs. of age.

Present status: Reduced numbers.

Range: Nearly all Africa south of Sahara.

Longevity: 16 yrs.

Special comments: Authorities differ on status of Dwarf or Forest Buffalo, either separate species (*S. nanus*) or a race of *S. caffer*. Also known as Bush-cow in W. Africa, less than 4' at shoulder, more lightly built, reddish-brown, horns shorter, lying back in plane of forehead.

BISON OF NORTH AMERICAN BUFFALO (*Bison bison*)

General characters: Forequarters and head massive, shaggy, 11' head and body, tail 2', 6' at shoulder, 3,000 or more lb. wt., dark brown, lighter towards hindquarters, horns short, upcurved.

Habits: In family parties, but herding for migration.

Habitat: Open plains.

Food: Grass.



Breeding: Mating Aug.–Sept., gestation 270–285 days, 1 calf at birth, can stand 3–4 days, mature at 3 yrs.

Present status: From millions, numbers reduced by persecution to about 750 to 1890, then protected and now number 21,000.

Range: U.S.A., Canada.

Longevity: 22 yrs.

Special comments: Two races recognised, Plains Buffalo, and Wood Buffalo (of Canada).

Other statistics: Temp. 102.3°F. (39.0°C.)

European Bison or Wisent (*Bison bonasus*). Exterminated in truly wild state, now preserved in a few zoos, parks and forest reserves (e.g. Bielowiecza forest, Poland). Less shaggy than *B. bison*. [Caucasian race (*B. bonasus caucasicus*), slightly smaller, less shaggy, dwindled in numbers until extinct in 1930 except in zoos and parks.]

WILD SHEEP (*Ovis*)

Wild sheep have hairy coats, often thick, never woolly, as in many small domestic sheep bred by primitive peoples, especially in hot climates. All have very short tails (except Arui or Barbary Sheep). Doubtful whether any existing wild sheep have played any part in origin of domestic sheep.

Mouflon (*Ovis musimon*), only European wild sheep, 27" at shoulder, reddish-brown with conspicuous whitish saddle patch and black marks on the limbs; horns up to 34" long form a close spiral with tips sometimes curving inward; live in most rugged mountainous areas; but continuous persecution has reduced numbers; now introduced on to several mountain ranges of Central Europe. Cyprian sheep or Red



Mouflon

Sheep (*O. orientalis*), little larger than Mouflon, generally reddish-brown, females without horns, curving horns of rams, up to 40" long, turn in over shoulders instead of curving forward by face as in Mouflon.

Urial or Shapu (*O. vignei*), of which several races from Caspian Sea to Tibet, Kashmir and Punjab, from near sea-level in Sind to 14,000' in Tibet; up to 3' at shoulder, reddish coat and light ruff at throat; horns in both sexes, those of females short and straight, those of males stout, strongly wrinkled, curling round by side of face in at least one complete turn, up to 39" long along the curve.

Argali (*O. ammon*) of mountains of central Asia, from Bokhara and Altai to Tibet and Mongolia, 4' at shoulder, thick massive horns thickly-wrinkled surfaces, in some races form more than a complete spiral and tips point outwards, giving wide tip measurement. Weight of horns may be up to 40 lb. with thick neck muscles and tendons to support them. Female horns short, straight, thin. Coat short, greyish-brown. Live at high altitudes, 15,000-18,000' or more, grazing on open plateaux or grassy, high-altitude valleys, taking to the higher ground when in danger. Ewes and young in flocks, rams in small parties. Marco Polo's Argali (*O. ammon poli*), of Pamirs, has longest horns of all, growing outwards in an open spiral, record length of 75", tip-to-tip span 54½".

BIGHORN OF ROCKY MOUNTAIN SHEEP (*Ovis canadensis*)

General characters: Only wild sheep in America. Ram 3½' at shoulder, wt. 320 lb. Horns forming one spiral, length up to 45". Ewes smaller, wt. 175 lb., horns short and nearly straight. Fleece fawny-buff, on back,

brownish on sides, yellowish-white underparts. Conspicuous whitish tail patch contrasting with rest of coat.

Habits: Prefers open feeding grounds near rocky hills or mountainsides, to which it can bolt for refuge. Alert to danger. Natural enemies mainly wolf, puma, golden eagle. Graze high pastures summer, at lower levels winter.

Habitat: Mountainous regions.

Food: Grass and other vegetation. Can survive long fasts.

Breeding: November rams form harems of ewes. Gestation 180 days. 1-2 lambs per birth, able to run at 2 hrs.

Present status: Numerous in places.

Range: Rocky Mountains (Mexico to Alaska).

Longevity: Up to 15 yrs.

Special comments: Various races are found from Mexico to Alaska. In Alaska Stone's Mountain Sheep (*O. canadensis stonei*) almost white in summer, pure white winter. Several races of wild sheep in Kamtschatka more related to Bighorn than to Asiatic Argali, suggesting former land-bridge between N.E. Asia and N. America.

Barbary Sheep (*Ammotragus lervia*), only wild sheep of Africa, has horns more goat-like than sheep-like, scarcely wrinkled, a heavy ornamentation of long straight hair on chest and forelimbs, and tail much longer than in most sheep, lacks facial glands. Lives in small parties in wildest rocky hills, north of Sahara, and in few isolated barren hill ranges in Sahara, tawny coat not easily seen when lying up for day among rocks, feeds mainly at night, on scanty grazing or dry shrubs, said to be able to go without water. 3' 3" at shoulder, horns, relatively large in female, up to 33½" (average 25"). [Not uncommon Morocco, Algeria, Tunisia, rare in Libya and Upper Egypt east of the Nile.]

Bharal or Blue Sheep (*Pseudois na hoor*), of Tibet and adjoining mountain country, 3' at shoulder, record horn-length 33", slaty-grey colour, inconspicuous at rest among boulders, horns goat-like curve backwards and inwards.

WILD GOATS (*Capra*)

True Goats (*Capra*) include Ibexes and Markhors. Horns, often of great length, curve upwards and backwards sabre-like, or spirally twisted, never grow laterally as in Sheep, males bearded, strongly scented, both sexes have horns, noted for sure-footedness, browse especially precipitous cliffs.

Wild goat (*C. hircus*), of S.E. Europe through Asia Minor to Persia and Pakistan, 3' at shoulder, sweeping scimitar-shaped horns, up to 52" long, narrow, laterally compressed, with inner front edge bearing



several large knobs. Horns of females small, slender. Coat reddish-brown in summer, greyish-brown in winter, with black marks on body and limbs. Live in the steepest and rockiest places, and where hunted are wary in extreme. [Temp. 103.2°F. (39.5°C.); pulse, 145-240.] Species closely related to *C. hircus* are Nubian Ibex (*C. nubiana*), of Egypt, Sinai and parts of Arabia (Longevity, 10 yrs.), and Abyssinian Ibex (*C. walie*), heavily built, horns up to 44" long, lives in limited area on immense cliffs of Simien highlands.

Ibex (*Capra pyrenaica*), of S.W. Europe, with parti-coloured coat and wide sweeping horns forming an open semi-spiral, formerly inhabited most of mountain ranges of Portugal and Spain, as well as the Pyrenees. Portuguese and Pyrenean forms probably now extinct. Spanish race owes survival to State protection, after being nearly exterminated about 1905. Alpine Ibex (*C. ibex*), of Alps of Switzerland, France, Italy and Austria, 5' long, less than 3' at shoulder, up to 200 lb. wt., horns up to 35". Mate in October, gestation 240-280 days, 1-2 kids, able to follow female over rough ground few hours after birth. Believed exterminated as a wild animal in most of its range and since re-introduced to many Alpine valleys, but as it interbreeds freely with domestic goat, doubtful if present stock is pure. Siberian and Himalayan Ibex (*C. sibirica*), of Central Asia, largest of true ibexes, up to 40" at shoulder, curved horns up to 58" length, chief enemies snow leopards and wild dogs.

