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THE AMERICAN NATURAL HISTORY

A FOUNDATION OF USEFUL KNOWLEDGE OF THE HIGHER ANIMALS OF NORTH AMERICA

BY

WILLIAM T. HORNADAY, Sc.D.,

DIRECTOR OF THE NEW YORK ZOOLOGICAL PARK

AUTHOR OF "TWO YEARS IN THE JUNGLE," "OUR VANISHING WILD LIFE," ETC.

ILLUSTRATED BY 225 ORIGINAL DRAWINGS BY BEARD, RUNGIUS, SAWYER, AND OTHERS, 151 PHOTOGRAPHS, CHIEFLY BY SANBORN, KELLER, AND UNDERWOOD, AND WITH NUMEROUS CHARTS AND MAPS

WITH SIXTEEN PLATES IN COLOR

FIRESIDE EDITION

VOLUME I—MAMMALS

NEW YORK
CHARLES SCRIBNER'S SONS
1914

E.V.

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PREFACE TO THE FIRESIDE EDITION

THE views entertained by the author and publisher as they were represented by the first edition of the "American Natural History" have been materially strengthened by the lapse of time. In 1904 we believed that the time was ripe for the publication of a work which, while scientifically accurate, would convey much practical information, and be read through for entertainment before being placed upon the shelf for reference. The highest compliment that the author ever received regarding the original volume was the assurance from a young lady that she had "read every page of it, from cover to cover."

During the past ten years, the conditions affecting the wild life of North America have swiftly changed. The total amount of scientific facts that have been accumulated by the technologists, and stored up for future reference, is enormous. Scientific "specialization" has become such an educational mania that the old-fashioned "all-round" naturalists now are few and lonesome. At the same time, however, the need for the dissemination of practical every-day knowledge regarding our mammals, birds, reptiles, and fishes never was so great as now. The wholesale destruction of bird life, with the enormously increased cost of living that has come as a natural and inexorable result, renders it highly necessary that people generally should have a chance to recognize their friends and their enemies in the animal world. To-day there are millions of American producers and consumers who do not know their best friends, and who think, for example, that a quail is valuable only as so many ounces of edible meat for the table.

This work was designed to afford the general reader, the parent, the teacher, and also young people an opportunity to obtain a speaking acquaintance, on a scientific basis, with the best representatives of the living vertebrate animal forms of North America. The great multiplication of species and geographic races that has taken place during the last few years renders necessary this new edition of the original work. A glance at the number of species and races in the Order of Gnawing Animals is sufficient to convince the average reader of the necessity of a general view, and the impossibility of a complete acquaintance with even our own quadrupeds.

The time was when a diligent student could at least know every mammalian species by name; but that time went by long ago. The gulf that now is fixed between the zoological investigators and the general zoologist is becoming wider and deeper day by day. Consider the possibilities for mastering the identity of 784 species and 453 subspecies of the Order of Gnawing Animals (Rodents).

We must accept the fact that in the scientific determination of the precise status of a fauna, subspecies are necessary, even though it is not possible for the layman to recognize them. I am convinced that to-day a great many subspecies exist on very narrow grounds; but we are concerned with only a very few of them. Let us become acquainted with the important forms, and the types of the groups that are most worth knowing.

In reckoning up numbers of species and subspecies I have accepted Dr. D. G. Elliot's "Check List of North American Mammals" (1905) as the best authority, and quite sufficient for the purposes of this work, even though a few forms have been added to our fauna since its publication. For the classification of the mammals of the world, living and extinct, the highest authority and literally the last word, is the "Age of Mammals," by Professor Henry Fairfield Osborn. The scientific student is advised to accept and follow his scheme of classification.

In view of the constant, and often exasperating, changes that are being made in the Latin names of animals, I regard it as useless and unnecessary to attempt to keep up with them; and therefore I have made no changes whatever in the names that were originally chosen with great care in the first composition of this work.

Both the author and the publishers thank the public and the press most gratefully for the signal marks of approval with which this work has been received. It is that approval which has made this four-volume edition seem worth while. The author, by numerous amplifications and by substantial additions in various directions, gladly avails himself of this opportunity to bring the work down to date, in all particulars save a few that will not seriously affect the progress either of the general reader or of the student.

W. T. H.

University Heights,
New York City.

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THE AMERICAN NATURAL HISTORY

FIRESIDE EDITION

VOLUME I—MAMMALS

"The concise and precise phraseology of science, admirable though it be for the use of those who have been trained to employ it, is to others not only misleading, but it may be repulsive."—G. Brown Goode.

"The highest type of scientific writing is that which sets forth useful scientific facts, in language which is interesting, and easily understood by the millions who read."—L. A. Mann.

Painted by Carl Rungius.

THE AMERICAN MOOSE, IN NEW BRUNSWICK.

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INTRODUCTION

THE GROUND-PLANS OF NATURE

SCIENCE is a collection of facts concerning natural objects or phenomena, arranged in good order, and made useful.

NATURAL SCIENCE is the study of Nature's works and forces, and embraces all things not made by man. Among its grand divisions may be mentioned natural history, chemistry, and physics.

NATURAL HISTORY is the study of Nature's common objects; but by most persons this name is applied only to the study of animal life. Natural history treats of three great kingdoms—the animal, vegetable, and mineral.

THE ANIMAL KINGDOM embraces not only all the living creatures which now inhabit the earth, but also those which have died, become extinct, and left only their buried remains, called fossils. Of the animal kingdom, three great groups of subjects may be recognized, as follows:

MAN, the study of whom is called . . . . . AN-THRO-POL'O-GY
THE LOWER ANIMALS, the study of which is called ZO-OL'O-GY
EXTINCT, or FOSSIL, ANIMALS, the study of which is called . . . . . PA-LE-ON-TOL'O-GY

In strict reality, Paleontology is only a branch of Zoology, for the two are inseparably dovetailed together. The living animals of to-day are the standards by which the paleontologist studies and determines those of the past.

This diagram illustrates the relations which the grand divisions of Natural History bear toward each other:

NATURAL HISTORY
(IN A BROAD SENSE)

KINGDOMS	SCIENCES
ANIMAL	Anthropology, Zoology, Paleontology
VEGETABLE	Botany, Paleobotany
MINERAL	Geology, Mineralogy

In its broadest sense, Natural History includes Chemistry and Physics; but as that term is now commonly used, it is intended to refer only to the life histories of living creatures.

AN ANIMAL is a living creature belonging to the animal kingdom; but this word is commonly, though incorrectly, used to designate mammals alone.

The animals of the world are so vast in number, and so varied in form, that these lessons will treat only of the higher forms of life, known as *Vertebrates.*

A VERTEBRATE is an animal having (usually) a bony skeleton and a spinal column or backbone, composed of a series of bones called vertebrae. This division of life is called a *Branch.*

THE BRANCH VERTEBRATA is divided into seven grand divisions, called *Classes;* which are known as *Mammals*, *Birds*, *Reptiles*, *Amphibians*, *Fishes*, *Myzonts*, and *Lancelets.*[1]

A MAMMAL is a warm-blooded creature that brings forth its young alive, and nourishes it with milk from its own body. All land mammals, save a few species, are covered with hair; and all sustain life by breathing air with the aid of lungs. Except man, the mammals which live upon land are also called *quadrupeds.*

[1] Two other Classes, Enteropneusts and Tunicates, are, by some modern zoologists, regarded as Vertebrates. These low forms, however, lack a complete backbone, or notochord, and are therefore omitted.

A QUADRUPED is a mammal which possesses four feet, or, having two hands and two feet, like the apes, yet walks upon all fours.

Man is a biped, or two-footed animal. Land mammals generally are quadrupeds, or four-*footed*, and monkeys are *quadrumanous*, or four-*handed*.

The term *quadrumana* is often applied to apes and monkeys because the long great toe on the hind foot makes the foot quite hand-like in its grasping power.

A BIRD is a warm-blooded animal, which comes from an egg that usually is laid and hatched by the parent. It breathes air, is covered with feathers, usually is provided with wings, and all save a few species can fly.

A REPTILE is a cold-blooded, egg-laying animal, usually covered with scales or a bony shell. All have lungs and breathe air, but some are able to live in water so comfortably they are called *amphibious*.

AN AMPHIBIAN is a member of the Class of animals which forms a connecting link between reptiles and fishes. Some breathe air, and live alternately on land and in water, like frogs. Others have gills, and live in water all their lives. A few are capable of developing *either gills or lungs*, according to the presence or absence of water, like the wonderful Axolotl of Mexico.

A FISH is a cold-blooded animal, possessing gills, fins, and (usually) scales. All save a very few species live permanently in water. The exceptions are certain fishes in the East Indies which for short intervals hop about on land, or even climb rocks or trees!

GRAND DIVISIONS OF THE ANIMAL WORLD

BRANCHES	CLASSES
VERTEBRATES	Mammals
	Birds
	Reptiles
	Amphibians
	Fishes
	Myzonts
	Lancelets

INSECTS—Body in segments, reproduce by a complete change in form.

CRUSTACEANS (Crabs, Lobsters, etc.)—Skeleton external; gill-breathing, chiefly aquatic.

MOLLUSKS ("Shell-Fish")—Soft-bodied, usually covered by a hard, limy shell.

WORMS—True worms, and other forms not fitting in elsewhere.

STAR-FISHES—Salt-water animals, with star-like structure.

CORALS—Minute, salt-water animals, which build up solid masses of their limy skeletons.

JELLY-FISHES—Disk-shaped, jelly-like sea animals, with no hard parts.

SPONGES—Stationary aquatic animals, which look like plants; skeletons of tough, fibrous cells.

PROTOZOANS—Lowest forms of life, beginning with the single cell; mostly microscopic.

HOW ANIMALS ARE CLASSIFIED

In order to know and appreciate even a small proportion of the world's animals, their correct arrangement into groups is as necessary as a systematic arrangement of the books in a vast library. By their forms and characters, animals are divided into natural groups and subdivisions, and in order that we may understand their proper relationships, and their places in Nature, we must learn and remember the general principles of animal CLASSIFICATION. Without this foundation knowledge, a clear view of the splendid domain of animal life is impossible, and the life histories of our living creatures will be but a jumble of disconnected facts of very slight practical use.

When properly simplified, the classification of the principal groups of our vertebrate animals is as easily learned and remembered as the leading facts of geography. Once learned, each animal observed thereafter can be located in the group to which it belongs, and its place in Nature understood. This helps toward exact knowledge of its anatomy and habits.

NOMENCLATURE is the naming of animals, and the groups to which they belong. The object of popular nomenclature, or naming, is to make the place and character of an animal clearly and correctly understood by the greatest possible number of people.

SCIENTIFIC NOMENCLATURE relates to the use of technical names, in Latin or Greek, in which the general student is not often interested. Whenever through frequent or frivolous changes of scientific names, or by the giving of too great a number of them, our knowledge of animals becomes confused and uncertain, scientific classification defeats its own object, and becomes worse than useless. The observance by technical writers of the fatal rule of priority, by which the most obscure names often are exalted at the expense of more appropriate names in universal use, is rapidly debasing the legitimate value of Latin names generally, and creating wide-spread uncertainty and confusion.

Latin words are used for most scientific names, because Latin is the universal language of scientific men, the world over; and Latin names are used by all educated nations without change in form.

In the development of animal classification, the various classes of animals are subdivided into groups which gradually grow smaller, until at last each species is named and placed, thus:

Classes are divided into Orders:
Orders are divided into Families:
Families are divided into Genera (singular = genus):
Genera are divided into Species (singular = species):
Species are divided into Individuals.

As an example, take the Puma, or Mountain "Lion."

Its Order is FERAE, the wild beasts.
Its Family is *Felidae*, the Cats.
Its Genus is *Felis*, the true Cats.
Its Species is *concolor*, gray.
Its scientific name, therefore, is *Felis concolor*.

All these groups are divided into subdivisions, such as suborders, subfamilies, subgenera, and even subspecies; but in the writer's opinion there is very little excuse for their creation, or for their continued existence, and the student will do well to let them alone—until he feels the need for them.

A *tautonym* is a scientific name in which the name of the genus is repeated as the name of the species. Thus, some authors write the Latin name of the American Bison as *Bison bison;* and the Anhinga is *Anhinga anhinga.* In America, the tautonym habit is merely another step toward the complete demoralization of zoological nomenclature.

A *trinomial* is a name in three sections, applied to a subspecies; such as *Felis concolor oregonensis.*

By scientific authors, *species* are frequently divided into *subspecies,* or *races,* because in widely separated localities, animals of the same parent stock sometimes are so influenced by differences in climate, food, and surroundings that they assume different colors, or grow larger or smaller than the type. But, no matter how much individuals may differ in size and color, if it is possible to bring together a collection of specimens which will show *all stages of variation from the type to the extremes,* then the specimens all belong to the same species. Thus, in passing from New York to Ohio, specimens of the Gray Squirrel show all shades of variation, from the typical gray to black; but all belong to the same species, called in Latin, *Sciurus carolinensis.*

A Species is an assemblage of individual animals which in at least one respect are distinctly different from all others, and whose peculiarities are so well marked and so constant that they can be distinguished from all others without the aid of locality labels.

When a new kind of animal is found, adult specimens of which are distinctly different from those of all known species, an average specimen is taken as a *type,* and it is *described,* and christened by its describer. Every species should be distinguishable by external

characters; and any animal which requires to be killed and dissected before it can be named, is of no practical value as an independent form.

To secure RECOGNITION among zoologists, it is important that the first description of a new species should appear in a regular publication of some scientific society, or in a scientific journal. In case the creature has not already been described, and the proposed species has just claims to stand alone, this name is entitled to stand, by right of PRIORITY, or first christening.

Many times it happens that through ignorance of what has been done by others, or by errors in judgment, a new name is bestowed upon an animal or plant that has already been named. Sometimes, also, it is found that the name bestowed has already been used for some other animal. A name applied to an animal or plant already named is called a *synonym*. In scientific books, synonyms sometimes are printed in a list under the correct name, followed by the names of their respective authors. A zoological synonym always stands for a published error, and scientific authors should be chary of describing as "new" any species which are likely to prove mere synonyms.

THE TYPE of any species is a carefully selected specimen which in size and color may fairly be considered the standard, or average, for that species. Among zoologists, this term is applied to the identical skin, or other specimen, described by its discoverer. Because of the many scientific names that are erroneously bestowed upon animals, the name of the author who is responsible for a name is usually printed, in abbreviated form, immediately after the name itself, thus:

Popular name.	*Scientific name.*	*Authority.*
COYOTE.	*Canis latrans.*	Say.

A parenthesis enclosing a Latin name and the name of its author is a sign that the name has been changed somewhat from the form originally chosen and put forth by the author of the species.

Taken as a whole, this name means (1) that the "popular" name of the animal is Coyote; (2) that its scientific name (Latin) is *Canis* (= dog) *latrans* (= barking); and (3) that it was first correctly described and named in print by a man named Say. If we consult our books, we will find that Thomas Say was a Philadelphia naturalist, and his description of this animal appeared in "Long's Expedition to the Rocky Mountains," published in 1823, Vol. I, page 168.

Whenever the name of an animal has been so long in use that it has become familiar to millions of people, any attempt to change it tends to create confusion. A slightly incorrect name in universal use is often better than the confusion and doubt inseparable from attempting a change. Thus, the American buffalo, considered in connection with the world's bovine animals generally, is really a bison; and the prairie-"dog" is really a prairie marmot; but since nearly all the inhabitants of America know these animals by their incorrect names, and any effort to force a universal change would be quite fruitless, it would be unwise to attempt it.

It is very important to the student that the names of the various Orders of vertebrate animals should be learned and remembered; for they are the keys with which to unlock and reveal all systematic knowledge of mammals, birds, reptiles, amphibians, and fishes.

THE INTELLIGENCE OF ANIMALS: A WARNING

During the past ten years, so many persons have requested my views regarding the mental capacity of animals, that I feel impelled to enter here a brief statement, coupled with a warning. Unfortunately, it cannot be written otherwise than in the first person.

While I have no desire to exploit my personal experiences among wild creatures, it is at least fair to state, for the benefit of the millions to whom the writer is unknown, that of wild creatures in their haunts, and also in captivity, he has seen as much as most men of his tastes.

The tendency of the present is to idealize the higher animals, to

ascribe to them intelligence and reasoning powers which they do not possess, and in some instances to "observe" wonderful manifestations that take place chiefly in the imagination of the beholder. For example, to a woodcock, having mingled blood and mud on a broken leg, is ascribed a deliberate and well-considered attempt at "surgery," and the intentional making of a clay jacket, re-enforced with pieces of grass. To my mind, all such "observations" as the above are too absurd for serious consideration; and when put forth for the information of the young, they are harmful.

There exists to-day a tendency to ascribe to wild animals a full measure of human intelligence. But wild creatures must not be taken too seriously. With all their "schools" in the woods, they are not yet as intelligent as human beings; and the strain that is being put upon them by some of their exponents is much too great. With the most honest intentions, a naturalist may so completely overestimate and misinterpret the actions of animals as to reach very ridiculous conclusions.

Judging from all that I have seen and heard of wild creatures of many kinds, from apes to centipedes, both in captivity and out, I believe that practically all their actions are based upon natural, inborn instinct—nearly all of it in the line of self-preservation, and the exceptions are due to the natural tendency to imitate leaders. Of hereditary knowledge—another name for instinct, some animals have an abundance. Of special knowledge, acquired by systematic reasoning from premise to conclusion, most animals have very little, and very few ever exhibit powers of ratiocination.

It is *not* true that young animals know things only as their parents teach them. The assertion that all young birds must be "taught" to fly, or run, or swim, or catch insects, is ridiculous, and not even worthy of discussion. It is just as natural for a one-week-old lion cub to spit, and claw at a human hand, as it is for it to breathe and suck. There are no deer in a captive herd so insanely wild and fearful of keepers as the fawns.

No; even the higher animals are not yet as wise as human beings. In matters involving intelligence, such as in the treatment of wounds, or disease, below the higher Primates there is not more than one out of every hundred which has sense enough to comprehend a relief measure, or which will not fight the surgeon to the utmost. Some apes do indeed learn to be doctored; but there are many which never grasp the idea, and fight until they die. Of mammals generally, not more than one out of every hundred will permit a bandage to remain on a broken leg when they have the power to tear it off. "Animal surgery," indeed!

In the matter of disposition, wild mammals and birds are no more angelic than human beings. In every family, in every herd, and in every cage, from tigers to doves, the strong bully and oppress the weak and drive them to the wall. Of all quadrupeds, deer are the greatest fools, wolves are the meanest, apes the most cunning, bears the most consistent and open-minded, and chimpanzees the most intellectual.

Of birds, the parrots and cockatoos are the most philosophic, the cranes are the most domineering, the darters are the most treacherous, the gallinaceous birds have the least common-sense, and the swimming birds are by far the quickest to recognize protection and accept it.

The virtues of the higher animals have been extolled unduly, and their intelligence has been magnified about ten diameters. The meannesses and cruelties of wild animals toward each other form a long series of chapters which have not yet been written, and which no lover of animals cares to write.

I can see no possible objection to the writing of good fiction stories in which animals are the characters and the actors throughout. I love a good story, and I enjoy a wild-animal hero, even when the entire plot and all its characters are imaginary. To such there can be no objection, *so long as the reader knows that fiction is fiction!* But the realms of fact and fiction are very distinct, and

the boundary should be maintained openly and visibly. In books for children, especially, fantastic imaginings should not be offered as serious facts; but such stories as "Raggylugg," "Redruff," and "Krag," by Mr. Ernest T. Seton, deserve to live forever. "Moos-wa" is a fiction story of animals that is one of the best of its kind.

The most marvellous doings of wild animals are to be found in books and newspapers. Only in books do porcupines roll down steep hills in order to gather dead leaves upon their quills, and thereby be able to do more wonderful things. Only in books do kingfishers catch fish, carry them a mile or less, and place them in a brook in order to give their nestlings object lessons in ichthyology and in the gentle art of angling. You or I may spend years in the forests and fields, observing and collecting wild creatures, and see only a very few acts of the wild folk which we can call wonderful. But then, somehow, our animals rarely have been as large, or as well educated, as those of some other observers.