Markhors are heavily-built wild goats inhabiting precipitous country, open or forested, in Bokhara, Afghanistan and the Western Himalayas. Old males have thick shaggy beard down to throat and



chest, horns compressed and twisted in corkscrew spiral, either open with widely diverging tips, as in Astor Markhor (*C. falconeri*), up to 59° on curve or 40° in straight line, or straight as in Suleman Markhor (*C. falconeri jerdoni*).

Tahr (*Hemitragus*), goat-like, smaller horns than true goat or ibex, lacks glands on the face or feet. Himalayan Tahr (*H. jemlahicus*), largest, noted for shaggy coat with particularly long mane on neck and



chest, horns up to 14", lives on steepest hillsides mixed with precipices. Nilgiri Tahr (*H. hylocrius*), of S. India, about the same size but short-haired, horns compressed and closely set together, up to 16 $\frac{3}{4}$ ". Arabian Tahr (*H. jayakari*), of S.E. Arabia, little more than 24" at shoulder, coarse, brittle hair, very little known.

Goat-antelopes, goat-like mountain animals with short horns, worn by both sexes, include remarkable rock-climbers although hoofs appear unsuitable. Only European species is

CHAMOIS or GEMS (*Rupicapra rupicapra*)



General characters: Sturdy, 4' head and body, 32" at shoulder, up to 90 lb. wt., does smaller than bucks, coat long, thick underfur, light tawny in summer, dark brown to black in winter, horns in both sexes, vertical to 10", then curve back and down, sharp-pointed.

Habits: Can leap 13' high or 23' long. Remarkable sight and hearing.

Habitat: Mountain tops, at upper edge of tree-line, going higher in summer.

Food: Sparse herbage.

Breeding: Gestation 153-180 days, 1-3 kids born May-June, able to follow female almost at birth.

Present status: Much reduced.

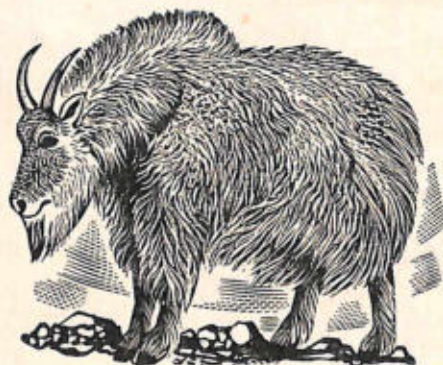
Range: Alps, Apennines, Carpathians, Asia Minor.

Longevity: No information.

Gorals (*Nemorhaedus*), shaggy, goat-like animals, less than 3' high, with small horns curving backwards, up to 8½". Live between 3,000' and 8,000' in Himalayas, China and Korea, always in forest on steep mountainsides, especially where rocky cliffs to which they can retire for security and rest, coat brownish-grey. [Gestation 180 days.]

Serows (*Capricornis*) 38 to 42" at shoulder, heavy, ungainly, long mule-like ears, short tail, coat blackish to reddish-brown, often with conspicuous white or grey mane on the neck, short curved horns up to 9½", head large with deep facial pits, or face glands, in front of eyes, and naked muzzle. Range from Malaya to Burma, eastern Himalayas, China, Formosa and Japan, lie up by day in thickets or bamboos, feed only in the evening and morning, said to cross perpendicular cliffs with amazing ease, shy, wary, dangerous if brought to bay. Hunted with dogs, and will charge with determination both dogs and hunters. Smallest species *C. crispus* of Japan, has woolly coat and no neck-mane.

ROCKY MOUNTAIN GOAT (*Oreamnos americanus*)



General characters: Head and body 5', tail 6½", 41" at humped shoulders, male 300 lb. wt., female 250 lb., coat shaggy, white all year round, hair long, coarse, covering legs down to knees, beard small, eyes and hoofs black, horns black, 1' long.

Habits: In family groups, pastures high above tree-line in summer, winters at lower levels. Strong sense of curiosity makes it easy to approach. Can run up almost perpendicular cliff-face.

Habitat: Wild mountain country.

Food: Any vegetation.

Breeding: Probably monogamous, gestation 147 days, 1-2 kids able to stand almost immediately after birth, 13" at shoulder 7 lb. wt.

Present status: Much reduced numbers, now found almost entirely in reserves.

Range: Rocky Mts. (from Montana to Alaska).

Longevity: No information.

Other statistics: Temp. 101.6°F. (38.6°C.)

Takin (*Budorcas taxicolor*) (sometimes included among Goat-



Antelopes) of Himalayas and W. China, 42" at shoulder, horns 24" along curve, large heavy build suggestive of an ox, angular horns like those of gnu; active rock-climber as expert as any in this group. Head has prominent Roman nose, whole aspect of the animal suggests power and force. Lives in some of wildest and most rugged country in the world among dense thickets of rhododendron and dwarf bamboo on precipitous hillsides and rocky cliffs. Reputation for fierceness if cornered and wounded. Three races: Himalayan Takin (*B. taxicolor taxicolor*) from Bhutan and Assam, reddish-brown to golden-yellow with face and legs black; Tibetan Takin (*B. taxicolor tibetana*), of Szechwan Mountains, S.W. China; Golden Takin (*B. bedfordi*), of Shensi, W. China, striking golden yellow all over.

MUSK-OX (*Ovibos moschatus*)

General characters: Shaggy-coated, cattle-like but not related to cattle or sheep. Dense coat deep brown, almost reaching to ground in winter, underparts black. 5' at shoulder, wt. up to 700 lb. Cows smaller than bulls. Recurved "meat-hook" horns meeting in centre of head. Hairy muzzle. Broad hoofs. Bulls have musk-gland on face.

Habits: Live in herds: best known for habit of forming a phalanx for protection of calves.

Habitat: Arctic tundra.

Food: Sparse vegetation.



Breeding: Single calf, born May, 16 lb. at birth, 18" high at shoulder, follows cow at 1 hr.

Present status: Much reduced: fears for survival of species.

Range: (Formerly Arctic Europe, Asia, America) now Arctic Canada and Greenland.

Longevity: Unknown.

Special comments: Pelt favoured as sleigh-rug. Habit of forming phalanx to protect calves or fallen comrade, useful against wolves, has led to destruction from fire-arms.

Other statistics: Temp. 104°F. (40·0°C.)

ANTELOPES

[Name probably from Coptic *Pantholops*, originally applied to mythical unicorn, now loosely applied to all gazelles and related forms (e.g. hartebeestes, waterbucks, sables, etc.)]

Most are active runners. Muzzle hairy, check-teeth narrow, facial glands present, horns either compressed, lyrate or spiral. Confined to Old World (except Madagascar, Malaya and Australasia) and mainly to Africa. Some of least typical of African antelopes are hartebeestes and topis, over 4' at shoulder, with sloping backs, straight and very long faces accentuated by a pedicle on the crown bearing short but angular horns.

Hartebeestes graze in herds on plains, mix regularly with other game and commonly seen with zebras, wildebeestes or gazelles, despite awkward build, have considerable speed and stamina. Cape Hartebeeste (*Alcelaphus caama*) survives in very small numbers, protected on



farms. N. African or Bubal Hartebeeste (*A. buselaphus*), formerly from Egypt to Morocco, almost certainly extinct. Lelwel (*A. lelwel*), of Lake Chad, Sudan, Kenya and Uganda, foxy-red, up to $4\frac{1}{2}$ ' at shoulder. Kongoni or Coke's Hartebeeste (*A. cokei*), Kenya, is one of most numerous.

Bastard Hartebeestes (*Damaliscus*) smaller, less ungainly than hartebeestes, often with rich plum-coloured, short coats. [Tiang and Topi are local names applied to E. African subspecies of *Damaliscus korrigum*.] All species of *Damaliscus* have shorter faces than true hartebeestes, horns are prominently ringed, spring from skull separately and curve evenly back instead of rising in angular shapes from a common pedicle. The S. African Sassaby or Tsessebe (*D. lunatus*), of less settled parts of S. Africa, especially Rhodesia and Portuguese E. Africa, rich chestnut-red with purple and orange sheen, black blaze on forehead, still plentiful, has reputation of exceeding all other antelopes in sustained speed, over a distance of 6 or 7 miles can beat a good horse. Bontebok (*D. pygargus*) and Blesbok (*D. albifrons*), of S. Africa both smaller (42" at shoulder), coat glossy, plum-coloured, face white [bontebok has prominent white rump patch]. Once most numerous of all S. African antelopes, no longer exist in wild (about 100 bontebok survive in Bontebok National Park, Cape Province, and a few adjacent farms; blesbok now farmed as a source of venison for the S. African towns).