Try all questions of animal action and intelligence with the touchstone of common-sense. Be not startled by the "discovery" that apes and monkeys have "language"; for their vocabulary is not half so varied and extensive as that of barn-yard fowls, whose language many of us know very well. Take no stock in the systematic and prolonged "duels" of wild animals who meet and fight to the death, under Marquis of Queensberry rules. A fight between two wild animals is usually a very brief event,—so say reliable men who have seen them in the wilds,—and unless there is an accidental death-lock of antlers, the vanquished party usually shows his heels long before he is seriously wounded.

Animal psychology is a most interesting study, and its pursuit is now engaging the serious attention of scientific men. If the general public could know the plain and simple basis on which they are proceeding, this warning against the idealization of animals would hardly be necessary. Men of science who study the minds of animals do not idealize their subjects, or ascribe to them super-

human intelligence; nor are they always on the alert to ascribe to every simple action some astoundingly intelligent and far-fetched motive. In the study of animal intelligence, the legitimate Truth is sufficiently wonderful to satisfy all save those who crave the sensational, regardless of facts.

RULES FOR MEASURING MAMMALS, HORNS, ETC.

The increasing amount of attention that is being paid to the measurements and weights of animals renders necessary the adoption of a uniform system, in order that species and individuals may be compared on a fair basis. To promote this end the following rules are offered:

Small Mammals Generally

1. Record all measurements in feet and inches, and leave the metric scale for those who prefer a foreign system.

2. Measurements of skins are of very slight value; therefore, always measure a specimen before skinning it.

3. Lay every mammal on its side, pull the head straight forward, and measure from the tip of the nose to the point where the tail joins the body. This is the "*Length of head and body.*"

4. From the last-mentioned point, measure to the *end of the tail vertebrae, not* the hair, for "*Length of tail.*" If the tail-tuft is important, measure it separately.

5. Weigh large examples of species that are larger than rats and mice; and in each case, *weigh the whole of the specimen.*

Large Mammals

1. The "*Height at the shoulder*" is the most important measurement. To obtain this, hold the uppermost fore leg *as nearly as possible in the position it occupied when supporting the animal.* Do *not* measure from the "point of the hoof," for that means nothing. Hold the hoof with its bottom parallel with the body, as when the

animal stood upon it; erect there a stick to mark the bottom line, and another to mark the top of shoulders, at the skin. The distance between the two perpendiculars, in a straight line, will be the true height of the animal. Do not follow any curves.

2. The "*Length of head and body*" must be obtained in a *straight line* between root of tail and end of nose, *with the head drawn straight forward*, and not following any curves. The "*Length of tail*" is from its base to the end of the vertebrae.

3. The "*Girth*" is the tight circumference of the animal immediately behind the fore legs.

4. The "*Depth of the body*" is the distance in a straight line from the top of the shoulders to the brisket, or lower line of the breast, immediately behind the fore leg. To artists, sculptors, and taxidermists, this is a very important measurement.

5. The "*Circumference of the neck*" is taken half-way between the ears and shoulders, close to the skin.

6. The "*Length from head of femur to head of humerus*" is also a highly valuable figure for artists, and it is easily taken by feeling through the skin for the high points of those joints.

7. Weigh an animal before it is "dressed"; but if the dressed weight of a deer is known, a close approximation to its live weight can be obtained by the aid of the rule given on page 68, volume II.

Antlers and Horns

1. The "*Length on outer curve*" is obtained by starting the tape-line at the base of the horn, at its lowest point on the face, and following the curves or windings of the horn, quite to the tip. In horns that are deeply ringed, such as those of the large African antelopes, the tape must not be pressed into the hollows between the ridges.

2. The "*Greatest spread*" is taken from outside to outside of the antlers *where they spread widest!* This should *not* be taken inside the horns, for that does not represent the real width of the

horns, any more than interior measurements would represent the spread of a tree.

3. The "*Distance between tips*" needs no explanation.

4. The "*Circumference at base*" should, for all bovines, sheep, goats, ibex, and deer, be taken in a circle around the largest diameter of the horns. The tape should *not* follow the meanderings of the end of a sheep's horn. With the antlers of all members of the Deer Family, the circumference should be measured immediately above the burr.

5. "*Width of palmation*" of moose and caribou should always be measured where the palmation is widest.

6. A "*Point*" on an antler is any pointed projection of sufficient length that a watch can hang upon it without falling off.

7. The "*Weight of horns*" must state whether it be with "entire skull," or "with skull-piece" only.

8. Shed antlers that have been set artificially on a manufactured skull, or frame, are not entitled to measurement for "spread"; but where a skull has been sawn in two lengthwise by a clean cut, and bolted together again *without alteration of the sawn surfaces*, it is entitled to measurement for "spread" and "distance between tips."

MAMMALS

CHAPTER I

ORDERS OF MAMMALS

THE living mammals of the world, as distinguished from those which are extinct, or fossil, may be divided into fifteen grand divisions, called ORDERS. The Order is the foundation of mammalian arrangement. Without adequate knowledge of these divisions, a clear understanding of the relationships of mammals is quite impossible.

It is customary with technical writers to begin with the lowest forms of life and toil upward toward the highest; but to the general reader, or even to the average student, it is very discouraging to find the most interesting forms the farthest away. Frequently the most interesting animals are never reached! For many reasons, it is best that we should first consider the forms that are most important, and also most interesting, and thus make sure of them. We therefore begin our studies of the animal kingdom with the highest forms.

While the great majority of the examples cited will be North American, a few from other continents will be introduced to complete the chain of important facts.

The Orders of Living Mammals

ORDER	PRONUNCIATION	MEANING	EXAMPLES
Primates	*Pri'matz*	First order	Man, apes, and monkeys.
Ferae, or Carnivora	*Fe're*	Flesh-eating Wild Beasts	Cats, dogs, bears, martens.
Pinnipedia	*Pin-ni-pe'dia*	Fin-footed	Sea-lions, seals, walrus.
Insectivora	*In-sec-tiv'o-rah*	Insect-eaters	Moles and shrews.
Chiroptera	*Ki-rop'ter-ah*	Wing-handed	Bats and flying "foxes."
Glires, or Rodentia	*Gli'rez*	Gnawers	Hares, gophers, rats, squirrels.
Ungulata[1]	*Un-gu-la'tah*	Hoofed	Cattle, deer, sheep, swine, tapirs.
Proboscidea	*Pro-bos-cid'e-a*	With proboscis	Elephants only.
Hyracoidea	*Hy-ra-coi'de-a*		Hyraxes only.
Cete	*Se'te*	Whales	Whales, porpoises, dolphins.
Sirenia	*Si-re'ne-a*	Sea-Cows	Manatee and dugong.
Edentata	*E-den-ta'ta*	Toothless	Armadillos, sloths, and ant-eaters.
Effodientia	*Ef-fo-de-en'shia*	Diggers	Pangolin, aardvark.
Marsupialia	*Mar-su-pi-a'li-a*	Pouched	Opossum, kangaroo.
Monotremata	*Mon-o-trem'a-ta*	Single duct	Platypus and echidna.

[1] In accordance with the requirements of exact science, Professor Henry Fairfield Osborn divides the Ungulates into two Orders: the *Artiodactyla*, or Even-toed, and *Perissodactyla*, or Odd-toed hoofed animals. On account, however, of the place now held in the mind of the general reader and teacher by the long-known Order Ungulata, I hesitate to make here a complete change in its form.

FEMALE CHIMPANZEE, "SUSIE."
In the New York Zoological Park.

EXPLANATION OF THE CHART OF THE ORDERS OF MAMMALS

To the student of Natural History, the Order is the master-key to classification; and these grand divisions should always be kept fresh in the mind.

This chart is based on the well-known fact that in the pursuit of a difficult study, any scheme which properly and truthfully appeals to the eye is an aid both to the understanding and the memory. It shows the relative importance of the various Orders of Mammals, but *not* their relative sizes, based on the number of species in each, as has been done later on with the birds. If number of species were given precedence over economic importance, the Order Glires would dominate, and the Order Ungulata would appear small and insignificant.

It is impossible to construct a diagram which will show correctly the relations which the various Orders bear toward each other, anatomically. This is because some Orders are characterized by their teeth, some by their feet, or hands; others by their wings, and two by their mode of producing their young.

It will be noted that:

The Primates, of the tree-tops, have the highest position.

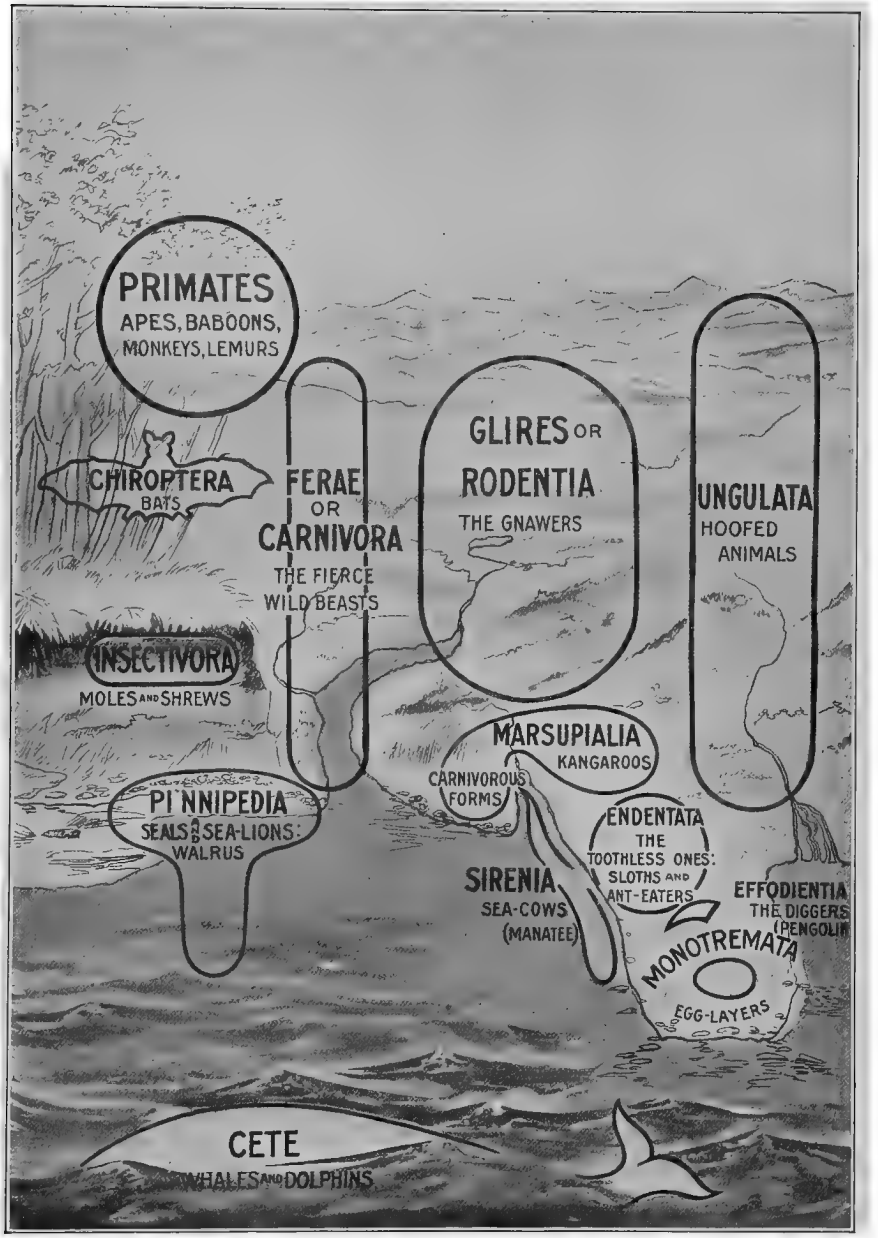
The Cete, which in some respects are the lowest of the Mammalia, occupy the lowest position.

The Bats are shown in mid air, and the Insectivores appear underground, where they live out their lives.

The Seals and Sea-Lions appear both on the shore and in the sea, and the Sirenians are located in an estuary.

The Ferae, Glires, and Ungulata spread throughout the whole visible earth, covering forest and plain, sea, pond, and stream, from the sea to the most distant mountains.

The Monotremates, or egg-laying mammals, are quite apart from all other land mammals, and appear low down, near the home of the ducks, as shown on the bird chart. The space allotted to this strange Order has been made egg-shaped, to suggest the leading characteristic of its members.



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LANDSCAPE CHART OF THE ORDERS OF LIVING MAMMALS.

CHAPTER II

ORDER OF APES AND MONKEYS

PRIMATES

THIS Order includes all creatures with hands, and hand-like feet. With the exception of the Japanese red-faced monkey, the tscheli monkey of China, and two or three other Chinese species, all its members inhabit the tropics, far below the frost-line. It is on or near the Equator that the lower Primates reach their highest development, and the great apes approach nearest to man. Let it not be supposed, however, that the chain of evolution from the aye-aye to the gorilla is complete; for the gap between the gibbons and the monkeys is much greater than that between the gorilla and man.

All men, even savages, are specially interested in apes and monkeys, because they are the highest of the lower animals, and stand nearest to man. There is no human being of sound mind to whom their human-likeness does not appeal. We will introduce here several species which do not exist in the New World, because without them our Foundation for the Mammalia would be incomplete.

Although tropical America contains a very respectable number of species of monkeys, they are, as a whole, both

structurally and mentally, far lower than the monkeys and baboons of the Old World. Structurally they are weak, in spirit they are timid and cowardly, and intellectually they are dull to the point of stupidity. With the exception of the sapajous, they are in general so ill fitted to survive that if they are on exhibition it is a difficult matter to keep any of them alive in captivity much longer than one year. If not exhibited, they survive longer.

On the other hand, very many of the monkeys and baboons of the Old World have developed first-class fighting powers and pugnacious tempers. They have dangerous canine teeth, wide-spreading jaws, strong muscles, and keen wits for either attack or defence. The Lemuroids, however, the lowest of the Primates, are almost as mild-mannered and harmless as rabbits.

With Ethnology, the study of the races of Mankind, we have here nothing to do. That subject is so interesting, and so vast in its extent, that nothing less than an entire volume could adequately set it forth. The grand divisions of the Primates in general are as shown below.

ORDER PRIMATES

Suborder Anthropoidea

FAMILIES		EXAMPLES	
MAN	*Hom-in'i-dae.*		
ANTHROPOID APES	*Sim-i'i-dae*	Gorilla	*Gorilla gorilla.*
		Chimpanzee	*Pan troglodytes.*
		Orang-Utan	*Simia satyrus.*
		Gibbon	*Hylobates leuciscus.*
OLD WORLD MONKEYS AND BABOONS	*Cer-co-pi-the'-ci-dae*	Japanese Red-faced Monkey	*Macacus speciosus.*
		Diana Monkey	*Cercopithecus diana.*
		Gelada Baboon	*Theropithecus gelada.*

FAMILIES		EXAMPLES	
New World Monkeys	*Ceb'i-dae*	White-throated Sapajou	*Cebus hypoleucus.*
		Black Spider-Monkey	*Ateles ater.*
		Howlers	*Alouatta.*
Marmosets	*Cal-li-thri'ci-dae*	Common Marmoset	*Callithrix jacchus.*

Suborder Lemuroidea

Lemurs	*Le-mur'i-dae*	Ruffed Lemur	*Lemur varius.*
Tarsier	*Tar-si'i-dae*	Tarsier	*Tarsius tarsius.*
Aye-Aye	*Dau-ben-ton-i'-i-dae*	Aye-Aye	*Daubentonia.*

The Apes.—The three great manlike (or an'thro-poid) apes—gorilla, chimpanzee, and orang-utan—are so much like human beings that, to most persons, they are the most wonderful of all living creatures below man. Their points of resemblance to man are so many and so striking that they are a source of wonder even to savages.

As will be observed from a comparison of the skeletons of man and gorilla, below the skull their parallelism is remarkably close. Both in kind and in number the bones are the same, and they differ only in their proportions. The hands and feet of the gorilla are designed for a life that is half terrestrial and half arboreal, while those of man are for life on the ground. The long thumb and great toe of the gorilla are far superior to those members in the chimpanzee and orang-utan.

The widest differences between man and the gorilla are in their skulls. In the gorilla, the high forehead and intellectual faculties so characteristic in man are totally wanting, indicating a very low order of intelligence. The long and power-

ful canine teeth are alone sufficient to proclaim the savage wild beast.

To many persons it seems strange that, notwithstanding the seemingly wide differences between the various races of

By permission of J. F. G. Umlauff.

SKELETONS OF MAN AND GORILLA.

1, cervical vertebrae,
2, collar bone,
3, humerus,
4, sternum,
5, ribs,
6, rib cartilages,
7, dorsal vertebrae,
8, lumbar vertebrae,
9, pelvis,
10, radius,
11, ulna,
12, carpals,
13, metacarpals,
14, phalanges,
15, cavity of pelvis,
16, sacrum,
17, femur,
18, patella,
19, fibula,
20, tibia,
21, tarsals,
22, metatarsals,
23, phalanges.

men, all mankind is classed in a single species. In spite of the vast differences in intellect between the native Australian —not yet out of the stone age—and a Caucasian philosopher, both belong to *Homo sapiens*, and between them there is not even a subspecific difference.

Even if the great apes could talk as well as the Veddahs of Ceylon, whose vocabulary consists of only about two hundred words, their anatomical differences from the genus *Homo* would separate them quite as widely as they now are. The segregation of a species requires a *structural difference that is constant.*

The classification of the species and alleged species of gorillas, chimpanzees, and orang-utans is in a highly unsettled condition. Of the scientists who have studied these genera with the most care and pains, no two agree, either on names or number of species. The trouble seems to lie in the lack of study in the haunts of the animals, and lack of materials to study in the museums. Under the circumstances it is useless to attempt to decide between the conflicting authorities, and therefore we will adhere to the old names until pending questions are settled.

THE GORILLA[1] is the largest, the ugliest, the most fierce of the apes, and by reason of its shorter arms and longer legs, it is really the nearest to man. It is the only large ape that walks erect without being taught, and that spends a considerable portion of its life upon the ground. In bulk it is larger than an average man, and its arms and chest are of enormous proportions.[2] The countenance of the Gorilla is very ugly

[1] *Go-ril'la gorilla.*

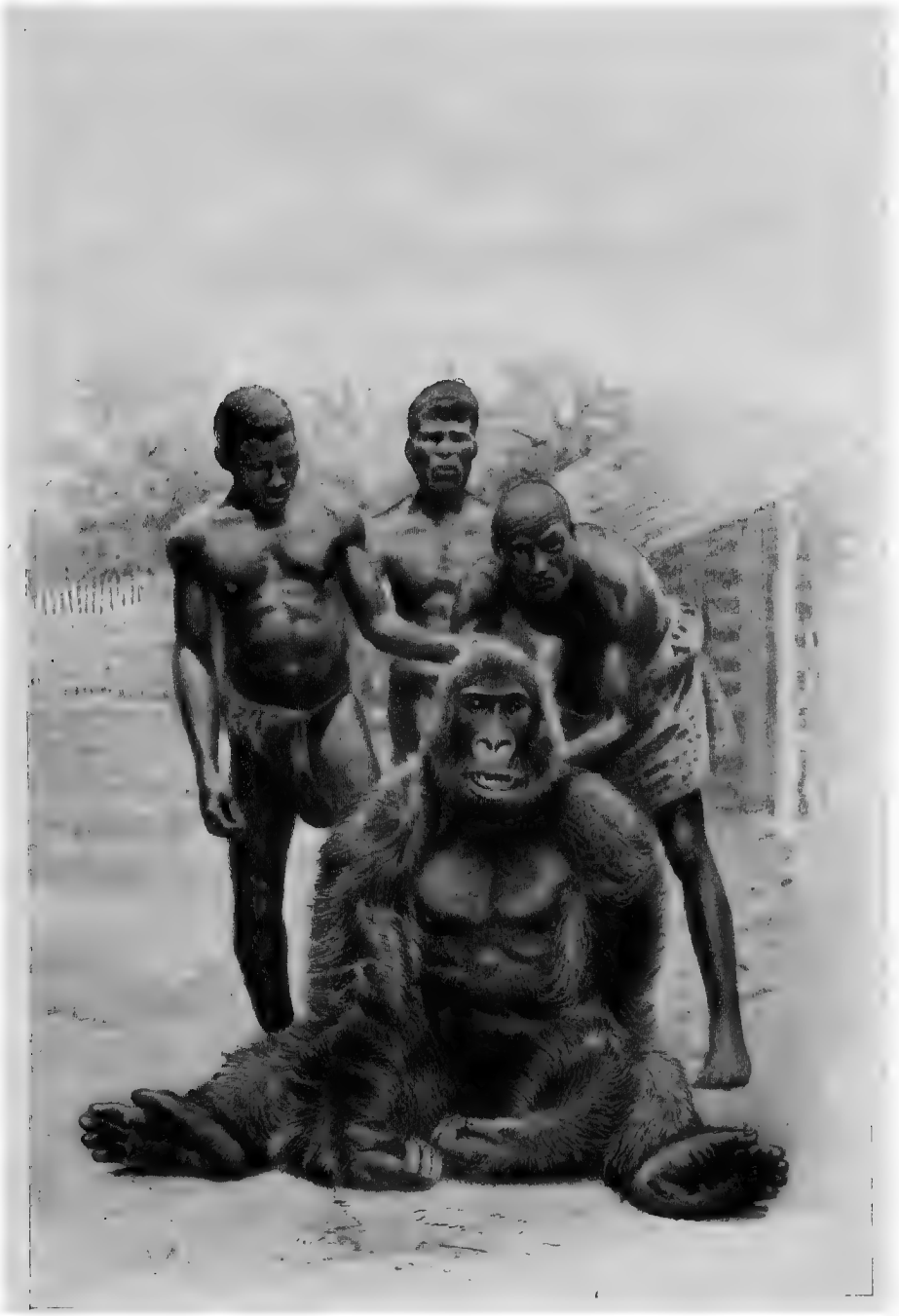
[2] The average man of the Anglo-Saxon race is 5 feet 6 inches in height and weighs 160 pounds.

and repulsive, and the shape of its skull is much farther from that of man than are those of the chimpanzee and orang-utan. Its skin is black, and the hair of full-grown specimens is grizzly gray.