Gnus or wildebeestes, even more ungainly in appearance than hartebeestes, have buffalo-like head and horns (record length on curve $30\frac{7}{8}$ "), mane and tail like a horse, noted for manoeuvring in formation or leaping in capricious antics. White-tailed Gnu (*Connochaetes gnu*), of S. Africa, no longer in wild state, fair number

preserved on farms in the Orange Free State and Transvaal; less than 4' at shoulder, blackish, with dirty-white, long-haired tail almost reaching to ground, tufts of long black hairs on broad muzzle, throat, and chest, mane erect, black-and-white. Breeding: cows and bulls normally in separate herds, mate in June, gestation 240-276 days, 1-2 young.

Brindled Gnu or Blue Wildebeest (*Gorgon taurinus*), of Kruger



National Park north to Tanganyika and Kenya (abundant on open plains in northern part of range), 4' at shoulder, 7' head and body, spreading horns with span of up to 33", all-black tail, slate-coloured body, pendant mane, long hair on the throat forming a beard. [E. African race is white-bearded.] Freakish behaviour: quietly grazing will suddenly suspect danger, throw up heels, buck and cavort, gallop off in long line, suddenly wheel and stop to gaze back at intruder. Rely on keen sight and scent to avoid lion, greatest enemy. [Longevity, 16 yrs.]

The Duikers (Dutch for divers) skulk in thick cover. Most are small, short-legged, with spike-like horns, naked muzzles and large face glands. Three main divisions: genus *Cephalophus* contains all the larger species, including Yellow-backed Duiker (*C. sylvicultrix*), of Sierra Leone to Ituri, N. Rhodesia and Uganda (= Bush Goat of W. Africa), 3' at shoulder, horns up to 7½", heavy build, low in front, as in all forest duikers, blackish-brown with conspicuous yellowish-white rump patch extending forward as narrow line to centre of back. Much trapped as a source of meat.

Several species of Red Duikers inhabit mountain forests or bushy

ravines in E. Africa. Coat bright bay or chestnut red, keep to cover except in early morning and late evening. Little known of habits.

Banded Duiker or Zebra Antelope (*C. doriae*), of Sierra Leone and Liberia, colour pale rufous ground with a dozen vertical stripes of black from shoulders to root of tail, 16" at shoulder, with horns 1 $\frac{7}{8}$ " long.

Blue Duikers, uniformly slate coloured, are large group of smallest duikers. Common Blue Duiker (*Guevei monticola*), of most of tropical Africa, 13" at shoulder, horns up to 3", common in forest or bush, scuttles under scrub like a rabbit; flesh makes good eating.

COMMON OR GREY DUIKER, OR DUIKERBOK (*Sylvicapra grimmia*)



General characters: Small antelope, 2' at shoulder, up to 30 lb. wt. Coat grizzled, greyish-fawn, thick tuft of long hair on forehead. Horns, in both sexes straight, up to 6 $\frac{1}{2}$ " long.

Habits and habitat: Solitary, dives for thick cover when disturbed, whence duiker (Cape Dutch for diver or ducker).

Food: Herbivorous, mainly grass.

Breeding: Gestation 120-210 days.

Present status: Reduced numbers but still numerous in parts to be pest to agriculture.

Range: E., W. and S. Africa.

Longevity: No information.

Special comments: Duikers include several species of moderate-sized to small antelopes, typical of thick bush, seldom seen in open. Little information on habits.

Small species, with normal hoofs and pelage and small spiky horns, include: Oribi (*Ourebia ouribi*), 2' high, living in long grass in S., E. and W. Africa; Steinbuck (*Raphicerus*), a grass antelope, lies close like a

hare until put up; Sunis (*Nesotragus*), rabbit-like in habits, live among thick scrub, bolted with difficulty. 13-14" at shoulder, tiny horns, grizzled rufous coat, face glands exude a strongly-scented musk (Common Suni or Soenie (*Nesotragus moschatus*), of Zululand to Kenya, Nyasaland, N. Rhodesia, always in dry scrub country, said to be independent of water); Pygmy Antelope (*Hylarnus batesi*), of Camerouns; Royal Antelope (*Nesotragus pygmaeus*), of W. Africa, 12" at shoulder, very short spike-like horns, smallest of all Artiodactyla. [Local folklore credits Royal Antelope with high cunning to make up for diminutive size.]

KLIPSPRINGER OR KLIPBOKKE (*Oreotragus oreotragus*)



General characters: Small specialised antelope 20" at shoulder, 40 lb. wt. Coat thick, of bristle-like hairs grizzled, mixture of olive-grey and yellow. Horns, in male only, erect widely spaced spikes up to 6" long. Hoofs tiny, cylindrical.

Habits: Solitary or in family parties. Agile rock-climber, able to poise on incredibly small footholds on rock, partly due to very small cylindrical hoofs.

Habitat: Specialised, rocky kopjes or cliff ravines, under desert conditions.

Food: Rock plants, especially succulents, and appears able, if necessary, to go without drinking.

Breeding: Gestation 214 days. No other information.

Present status: Owing to specialised requirements is unable to adapt to changes, which often leads to extinction locally: still survives in fair numbers in places.

Range: Eastern and southern Africa (Somaliland to N. Nigeria southwards to Cape).

Longevity: No information.

STEINBOK, STEENBOK OF VLAKBOKKIE (*Raphicerus campestris*)

General characters: Small antelope, 22" at shoulder, 24 lb. wt. Coat uniformly tawny. Horns straight, erect, 4" long (rarely 5" or more). Eyes large, ears enormous.

Habits: Solitary or in pairs, keeping to thick cover, seldom seen except when put up, then bounds away to cover again.

Habitat: Long grass and bush country.

Food: Herbivorous (little else known).

Breeding: Gestation 210 days. No other information.

Present status: No information.

Range: E. Africa (Nyasaland, Kenya) to S. Africa.

Longevity: No information.

GRYSBOK (*Raphicerus melanotis*)

Very similar to the Steinbok differing in having a coat of reddish and white hairs intermingled and small lateral hoofs. S. Africa, as far north as the Zambesi, mainly reported from reserves.

SHARPE'S STEINBOK, SHARPE'S GRYSBOK OR TROPIESE GRYSBOK
(*Raphicerus sharpei*)

Differs from Steinbok in fox-red coat stippled white, and from Grysbok in absence of lateral hoofs. Southern Africa from Nyasaland to Transvaal.

Dik-diks (*Madoqua* and *Rhynchotragus*), abundant in arid scrub Somaliland and N. Kenya, with one species in S.W. Africa, largest 14" at shoulder, legs pencil-thin.

WATERBUCK (*Kobus ellipsiprymnus*)

General characters: Large antelope, 4' or more at shoulder, up to 450 lb. wt. Coat shaggy, especially thick on neck and throat, reddish-brown. Narrow white ring on rump. Horns, in males only, ringed, sweeping slightly backwards but forwards at tips, up to 3' long.

Habits: Gregarious, herds of up to 20. In spite of name not particularly found in water.

Habitat: Grassy or swampy plains, especially in valleys, never far from cover.

Food: Herbivorous, mainly grass.

Breeding: Gestation 240 days. No other information.

Present status: Reduced numbers.

Range: E. to W. Africa.

Longevity: No information.

Special comments: In department, carriage of head, colour of coat recalls red deer and wapiti.

SING-SING OR DEFASSA (*Kobus defassa*)



Like Waterbuck in size and habits. Distinguished by larger white rump patch, absence of gorget and, in typical race, white round eyes. Range extends north into Ethiopia.

Lechwe Waterbuck or Basterwaterbok (*Kobus leche*), smooth coat, more definitely associated with swamps and riversides than Waterbuck. Example: the Black Lechwe (*Kobus leche smithemanni*), of swamps of Lake Mweru, N. Rhodesia, old males tend to become dark and appear black, females and young foxy-red, live in shallow water, feeding on submerged vegetation, and splashing in bounds when alarmed.