The Gorilla inhabits only a very small area in West Africa, directly on the Equator, between the Gaboon and Congo Rivers, and extending only two hundred miles back from the coast. It is very shy, and so difficult to approach in those dark and tangled forests that very few white men have ever seen one wild.

One of the most remarkable specimens ever secured was the huge old male killed and photographed by Mr. H. Paschen, a German trader, near Tsonu Town, German Cameroon country, two hundred and forty miles north of the Equator, in 1901. This animal, photographed in the flesh, with three natives beside it for comparison, to show its immense size, was shot in a tree, without difficulty or danger. It measured 66 inches in height, its chest, arms, and shoulders were of gigantic proportions, and its weight was estimated at 500 pounds. Twelve men were required to carry it from the jungle to the village, where it was photographed.

On account of the sullen, sulky disposition of the Gorilla in captivity, only one of the four or five young specimens that have been brought to Europe has lived longer than about eighteen months. They sulk, often refuse food, will not exercise, and die of indigestion. Up to January 1, 1914, only two live Gorillas have landed in the United States. One of them lived five days and the other ten days. The latter was imported in 1912 by the New York Zoological Society, and while



THE GORILLA.

Shot and photographed at Tsonu Town, West Africa, by H. Paschen, 1901.

it survived was exhibited in the New York Zoological Park. Showmen sometimes label a baboon "Gorilla," or "Lion-Slayer," and it is well to remember that the Gorilla has no tail whatever.

THE CHIMPANZEE[1] is about one-third smaller than the gorilla. Its brain, face, ears, and hands are more manlike

CHIMPANZEES AND ORANG-UTANS DINING IN THE NEW YORK ZOOLOGICAL PARK.

than those of any other ape, and its large brain and keen mind render it in thought and habit much more manlike than is the gorilla. It is an animal of bright and cheerful disposition, though subject to sudden fits of bad temper, and, having a good memory, it is easily taught. Young Chimpanzees are

[1] *Pan troglodytes*. Described in most books under the untenable and more unwieldy name of *Anthropopithecus troglodytes*. This animal has been described under nine different generic names, but *Pan* is the oldest one available and the best.

affectionate and childlike, but when large and strong the males are usually dangerous and not to be trusted. Some individuals have displayed remarkable intelligence. "Sally," of the London Zoological Gardens, could count correctly up to five, whenever bidden, and hand out the correct number of straws. Several very intelligent Chimpanzees have been exhibited for long periods in the New York Zoological Park, where a large collection of apes is constantly maintained.

After several years of observation of living Chimpanzees and orang-utans, in daily comparison, I am convinced that the only substantial psychological differences between the two species are that the temperament of the Chimpanzee is of the nervous type, and its mind is more alert and prompt in action than that of the orang, while on the other hand the temperament of the orang is sanguine, its disposition is more serene, and while its mind may be somewhat less showy on exhibition, its capacity is very nearly equal to that of the Chimpanzee. The greater quickness of the Chimpanzee, both in thought and action, renders it on the whole the best show animal in public performances.

Many persons consider the Chimpanzee superior in intelligence to the orang-utan, but thus far the only real difference appears to be that the mind of the former is more alert, and acts more quickly than that of the orang. This renders the former a more showy animal.

In walking, the Chimpanzee does not place the palms of its hands flat upon the ground, but bends its fingers at the middle joint, and walks upon its knuckles.

It does not, as so often is asserted on hearsay evidence,

build a hut or a roof of branches under which to sleep. Its home is the heavy forest region of equatorial Africa, from the Atlantic Ocean to Lake Tanganyika. Like the gorilla, its skin is black, and when young its hair is also, but when

By permission of Edwards Bros.

A DRESSED-UP CHIMPANZEE.

fully grown its hair is dark iron-gray. This animal can be distinguished from the orang-utan at a glance by the greater size of its ears and its black color.

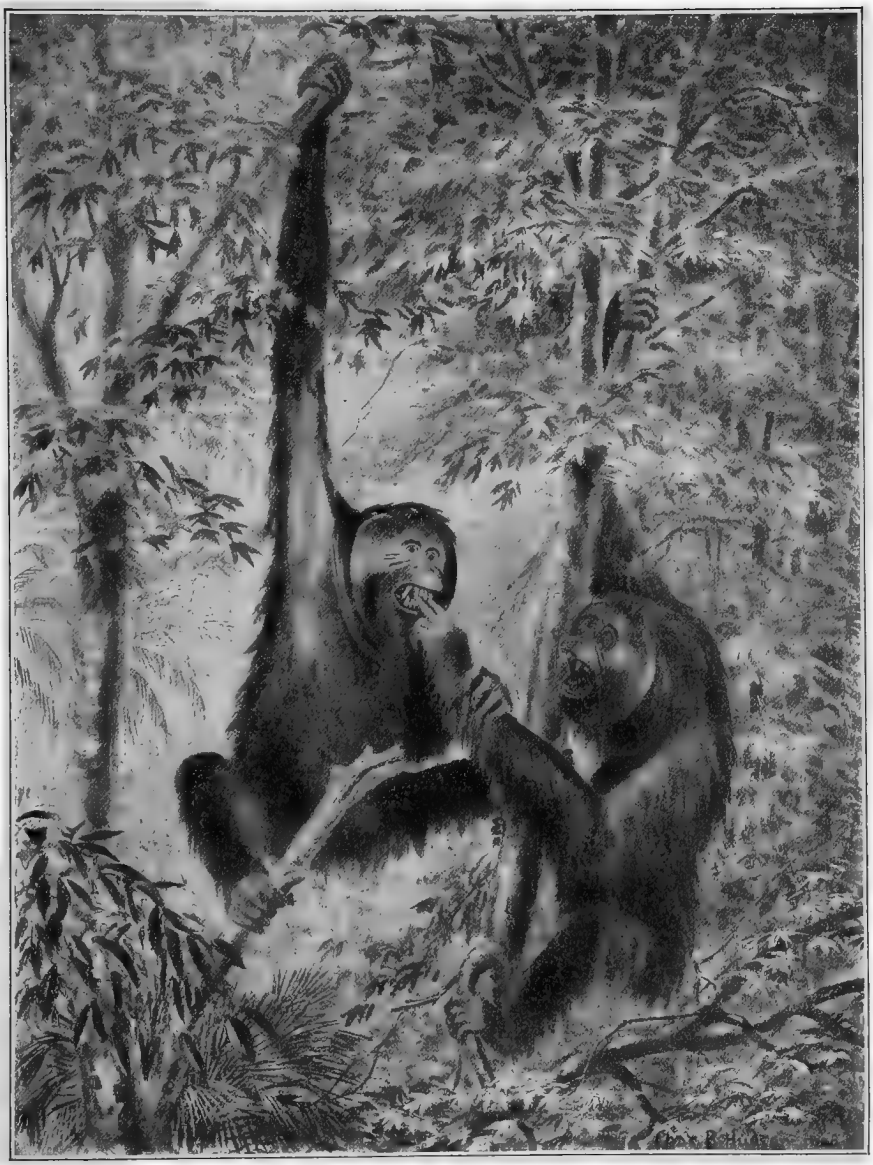
THE ORANG-UTAN (from two pure Malay words, "orang" =man, and "utan"=jungle) is also about two-thirds the size of the gorilla, and is easily recognized by its brick-red hair, brown skin, and small ears. The largest specimen on

record stood 4 feet 6 inches in height from heel to head, measured 42 inches around the chest, and between finger-tips stretched 8 feet. The old males develop a strange, flat expansion of the cheek, called "cheek callosities," 13 inches across; but in young animals this is seldom developed. The hand is 11½ inches long, the foot 13½ inches, but the width of each across the palm is only 3¾ inches. The weight of a large, full-grown male Orang is about 250 pounds.

The black gorilla and chimpanzee both inhabit the land of black men; the brown Orang-Utan lives only in Borneo and Sumatra, the land of the brown-skinned Malay. The latter prefers the belt of level, swampy forest near the coast, lives wholly in the tree-tops, and rarely descends to the earth except for water. Orangs travel by swinging underneath the large branches with their long, muscular arms. Because of their great weight, they cannot leap from tree to tree, as monkeys do, but they swing with wonderful rapidity and precision. They eat all kinds of wild fruit, fleshy leaves, and the shoots of the screw pine.

In proper hands, young Orang-Utans are very susceptible to training. The New York Zoological Park maintains almost constantly a collection of chimpanzees and Orangs, all of which have been taught to wear clothes, sit in chairs at table, eat with fork and spoon, drink from cups and bottles, and perform many other human-like actions without nervousness, in the presence of two thousand visitors. Each of the Orangs learns its part in about two weeks' training, and at the dinner-table acts with gravity and decorum.

In captivity, young Orang-Utans are as affectionate as



Drawn by C. B. Hudson.

A FIGHT IN THE TREE-TOPS.

Old male Orang-Utans, with cheek callosities.

human children and are very fond of their human friends. In the jungles of Borneo the full-grown males often fight savagely by biting each other's faces and by biting off fingers and toes. At night the Orang makes a nest to sleep upon, by breaking off leafy branches and laying them crosswise in the forked top of a sapling. On this huge nest-like bed it lies flat upon its back, grasps a branch firmly in each hand and foot, and is rocked to sleep by the cradle-like swaying of the tree-top.

Unless attacked at close quarters, in their forest homes, none of the great apes are dangerous to man. All of them flee quickly from the dreaded presence of Man, the Destroyer. They never fight with clubs, but when attacked at close quarters they bite, just as do human roughs. When enraged, the gorilla *does* beat its breast with its fists, just as Du Chaillu said; and it does this even in captivity.

"The Missing Link."—For thirty years at least, Science has been seeking in the earth for fossil remains of some creature literally standing between man and the great apes, but at present unknown. In 1879, Mr. A. H. Everett made for the Zoological Society of London a thorough examination of the deposits on the floors of some of the caverns of Borneo. To-day, some naturalists are straying toward the lemurs in search of the parent stem of man's ancestral tree. Vain quest! The gap between Man and Lemur is too great to be bridged in this world. A coincidence between skull bones is a long way from manlikeness.

In 1913 there was discovered at Piltdown, England, a fossil human skull of great antiquity, with a strongly ape-like

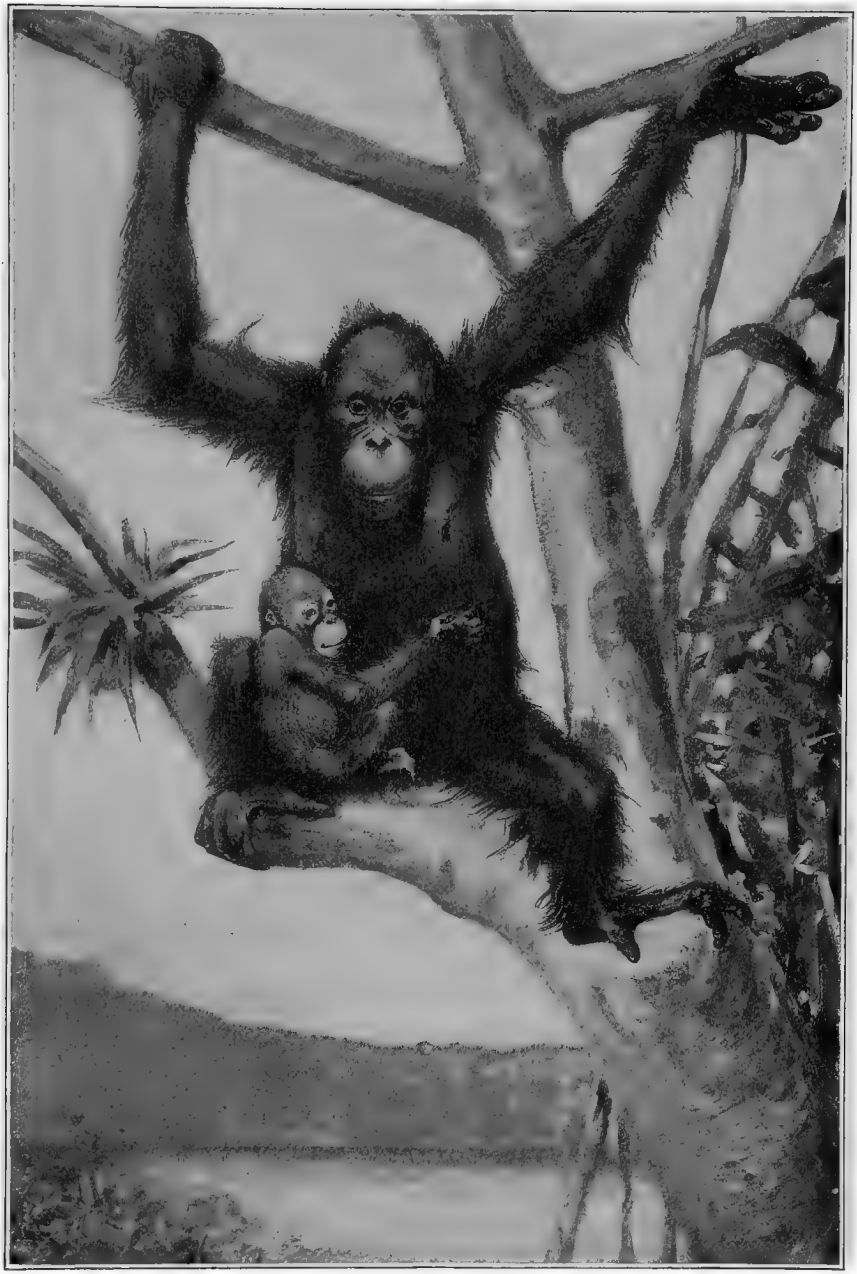
lower jaw. This, with the Neanderthal man and other fossil human remains, tends to bring man down nearer to the apes. It now remains for Africa completely to bridge the chasm by revealing fossil remains of apes trending upward, well above the living species of gorillas and chimpanzees.

Place upon the shoulders of a gorilla the head of a chimpanzee, and we would have—what? The Missing Link, no less—a hairy, speechless man! The man-apes we have. Let those who seek the undiscovered ape-man search the Tertiary deposits of the fertile uplands that lie between the gloomy equatorial forests of the black apes and the Bushmen of South Africa; for there, if anywhere, will the Missing Link be found.

The Gibbons.—From the three huge, coarsely formed, and unwieldy manlike apes just described, the line of descent drops abruptly and far. Their nearest relatives are the Gibbons—creatures of small size, marked delicacy of form, no weight or strength to speak of, but of marvellous agility in the tree-tops. Their heads are small and round, their teeth are weak, and their faces are like those of very tiny old men.

Their arms and hands are of great length in proportion to their body size, yet so very slender are their muscles that a live Gibbon seems like a hairy skin drawn over a skeleton. The largest specimen I measured in Borneo had the following remarkable dimensions: head and body, 19 inches; extent of outstretched arms and hands, 5 feet 1 inch; entire reach of arms and legs from finger-tips to ends of toes, 5 feet 1 inch; hand, 6½ inches long by 1 inch wide; weight, 10¼ pounds.

Of Gibbons there are about six species, and they inhabit



FEMALE ORANG-UTAN AND YOUNG.

Drawn from specimens living in the New York Zoological Park, by A. G. Doring.

Borneo, Sumatra, the Malay Peninsula, Burma, and Siam. With the GRAY GIBBON,[1] of Borneo, I am well acquainted; and after the three great manlike apes, it is to me the most wonderful of anthropoids. They are very timid, the shyest of all Primates that I ever hunted, and wonderfully successful in eluding the hunter. Nevertheless, so strong is their affection for their young, I have seen a whole troop that had made good its escape, return at the call of an infant Gibbon in trouble, and all reckless of their own safety come down within twenty feet of their deadly enemy. Very few other mammals will do this.

The most wonderful habit of the Gibbon is its flight downhill when pursued. Of course it never dreams of descending to the earth, but in the half-open hill forests of Borneo I have seen these creatures go downward through the tree-tops, in a straight course, leaping incredible distances, catching with their hands, swinging under, catching with their feet, turning again, and so on by a series of revolutions, almost as fast as the flight of a bird.

THE SIAMANG,[2] of Sumatra, is the largest and rarest of the Gibbons. It is jet-black, all over, face as well as fur, and it has a throat pouch which is distended to astounding proportions when it utters its peculiar, piercing cry. This species is as rare in captivity as the gorilla, and the only specimen seen alive in the New World up to 1914 was exhibited at the New York Zoological Park in 1903.

[1] *Hy-lo-ba'tes leu-cis'cus.*

[2] *Sym-pha-lan'gus syn-dac'ty-lus.*

OLD WORLD MONKEYS AND BABOONS

Cercopithecidae

TYPICAL OLD WORLD MONKEYS.—Asia, Africa, and the islands of the Malay Archipelago contain a great number of

JAPANESE RED-FACED MONKEY.
Note the narrow space between the nostrils.

species of monkeys. The most northern is the sturdy JAPANESE RED-FACED MONKEY, with no tail to speak of. It is clothed with long, shaggy hair, and those in the New York Zoological Park live outdoors all winter, and gallop about in

the snow without catching cold. Their tempers are quite as warm as their blood.

From Japan, monkey-land extends southward through China and southern Asia generally, over the Malay islands

DIANA MONKEY.

almost to Australia, and throughout the whole of Africa except its great deserts, to the extreme south.

Of all these Old World species, *none have prehensile* (grasping) *tails*, like many American species. Many of them are beautifully colored, however, and the markings of some are quite fantastic. The DIANA MONKEY, of West Africa, is elaborately marked with black, white, gray, and brown, and it is one of the most beautiful of all monkeys. An Old World monkey can nearly always be recognized by the very narrow space between the nostrils.

Short-Tailed Monkeys.—It must not be supposed that because the tail of a monkey is so short as to be scarcely visible, the wearer is therefore a true ape. There are several baboon-like animals with tails exceedingly short and insig-

N. Y. Zoological Park.

DEAD GELADA BABOON.
Note the lion-like aspect.

nificant, but which are far removed from the true apes. Some of these are *called* apes, but they are all much lower in the scale. Of these, the most important are:

The Black "Ape" of Celebes;

The Barbary "Ape" of Gibraltar and North Africa;

The Pig-tailed Macaque (pronounced Ma-cak′) of the East Indies, east of Ceylon, and

The Japanese Red-faced Monkey.

THE BABOONS.—In nearly every portion of Africa abounding in rocky hills covered with scanty vegetation may be found Baboons,—fierce of aspect, domineering in temper, strong of limb, and sometimes very ugly in countenance. Their noses are long and dog-like. They live on the ground, travel in troops of ten to twenty individuals, and rob grain-fields with great boldness. It is asserted by African explorers that even hungry lions prefer to let them alone. The canine teeth of an adult Baboon are so long and sharp that they are dangerous weapons. Without exception, Baboons are the most fierce-tempered animals of all the Primates, not even excepting the great apes, which never fight when they can run away.

All told there are about twenty-one species of Baboons, all of which are found in Africa, outside of the dark forests of the equatorial regions. The great GELADA BABOON,[1] of Abyssinia, is one of the most remarkable of all animals. It is like a small lion, with a Baboon's feet and hands; but its wonderful grimaces are peculiar to itself.

A Baboon of average size stands 24 inches in height at the shoulders, and weighs about 45 pounds. The majority of the species are of a yellowish color, mixed with brown. The MANDRILL is known everywhere by its brilliant blue and scarlet muzzle, and yellow chin beard.

[1] *The-ro-pith'e-cus ge-la'da.*

NEW WORLD MONKEYS

All the monkeys of the New World are marked by the wide space between the nostril openings, and nearly all the larger species possess prehensile, or grasping, tails, that are as useful as a fifth arm and hand. Most of the species which do not have prehensile tails are quite small. Of the clinging-tailed monkeys there are three important groups, which are represented in North America. They are the Sapajous, the Spider Monkeys, and Howlers.

The American monkey most frequently seen in captivity is the WHITE-THROATED SAPAJOU[1] (sap'a-jew) or CAP'U-CHIN, called by animal dealers and showmen, the "Ring-Tail." This monkey is a kind-spirited and affectionate little creature, and rarely gives way to bad temper. It has a wrinkled and care-worn face, as if burdened with sorrows—which most captive monkeys certainly are! Its forehead, throat, and shoulder points are white, and the remainder of the body is either gray, brown, or jet-black. The Sapajous inhabit Central America and northern South America. About two hundred specimens are brought to New York every year, where they are sold by dealers at prices ranging from $10 to $15 each.

THE SPIDER MONKEYS[2] may easily be recognized by their very long, slender legs and tails, and small, round heads. In color they are usually either black or gray, and rarely reddish brown. As they swing on their way through life, always using their prehensile tails to cling with or to swing by, they have

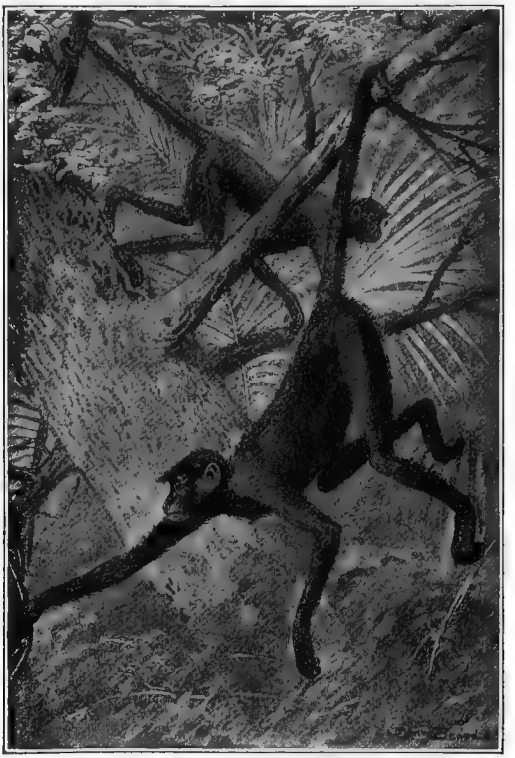
[1] *Ce'bus hy-po-leu'cus.* [2] *At'e-les.*

a very uncanny look, and it is no wonder that they are called "Spider" monkeys. They can come as near tying themselves into knots as living mammals ever can.

WHITE-THROATED SAPAJOU.
Note the wide space between the nostrils.

When fully grown, they are much larger than the sapajous, but are weak, unable to fight, and therefore timid. In a cage containing several species of monkeys, they are always

the greatest cowards, and often are heard shrieking from fright at imaginary dangers. They are dainty feeders, and very difficult to keep in health in captivity. Four species



BLACK-FACED SPIDER MONKEY.
At'e-les a'ter.

are found north of Panama. The Mexican Spider Monkey occurs up to Latitude 23°, and is the most northern monkey on this continent.

The Owl Monkeys.—Next to the spider monkeys is found a group often represented in captivity, the members of

which are distinguished by their small size, their round heads, very large, owl-like eyes, and long, hairy tails, which are not prehensile. As their staring eyes suggest, these creatures are of nocturnal habits, and in daylight hours are as inactive and uninteresting as opossums. Because of this, they make rather uninteresting pets; but being good-tempered creatures, they are frequently kept. They are sometimes called DOROU-COU'LIS. They are found from Central America to southern Brazil.

THE SQUIRREL MONKEYS of northern South America and Central America are next in order, and in activity and general liveliness of habit they make up for all that the owl monkeys lack. They are the most active of all the small American monkeys, and are so nervous and unmanageable that they are unfit for captive life elsewhere than in cages. The COMMON SQUIRREL MONKEY,[1] sometimes, though erroneously, called the TEETEE, is a trim little yellow fellow, with a very long cranium, close-haired head, and a very long tail, which he gracefully curls up over his own shoulders whenever he sits down. This species comes from the Guianas and Venezuela, and is very common in captivity.

This creature is a skilful climber, and it is the only mammal I ever saw which could exert sufficient lateral pressure with its hands and feet to enable it to climb with ease a perfectly smooth, right-angled corner of wood to a height of six feet.

THE SAKI MONKEYS, of tropical South America east of the Andes, are of medium size, mostly black and shaggy-

[1] *Sai-mi'ri sci-u're-a.*

haired, and sometimes possessed of a *long, black chin beard.* They are always marked by their big, heavily haired tails, which are long, but not prehensile. They are often mistaken for howling monkeys. They are difficult to keep alive, seldom live to reach the United States, and for this reason are likely to remain but little known. The most remarkable species is the BLACK SAKI,[1] two specimens of which were placed on exhibition in the New York Zoological Park in 1903.

THE UAKARI, or YARKEE, MONKEYS, of which there are three species, all found in Brazil, have the shortest tails to be found amongst American monkeys. The BALD YARKEE[2] of the Upper Amazon is an excellent imitation of the Japanese red-faced monkey, having not only the same stubby tail and long, shaggy hair, but also a *red face!* Unfortunately this species is one of the rarest in all America.

THE HOWLERS are rarely seen in captivity, because it seems almost an impossibility for man to find food which they will eat, and which agrees with them.

Between the two sides of the lower jaw, the Howler possesses a large sound-box of cartilage—a development of the hyoid bone—which gives to the creature's voice a deep resonance, of a very unusual character. These monkeys delight to indulge in vocal concerts, and the deep roar of their unearthly voices can be distinguished at a distance of a mile or more.

In all there are fourteen species of Howling Monkeys. Occasionally young specimens of the GOLDEN HOWLER are brought from Venezuela and Guiana to New York, but in

[1] *Pi-the'cia sa-tan'as.* [2] *U-a-ka'ri-a cal'va.*

confinement their digestive organs are easily disturbed, and they seldom, if ever, live to reach maturity.

THE FAMILY OF MARMOSETS
Callithricidae

Lowest in the scale of all the American monkeys, and in fact next to the lemurs, we find a collection of small and odd-looking creatures, some of which are so strangely formed that often it is necessary to state that they belong to the Order of Apes and Monkeys. This is the Family of MARMOSETS, the members of which are distributed variously from southern Mexico to southern Brazil. They are frequently found in the stores of animal dealers, and by ladies who have abundant time for their care are often prized as household pets. But they are very delicate, and do not long endure the strain of being on public exhibition. Their market price varies from $3.50 to $8.

Without exception these are all very small, delicately formed creatures, with hairless faces, eyes that are large and bright, and long tails. Their hair is long, abundant, and silky, and in some species it stands up on the top of the head like a white ruff. As these frail little creatures perch motionless in their cages, and focus their brown eyes upon the visitor, they seem more like little toys than living animals of Man's own Order. They are really very odd, picturesque, and interesting.

THE PINCHE MARMOSET[1] is a good representative of this group. It comes from the United States of Colombia, is

[1] *Mi'das aed'i-pus.*

about as large as a small chipmunk, and can be recognized anywhere by the jaunty bonnet of white hair which stands stiffly erect on the top of its head.

Photo. by Jenness Richardson.

COMMON MARMOSET.

Of marmosets there are altogether about twenty-one species. The best-known are the COMMON MARMOSET,[1] with a fan of white hairs standing stiffly erect above each ear, and the SILKY MARMOSET,[2] which is half buried in a mop of long, silky, yellowish hair.

[1] *Mi'das ros-a'li-a.*

[2] *Cal'li-thrix jac'chus.*

THE SUBORDER OF LEMURS
Lemuroidea

On the great island of Madagascar there are no fewer than thirty species of lemurs, many of them very beautiful creatures, all very kind-spirited and inoffensive, and so numerous that some travellers have declared that "every bush has its lemur." And yet, in America, these creatures are about as little known as if they inhabited Mars instead of Madagascar. During the first six months following the opening of the Primates' House in the New York Zoological Park, at least twenty educated and intelligent young men asked how to spell the word "lemur."

The lemurs, tarsiers, and aye-aye constitute the lowest grand division of the Ape-and-Monkey Order—Primates. Their low position is due chiefly to their long, foxlike muzzles, and their teeth, which are not monkey-like. Their hands and feet, however, define their position.

THE RUFFED, or BLACK-AND-WHITE, LEMUR[1] is the handsomest and most conspicuous animal in this strange group. It is the size of a large house cat, its tail is very long, and the creature is abundantly clothed with long, soft, silky-fine fur, jet-black and pure white.

Although lemurs have large eyes, and are supposed to be night-prowlers, they are fairly active in the daytime, and are not at all disturbed by daylight. They are charming pets, very affectionate, easily kept, and even with twenty in one large cage they do not quarrel, as monkeys are so prone to do.

[1] *Le'mur va'ri-us.*

KEEPING MONKEYS IN CAPTIVITY.—Large monkeys need large cages, with means to climb and swing. Fine hay should cover the floor. Cages should always stand three feet

Sanborn, Photo., N. Y. Zoological Park.

THE RUFFED LEMUR.

above the floor of a room, and while the ventilation should be good, there should be freedom from draughts. The temperature should be 75° F., kept as even as possible. *Food:* boiled rice or tapioca, baked or boiled potatoes, ripe bananas or apples; a little raw meat, finely chopped; dried or parched sweet corn that is easily chewed; a little stale bread; occa-

sionally, a small raw onion. Permit no teasing; feed regularly, water frequently, and keep cages clean. When monkeys become ill, carefully ascertain their trouble, then treat them the same as one would treat sick children.

CHAPTER III

ORDER OF FLESH-EATING MAMMALS

FERAE, OR CARNIVORA

NORTH AMERICA contains a fine array of animals belonging to the ORDER FE'RAE,[1] numbering about one hundred and forty-seven species north of Panama, not counting subspecies. They are divided into the following groups:

ORDER FERAE

FAMILIES		APPROXIMATE NUMBER OF FULL SPECIES IN NORTH AMERICA NORTH OF PANAMA (1905)	
THE CATS	*Fe'li-dae*	14	Species.
THE DOGS	*Ca'ni-dae*	37	"
THE MARTENS, ETC.	*Mus-te'li-dae*	71	"
THE BEARS	*Ur'si-dae*	16	"
THE RACCOONS, ETC.	*Pro-cy-on'i-dae*	9	"

THE CAT FAMILY

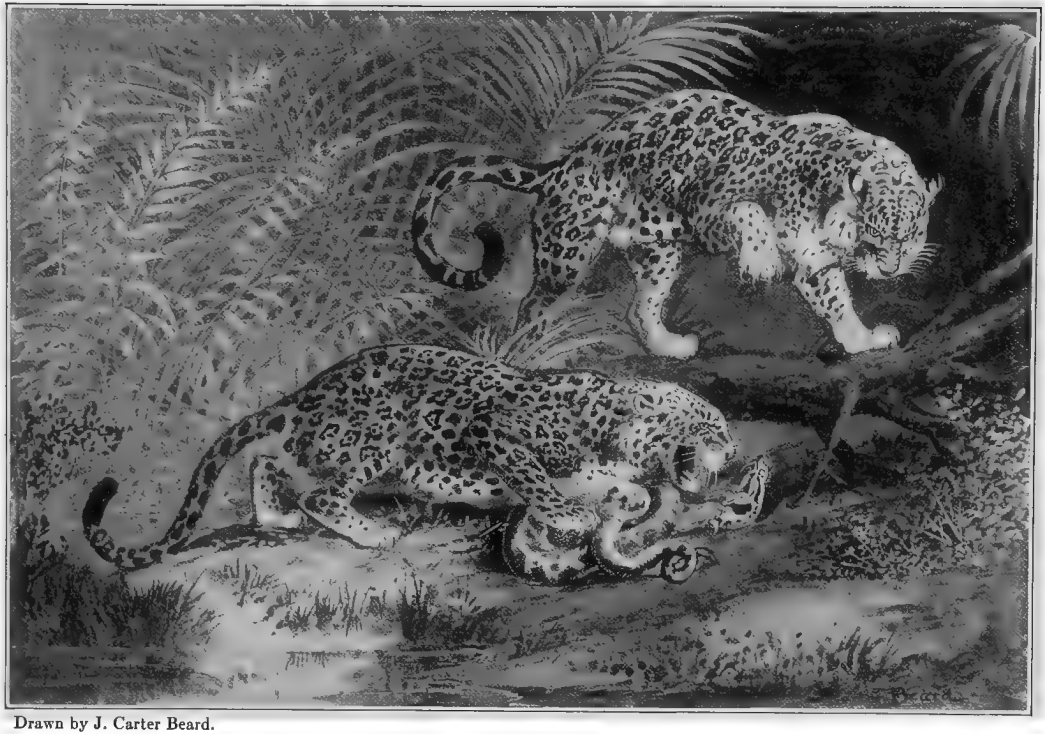
Felidae

In the order of their size, the five largest catlike animals of North America are the following: Jaguar, Puma, Canada Lynx, Red Lynx, and Ocelot.

Of the Cat Family, the JAGUAR[2] (pronounced Jag'you-ar) is not only the largest, but also the handsomest species in

[1] From Latin *fe-rus*, meaning a wild beast. This is a much older name than *Carnivora*, which heretofore has been generally applied to this group.

[2] *Fe'lis on'ca.*



Drawn by J. Carter Beard.

JAGUAR.

America. Of yellow-and-black cats it stands next in size to the tiger, but in form it is not so finely proportioned as the leopard. It is of massive build, throughout, and its head is very large for the height and length of the animal. Its tail, however, is disproportionately short.

This creature has a golden-yellow coat, marked on the back and sides by large, irregular hollow islands of black, called rosettes—quite different from the smaller and more solid black spots of the leopard. Between these rosettes run the narrow lines of yellow ground-color, like the streets of an oriental city on a map. The legs, head, and under-parts are marked with solid black spots. An animal of this species can always be *recognized by its large rosettes, large head, heavy build, and short tail.*

The Jaguar, which in Mexico and South America is called "el Tigre" (tee'gre), is found as far north as southern Texas, and from that region southward to the limit of tropical forests in South America. A female specimen which once lived in the New York Zoological Park measured 48 inches in length of head and body. its tail was 20 inches long, it stood 24 inches high at the shoulders, and weighed 120 pounds.

In killing pigs, cattle, horses, deer, and other wild animals, the Jaguar is a fierce, powerful, and dangerous beast; but, like all other wild creatures, it is afraid of man.

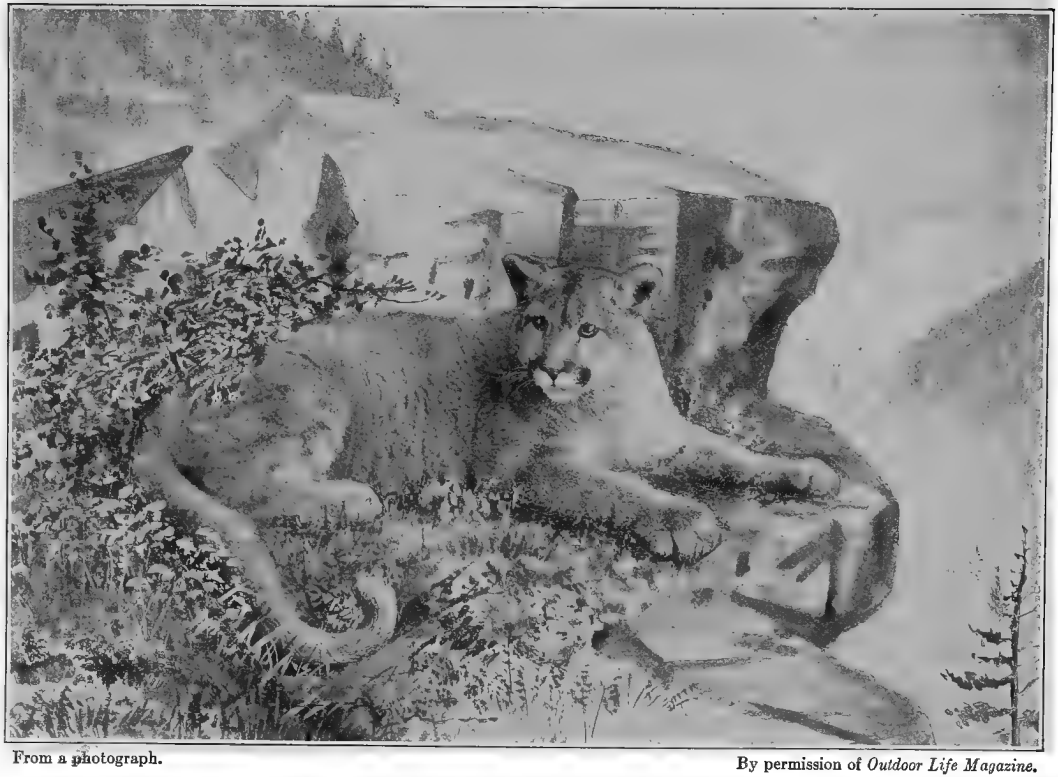
It is my belief that the strength of the jaws of the Jaguar is greater in proportion to its size than that of any other member of the Cat Family. Of this power we once witnessed in the Zoological Park a tragic illustration. A full-grown female Jaguar was purchased as a cage mate for a large and

powerful male, named "Lopez," from the interior of Paraguay. After two days' preliminary introduction through their cage fronts, the two animals were placed together. No sooner had the female entered the cage of Lopez than he rushed upon her, seized her neck between his jaws, and by a square bite crushed two of the neck vertebrae, killing her almost as quickly as if her head had been cut off with an axe. The murderous male was fully one-fourth taller, and was larger in every way than the female.

THE PUMA, also called MOUNTAIN "LION" and COUGAR,[1] is the most widely known cat animal of North America. It is found in all the great western mountain ranges of the United States, in many tracts of "bad lands" in Wyoming and Montana, in British Columbia, and in the Adirondacks and Florida. Southward it ranges over table-lands and through tropical forests, all the way to Patagonia. In the United States it is most abundant, and also most accessible, in Routt County, Colorado, where it is easily found by dogs, chased into low trees, and shot without danger. In this manner Mr. John B. Goff has killed nearly three hundred Pumas, "only two of which fought courageously."

Hundreds of thrilling stories of (imaginary) adventures with Pumas have been written and printed, but in reality this animal is less to be dreaded than a savage dog. It appears to be true, however, that it occasionally follows belated hunters or travellers, out of curiosity. It is now a well-established fact that prowling Pumas do sometimes scream, in a manner calculated to inspire terror, just as caterwauling cats

[1] *Fe'lis con'co-lor*, and other species and races recently described.



From a photograph.

By permission of *Outdoor Life Magazine.*

PUMA, OR MOUNTAIN "LION."

frequently do. I have heard Pumas scream precisely like terrified women or boys, but they always flee from man when the way is open.

The Puma is *a thin-bodied, flat-sided animal, tall for its weight, and of a brownish-drab color.* It has a beautiful face, and is a handsome creature. Of all the large cats of the world, it is by far the best climber. It reaches its maximum development in Colorado, and also its finest (tawny) color. The fine male specimen killed by Colonel Theodore Roosevelt on February 14, 1901, near Meeker, Colorado, measured, before skinning, exactly 8 feet in total length, and weighed 227 pounds. I regard that animal as fairly representing the maximum size attained by the largest species of Puma.