Nile Lechwe or Mrs. Gray's Kob (*K. megaceros*) of papyrus swamps of Upper Nile, Sudan, old bucks have black sleek coats with white saddle-marks, horns up to 34", slender, doubly curved.

Kobs (*Kobus kob*), of Senegal to Uganda, uniformly foxy-red, small horns, in herds on plains usually not far from lakes or large rivers, do not frequent swamps.

Rhebok, Vaal rhebok, or Vaalribbok (*Pelea capreolus*), of mountainous or hilly districts of S. Africa, 30" at shoulder, horns 7-11" rising nearly vertically, ringed, slender, widely spaced over eyes, coat greyish-fawn, "one of most peculiar antelopes . . . relic of the distant past".

Reedbuck (*Redunca*), of Africa, south of Sahara except in forest, greyish-brown, up to 3' at shoulder, horns up to 17" curve forward at tips, tail bushy. Mainly solitary, in long grass on hilly ground, bolt when disturbed, erecting bushy tail, white undersided.

Saiga (*Saiga tatarica*), of S.E. Russia and parts of Central Asia,



stockily built, 30" at shoulder, buff in summer and almost white in winter, heavily-ringed amber-coloured horns up to 14 $\frac{3}{8}$ ", muzzle enlarged and puffy, with nostrils overhanging mouth like short proboscis. [Once numbered in thousands, fancied efficacy of horns, powdered for use as medicine by Chinese, led to great reduction in numbers. Single pair of horns worth £40 to £50 in China. Now completely protected. Former range, from River Don to Chinese frontier.]

Chiru (*Pantholops hodgsoni*) of Tibet, related to Saiga, also with inflated nasal region, but with very much longer, straight and slender, upright horns, up to 27 $\frac{3}{4}$ " long. Coat pale fawn, thick, woolly, fleecelike, an adaptation to life on bleak Tibetan highlands, 12,000-18,000'; muzzle enlarged, puffy, horns in male only. Gestation 180 days. Suggested that enlarged nasal passages of Chiru enable it to live at



high altitudes and use rarefied air, but Saiga also has these yet lives at much lower altitudes.

Gazelles, of Asia and drier parts of Africa, are small, fawn-coloured antelopes with conspicuous black-and-white face markings, often with darker-coloured flank-band bordering white underside. Horns in bucks erect, ringed, often gracefully curved, in does slender, weak. Speedy, active, keep well away from cover to avoid ambush by lion, wild dog, etc.

Dorcas Gazelle (*Gazella dorcas*), of Algeria to Egypt and Sudan,



one of smallest gazelles, less than 2' at shoulder, horns up to 13½".

Common Gazelles of E. Africa include: Thomson's Gazelle or "Tommy" (*G. thomsoni*), 2' at shoulder, with a jet-black flank-band and erect horns up to 16½"; Grant's Gazelle (*G. granti*), up to 34" at shoulder, with a white rump-patch bordered by black lines, horns divergent, up to 30", longest of all gazelles.

Korin or Red-fronted gazelle (*G. rufifrons*), Senegal to Sudan: Longevity, 11 yrs.

Asiatic gazelles include Arabian Gazelle (*G. arabica*), from Sinai to Aden; Goitred or Persian Gazelle (*G. subgutturosa*), of Euphrates Valley to Mongolia, inflated throat during the breeding season; the Mongolian Gazelle or Zeren (*G. gutturosa*), in large numbers on steppes of central Asia, from Tibet to China and eastern Siberia, 30" at shoulder, horns in male only, up to 15¾", male also has distended throat in breeding season.

Blackbuck or Indian Antelope (*Antelope cervicapra*), 32" at shoulder, females and young fawn, males dark becoming blackish-brown when fully adult, with white underside, white muzzle, white rings round eyes. Lives in herds on open plains, noted for speed, able to take strides 19-22' between hoofprints. When suddenly alarmed will leap into air like impala and springbuck in Africa, will clear high fence in standing jump. [Longevity, 15 yrs.]

IMPALA (*Aepyceros melampus*)



General characters: Long-legged, most agile and graceful antelope. Male 3' at shoulder, 150 lb. wt. Coat sleek, rich chestnut, black ear-tips, black patch on forehead, black recognition marks on rump. Horns, on males only, lyrate, wide-spreading, average 28½" (record 33").

Habits: Gregarious, herds of 20-100, never far from trees or bushes. When alarmed leap in all directions, single leaps of up to 35' measured.

Habitat: Open bush, sandy scrub, always near rivers.

Food: Herbivorous.

Breeding: Gestation 250-210 days. No other information.

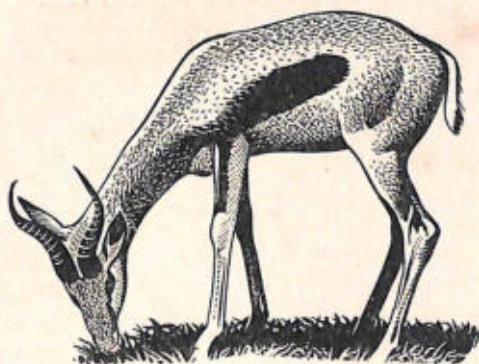
Present status: Formerly in large droves over much of Africa south of Sahara. Now reduced in numbers, but common in reserves.

Range: S.W. Africa to Kenya, but mainly E. Africa today, and National Parks elsewhere.

Longevity: No information.

Special comment: A herd of impala in full flight leaping in a giant follow-my-leader across roads is one of most striking sights of Africa. Impala a favourite prey of lions, taken especially in ambush at waterholes.

Springbuck or Springbok (*Antidorcas marsupialis*) (national emblem



of Union of S. Africa), almost exterminated in wild state in Cape Province, but is still found farther north in Kalahari and Angola. Differs from all other gazelles by deep fold of white-haired skin in middle line of back expanded in excitement to form conspicuous white dorsal crest, visible at long range. Lives on open plains; name derived from the habit of leaping 8-10' into air in stiff-legged jumps before taking flight. Formerly in immense numbers periodically overflowing into the more settled areas in great treks, sometimes reaching sea on migrations.

Gerenuk (*Lithocranius walleri*), long-necked gazelle of Somaliland



and arid parts of E. Africa, up to 41" at shoulder, horns short, thick, up to 17", coat fox-red, browses dry thorn bushes by means of long giraffe-like neck and habit of standing up on hind-legs, moves with skulking action, head as low as the line of the back. Apparently able to exist without water. [Although not "discovered" by Europeans till 1878, it was represented in Egyptian bas-reliefs as long ago as 5600 B.C.]

Gemsbuck, Oryx, Addax, Roan and Sable Antelopes are large and powerful African antelopes. Both sexes have long horns, straight, spiral or sabre-like, tufted tails, no face glands, and large and square teeth like cattle rather than antelope.

Gemsbuck (*Oryx gazella*) now very scarce, able to live without drinking, survives mainly in remote deserts of Kalahari and S.W. Africa, including Kalahari National Park. 48" at shoulder, horns straight, tightly ringed, 3-4' long, coat fawn-grey, face striped black-and-white. [Horns are used with deadly effect against enemies, authentic reports of lion found dead transfixed by Gemsbuck's horns.]

♂. African Oryx or Beisa (*O. beisa*) similar but without some of black markings. White or Scimitar Oryx (*O. algazel*) of deserts of W. Sudan, very pale colour, almost without dark markings, horns curved, up to



45". The deserts of Arabia, now being opened up by travellers, harbour the smallest and rarest of the Oryx group, the Arabian or Beatrix Oryx (*O. leucoryx*) [possibly now extinct from slaughter in 1961]. Almost white with chocolate markings on legs, 40" at shoulder, horns straight, up to 29", formerly in Syria and Iraq, later driven by modern firearms to most remote of sandy deserts. Gestation 8 mths.

Addax (*Addax nasomaculatus*), of Sahara, sandy coloured, 42" at shoulder, horns spirally twisted, up to 43" on curve, hoofs short and broad for travelling on sand.

SABLE ANTELOPE (*Hippotragus niger*)



General characters: Slightly smaller than roan. Body colour velvety black with contrasting white underparts and face markings. Well-developed mane. Adult male $4\frac{1}{2}'$ at shoulder, up to 450 lb. wt. Horns curved, backward-sweeping, closely ringed for most of length, up to $52\frac{1}{2}''$ along curve. Females reddish-brown, smaller horns.

Habits: Small herds, 10-20 sometimes up to 50, alert, difficult to approach. Old males able to put up good defence, even against lions.

Habitat: Bush country.

Food: Herbivorous.

Breeding: Gestation 270-281 days.

Present status: Much reduced numbers: more often seen now inside reserves.

Range: Formerly E. to S. Africa.

Longevity: No information.

Special comments: Most handsome of all antelopes.

GIANT SABLE ANTELOPE (*Hippotragus niger varians*)

Larger than typical form, horns up to 65". Occupies limited territory in Angola. Much sought for trophies, but given government protection.

Roan (*Hippotragus equinus*), of W. to E. Africa to S. Africa, in open woodland or bush, similar to sable except body greyish-roan, up to 4' 9" at shoulder, horns up to 39".

BUSHBUCK OR HARNESSSED ANTELOPE (*Tragelaphus scriptus*)

General characters: Related to kudu but smaller. Male 3' at shoulder, 150 lb. wt. Coat dark red, white spots on flanks, crest of black-and-white hairs mid-line of back. Tail thick, bushy. Horns almost straight, sharply-keeled spiral twist, average 15" (record $21\frac{3}{4}''$). Female smaller, fox-red, more numerous white spots and stripes, hornless.

Habits: Solitary, mainly nocturnal, hide well in thick cover. Emerge at night to graze.

Habitat: Thick cover near grazing ground.

Food: Grasses mainly.

Breeding: Gestation 180-225 days. No other information.

Present status: Numerous in spite of snaring. Pest to cultivated land.

Range: Most of Africa south of Sahara, wherever thick cover.

Longevity: No information.

Special comments: Common, but so secretive that seldom seen. Many local races, varying in amount of white striping and in redness of



45". The deserts of Arabia, now being opened up by travellers, harbour the smallest and rarest of the Oryx group, the Arabian or Beatrix Oryx (*O. leucoryx*) [possibly now extinct from slaughter in 1961]. Almost white with chocolate markings on legs, 40" at shoulder, horns straight, up to 29", formerly in Syria and Iraq, later driven by modern firearms to most remote of sandy deserts. Gestation 8 mths.

Addax (*Addax nasomaculatus*), of Sahara, sandy coloured, 42" at shoulder, horns spirally twisted, up to 43" on curve, hoofs short and broad for travelling on sand.

SABLE ANTELOPE (*Hippotragus niger*)



General characters: Slightly smaller than roan. Body colour velvety black with contrasting white underparts and face markings. Well-developed mane. Adult male 4½' at shoulder, up to 450 lb. wt. Horns curved, backward-sweeping, closely ringed for most of length, up to 52½" along curve. Females reddish-brown, smaller horns.

Habits: Small herds, 10-20 sometimes up to 50, alert, difficult to approach. Old males able to put up good defence, even against lions.

Habitat: Bush country.

Food: Herbivorous.

Breeding: Gestation 270-281 days.

Present status: Much reduced numbers: more often seen now inside reserves.

Range: Formerly E. to S. Africa.

Longevity: No information.

Special comments: Most handsome of all antelopes.

GIANT SABLE ANTELOPE (*Hippotragus niger varians*)

Larger than typical form, horns up to 65". Occupies limited territory in Angola. Much sought for trophies, but given government protection.

Roan (*Hippotragus equinus*), of W. to E. Africa to S. Africa, in open woodland or bush, similar to sable except body greyish-roan, up to 4' 9" at shoulder, horns up to 39".

BUSHBUCK OR HARNESSSED ANTELOPE (*Tragelaphus scriptus*)

General characters: Related to kudu but smaller. Male 3' at shoulder, 150 lb. wt. Coat dark red, white spots on flanks, crest of black-and-white hairs mid-line of back. Tail thick, bushy. Horns almost straight, sharply-keeled spiral twist, average 15" (record 21¾"). Female smaller, fox-red, more numerous white spots and stripes, hornless.

Habits: Solitary, mainly nocturnal, hide well in thick cover. Emerge at night to graze.

Habitat: Thick cover near grazing ground.

Food: Grasses mainly.

Breeding: Gestation 180-225 days. No other information.

Present status: Numerous in spite of snaring. Pest to cultivated land.

Range: Most of Africa south of Sahara, wherever thick cover.

Longevity: No information.

Special comments: Common, but so secretive that seldom seen. Many local races, varying in amount of white striping and in redness of coat.



Bushbuck

Situtunga, Marsh-buck, or Water-koedoe (*Limnotragus spekei*), related to Bushbuck, of papyrus swamps of Uganda, upper Zambesi watershed and parts of W. Africa, practically never leaves swamps and is seldom seen. Coat of male long, silky, chocolate-brown, of female, which is hornless, fox-red with a varying amount of white striping. Hoofs long, joints of the foot loose, thus spreading weight of body over soft ground. Escape observation by submerging with only nostrils above water. [Hunted from canoes in flood-time, in dry seasons reed-beds fired to drive out Situtunga.]

Nyala (*Tragelaphus angasi*), of limited area of S.E. Africa, including reserve in Zululand, 3' 4" at shoulder, coat black and chestnut, with conspicuous white stripes and spots, long fringes of dark hair down throat, underside and on thighs, horns are twisted and blackish with pale tips, up to 33", females hornless, bright fox-red with white stripes. Mountain Nyala (*T. buxtoni*), discovered in 1908 at 9,000' in mountains of S. Abyssinia, coat short-haired, greyish-fawn with indistinct white striping, 4' 5" at shoulder, horns in open spiral, up to 44" along curve.

GREATER KUDU (*Strepsiceros strepsiceros*)

General characters: One of largest African antelopes, adult bull 5' shoulder, up to 650 lb. wt. with spiralling horns up to 66½" along curve



Mountain Nyala



Kudu

1
5

51" in straight line. Coat short, body colour pale tawny or greyish-brown, 5-8 vertical white stripes on flanks, white markings on face. Well-marked mane, fringe of long hairs on throat. Cows similar, smaller, hornless.

Habits: In small parties (mainly one old bull, several cows, and young). Senses well-developed, especially hearing; alert, adept at keeping to cover, very difficult to approach. Use low bark when alarmed.

Habitat: Hilly country, with good bush cover.

Food: Browsers (leaves, young shoots), also some grazing.

Breeding: Gestation 210-214 days. No other information.

Present status: Much reduced in parts of range.

Range: E. Africa (formerly S. Africa also).

Longevity: Not known.

LESSER KUDU (*Strepsiceros imberbis*)

Differs mainly from Greater Kudu in smaller size, up to 41" at shoulder, lighter build. Horns up to 36" and more nearly parallel. Behaviour, habitat, colour similar to Greater Kudu except more numerous body stripes.

Range: Somaliland, Northern Tanganyika, Kenya.

ELAND (*Taurotragus oryx*)



General characters: Largest African antelope, of great bulk, fully-grown bull 6' at shoulder. Colour tawny-grey with 5-6 indistinct white stripes down sides, stripes more pronounced in northern part of range. Sexes alike, both have horns, up to 37" long in bull, 39½" in cow. Horns straight, backwardly directed, spiral ridges on lower half. Dewlap pronounced, may have tuft of black hair. Area of dark-brown erect hair on forehead in bull.

Habits: Gregarious, in herds of a few to 30-40 or even 150. Docile, inoffensive. In spite of bulk are good jumpers: will clear 6' high. Cover long distances with long-striding walk or fast trot.

Habitat: Bush or grassland (veld), desert or wooded country.

Food: Mainly browsers, but will graze veld grass.

Breeding: Mate every other year. Gestation 255-270 days. One calf at birth.