Our Pumas make their dens among rocks, in "washout" holes, or in very thick brush or forests, and prey upon every living creature that can be killed and eaten, except man. In settled regions they frequently destroy much young stock. Throughout the Rocky Mountains, they are dangerous enemies of the mountain sheep and mule deer. In the "bad lands" of Montana I once saw a mule deer killed which had on its neck a twelve-inch scar, a torn ear, and the beam of one antler broken off half-way up. Apparently these injuries were received in an encounter with a Puma, and a fall over a cut bank, which evidently released the deer from its savage assailant.

The young of the Puma vary in number from two to five, and are *spotted.* Living specimens vary in value from $30 to $75, according to age and size.

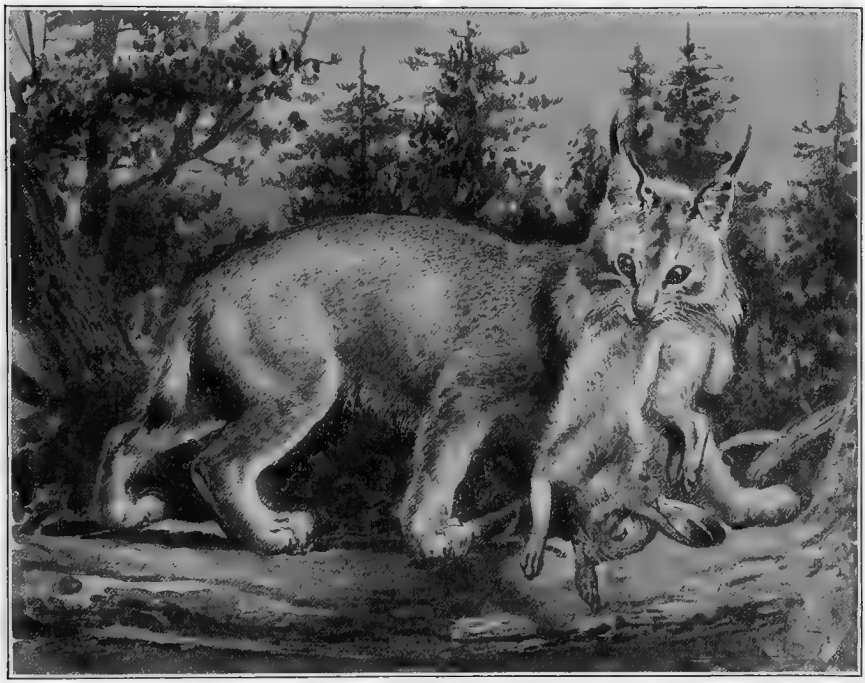
At first glance the OCELOT, or TIGER-CAT,[1] seems to be a small leopard with a pale-yellow body-color. Its legs are spotted, but instead of having spots on its body, its back and sides are marked with irregular stripes and bands of black which run *lengthwise*. It may be instantly recognized by its *horizontal stripes*, for the like are not possessed by any other animal. But no two Ocelots are ever marked exactly alike.

This animal is the size of a cocker spaniel, and, being a good climber, when in its native forests it spends much of its time on the lower branches of trees, watching for prey. It feeds chiefly upon small quadrupeds and birds. The following are the dimensions of an average specimen: Height, 13 inches; head and body, 30 inches; tail, 15 inches; weight, 36 pounds. It is frequently taken in southern Texas—its northern limit—and its range is about the same as that of the jaguar. In the New York Zoological Park it has been kept outdoors all winter, and has bred and reared young very successfully. Like most small yellow cats, Ocelots are usually bad-tempered. The value of a living specimen is about $30.

THE LYNXES of North America form a very distinct group of short-tailed, heavily furred, tree-climbing cats, the members of which are spread throughout nearly all portions of the continent north of Mexico which are yet sufficiently wild to shelter them from man. They inhabit with equal facility forests, mountains, canyons, sage-brush plains, and even deserts. They prey chiefly upon rabbits and hares,

[1] *Fe'lis pard-a'lis.* See page 111.

grouse, prairie-"dogs," ground-squirrels, and any other living creatures, except porcupines, which they can catch and kill. They are not courageous, or disposed to fight except when



Drawn by J. Carter Beard.

CANADA LYNX.

cornered, and, so far as voluntarily attacking human beings is concerned, Lynxes are no more dangerous than rabbits.

In North America the genus *Lynx* is represented by two well-marked types.

THE CANADA LYNX[1] is a heavily furred, short-bodied, long-legged, bob-tailed wild cat of a pepper-and-salt gray

[1] *Lynx can-a-den'sis.*

color, standing about 18 inches high at the shoulders. It is readily recognized by the *long pencil of stiff, black hair rising from the tip of each ear, and its huge, hairy paws.* Its big eyes and long side-whiskers give it a really terrifying countenance, particularly when it snarls. To the lone hunter who camps in the dark and gloomy forests inhabited by this creature, it seems a very dangerous animal; but in reality it is not so. Those who have hunted it say it is not courageous, and at close quarters is easily killed with a stick. It is a good climber, swims well, but on land runs rather poorly, with a galloping gait. Although found in a few localities in the northern United States, its real home is in the provinces of Quebec, Ontario, and the Northwest, up to Latitude 60°. A good average-sized male specimen collected by Professor Dyche in British Columbia measured as follows: Height, 17½ inches; head and body length, 32 inches; tail, 5 inches; girth, 17½ inches.

The weight of a full-grown specimen is 22 pounds, and the young are two in number. This species is rarely seen in captivity, and is always desired by zoological parks and gardens. Living specimens are worth from $10 to $40 each.

The fur of this lynx is now valuable. In London the price of fine, large skins has gradually risen from $4.87 in 1882 to $39.85 in 1910.

THE BAY LYNX[1] is also called the RED LYNX, WILD CAT, or BOB CAT, according to the locality in which it is found. Owing to variations in its color and in other characteristics several subspecies have been described, but these are too

[1] *Lynx ru'fus.*

closely related to the type to be set forth separately here. This species is marked by the absence of the long ear-pencil of the Canada lynx (although sometimes a small pencil is present), by the small feet and the warm brown tone in the color of the fur.

Western specimens are sometimes so strongly marked with round black spots that we feel impelled to recognize the "Spotted Lynx" as a distinct species; but when we find others from the Atlantic coast also spotted, besides others of the standard reddish gray, we are compelled to refer all of them to the species of the Bay Lynx. In the Atlantic states the standard color for this animal is a mixture of rusty red, gray, and blackish brown, with the red so prevalent as to have given a name to the creature. In the West, the spotted coat is more common, and occasionally the spots are strongly marked all over the animal.

E. R. Sanborn, Photo., N. Y. Zoological Park.

THE OCELOT.

The face of the Bay Lynx is really very beautiful and, when not too fat from overfeeding in captivity, the body is lithe and graceful. When kept in large cages in the open air and sunlight, sheltered from storms, and not overfed, this animal is easily kept in fine condition. In artificially heated buildings they do not thrive.

This species is found in nearly all the states east of the Mississippi which contain large areas of rough forests, but is most numerous in Maine, the Carolinas, Florida, Virginia, and Tennessee. In the "bad lands" and mountains of Montana, Wyoming, Colorado, and Texas they are really

Photo. and copyright by W. L. Underwood, 1902.

BAY LYNX.

numerous, and feed luxuriously on the cottontail rabbits that are now so abundant in those regions. Varieties of this species extend westward to the Pacific coast states. East of the Mississippi River about twenty specimens are caught alive each year and offered for sale. Their value when caught is $10 each, and the supply exceeds the demand.

By measurement the Red Lynx is fully as large as the

Canada lynx. The largest specimen that ever came into my hands (on Pryor Creek, Montana) measured in length of head and body 31 inches, tail 7 inches, height at shoulder 18 inches, and weighed 18 pounds. The largest of nine specimens killed by Colonel Roosevelt's party in Routt County, Colorado, in 1901, weighed 39 pounds. One killed near Asheville, North Carolina, in 1900, is reported to have weighed 51 pounds.

No lynxes are found in the lowlands of the tropics, or in South America.

THE DOG FAMILY

Canidae

Of all the wild creatures of North America, none are more despicable than wolves. There is no depth of meanness, treachery, or cruelty to which they do not cheerfully descend. They are the only animals on earth which make a regular practice of killing and devouring their wounded companions and eating their own dead. I once knew a male wolf to kill and half-devour his female cage mate, with whom he had lived a year.

In captivity, no matter how well yarded, well fed, or comfortable, a wolf will watch and coax for hours to induce a neighbor in the next cage to thrust through tail or paw, so that he may instantly seize and chew it off, without mercy. But in the face of foes capable of defence, even gray wolves are rank cowards and, unless cornered in a den, will not even stop to fight for their own cubs.

THE GRAY WOLF, or TIMBER WOLF,[1] is really a formidable animal, but in its dealings with men it has learned to fear the deadly rifle, the poison pot, and the trap. Storms, cold, and fatigue affect it but little, and its powerful teeth, strong jaws, and wide gape enable it to bite with great cutting power. In fighting with dogs, every well-aimed snap means either a deep wound or a piece of flesh bitten out.

GRAY WOLF.

The type of this species is a strong, robust animal, cunning and merciless. Its winter coat is long, shaggy, and coarse-haired. Its standard color is mixed black and white, but it varies greatly and unaccountably. In Florida it is often black, in Texas reddish brown, and in the far North it varies from black to white. Although in some localities it is called the Timber Wolf, it is equally at home on the treeless prairies of the West, in the dark, evergreen forests of British Columbia, and on the desolate barren grounds of arctic America.

Although once very abundant on the Great Plains, the coming of the cattle ranchman and sheep-herder provoked against the Gray Wolf and coyote a relentless war of extermi-

[1] *Ca'nis oc-ci-den-tal'is.*

nation, which is still being waged. Several states in the cattle country of the Great Plains offer cash bounties on wolf scalps ranging from $2 to $20, and large sums of money have been paid out for them. In Montana the number of wolves has so greatly diminished that in the course of a month in the saddle in 1901, in wild country, no Gray Wolves were seen, and only four coyotes. Wolves have now become so scarce that the occupation of the professional "wolfer" is almost gone.

Nevertheless, even on the cattle plains, the Gray Wolf is very far from being extinct; and as long as the "bad lands" remain, with their thousands of washout holes, and tens of thousands of rabbits, the gray marauder will remain. In the far North, above the Arctic Circle, and in the land of the musk-ox, in 1899, Mr. C. J. Jones and his companion were so beset by packs of huge and fierce White Wolves, seeking to devour their five living musk-ox calves, that for over forty-eight hours they fought them continuously at short range, killing a wolf at every shot.

The young of the Gray Wolf are usually five in number, and are born early in May. At first they are of a sooty-brown color, and are distinguishable from coyote puppies by the large size of the head. One which was examined when four days old measured 9½ + 3 inches,[1] and weighed 16 ounces. When twenty days old, it was 15+4 inches, and weighed 4½ pounds.

The cry of the Gray Wolf is a prolonged, deep-chested howl, corresponding with B-flat below middle C, not broken

[1] That is, head and body, 9½ inches; tail, 3 inches.

into a bark, like the cry of the coyote. When seen at home, the Gray Wolf can readily be distinguished from the coyote, even at a distance, by the way it carries its tail,—pointing above the horizon.

Gray Wolves hunt in packs, often in relays, and successfully pull down deer, antelope, and wounded animals of all sizes. In the cattle country their specialty is the destruction of calves and colts. Except in the far North, they know well what firearms are, and are very careful to keep out of rifle-shot.

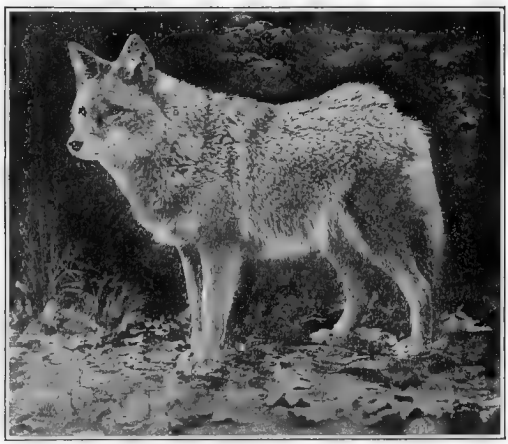
To-day the range of the Gray Wolf embraces the Great Plains and the Rocky Mountain region from Mexico to the northern limit of land. Lockwood and Brainard found tracks of a Gray Wolf at Latitude 83° 24′. In Alaska, animals of this species grow larger than in the United States, and frequently are white instead of gray. A fairly large Gray Wolf is 48½+15¼ inches long, stands 26 inches high at the shoulders, and has a girth measurement of 29½ inches. (L. L. Dyche.)

The Coyote, or Prairie Wolf,[1] is about one-third smaller than the gray wolf, but in form and color the two species look very much alike. It carries its tail low—humbly—as befits a cowardly animal. It is not dangerous to man, and never was, and is bold only in the persistence with which it hangs upon the outskirts of civilization and prowls around ranches in quest of food.

The delicacy of the Coyote's judgment in keeping always beyond fair gunshot is truly wonderful. If he is not a

[1] *Ca'nis la'trans*, and related forms.

mind-reader, his actions belie him. Twice in Montana, each time for two weeks, I tried my utmost to shoot a Coyote; but during those periods not one would offer more than a running shot at three hundred yards or more. Twice, however,—and immediately after these experiences,—when I was riding quite unarmed, have Coyotes sat down beside the trail, waited for me to approach within forty yards, then yawned in a bored manner, and slowly trotted off. It is my belief that those animals knew perfectly well my inability to shoot.



N. Y. Zoological Park.

COYOTE.

The food of Coyotes consists chiefly of prairie-"dogs," ground-squirrels, sage-grouse, hares, and rabbits. The largest animals ever killed by them are deer and prong-horned antelope. From the ranchman they steal poultry, pigs, lambs, and sheep. They "den" in "washouts," or deep holes in the cut banks of ravines, and rear from five to seven puppies every May.

The cry of the Coyote is a dog-like yelping, half howl and half bark; whereas the call of the gray wolf is a prolonged and steady deep-bass howl. As far as they can be heard, these wolves can be distinguished by their cries, and to those who have camped on the plains, or in the wild and

weird "bad lands" of the great West, the high-pitched, staccato cry of the Coyote, as he announces the coming dawn, is associated with memories of vast stretches of open country, magnificent distances, fragrant sage-brush, and freedom. The specific name of this animal (*latrans*) means "barking," and was bestowed on account of its peculiar dog-like cry.

The Coyote ranges from the latitude of the City of Mexico northward through the Great Plains and Rocky Mountain region to Alberta. The size of my best Montana specimen was 37¾+16 inches in length and 20¾ inches in height at the shoulders.

Coyotes vary in color from the typical pepper-and-salt gray to yellowish gray, the latter being found in the Southwest. At rare intervals, black specimens occur.

NORTH AMERICAN FOXES
(NORTH OF MEXICO)

RED FOX GROUP: GENUS *Vulpes*

ENGLISH NAME	LATIN NAME	LOCALITY
RED FOX	*Vulpes fulvus* (Desmarest)	Virginia to Alaska.
CROSS FOX	*Vulpes fulvus decussatus* (Desmarest)	New York to Manitoba.
BLACK FOX	*Vulpes fulvus argentatus* (Shaw)	Northwest Territory, Alaska.
PLAINS FOX	*Vulpes macrourus* (Baird)	Great Plains.
KADIAK FOX	*Vulpes harrimani* (Merriam)	Kadiak I., Alaska.
NEWFOUNDLAND FOX	*Vulpes deletrix* (Bangs)	Newfoundland.
SWIFT FOX	*Vulpes velox* (Say)	The Great Plains.
LARGE-EARED FOX	*Vulpes macrotis* (Merriam)	Southern California.
ARCTIC, OR BLUE FOX	*Vulpes lagopus* (Linnaeus)	Polar regions of both hemispheres.
HALL ISLAND FOX	*Vulpes hallensis* (Merriam)	Hall Island, Bering Sea.

GRAY FOX GROUP: GENUS *Urocyon*

ENGLISH NAME	LATIN NAME	LOCALITY
GRAY FOX	*Urocyon cinereo-argenteus* (Schreber)	Southeastern states.
FLORIDA GRAY FOX	*Urocyon cinereo-argenteus floridanus* (Rhoads)	Florida.
SCOTT'S GRAY FOX	*Urocyon cinereo-argenteus scottii* (Mearns)	New Mexico to Southern California.
TEXAS GRAY FOX	*Urocyon cinereo-argenteus texensis* (Mearns)	Texas.
COAST GRAY FOX	*Urocyon cinereo-argenteus californicus* (Mearns)	Southern California.
TOWNSEND'S GRAY FOX	*Urocyon cinereo-argenteus townsendi* (Merriam)	Northern California.

THE RED FOX.[1]—Of the handsome and valuable species of foxes inhabiting North America, our wise old friend, the Red Fox, is the one most widely distributed and the best known. Between the southern Alleghenies and Point Barrow it appears in coats of many different shades, but everywhere it is recognizable by the prevailing yellowish-red color from which it derives its name. It is palest in the desert regions, where shade is scarce, and brightest in the forest regions and Alaska, where the bleaching power of the sun is not so great. The largest and finest skins come from Alaska, and values decrease southward. An Alaskan Red Fox skin (No. 1, large) is worth $12; in Newfoundland and Labrador, $9; Maine, $8; New York, $7; Pennsylvania, $5; Southern states, $4.25. Amateur fox farmers will do well to note these prices when locating their farms. The world's annual output of Red Fox skins is estimated by an expert at

[1] *Vul'pes ful'vus.*

1,165,000,—for America, Europe, Asia, and Australia. In the London market the price of the finest skins has risen from $2.50 in 1896 to $16.55 in 1910. This is due to the decreasing annual supply.

The range of the Red Fox is very wide. From North Carolina and Tennessee it extends through the whole northeastern United States, westward to Montana, and northward to the limit of trees. It is the most common fox in Alaska, wherever there are trees. It is so cunning and so well able to take care of itself, even in populous countries, that it refuses to be exterminated. The length of an average specimen is 24+13 inches; height, 13 inches.

Sanborn, Photo., N. Y. Zoological Park.

RED FOX.

There is little pleasure to be derived from foxes kept in captivity as pets. They are very nervous, easily frightened, and, as a rule, are totally lacking in all the sentiments which resemble affection. Nevertheless, we have seen, and also owned, Red Foxes that were tame and partially trustworthy when handled.

The Cross Fox is really a color phase of the red fox, marked by black legs and under-parts, a dark-colored cross on the shoulders, steel-gray body and head, and a big black tail with a snow-white tip. There is a reddish patch behind

the fore leg, and another on the side of the neck. In my opinion a really typical Cross Fox is the handsomest fox in the world, far more beautiful than the much-sought "silver fox." Some day it will win the appreciation it deserves, and be sought accordingly. It stands between the red and the black foxes, and grades into both. It is found in Manitoba, Alberta, British Columbia, and Alaska, and occasionally in Idaho and Utah.

Drawn by J. Carter Beard.

BLACK, OR "SILVER" FOX.
A subspecies of the Red Fox.

The Black Fox, commonly called the "Silver Gray" Fox (although there is no silvery color about it, save its tail-tip), enjoys the distinction of having the highest price on his head that is offered for any fur-bearer. In March, 1900, a single skin of this animal sold at auction in London for $2,784; and it is not at all uncommon for extra fine skins to sell in this country at from $600 to $1,200. They are worth so much as furs for the very wealthy that zoological gardens cannot afford to purchase live specimens for exhibition. Their exhibition value is far below their fur value.

Like the cross fox, this is only a color phase of the typical red fox, but commerically the two forms are so distinct, and so sharply defined in dollars and cents, that they demand separate notice.

With the exception of its snow-white tail-tip, and a few scattering white hairs on the top of the hind quarters, a typical Black Fox is jet-black. This form inhabits the same localities as the cross fox, and is much given to mixing with it, which causes many variations from their standard colors toward the typical red fox. Both these animals are somewhat larger than the typical red fox found in New England.

The craze in London for skins of the Black Fox to wear is only surpassed by the craze in Prince Edward Island for living specimens with which to start Black Fox corporations. In London, Black or "Silver" skins sold (1911) at an average price, for the whole catch of "wild" and "ranch" skins, of $290. In 1910 the average was abnormally high, $414. In 1910, twenty-seven extra choice skins from Prince Edward Island sold for an average of $1,361 each. The finest specimens sometimes sell as high as $2,700; and this for a fur that is by no means the most beautiful fur in the world, not even in foxes, and is of limited durability. A handsome cross-fox skin is, as a color proposition, far more beautiful than the finest Black Fox; but the craze is for the latter.

The London craze has developed on Prince Edward Island, and incidentally elsewhere in North America, a genuine Black Fox "bubble." Men of speculative tendencies are paying as high as $10,000 *and more* per pair for live breeding stock with which to start more fox ranches and get rich quick. In 1912 the whole Prince Edward Island Black Fox output was sold alive on this basis.

In 1912 the fox-breeding industry in Canada, according

to "Fur Farming in Canada," by J. Walter Jones (Conservation Commission, Ottawa), was as follows:

FOXES IN CAPTIVITY IN CANADA

	RANCHES	BLACK	CROSS	BASTARD AND RED
PRINCE EDWARD ISLAND	200	650	150	1,000
NOVA SCOTIA	13	32	30	150
NEW BRUNSWICK	8	30	10	50
QUEBEC	6	40	10	50
ONTARIO	14	30	40	150
OTHER PROVINCES	..	18	10	50
	241	800	250	1,450

The Black Foxes are centred at the following points: Summerside, Charlottetown, and Montague in Prince Edward Island; Quebec City and Piastre Bay, Quebec; Wyoming, Ontario, and Carcross, Yukon.

THE SWIFT FOX, or KIT FOX,[1] is the smallest and daintiest of all our foxes. Its color is a beautiful silver-gray, with a tinge of yellow. It is strictly an inhabitant of the Great Plains region from the Rio Grande to the Saskatchewan, but, owing to the readiness with which it eats poisoned meat that has been put out for wolves, it has already become very scarce. In spite of its name, it does not run with remarkable swiftness.

THE ARCTIC FOX.[2]—This creature of the polar world is a striking example of climatic influences on a species, and also of the danger that lies in describing a species from a single specimen. In the far North, the Arctic Fox is snow-white all the year round. Farther south it is white in winter, but in summer is bluish brown. In the southern

[1] *Vul'pes ve'lox.* [2] *Vul'pes la-go'pus.*

part of its range, the Aleutian Archipelago, for example, except for an occasional white individual, it is dark all the year round, and is known only as the BLUE FOX. At first it may seem difficult to believe that these two widely different ex-

THE ARCTIC FOX.

tremes are only color phases of the same species; but it is quite true. The dark-colored animal is not even accorded subspecific rank.

The Arctic-Blue Fox is a simple-minded creature, of sanguine temperament, easily trapped and handled, and ever ready to adopt the prepared food of civilization. In its white phase, the finest skins sell in London at $22 each. In its blue-brown coat, it has a very comical countenance, characterized by much hair, close-cropped ears, and a total

absence of beauty; but its fur, when taken in season, is worth in the London market from $25 to $70 per skin.

On various islands along the Alaska coast, especially in the Aleutian Archipelago, about thirty commercial companies and individuals are engaged in breeding Blue Foxes for their

GRAY FOX.

fur, some of them with satisfactory success. The foxes are fed daily, on cooked corn-meal and dried fish. They come up to be fed, and when the time comes to handle and sort them previous to killing the annual allotment, they greatly facilitate matters by the readiness with which they enter box traps.

On the Atlantic coast of the United States, none of the efforts that have been made to breed the Blue Fox were successful. The great decrease in the annual supply of good fur

has caused many persons to hope that fox breeding may be developed into a remunerative industry. Except as already noted, no successful experiments in that line have been made, and it is quite desirable that fox breeding in the United States should be taken up under state or national auspices, and wrought out to a successful issue. There is good reason to hope and believe that it might be developed into an important industry.

THE GRAY FOX[1] is the fox of the South, but it ranges northward far into the home of the red fox. It is noticeably smaller than the latter, pepper-and-salt gray above, and rusty brown underneath, with a red patch on the side of its neck. For a fox it is very agile, and when hard pressed by dogs it can climb small trees up to a height of twenty feet or more.

The five subspecies of the Gray Fox extend throughout the southern United States from Florida to California.

Besides the foxes already mentioned, several other species and races are recognized.

THE SMALL FUR-BEARERS

Mustelidae

A majority of the valuable fur-bearing animals of North America are found in a group of flesh-eaters known as the Marten Family. It contains about fifty full species, and its conspicuous types are the following:

[1] *U-ro-cy'on cin-e're-o-ar-gen'te-us.*

THE MARTEN FAMILY

Mustelidae

OTTER, MINK, WEASEL, MARTEN: These four types are marked by long, slender bodies, very short legs, flattened heads, and general activity on foot.
WOLVERINE: The greatest glutton and pest in this Family.
SKUNK: Aggressive and destructive pests; valuable fur-bearers.
BADGER: A fat-bodied, inert, and practically harmless burrower.

The great demand for fur, both for ornament and use, has brought about the systematic destruction of all fur-bearing animals. Many species that once were numerous have now become very rare. Formerly the wearers of fur accepted nothing less desirable than beaver, otter, mink, and marten. To-day, the fur of the skunk, raccoon, fox, lynx, black bear, rabbit, and even the domestic cat are in active demand for garments and for trimmings.

THE OTTER[1] is as fond of water as a seal, and quite as much at home in fresh water as on land. Its regular food consists of fish, in the capture of which it is very expert. It has webbed feet, a thick, pointed tail distinctly flattened for use in swimming, and it is clothed with a thick coat of very fine, dark-brown fur. Strange to say, when fairly treated, the Otter is a good-tempered animal, tames easily when caught young, and makes an interesting pet. In a public park, one Otter is worth more to the public than twenty beavers.

In the days when they were numerous, and less persecuted than now, it was no uncommon thing for a party of

[1] *Lu'tra can-a-den'sis.*

Otters to select a steep and slippery river bank, and slide down it repeatedly, as small boys slide down hill on sleds, except that each slide of the Otter always ended in a plunge into the water.

The Otter of North America is still found occasionally in Florida and the Carolinas, the Canadian provinces, in a few localities in the Rocky Mountain region, and from British Columbia to central Alaska. Outside of Alaska and the far North its fur is taken so rarely that it has ceased to be regarded as an article of commerce. For all that, however, the annual output of Otter skins for all North America is said to be about 30,000. The value of the animal alive for exhibition purposes is from $10 to $40. The length of a large northern Otter, head and body, is 27 inches and tail 16 inches.

The unplucked fur of the Otter is the most durable of all furs, and it is ranked at 100 in the scale of durability. The Otters of land and sea are alike in this respect.

The Otter builds no house, but lives in a bank burrow, usually under the spreading roots of some large tree growing near the water. The young are usually two in number.

THE SEA OTTER,[1] one of the most valuable of all fur-bearing animals, is literally a child of the ocean surges and the surf-beaten rocks of the rugged north Pacific coast. It is born at sea, on a bed of kelp, and literally "rocked in the cradle of the deep." It was formerly found from California to the Aleutian Islands, but is now very rare except in certain parts of Alaska. There the pursuit of the animal is strictly limited by law to the natives, to whom it is vitally

[1] *La'tax lu'tris.*

important, and a white man may not kill a Sea Otter except under penalty of a fine of $500.

FISHER. MARTEN.
OTTER. MINK.

The fur of this creature is extremely valuable. In March, 1909, the finest skin in the London market sold for $1,849. A

full-grown specimen measures from 3½ to 4 feet in length (head and body) and has a tail 11 inches long. Its fur is very dense and fine, and in color is a shimmering, lustrous black. The pursuit of the Sea Otter usually is quite dangerous, but to the natives of the Alaskan Peninsula this creature is far more important than the fur-seal. Formerly between five thousand and six thousand skins, worth from $100 to $500 each, were taken annually, and formed practically the sole dependence of the natives along nearly two thousand miles of coast-line. But with the introduction of firearms, and the sealing schooners, the Sea Otter has been almost exterminated. The few individuals that remain are widely scattered, and are the wildest and wariest of all wild creatures. In 1912 only 202 skins appeared in the London fur market.

THE MINK[1] is much smaller than the otter, yellowish brown or dark brown in color, and while it prefers to live along the banks of streams, it is not an aquatic animal like the otter. When possible, it feeds chiefly upon birds, because they are easily caught and killed, and when opportunity offers, it is a wanton murderer. It also preys upon small mammals and fish, whenever it can procure them. In the Beaver Pond of the New York Zoological Park a murderous Mink once killed six wild geese in one night; and another slaughtered ten herring gulls.

A full-grown Mink looks very much like a large weasel, having a long, slender body and very short legs.

BREEDING.—It has been proven that the Mink can be successfully bred and reared in captivity. When its fur

[1] *Lu-tre-o'la vi'son*, and related species.

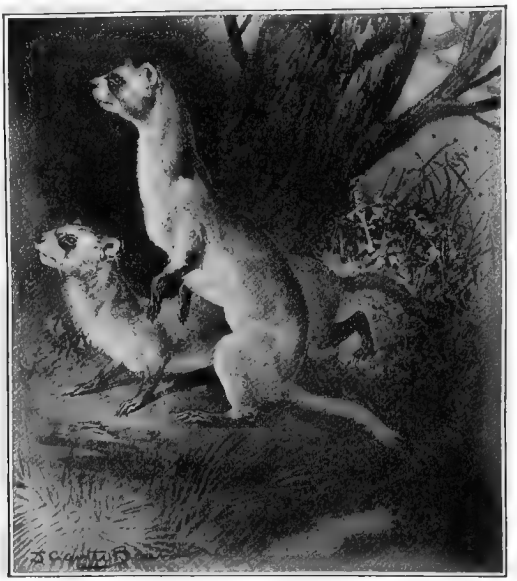
doubles in value, it will be profitable. Mr. J. Walter Jones says that "there have been hundreds of mink ranches in America, and there are probably fifty in Canada now." But this industry is conceded to be "still in the experimental stage." In the London fur market the value of Mink pelts has risen from 65 cents in 1888 to $6.34 in 1910.

The Mink is by no means as rare as the otter, and even to-day is found scattered throughout nearly the whole of North America, as far as the limit of trees. The annual catch of skins is about sixty thousand. The round, hairy tail, chocolate-brown or yellowish-brown color, and smaller size of this animal quickly distinguish it from all other animals of its Family. The body of a full-grown specimen is about as thick as the wrist of a medium-sized man. The length of the head and body is 19 inches, tail 7 inches. In durability the fur of the Mink is 70 per cent.

THE BLACK-FOOTED FERRET,[1] of Kansas, Colorado, Wyoming, and Montana, is, to many persons who live in its home country, an enigma. In 1849 this pretty creature was described and illustrated by Audubon and Bachman, after which it totally disappeared, and remained a mystery until it was rediscovered in 1886. In its home it is often called the PRAIRIE-"DOG" HUNTER, because its specialty is the killing of prairie-"dogs," and it is nearly always found in the towns of that jolly little animal. It can be recognized at a glance by its black feet, brown legs and black tail-tip, and the cream-yellow color of its head and body. Next to the skin, the fur is white, and there is a broad black or dark-brown

[1] *Pu-to'ri-us nig'ri-pes.*

patch across the nose, including both eyes. Its length of head and body is 19 inches; tail, 4 inches. Regarding its habits and life history, much remains to be ascertained by the young naturalists who live in the country it inhabits.



BLACK-FOOTED FERRET.

THE WEASEL, of which many species and races have been described, is the smallest animal in the Marten Family.[1] Its legs are very short and far apart, and its body is no thicker than a man's thumb, but it is of such great length that the animal is positively snakelike in its proportions. In life it is very odd to see the front legs walk to and fro quite independently of the hind quarters. Fifteen full species have

[1] The Least Weasel (*Putorius rixosus*), which is found from the Saskatchewan to Alaska, is said to be the smallest Carnivore in the world.

been described, several of them being very much alike. The COMMON WEASEL, or ERMINE,[1] is brown in summer and white in winter.

The Weasel is one of the most courageous and aggressive of all animals. It kills rabbits, grouse, chickens, and ducks of ten or twelve times its own size, and often kills ten times as many chickens as it can eat, purely to gratify its murderous disposition. It is as savage as a tiger, but on farms it often does good service in destroying rats and field-mice. Weasels are so small their fur has little value, but the time is coming when it will eagerly be sought and used.

THE MARTEN[2] looks very much like a young red fox, and in size it is about as heavy as a large domestic cat. Its head and body length is 17 inches, and its tail 7 inches. The body is brownish yellow, the legs are two or three shades darker, and it has three kinds of hair. It loves timber, and spends much of its time in trees. It is rarely found in open country, and is most abundant on rugged and rocky forest-covered mountains.

The Marten is not a poultry-killer, or a wanton murderer of more game than he can eat, but he lives by honest hunting of wild game. His food consists of small rodents, birds, eggs, or even an occasional reptile. In the United States this animal is now rare, for its fur has always been highly prized. It is often called the PINE MARTEN. As a fur-bearer it still is an important animal, and the annual catch for North America reaches the high total of about 120,000 skins. In durability the fur of the Marten is 65 per cent.

[1] *Pu-to'ri-us er-min'e-a.* [2] *Mus-te'la americana.*

THE FISHER, or PENNANT'S MARTEN,[1] is one of the largest members of the Marten Family in America. It is a bold, active tree-climber, an industrious hunter, an aggressive fighter, and as a stealer of baits it is almost as great a nuisance to trappers as the hated wolverine. With this animal, "all's fish that cometh to net," and with equal relish it devours dead fish, rabbits, squirrels, chipmunks, ground birds, snakes, toads, and frogs. Occasionally it murders its own cousin, the pine marten, and even feeds upon the Canada porcupine.

The Fisher is at home in the swamps or the rocky mountainsides of northern New York, and in the forest regions of North America generally from Maine and southern Labrador to the Pacific coast. Northward it ranges to Great Slave Lake and the Yukon River. In color it varies from glossy black to dark brown, with occasional gray, or grayish white, on head and neck, chin, chest, and abdomen. Its average length is 23 + 14 inches. The young vary in number from two to three. As a fur-bearer this is a rare animal, the total annual catch for North America being only 10,000.

THE WOLVERINE, or CARCAJOU,[2] is one of the most remarkable animals in North America. It is about the size of a full-grown bulldog, has a ravenous appetite, great strength, a fierce temper, and the combined cunning of many generations of criminals. It is the greatest thief among animals, and is such a greedy feeder that it is known to many as the GLUTTON. It will follow a trapper's "line" of marten traps, for miles, destroy every animal it finds in them, devour baits, and sometimes steal the traps also.

[1] *Mus-te'la pen'nant-i.* [2] *Gu'lo lus'cus.*

THE WOLVERINE.

It breaks open caches, raids cabins, and systematically destroys everything it encounters. It is the only animal living which maliciously and deliberately destroys property, and soils food which it can neither eat nor carry away. It steals articles which it cannot possibly use, and more than once has been known to strip a cabin of nearly its entire contents.

In form this animal resembles a cross between a badger and a bear. In Wyoming it is called the *Skunk-Bear*, and in Washington the Indians call it the *Mountain Devil*. It inhabits the northern Cascades and the Rocky Mountain region of the United States as far south as Great Salt Lake, and the whole of arctic and subarctic America to the northern limit of trees. It is especially abundant on the Kuskokwim River, Alaska. Its length is 32 + 10 inches. It is so very rare that only about three thousand are caught annually in all North America.

THE SKUNKS form a large group, widely distributed, but all the species, however much they differ in size or color, are arranged in three genera.

THE COMMON SKUNK,[1] to which eight other species are related, is very well known, chiefly because of its powerful odor, its wide distribution, and its very conspicuous jet-black color, divided on the back by one or two broad bands of white.

The type of this group is practically confined to the United States and Mexico, and is most abundant in the North. The very offensive fluid which constitutes its defence against all enemies is contained in two glands situated near the base of

[1] *Meph'i-tis meph-it'i-ca.*

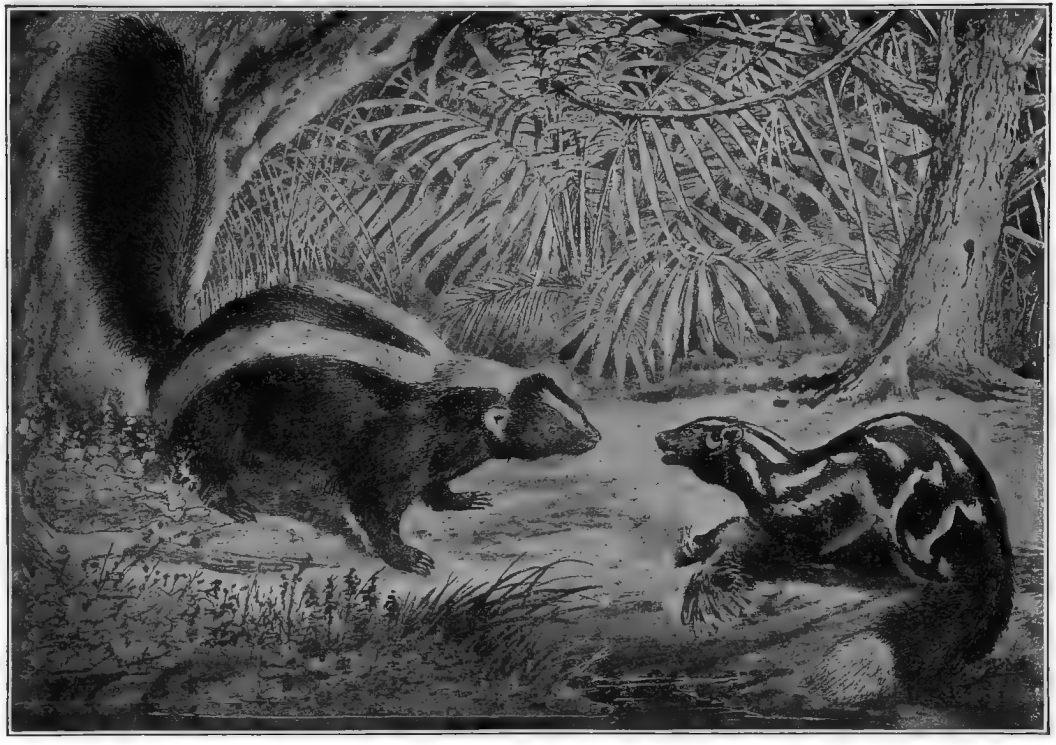
the tail, and can be thrown several feet. Its odor is so offensive and so stifling that neither man nor beast can long endure it.

The Skunk is a bold marauder, and destructive to poultry, but nevertheless of value as a destroyer of white grubs and other noxious insects. Owing to the disappearance of the otter, beaver, mink, and marten, the fur of the Skunk has become valuable, and is now very extensively used, the white portions being first dyed black. Its durability is 70 per cent. The best skins are worth $6.00 each.

The Little Spotted Skunks[1] are found chiefly in our southern states, and can immediately be recognized by the alternating bands of black and white which extend lengthwise along the body. Of these there are about a dozen species, but some of them are very much alike. They range from the Gulf coast north to West Virginia and Kansas, but on the Pacific slope they are found in Washington, Oregon, California, and Utah.

Skunk Farming.—Skunks can be bred and reared in captivity; and possibly skunk farming may some day become a paying industry, but it remains to be proven. The present low value of skunk fur is against it. The annual catch of wild skunks for North America is figured at the enormous number of 1,500,000; which cannot long endure! When skins double in value, skunk farming may prove profitable; but, like all other fur farming, save in foxes, it is still in its experimental stage. In the largest attempt yet made, a well-organized company lost $25,000 in three years because skunks

[1] *Spi'lo-gale.*



COMMON SKUNK. LITTLE SPOTTED SKUNK.

bred in close confinement persisted in devouring their young, and no way was found to prevent it. Other skunk-farms have achieved reasonable success.

THE BADGER SKUNKS[1] resemble the common skunks in size, but may be readily distinguished by the broad white

THE BADGER.

stripe on the back and the powerful claws on the fore feet. As indicated by their name, they are more badger-like than the other skunks, and are expert diggers. They are the only skunks which occur in South America, and their range extends from the Straits of Magellan northward along the west coast, through Central America and Mexico into southern Texas and Arizona.