Present status: Much reduced. Formerly abundant S. Africa (Zambesi to Cape), now in reserves mainly (1,600 Giants Castle Reserve, Natal, also in Kruger Park, Kalahari National Park: a few in small nature reserves). Persecuted for flesh and tough hide, and later victims of rinderpest 1896.

Range: E. Africa (Nyasaland, Kenya, Portuguese E. Africa), S. Africa (see above).

Longevity: Not known.

Special comments: Readily tameable: have been trained to harness: some attempts at domestication not successful.

Other statistics: Temp. 102°F. (38.8°C.)

Giant Eland or Lord Derby's Eland (*T. derbianus*), of Senegal to S.W. Sudan and N. Uganda, W. of Nile, differs little in bodily size from Eland but has more massive horns, up to 42" and differs in details of colour. Local in distribution, one of rarer of big antelopes, living in open country with plenty of scrub and other cover.

Bongo (*Boocercus euryceros*), confined to equatorial forests of Congo basin and W. Africa and forests of Mau and Aberdares in Kenya, bull up to 4' at shoulder, coat rich chestnut-red with prominent white striping, horns in both sexes, stout, smooth, spirally twisted, up to 39½". Rarely seen except when hunted, prefers densest parts of forests, where powerful build enables it to force way through dense thickets, with horns laid back on shoulders.

Indian Nylghaie or Blue Bull (*Boselaphus tragocamelus*), largest of Indian antelope, male slatey-grey, female tawny and hornless; ungainly build, very small horns show little resemblance to those of African forms, diurnal, moving in small herds on open plains. [Despite damage to crops, remains unmolested by Hindus owing to resemblance to sacred cows.]



Nylghaie

Four-horned Antelope (*Tetraceros quadricornutus*), of India, 2' at shoulder, lives in long grass in open country, has two pairs of horns, front pair never more than $2\frac{1}{2}$ " long, back pair up to 5" long. (In some areas, only one pair of horns is developed.) Coat short, dull brown.

Order CETACEA (Whales, Dolphins, Porpoises)

Mammals highly adapted for aquatic, mainly marine life. Hairless, fish-like form. Forelimbs paddles, no hind-limbs. Tail a pair of horizontal flukes. Dorsal fin often present.

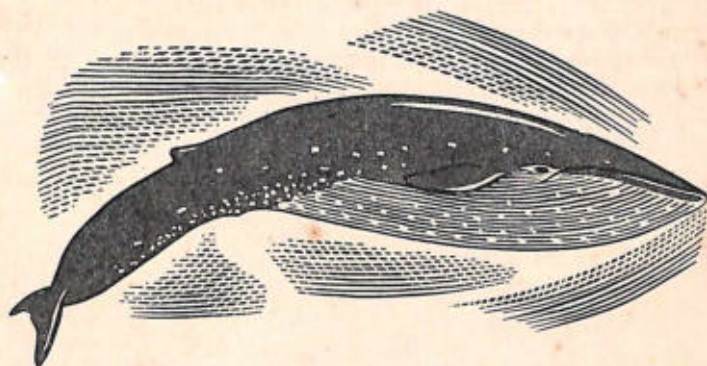
Suborder Mysticeti (Whalebone Whales)

Toothless, mouth with vertical plates of whalebone.

Family BALAENOPTERIDAE

Throat pleats numerous.

BLUE WHALE, SIBBALD'S RORQUAL or SULPHUR-BOTTOM (*Balaenoptera musculus*)



General characters: Length 100', girth 45', 119 tons wt., head less than $\frac{1}{4}$ total length, flipper 15' long, 80-100 grooves on throat, 20-40 hairs ("beard") on anterior part of head, colour dark slate-blue except on tip and underside of flippers, body may be mottled and underside may be yellow from growth of diatoms, baleen black, width of tail flukes 21', dorsal fin small, placed far back. Other statistics: Stomach holds 1 ton of food; wt. of skeleton 20 tons, of muscle 50 tons, of fat 25 tons, of tongue $2\frac{1}{2}$ tons, of liver 10 cwt., stomach 9 cwt., heart 8 cwt.; "blow" lasts 300 seconds, rises to 49'; speed 12-14 knots.

Distribution: World-wide but main populations in southern hemisphere, migration to low latitudes for breeding.

Breeding: Gestation about 1 yr., 1 calf at birth, 24' long, 4 tons wt.,

weaned at 6-7 mths., sexual maturity at 2 yrs. and up to 77' long, full growth reached at 12-14 yrs., longevity 50 yrs.

Present status: Much reduced in numbers through over-fishing.

Food: Krill (shoals of Euphausians).

Other statistics: Temp. 96.4°F. (35.7°C.)

FINNER WHALE, COMMON RORQUAL, RAZORBACK or FINBACK
(*Balaenoptera physalus*)

General characters: Length 82', 70 tons wt., head less than $\frac{1}{4}$ total length, body light grey above, pure white below, asymmetry of colouring leaves right upper jaw white, underside of both flippers and tail flukes white, dorsal fin high, set well back. Other statistics: "Blow" rises to 20', remains submerged up to 30 mins.

Distribution: World-wide.

Breeding: Mating in winter, gestation about 1 yr., 1 young, 22' long, weaned at 6 mths., full grown at 8 yrs.

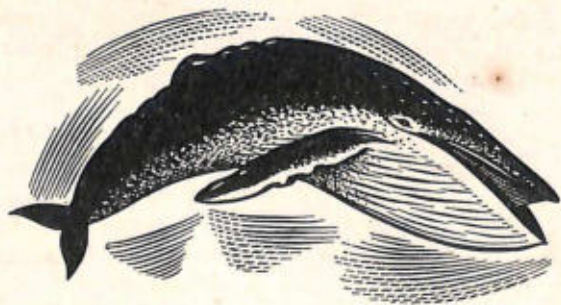
Present status: Much reduced in numbers.

Food: Varies with season, includes krill and fish (herring, and capelin).

Other statistics: Temp. 97.4°F. (36.3°C.)

Piked Whale or Lesser Rorqual (*Balaenoptera acutorostrata*) resembles common rorqual, up to 30' long, blue-grey above, white below, baleen yellowish-white, less than 1' long, frequents inshore waters, world-wide range, feeds on fish (especially herring), calves 9' long at birth, active and given to play, among ice-floes emerges upright with head clear of water for breathing, or rests head on edge of ice.

HUMPBACK WHALE or HUMPBACK (*Megaptera nodosa*)



General characters: Length 50' (average 45'), head about $\frac{1}{3}$ total length, flipper 14' or more long, scalloped on front margin, grooves on throat 14 to 20 or more, numerous tubercles on head, each bearing 1-2 bristles, black on back, lighter underneath with much white, flipper

white underneath, black or parti-coloured above, baleen grey-black, dorsal fin small, midway between head and tail. Other statistics: "Blow" rises to 20'; remains submerged 20 mins.

Distribution: World-wide, but mainly in coastal waters.

Breeding: Pairing and calving in winter, gestation about 1 yr.,

1 young, 16½' long, 1-2 tons wt.

Food: Krill and fish.

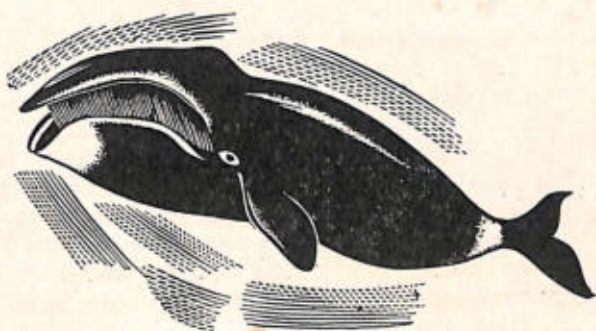
Present status: Much reduced in numbers.

Other statistics: Temp. 97·9°F. (36·5°C.)

Family BALAENIDAE

Throat smooth.

GREENLAND RIGHT WHALE (*Balaena mysticetus*)



General characters: Length 50'; head nearly ¼ total length, no grooves on throat, colour black, with white area on chin, baleen black, width of tail flukes 26', no dorsal fin. Other statistics: rarely dive below 80', remain submerged 80 mins.