[1] *Co-ne-pa'tus.*

THE BADGER is an animal of strange form, its body being very broad and flat and its legs very short. In size it stands midway between the common skunk and the wolverine. It has a savage and sullen disposition, and as a pet is one of the worst imaginable. It lives in burrows, and feeds on ground-squirrels, prairie-"dogs," and ground game of every description. Often Badgers will be found living in deserts where it would seem an impossibility for any carnivorous animal to find a supply of food. Its home is the Great Plains, the Rocky Mountains, and westward thereof to the Pacific coast, from Mexico to Manitoba and Alaska.

THE BEAR FAMILY

Ursidae

That nearly all young people, the whole world over, are greatly interested in bears, is no cause for wonder. Under proper conditions, young bears are the most merry-hearted wild animals that come into captivity, not even excepting monkeys, and in some respects the most interesting. Of all wild animals kept in zoological parks, there are none that more fully repay the care bestowed upon them and, excepting apes and monkeys, none that furnish more amusement. With plenty of sun-lit space in which to romp and play, good bathing pools, and no stone walls to depress their spirits, bears, *if not fed by visitors*, are more playful and mirth-provoking than most monkeys. If immured in gloomy "bear-pits," or confined in small cages, their spirits are correspondingly depressed. They are then like unhappy prisoners, rather than care-free wild creatures. If tantalized with bits

of food, they quarrel and fight, and their tempers become savage and dangerous.

Contrary to general belief, a bear is naturally cheerful and good-tempered. Elk, deer, buffalo, elephants, and large cats often attack their keepers, but bears that have been properly reared in captivity seldom do so. A keeper should have no bear "pets," and every bear over one year old should always be made to keep away from his attendants. With bears, familiarity is dangerous.

The bear dens of the New York Zoological Park contained (in 1914) thirty-nine bears, of eighteen different species, living in peace and harmony, in eleven paved yards. Fully one-half of their waking hours are spent in romping, wrestling, boxing, and swimming, and ill temper is rarely shown. The keepers go among these bears with pick handles for defence, and the great brutes are hustled about and driven to and fro as if they were so many sheep. At the same time, any visitor who is so unwise as to thrust a hand between the bars within reach of the jaws of any of the inmates is certain to be very severely bitten,—in playfulness rather than rage! In their rough play these bears continually bite each other, without inflicting injury; and they do not appreciate the difference between a tender human hand and a tough, hairy paw.

Never offer a finger to a carnivorous animal unless you really wish to have it bitten off. And do not feed peanuts, candy, peaches, or tobacco to animals in captivity. If you wish to kill any of them, a gun is far more respectable, and also more merciful.

Structure and Habits of Bears.—Bears are plantigrade, or flat-footed, animals, with long claws that are not retractile. They live on the ground, and eat all kinds of food, from green grass to elk steaks. A few species only are able to climb trees. In their food habits they are omnivorous, and devour almost everything they can chew, except wood and foliage. The bears of the Alaskan coast eat great quantities of marsh grass and berries, but salmon is their regular food. All bears eat succulent roots, insect larvae, honey, frogs, and also reptiles, fish, and every other kind of flesh they can obtain. In captivity they thrive best on a variety of food consisting of stale bread, raw meat, cooked meat, rice, raw fish, boiled potatoes, raw carrots, and fruit.

In the temperate zone, where the snow falls to a depth of a foot or more, bears are unable to procure food in winter, and pass that season in a sort of sleep, or hibernation. With its stomach and intestines empty, or nearly so, a bear enters its den in December, curls up, and with some of the functions of Nature entirely suspended, sleeps until spring! In reality, the creature lives upon the fat that has been secreted under its skin and elsewhere during the summer days of good living. Ordinarily, bears in captivity that are supplied with daily food do not hibernate in winter, but one cinnamon bear which I knew personally, at Mandan, North Dakota, dug a hole in the prairie, entered it on December 17, and did not reappear until March 14, of the following year. In the tropics, bears never hibernate.

Naturally, the dens of hibernating bears are of several

kinds, according to conditions. In the Adirondacks of New York, the black bear often chooses the base of a hollow tree, or digs a cavity under the roots of a tree. In the "bad lands" of the West, bears easily find warm and comfortable dens in the washout holes of rugged ravines. In the mountains, amongst rocks, small caves are easily found. In Washington, "Grizzly" Adams caught "Lady Washington" and "Ben Franklin" in a deep den that had been dug by their mother in a steep hillside.

All the world over, two bear cubs usually constitute a litter. In America, they are usually born in January, and at birth are ridiculously small, almost hairless, and as helpless as newly born mice. Although they grow rapidly during the first year, they are seven years in reaching full maturity. In captivity bears seldom breed and rear their young, chiefly because of the lack of satisfactory seclusion for the female. Mr. Arthur B. Baker, who has recently inquired into the habits of the American black bear in captivity, states that "at Cuyahoga Falls, Ohio, are two specimens which regularly hibernate, and also a pair, born in 1888, which, with the exception of three years, have had cubs each January (21st to 27th) up to 1903, all of which were raised, excepting a few which met death by accident."

Bears have bred in captivity in the zoological gardens and parks of Philadelphia, Cincinnati, Washington, and New York, but few of the cubs have been reared.

The dimensions of a Russian brown bear cub—a species that is an excellent understudy of our silver-tip grizzly, and but slightly inferior in size—when two days old were as follows:

Length, head and body, 9¾ inches; tail, ½ inch; height, 5 inches; circumference of chest, 6¾ inches; hind foot 1⅛ inches by ⅞ inch; weight, 15 ounces. This cub was born on January 17.

All American bears, except the polar, show great changes in the color of their pelage at different seasons of the year. In the late summer the new pelage is darkest, but by the following spring, the old coat has grown so much lighter in color that the wearer seems like a different individual. The shedding period is from May 1 to August 1.

North American Bears.—Leaving out of count the subspecies, and the species of which we know little or nothing, the world contains fourteen well-marked types of bears. Of these, eight inhabit Asia and Europe, four are found in North America, one is found all around the north pole, and one in South America. From both the Old World and North America, quite a number of additional species and subspecies have been described; but it must be remembered that at present we are dealing only with conspicuous types.

Owing to puzzling variations in color, claws, and skulls, and the great difficulty of bringing together several hundred adult skins with skulls, it is at present impossible to state precisely how many different kinds of bears inhabit this continent, or how they are related. In the near future, however, many existing questions will be settled; and until then the wisest course for the student and the general reader is to accept only well-known facts and to wait with patience for more.

List of the Important Bears of North America

Polar Bear	*Thalarctos maritimus* (Phipps)	Arctic regions generally.

THE BIG BROWN BEARS

Kadiak Bear	*Ursus middendorffi* (Merriam)	Kadiak Island, Alaska.
Yakutat Bear	*Ursus dalli* (Merriam)	Yakutat Bay, Alaska.
Peninsula Bear	*Ursus dalli gyas* (Merriam)	Pavlof Bay, Alaska.
Merriam's Bear	*Ursus merriami* (Allen)	Portage Bay, Alaska.
Admiralty Island Bear	*Ursus eulophus* (Merriam)	Admiralty Island, Alaska.
Sitka Bear	*Ursus sitkensis* (Merriam)	Alaska coast, near Sitka.

THE GRIZZLY BEARS

Silver-Tip Grizzly	*Ursus horribilis* (Ord)	Wyoming to Alaska.
Sonora Grizzly	*Ursus horribilis horriaeus* (Baird)	S. W. New Mexico.
Alaskan Grizzly	*Ursus horribilis alascensis* (Merriam)	Norton Sound, Alaska.
Barren-Ground Grizzly	*Ursus richardsoni* (Swainson)	Great Slave Lake and Barren Grounds.

THE BLACK BEARS

Black Bear	*Ursus americanus* (Pallas)	North America.
Labrador Bear	*Ursus americanus sornborgeri* (Bangs)	Labrador.
Louisiana Bear	*Ursus luteolus* (Griffith)	Louisiana and Texas.
Everglade Bear	*Ursus floridanus* (Merriam)	Florida.
Queen Charlotte Bear	*Ursus carlottae* (Osgood)	Queen Charlotte Islands, British Columbia.
Glacier Bear	*Ursus emmonsi* (Dall)	Yakutat Bay, Alaska.
Inland White Bear	*Ursus kermodei* (Hornaday)	N. British Columbia.

The bears of North America constitute four distinct groups, as follows:

POLAR BEAR, of the far North. White. Very large.
BIG BROWN BEARS, of Alaska. Light brown. Very large.
GRIZZLY BEARS, Mexico to Alaska. Gray or brown. Medium to very large.
BLACK BEARS, North America generally, from Mexico to Alaska. Black or brown. Medium size, and large.

To most persons, the second group of this series is quite new, and for several reasons its members are of unusual interest.

The Polar Bear

THE POLAR BEAR stands alone in its genus. It is the king of the frozen North, and its robe is pure white all the year round. It inhabits the coasts of the Arctic Ocean, all around the pole, and wanders over the arctic islands and the great ice-fields almost as far north as man has ever gone. Nansen saw its tracks at Latitude 84°,—its farthest north.

As a rule, the Polar Bear follows the edge of the great ice-pack, for the sake of the seals and walruses which move with it, north in summer, and south in winter. He seldom travels more than a day's journey inland on any shore. His food consists chiefly of seals, walruses, fish, and dead whales; at times of vegetable matter.

In 1874, when Mr. Henry W. Elliott and Lieutenant Maynard visited St. Matthew Island, a lonely bit of treeless

land in the northern portion of Bering Sea, they found upon it between 250 and 300 Polar Bears! The animals were basking in the warm sunshine, shedding their winter coats, and growing fat on the roots of the plants and mosses that

E. R. Sanborn., Photo., N. Y. Zoological Park.

POLAR BEAR.

grew there. On one occasion *twenty bears* were in sight simultaneously. The bears literally overran the island, grazing and rooting about like hogs on a common. They showed no disposition to fight, but always ran when approached.

The Polar Bear is a tall animal, with long legs, flat sides, and paws that are very wide and flat. The largest specimen in the New York Zoological Park is 50½ inches in height, 7 feet 2 inches in length, and weighs about 800 pounds. When standing erect on his hind legs, the end of his nose is 8 feet

8 inches from the ground. If properly and comfortably caged, and provided with a swimming pool five feet deep, Polar Bears in the temperate zone do not suffer from the heat of summer, and can endure hot weather fully as well as our black bears. Of course they require shade in summer; but it is not necessary to put ice in their pool to cool the water.

The power of this active, warm-blooded animal to resist cold is one of the wonders of Nature. With the temperature many degrees below zero, the Polar Bear cheerfully leaps into the Arctic Ocean, amid the broken ice, and swims for hours. Of all bears, it is the best swimmer, and it dives with great ease.

Ten years ago we believed that the Polar Bear was in no danger of being exterminated by man. That view was entirely too optimistic. Carl Hagenbeck's sons inform me that they are greatly alarmed over the impending fate of that species, and fear that it is doomed to disappear before the constant and persistent attacks of commercial hunters, connected with the whaling industry, who kill these bears for their skins.

Until very recently the annual catch of live Polar Bear cubs was abundant, and indicated a well-maintained source of supply. Now, however, the annual catch has fallen to about one-fifth the normal number of past years, and it is feared that the destruction of the adult animals soon will cause the practical disappearance of the species.

The Big Brown Bears

In 1896 the specimens collected by the United States Biological Survey, at Washington, revealed to Dr. C. Hart Merriam the presence in Alaska of two or three species and subspecies of huge brown bears, totally different in character from all the American bears previously known. These bears range from Sitka around to the extremity of the Alaskan Peninsula, Kadiak Island, and on northward to the Kobuk River, only 300 miles from Point Barrow. They are marked by their light-brown color, high shoulders, massive heads of great breadth, short, thick claws, and shaggy pelage. In their high shoulders, they resemble grizzly bears, but otherwise differ from them in many ways. Of these bears, Dr. Merriam has published preliminary descriptions of four new species and one subspecies, but additional collections and information may possibly result in the consolidation of some of these.

It is sufficient for our purpose to set forth only the species which seems most sharply defined, and which may be considered representative of the whole group.

THE KADIAK BEAR,[1] of Kadiak Island, and probably also of the Alaskan Peninsula and the mainland for some distance eastward, is not only the largest of all living bears, but also the largest carnivorous animal in the world. Several skins of immense size, and skulls 21 inches in length, have been collected. The largest specimen ever killed and measured by a naturalist was a female killed at Chinitna Bay, by Mr. James H. Kidder, which had a shoulder height of 51 inches.

[1] *Ur'sus mid'den-dorf-fi.*

A very large flat skin measured at Kadiak by Mr. J. A. Loring was 9½ feet long by 10½ feet wide across the fore legs.

Immediately after shedding, the new coat of the Kadiak Bear is dark brown, like that of a grizzly, but it soon changes to a beautiful golden-brown tint. In March and April, the old coat is of a golden-yellow color, and really very beautiful. The full coat is long, thick, and shaggy, and except when shedding is in progress, the animal makes a very imposing appearance. This species is recognized by its uniform brown or golden color, its high shoulders, broad and massive head, flat forehead, short, square nose, and a drop in the upper line of the head in front of the eyes. Mr. Kidder states that the bears on Kadiak Island are uniformly colored over the body and legs, but those on the mainland are darker on the legs than on the body.

The Kadiak Bear catches and devours great numbers of salmon, which are so abundant in many Alaskan streams that it can throw them out with its paws. It also eats quantities of the rank marsh grass which grows along many salmon streams where they flow through alluvial plains before discharging into the sea. It inhabits the most rugged mountains, and is seldom killed save when it leaves the shelter of the timber and comes into the open river valleys and bayheads to feast on freshly caught salmon, with tender grass for dessert.

Just how far eastward this bear ranges on the mainland remains to be determined, but I believe it will be found as far as the Copper River. The big animal found in the Yukon

Drawn from life in the N. Y. Zoological Park, by J. Carter Beard.

ALASKAN BROWN BEAR.

Ursus dalli, from near the head of Cook Inlet, Alaska.

Valley, and commonly called the "Red Bear," undoubtedly belongs to the group of big brown bears, and in all probability is the same as the Kadiak Bear. The illustration shown opposite page 92 is a portrait of a fine Alaskan brown bear (*Ursus dalli*), living in the New York Zoological Park, which came from the country between Cook Inlet and the Copper River. Inasmuch as all the descriptions of the species composing the brown-bear group have been based chiefly upon skulls, the exact identity of some of our specimens cannot be determined while they are alive. In the month of September its entire pelage is of the uniform dark-brown color characteristic of the bears of Kadiak Island at the season when the majority of them are killed, but later on the pelage of the body becomes lighter than that on the legs.

From a fine male specimen, of a species as yet undetermined, that came to us from the Kobuk River, Alaska, we know that the group of Alaskan brown bears is represented at a point only 300 miles southwest of Point Barrow, and well within the Arctic Circle.

The Grizzly Bears

THE GRIZZLY BEAR.[1]—Of all the bears of the world, this species is certainly one of the most celebrated. During the days of muzzle-loading rifles, its name and fame inspired terror throughout the mountains and foot-hills of the wild western domain which constituted its home. For many years it held the old-fashioned Kentucky rifle of the pioneer in

[1] *Ur'sus hor-ri'bi-lis.*

profound contempt, and frequently when it was used to annoy him, the user met a tragic fate. I believe that Grizzlies have killed and maimed a larger number of hunters than all other bears of the world combined.

Down to the advent of the breech-loader, the Grizzly was a bold, aggressive, and highly dangerous animal. When attacked, he would charge his enemies with great ferocity, striking terrible blows with paws that were like sledge-hammers armed with huge hooks of steel. The combined swiftness and strength with which any large bear can strike must be seen or felt to be fully appreciated.

I have made many observations on the temper of the Grizzly Bear, and am convinced that naturally the disposition of this reputedly savage creature is rather peaceful and good-natured. At the same time, however, no animal is more prompt to resent an affront or injury, or punish an offender. The Grizzly temper is defensive, not aggressive; and unless the animal is cornered, or *thinks he is cornered*, he always flees from man.

Either in captivity or freedom, the Grizzly responds to fair treatment as well as any well-armed wild animal ever does, and far better than any other species with which I am personally acquainted. In the Yellowstone Park, where for several years past all bears have been fully protected, both the Grizzly and black bears now live in close touch with man, rarely breaking faith with him. Although they frequently visit the hotels, and steal food from the wagons and camps of tourists, I believe *no bear has yet broken faith with the Government* by molesting either his human neighbors or

Copyright, 1902, by F. C. Wolcott.

A GRIZZLY BEAR AT HOME.

Photographed in the mountains of western Wyoming, by F. C. Wolcott. The bear was enticed by a bait to within thirty feet of the camera, and taken by flashlight.

domestic animals! This fact speaks volumes for the moral character of our bears.[1]

The Grizzly is an animal of commanding appearance, and amongst other wild beasts it acknowledges no superior. A small Grizzly cub which we once set free in a mixed company of five or six bears of other species, all of which were larger than he, boldly stalked into the centre of the group, with an air of conscious superiority and courage that was both characteristic and amusing. It was the other bears which were frightened, not he!

Specimens of this species are readily recognized by their high shoulders, powerful proportions, grizzly-gray hair, and long, curved claws. The standard color (in winter) is brown next to the skin, the extremities of the hair being tipped with silvery gray, from which has come the common name of "Silver-Tip."

From Mexico and southern California to the Yukon Valley, especially along the main ranges of the Rocky Mountains, the Grizzly shows about six different shades of color, from brown to silvery gray. The huge brown Grizzly of southern California, now very rare, has been described as a species distinct from the Rocky Mountain Silver-Tip. I once measured the dry skin of one of these animals, which was 9 feet 4 inches in length, and 10 feet 3 inches wide across the shoulders, between the ends of the front claws.

So far as I am aware, the largest Grizzly Bear ever actu-

[1] Since the above was written, the truce of the Yellowstone Park has been broken. Two horses belonging to a party of tourists have been killed by bears, and the aggressiveness of the animals has become so serious that it will be necessary for the Government to take measures which will teach them to keep their place.

ally weighed was one that lived and died in the Lincoln Park menagerie, Chicago, and was weighed by Mr. G. O. Shields. Its weight was 1,153 pounds; yet when alive, western hunters who saw it frankly admitted that it was larger than bears killed by them which they "estimated" at 1,800 pounds! Thus far the Rocky Mountains have not produced a wild Grizzly actually weighing over 800 pounds, and the average weight of the adult Grizzlies killed in the United States during the last fifteen years has been between 500 and 600 pounds.

In all parts of the United States save the Yellowstone Park and the Clearwater Mountains of Idaho, the Grizzly is now a rare animal, and so difficult to find that it is almost useless to seek it this side of British Columbia. The long-range, high-power rifles leave them, like other large mammals of this continent, absolutely no chance for their lives, and in a short time none will exist in the United States outside of the Yellowstone Park and the zoological gardens. In the wilds of Alaska, they may survive for perhaps a quarter of a century longer. Unfortunately, the Grizzly loves to roam over treeless mountains, on which his huge bulk makes him conspicuous for miles, and invites the attacks of his enemies. He loves water, swims well, and is a great traveller, but is quite unable to climb trees. Like all other bears, he eats nearly everything he can chew, and is very partial to berries and fruit of all kinds.

AMERICAN BLACK BEAR.
From northern Wisconsin.

The Black Bears

THE BLACK BEAR[1] is the best-known bear in North America. It is found in nearly all the mountains and great tracts of forest between Florida and Alaska, and from Nova Scotia to the Pacific coast. During the past twenty years it has been seen or killed in forty states of the United States, in Mexico, Alaska, and in eleven of the British provinces. Its farthest south is the mountains of Costa Rica.

Its standard color is jet black, all over, except the nose, which is dirty white or light brown. A very confusing fact about the Black Bear is the frequency with which it runs into brown or cinnamon colors. Sometimes black and brown cubs have been found in the same litter. Very curiously, however, bears of this color are found only in the Rocky Mountains, and farther west. In its brown phase, this animal is called the CINNAMON BEAR, and in the Rocky Mountain regions and Alaska, brown specimens are almost as numerous as black ones. Sometimes it is difficult to believe that both kinds belong to the same species, but this seems to be a fact.