Distribution: Arctic.

Breeding: Mating in July, gestation 276 days, 1 calf 15' long, nursed 6-12 mths.

Food: Krill.

Present status: Very rare. (Result of over-fishing.)

Black Right Whales (*Balaena glacialis* of N. Atlantic, *B. australis* of S. Atlantic, *B. japonica* N. Pacific, *B. antipodarum* of S. Pacific, and many other species) up to 60' long, similar to Greenland Right Whale but head shorter, baleen shorter, lower jaw less deep, without white chin patch, usually horny lump (or "bonnet") on snout, formerly abundant, now protected by international agreement.

Pigmy Right Whale (*Neobalaena marginata*), 20' long, known only

from S. America, Australia, New Zealand, has unusually stout skeleton with very broad ribs, little known of habits.

Family *RHACHIANECTIDAE*

Throat pleats few.

CALIFORNIAN GREY WHALE (*Rhachianectes glaucus*)

General characters: Length 45', wt. 20 tons, head just over $\frac{1}{3}$ total length, 2-4 grooves on throat, hairs in irregular rows on top of fore-part of head, colour black, blotched with grey scars, no dorsal fin. Other statistics: Speed 7 knots, "blow" rises 11'.

Distribution: N. Pacific (Japan to California).

Breeding: 1 young, born Jan., 16' long, weaned at 6 mths.

Food: Krill and fish.

Present status: Over-fished almost to extinction, but present signs of recovery.

Other statistics: Temp. 97.4°F. (36.3°C.)

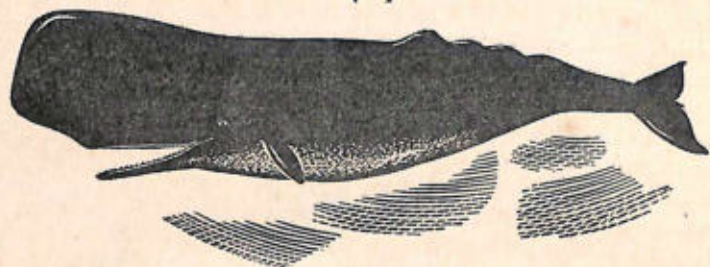
Suborder *Odontoceti* (Toothed Whales)

Teeth in one or both jaws.

Family *PHYSETERIDAE*

Numerous teeth in lower jaw only. Single blowhole.

SPERM WHALE (*Physeter catodon*)



General characters: Length 60' (female $\frac{1}{2}$ as long), head more than $\frac{1}{3}$ total length, colour nearly black above shading to white or silvery on belly, no dorsal fin. Other statistics: May submerge for 70 mins., on surfacing may make 70 exspirations in 10 mins. "Blow" inclined forward to left side of head, lasts 6 secs. 18-28 conical teeth on either side of jaw, each 8" long. Speed 3-4 knots, increased to 10-12 knots when pursued.

Distribution: World-wide.

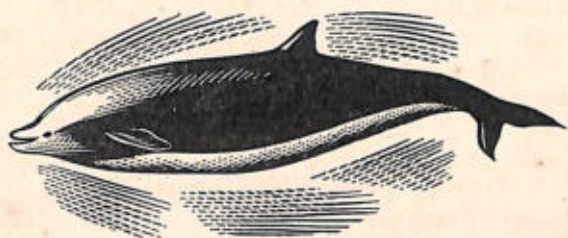
Breeding: Gestation 365-480 days, 1 calf 14' long, may double length 1st yr., mature at 8 yrs.

Food: Squid and cuttlefish.

Present status: Reduced numbers (fished for fine oil in head, which may contain 1 ton of spermaceti, and for ambergris, largest mass weighed about 600 lb.).

Pigmy Sperm Whale (*Kogia breviceps*), 13' long, lacks large head of Sperm Whale, 9-14 pairs of slender teeth, world-wide but rare, little known of habits, looks outwardly like common dolphin but has single blowhole to left of head, as in Sperm Whale, and has spermaceti organ.

Family ZIPHIIDAE (Bottle-nosed or Beaked Whales)



General remarks: Related to Sperm Whales but medium-sized, 15-30' long, snout beaked (i.e. sharply defined), often high rounded forehead, 2 deep grooves on throat almost meeting in front, diverging backwards, males have 1 to 2 pairs of teeth exposed in lower jaw only together with vestigial teeth, latter present in females and young, dorsal fin triangular, hind edge concave.

Common Bottle-nosed Whale (*Hyperoodon rostratus*), of North Atlantic, in schools of 4-12; 21' 8" long, 2 tons 18 cwt. wt., high forehead bulge supported by two crests of bone on skull, feed on cuttlefish, stomach divided into numerous compartments, intestine short, lining much folded; young 10' long at birth.

Beaked Whales (*Mesoplodon*), not more than 22' long, include some of rarest whales, several species have single pair of tusk-like teeth in lower jaw: e.g. Strap-toothed Whale or Layard's Whale (*M. layardi*) has long flattened teeth arching over upper mandible.

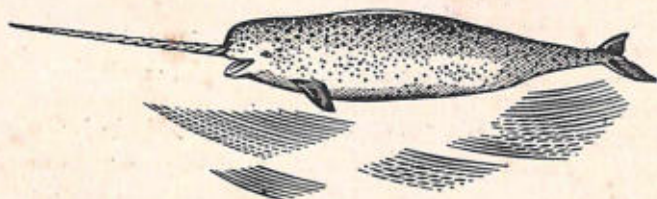
Examples of rarity:

M. densirostris, 7 specimens known from Atlantic, Indian Ocean, Lord Howe Island.

M. stejnegeri, 2 specimens, Pacific coast N. America.

M. bowdoini, 2 skeletons, New Zealand.

Family *MONODONTIDAE*
 NARWHAL (*Monodon monoceros*)



General characters: Length 16', head blunt, colour grey-white with dark-grey or blackish spots on back, no dorsal fin. Other statistics: Males have 1 tusk, exceptionally 2, twisted clockwise in spiral, 9' or more long; may submerge to 1,200'.

Distribution: Arctic.

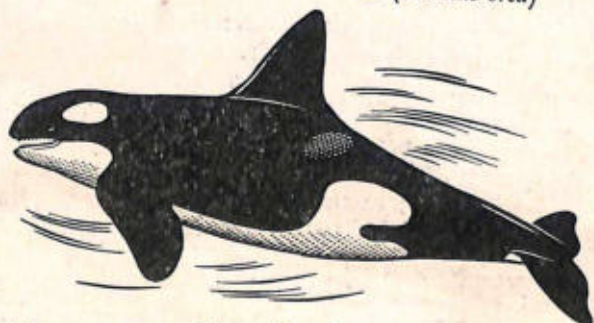
Breeding: 1-2 calves, 5' long, bluish-grey in colour.

Food: Mainly cuttlefish, also fish and crustaceans.

Present status: No information.

Beluga or White Whale (*Delphinapterus leucas*), of Arctic, 18' long, head small, rounded, adult uniformly pure white, without dorsal fin, feeds on cuttlefish and crustacea, voice a faint ox-like lowing heard at times when surfacing, caught in nets for quality skin (porpoise-hide to trade). [Pulse, 12-23.]

Family *DELPHINIDAE*
 KILLER WHALE OR GRAMPUS (*Orcinus orca*)



General characters: Length 30' (females $\frac{1}{2}$ as long), colour black with white belly and white lens-shaped patch of white above and behind eye, dorsal fin triangular, 6' high, midway between nose and tail, flipper may be $\frac{1}{3}$ length of body.

Distribution: World-wide.

Food: Large whales, walrus, seals, sea-birds (Killers hunt in packs to attack large whales, biting first at tongue and lips; said to overturn ice-floes to capture seals).

Breeding: Gestation about 1 yr., 1 young 7' long.

Present status: No reduction in numbers.

False Killer (*Pseudorca crassidens*), world-wide, harmless, feeds on cuttlefish, males 18½', females 16½' long, uniformly black, small flippers, small dorsal fin. Unusual history: 2 skeletons found 1846 sub-fossil Lincolnshire Fens, thought to be extinct, then 100 stranded near Kiel (1861) followed by other strandings in several parts of world, e.g. several hundreds on Chatham Island (1906), 150 on Dornoch Firth, Scotland (1927), 100 Cape Town (1928), 167 on Island of Velanai (1933), 75 British Isles (1935), 200-300 at Mamre, 300 miles from Cape Town (1935).

RISSE'S DOLPHIN (*Grampus griseus*)

General characters: Length 13', colour grey with lighter undersurface, fins and tail black, dorsal fin midway along back, high and recurved, flippers about total length, teeth 3-7 in each half of lower jaw, usually none in upper jaw.

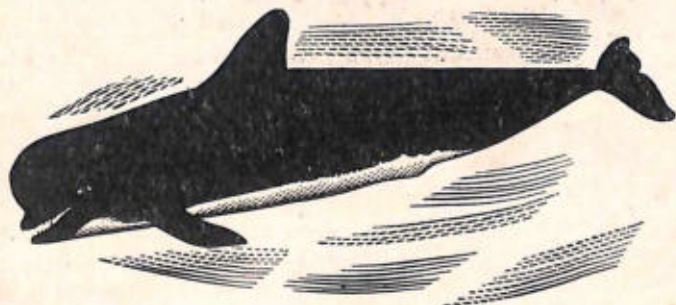
Distribution: N. Atlantic, Mediterranean, New Zealand, S. Africa (famous Pelorus Jack was protected by New Zealand Order in Council).

Breeding: Gestation probably 1 yr., calf 5' long, may have white bristles on upper lip.

Food: Cuttlefish.

Present status: No information.

PILOT WHALE, CAA'ING WHALE, GRINDHVAL (*Globicephala melaena*)



General characters: Length 28', head swollen in front, colour black with white area under chin, dorsal fin middle of back, base long

compared with height, 10 teeth in each side of upper and lower jaw confined to front portion of jaw.

Distribution: N. Atlantic (some specimens reported S. Africa, New Zealand).

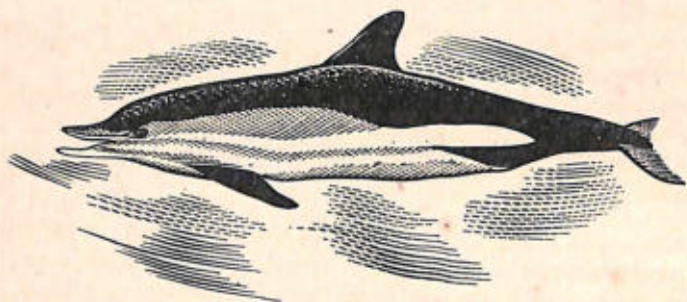
[Other species: *G. scammoni*, *G. indica* of Indian Ocean, *G. brachyptera* North coast of America, differ mainly in details of flippers.]

Food: Cuttlefish.

Present status: Little reduction in numbers.

Breeding: Little known, calves born Sept., 6' long.

COMMON DOLPHIN (*Delphinus delphis*)



General characters: Length 8', head beaked, beak 6" long, separated by groove from forehead, colour black or dark brown, white on belly, undulating bands of grey, yellow and white on flanks, ring of black round eyes, dorsal fin tapering, recurved, concave hinder margin. Other statistics: Speed up to 30 knots.

Distribution: Temperate and warm seas throughout world.

Breeding: Gestation 276 days, 1 calf born summer.

Food: Fish (herring, pilchard).

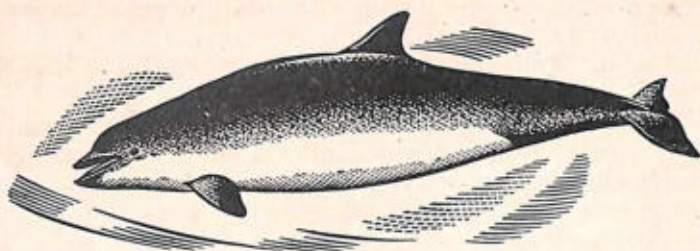
Present status: Numerous (reports of about 10,000 in view at one time playing at surface).

Longevity: 25-30 yrs.

BOTTLE-NOSED DOLPHIN (*Tursiops truncatus*)

General characters: Length 12', colour black or dark-grey brown, belly white, dorsal fin in middle of back, hinder margin strongly concave.

Distribution: Atlantic coast of America (Maine to Florida), Atlantic coast of Europe (British Isles to Bay of Biscay), Mediterranean, (? New Zealand).



Breeding: Mating summer, gestation 360–390 days, 1 calf, 3' 10" long.

Food: Fish.

Present status: No change.

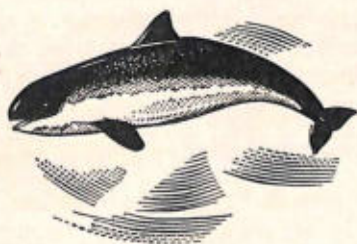
Other statistics: Pulse, 150.

Commerson's Dolphin, Piebald Porpoise or Le Jacobite (*Cephalorhynchus commersonii*), of southern tip of S. America, 5½' long, most strongly marked of small whales, pure white but head and flippers and dorsal fin to tail flukes black.

Genus *Sotalia* contains several species, less than 6' long, mostly found in estuaries or rivers in Tropics, e.g. *S. teuszii*, of W. Africa, 1 specimen known, stomach filled with grass, mangrove leaves and fruits, only herbivorous whale; *S. sinensis* (Chinese White Dolphin), of coast of China, pure white, pinkish fins, black eyes; *S. fluviatilis* (Buffe negro), of Upper Amazon, in schools of 20–30, said to attack River Dolphin (*Inia*).

Family PHOCAENIDAE

COMMON PORPOISE OR HARBOUR PORPOISE (*Phocaena phocaena*)



General characters: Length 6', wt. 120 lb., colour black on back, white on belly, flippers black, dorsal fin just behind middle of body, teeth spade-shaped, up to 27 on each side of upper and lower jaw.

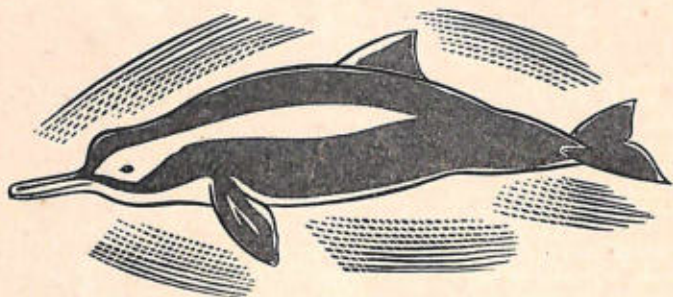
Distribution: N. Atlantic.

Breeding: Mating late summer, gestation 183 days, 1 calf, 3' long.

Food: Fish (herring, whiting, sole), also crustaceans, cuttlefish.

Present status: Still abundant.

Family *PLATANISTIDAE* (River Dolphins)



General remarks: True River Dolphins, or Long-beaked Dolphins (names in contrast to members of genus *Sotalia*), body less streamlined than marine Cetacea, small, beaks slender with numerous small teeth.

Susu or Gangetic Dolphins (*Platanista gangetica*), of Ganges and Indus, 8' long, lead-black dorsal fin no more than a ridge, flippers fan-shaped, blind, searches mud for fish. Gestation 240-270 days.

Boutu or Amazonian Dolphin (*Inia geoffrensis*), of Amazon, may live 1,500 miles from sea, 7' long, black above, pink underside (may be completely flesh-coloured), low dorsal fin, distinct neck, eye very small.

La Plata Dolphin (*Pontoporia blainvillei*), of estuary of River Plate, 5' long, beak long, slender, bears 50-60 small teeth on each side of upper and lower jaws, dorsal fin well-developed, eye small.

Chinese River Dolphin (*Lipotes vexillifer*), of Tung Ting Lake, 600 miles up Yangtse River, discovered 1918, 7½' long, greyish-black, white underneath, foot-long beak curves upwards, blowhole on left of head, searches mud in shallows for catfish.

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