Some grizzlies are very dark brown, but they are never inky black, like the true Black Bear. The latter differs in form from the grizzly in being highest in the middle of the back, very round on the hind quarters, low at the shoulders, and also by the fact that in walking it usually carries its head low. It is a smaller animal, and its claws are short and well adapted to tree-climbing. It conceals itself from its enemies much more successfully than the grizzly, and

[1] *Ur'sus a-mer-i-can'us.*

therefore still survives in such places as the forests of the Adirondacks, the Catskills, in West Virginia, and the swamps of the southern states.

When properly treated, small Black Bears are good-tempered and playful in captivity; and some are easily tamed, and taught to perform tricks. Cubs are very interesting when small, but by the time they are a year old, they become so strong and troublesome, as well as dangerous, that private owners nearly always are heartily glad to get rid of them. Never buy a Black Bear cub in the belief that it can be kept for amusement and resold at a profit; but if thine enemy offend thee, present him with a Black Bear cub.

The Black Bear is a timid animal, and always runs when observed by man. It is a good climber, runs quite swiftly when pursued, but in a rough-and-tumble fight it bawls, roars, and coughs.

THE GLACIER BEAR,[1] found on the glaciers around Yakutat Bay, near Mt. St. Elias, Alaska, is one of the recent discoveries in the Northwest, but it is so clearly distinct as to merit special notice. Thus far no living specimens have found their way into zoological parks or gardens, and the only mounted skin on exhibition is in the United States National Museum. It is exactly reproduced in the accompanying illustration.

The species is known to-day only by the specimen referred to and by a few flat skins. As mounted it is only 24 inches in height at the shoulders, and is one of the smallest species of bears in North America. Its color is a peculiar bluish gray,

[1] *Ur'sus em'mons-i.*

GLACIER BEAR.

Drawn from a specimen in the United States National Museum.

on all parts save the muzzle from the eyes forward, which is dark brown or black. The hair is long, very thick, woolly in texture, and stands out straight all over the body. The rarity of this animal in collections and the long delay in its discovery are partly due to the rough, inhospitable, and dangerous character of the country in which it lives.

THE INLAND WHITE BEAR.—The most interesting discovery in bears of the past ten years is the Inland White Bear of northern British Columbia, described by the author (New York Zoological Society, Ninth Annual Report, 1905) from specimens brought to light through the enterprising efforts of Mr. Francis Kermode, curator of the Provincial Museum at Victoria, British Columbia. The species was named *Ursus kermodei*.

This is a small bear, of a clear, creamy-white color, structurally belonging in the group of black bears. The type specimens came from Gribble Island. At first the type specimens were by some observers believed to be albino black bears, but the twenty-five or more specimens that have been taken since 1905 thoroughly dispose of that idea. The Inland White Bear has come to stay. Five mounted specimens are shown in a group in the Victoria Museum, and another is to be seen in the Carnegie Museum at Pittsburgh. Up to 1914 no specimens had been taken alive.

THE SPECTACLED BEAR.—The bear species of South America are very few in number, very difficult to find, and are among the rarest of the animals to be seen in zoological parks and gardens. So far as we know, there are two forms, both of which are found only in the mountains of the great

Andean chain, in the northern half of the continent. In size the Spectacled Bear of Ecuador and Peru is like a small, lightly built North American black bear. Its general color is glossy black, and it derives its name from a large, irregular,

SPECTACLED BEAR.

and often broken circle of white that surrounds each eye. Usually, also, there are irregular white bands extending down the cheeks and throat.

This bear is of light build, its legs are longer in proportion than those of our common black bear, its ears are very small and far apart, and its feet are large. Its dentition is said to resemble somewhat that of the sloth bear of India (*Ursus labiatus*).

INLAND WHITE BEAR.

(*Ursus kermodei*) Northern British Columbia.

From the mounted group in the Provincial Museum, Victoria, B. C.

The Spectacled Bear is so very rare in captivity that ten years of constant effort were required before we finally secured, in 1910, our first specimen for the New York Zoological Park. It came from Quito, and but for the fact that it was procured in that city and forwarded to us by a life member of the Zoological Society, Mr. Edgar Beecher Bronson, it never would have reached us. A portrait of "Frederico" is shown herewith. This animal stood 28 inches in height, its length was 62½ + 2½ inches, and it weighed 143 pounds.

THE ANDEAN BLACK BEAR (*Ursus ornatus thomasi*), a subspecies of the preceding, is very much like the spectacled bear, but it lacks the spectacle markings around the eyes. In 1909 the Zoological Park received a specimen from the southern mountains of the United States of Colombia.

THE RACCOON FAMILY

Procyonidae

THE RACCOON,[1] placed next to the bears, is also plantigrade in its manner of walking. It is a cheerfully persistent animal, and no amount of hunting discourages it or drives it away from its favorite haunts. It is at home in the timbered regions of the southern and eastern United States, especially where there are swamps,—for the Raccoon loves to play in water. In the West it ranges from Arizona to British Columbia.

Its favorite dwelling-place is a hollow tree, and its yearly family consists of five or six young. In its appetite it is as omnivorous as any bear, and eats everything that it can chew,

[1] *Pro'cy-on lo'tor.*

—from live rabbits down to green corn,—fish, flesh, or fowl. The only point on which the Raccoon is particular, regarding its food, is in soaking it in water before eating it.

A live "'Coon" makes one of the most satisfactory carnivorous pets that a boy can keep in confinement.

Photo. and copyright, 1902, by W. L. Underwood.

THE RACCOON.

THE CACOMISTLE, "CIVET CAT," or BASSARISK[1] is a strange little creature like a small pine marten with a long, bushy tail and many common names. It is spread over so wide an area of our country that its personality should be better known. It inhabits Mexico and the southwestern United States from Texas to California and north to southern Oregon. These are the names by which it is called and mis-

[1] *Bas-sa-ris'cus as-tu'tus.*

called: in Mexico, *Cacomiz'tli*, or in English *Ca-co-mis'tle;* in Texas, *Texas Civet Cat* and *Cat Squirrel;* in California, *Mountain Cat* and *Ring-Tailed Cat;* in Arkansas, *Raccoon Fox;* by various scientific authors from Audubon to Allen, *Civet Cat, Ring-Tailed Bassaris,* and *Northern Civet Cat.*

Now, as to the facts regarding this pretty little creature, it is not a "cat" of any kind, and there is about it not a trace of "civet." Dr. Coues proposed Bassarisk as a name that was appropriate and entitled to use. Let it be so called henceforth, and the misnomers relegated to obscurity, where they belong. Its original Mexican name is so ill adapted to our wants it never will be generally used.

The Bassarisk is, after the true raccoon, the only animal in the United States possessed of a long, bushy tail with alternating black and white rings around it. It climbs trees, and nests in hollow branches like a squirrel; it scratches and bites, and catches rats, mice, and small birds like a cat; and it has a many-sided appetite, like a raccoon. Its length of head and body is 16 inches, tail about the same, and its general color is a brownish gray. It is a night prowler, and often makes its home in outbuildings and deserted ranch-houses. In California it is occasionally kept in captivity by miners, and is said to make a very attractive and interesting pet.

CHAPTER IV

ORDER OF SEALS AND SEA-LIONS

PINNIPEDIA

SOME students may feel that it is useless for land dwellers to try to become acquainted, at long range, with sea animals. Toward many sea animals this feeling is justified; but it should not be entertained toward the bold and hardy fin-footed children of the surf. The seals and sea-lions of our shores are well worth knowing.

From the warm and luxurious shore of southern California to Oregon's storm-beaten Tillamook Rock, and on up to the inhospitable, rock-bound edge of western Alaska, you will find at intervals, where Nature has done some of her grandest work in shore-building, colonies of bold and hardy sea-lions. On the Pribilof Islands lives the most valuable of all the fur-bearing animals of the world, the fur-seal, which has contributed millions of dollars to our national treasury, more than repaying the whole price of Alaska.

On the low shores and adjacent ice-floes of the north Atlantic live the seal herds that annually yield an immense store of valuable oil, and furnish employment for thousands of Newfoundland sailors and sealers.

The reader may rest assured that, even though his home be in the centre of the Great Plains, the North American seals

and sea-lions are well worth knowing; for, sooner or later, travel surely will bring him into visual contact with many of them, either in museums, zoological gardens, or alive in their haunts. Let us, then, lay the foundation for a profitable acquaintance with them.

By some writers, these animals are classed with the Ferae, because they eat flesh; but to associate in the same Order such widely different creatures as sea-lions and cats seems incongruous, if not incorrect.

The Order Pinnipedia[1] contains three groups of seafaring animals, distributed widely through the ocean waters of the world, and, in some instances, in fresh water also. They are the Sea-Lions, Seals, and Walruses.

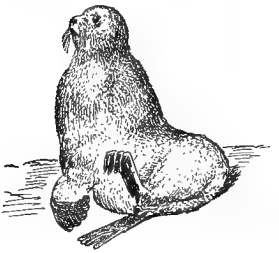
A Sea-Lion has a long, supple neck, and long, triangular front flippers that have neither hair nor claws, but are simply living paddles. Their hind limbs are web-toed flippers. They have very small, sharp-pointed ears, carry their heads high, and all are lively, active animals, both in swimming and in climbing rocks. The males of some species grow to enormous size, and have faces so lion-like in appearance that this resemblance has given the group its popular name,—Sea-Lion.

A Seal is a short-necked, fat-bodied, low-lying, clumsy animal, not nearly so active on land or so intelligent as a Sea-Lion. Its front flippers are short, square-ended, fully covered with hair, and provided with claws. They have no external ears of skin and cartilage. Their hair is short, close, and stiff, and of no value as fur save to the Eskimo, to whom every Seal is a godsend, and is utilized in a great variety of ways.

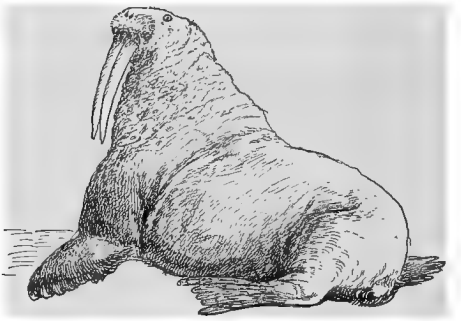
[1] *Pin-ni-pe'di-a* means "fin-footed."

A WALRUS is a sea mammal of great size, formed somewhat like a Sea-Lion, and it is the clumsiest living creature that ever comes upon land. It has two long ivory tusks that grow

HARBOR SEAL.



STELLER SEA-LION.



PACIFIC WALRUS.

On the same scale.

downward from the upper jaw, a very thick skin which lies in deep folds, no hair worth mentioning, and a very dull brain.

The following are the groups and species which every American should know:

ORDER PINNIPEDIA

FAMILIES	EXAMPLES DESCRIBED	
SEA-LIONS...*O-ta-ri'i-dae*...	California Sea-Lion	*Zalophus californianus.*
	Steller Sea-Lion	*Eumetopias stelleri.*
	Fur-Seal	*Callotaria ursina.*
SEALS.....*Pho'ci-dae*. ..	Ringed Seal	*Phoca foetida.*
	Harbor Seal	*Phoca vitulina.*
	Harp Seal	*Phoca groenlandica.*
	Hooded Seal	*Cystophora cristata.*
	Ribbon Seal	*Histriophoca fasciata.*
WALRUSES...*Od-o-ben'i-dae*.	Pacific Walrus	*Odobenus obesus.*
	Atlantic Walrus	*Odobenus rosmarus.*

THE SEA-LION FAMILY

THE CALIFORNIA SEA-LION,[1] or BARKING SEA-LION, is the most familiar representative of the first group, for the reason that this species is easiest to catch alive and to keep in captivity. In zoological gardens and travelling shows, this is the animal which cries out so frequently, and with ear-piercing clearness and volume, "How-woo! *Hook! Hook! Hook!*" It inhabits nearly the entire coast of California, the Farallone Islands, the famous Cliff House rocks, and the Lower California peninsula. Full-grown males are about 7 feet in length, weigh about 450 pounds, and all are of a uniform dark-brown color. An adult female which died in the Zoological Park weighed 112 pounds and measured: length of head and body, 56½ inches; tail, 2¾ inches; total length from nose to end of hind flippers, 70¼ inches; girth, 31½ inches. These creatures are very active in the water, and can climb rocks, and even high cliffs, with surprising agility. When frightened, Captain Scammon says they will leap from a height of sixty feet into the sea.

The hair of this animal is very short, coarse, and of no value. The California Sea-Lions rarely eat fish, but live chiefly upon squids, shell-fish, and crabs. For reasons known only to themselves, they swallow many round pebbles, from one to two inches in diameter. We once took sixteen pounds (half a pailful) from the stomach of a medium-sized specimen.

In captivity all kinds of seals and Sea-Lions live contentedly in fresh water. The value of a living California Sea-

[1] *Zal'o-phus cal-i-for-ni-an'us.*

Lion in New York City is about $100. This species possesses great intelligence, and quite recently several specimens have been trained to go through a show performance which is really wonderful, including a most remarkable act in which a Sea-Lion successfully balances a large ball on the point of its nose.

An important incident in the life history of the California Sea-Lion furnishes a good illustration of the folly of condemning a wild species to destruction on insufficient evidence.

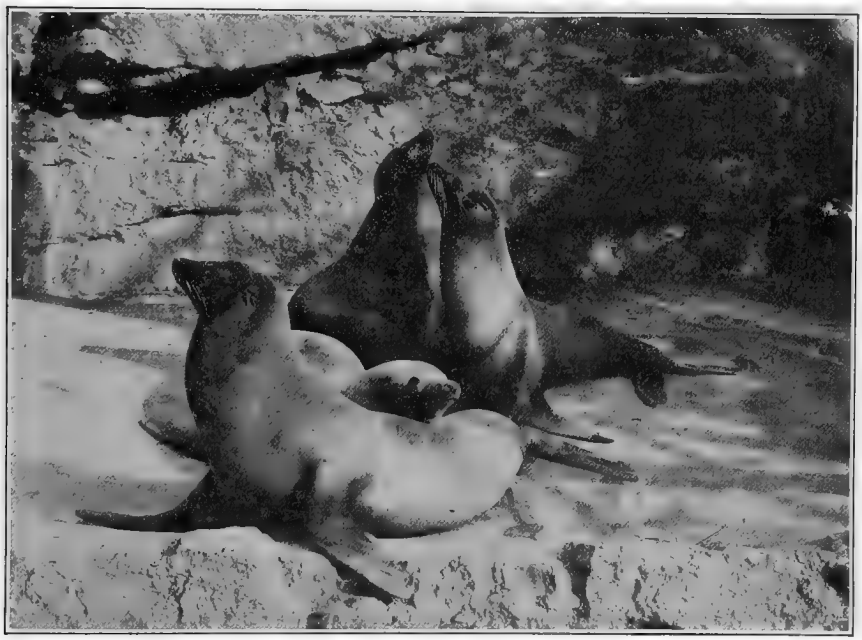
For several years the fishermen of San Francisco complained that the Sea-Lions of the California coast devoured such enormous quantities of salmon and other fish that they were seriously affecting the available supply; besides which they caused great damage to nets and impounded fish. They demanded that the Sea-Lions be destroyed, and finally convinced the state authorities that their contentions were well founded.

It was decided that the animals should be destroyed, by systematic shooting, down to a comparatively small number; and the slaughter was duly ordered. Men were engaged to do the work, in a businesslike way, and an official request for permission to kill on the lighthouse reservations of the Government was granted.

But there were certain naturalists who doubted the entire accuracy of the charges made against the Sea-Lions, and asked for proof in detail. When no evidence of a specific and convincing nature was brought forward, they requested that the slaughter proposed on the Farallone Islands, and other

lighthouse reservations, be deferred, pending a careful inquiry; and this was done.

However, where the state authorities had full power to act, the killing proceeded in a few localities. It happened



Keller, Photo., N. Y. Zoological Park.

CALIFORNIA SEA-LION.

that during the killing of California Sea-Lions on the shore of Monterey Bay and vicinity, Professor L. L. Dyche, of the University of Kansas, arrived on the scene to pursue studies in marine life. He examined the stomachs of twenty Sea-Lions which were washed ashore, and of five more which he killed for the purpose of mounting their skins.

Every stomach examined contained the remains of squids

and devil-fish (Octopus), one or both; and both of which are among the fisherman's enemies! Not one of the twenty-five stomachs which he carefully examined and reported upon contained any portion of a scaled fish.

In 1901, the United States Fish Commission conducted a systematic investigation of the food habits of the Sea-Lions of the Pacific coast, and the report of Messrs. Rutter, Snodgrass and Starks appears in the Report of the Fish Commissioner for 1902. At six points on the coast of California, the investigators killed a total of twenty-four specimens of the California Sea-Lion, and eighteen of the Steller Sea-Lion. The report says:

"Of thirteen California Sea-Lions whose stomachs contained food, five had eaten fish and eleven had eaten squid. The quantity of fish was inconsiderable, seventeen small fishes being the maximum, while the remains of one hundred to three hundred squid were found in each of five stomachs.

"All the thirteen Steller Sea-Lions whose stomachs contained food had eaten fish, and five had eaten squid, or octopus. The number of squid eaten was small, six being the maximum number in one Sea-Lion, while the quantity of fish was large, at least thirty-five pounds being taken from one stomach."

The detailed report of the kinds of fishes consumed as food by these animals reveals an assortment of very little value, and not one salmon or shad. Professor Dyche's discovery—that the California Sea-Lion feeds almost exclusively upon squid—was fully confirmed, for the twenty-four animals

killed contained only three rockfish, two hake, twenty-four "small fish" and one chimera,—but over eleven hundred squid! The stomachs of the Steller Sea-Lions contained fourteen rockfish, two perch, thirty clupeoid fish, seventeen "large fishes of 12 to 18 inches," and a few skates, sharks, and squids.

"The testimony of the fishermen was so contradictory it is of no value. . . . One man claims that the Sea-Lions are becoming more numerous and destructive every year, while another claims that they are rapidly becoming exterminated." There was "practically no complaint" of fish destruction "at the time of the investigation. Sea-Lions were scarcely ever seen in the vicinity of the salmon nets during 1901."

At the mouth of the Columbia River, "the fishermen were unanimous in their denunciation of the Sea-Lions." "The shallow water and the large number of salmon make that point a favorite feeding ground, and there is no doubt that the Sea-Lions are doing much damage there." "It appears that the Sea-Lions are doing very little damage anywhere excepting at the mouth of the Columbia River." (Report, page 117.)

A summary of the results of the investigation establishes three facts:

1. The California Sea-Lion is not guilty of destroying fish to any great extent, and deserves protection, not death.

2. The Steller Sea-Lion eats miscellaneous fish, but on the coast of California does nothing to merit destruction. At the mouth of the Columbia it is destructive, and there deserves to be kept in check.

3. Wild animals never should be destroyed on the strength of general opinions, for a supposed enemy may, on careful investigation, prove to be a friend.

THE STELLER SEA-LION,[1] the largest Sea-Lion in the world, inhabits a few isolated spots on the Pacific coast, from Santa Cruz, California, to Bering Strait. Large male specimens attain an average length of 10 to 11 feet, stand 6 feet high, and attain a weight estimated by competent observers at 1,400 pounds. The full-grown male has a girth of 8 to 9 feet, a lion-like head, coarse neck hair 4 inches long, and canine teeth, like those of a grizzly bear, which are much used in fighting.

The full-grown females are from 8 to 9 feet long, weigh from 400 to 500 pounds, and are more finely formed than the males. The hair is coarse, and the animal is now of practically no commercial value, save for its oil. This species is readily distinguished from the California sea-lion by its far greater size, its hoarse voice, the very large neck, and the long, coarse neck hair of the males.

In its habits, this great Sea-Lion is very peculiar. Amongst themselves the old males fight fiercely, and with their big canine teeth inflict upon each other many severe skin wounds. I have seen specimens whose necks bore scores of large scars. In the presence of man, however, they are timid and easily frightened.

This giant among Sea-Lions is found on the coast of California, in small numbers only, at Point Ano Neuvo, near Santa Cruz, at Purissima, the Farallone Islands, Point Reyes,

[1] *Eu-me-to'pi-as stel'ler-i.*

STELLER SEA-LIONS.

and Point Arena. On the coast of Oregon it is found about the mouth of the Columbia and near Tillamook Head. The agents of the United States Fish Commission, reporting observations made in 1901, stated that "probably half of the Sea-Lions of California (of both species) are found at the Farallone Islands, and it seems doubtful whether the total number on the coast amounts to five thousand." A large colony of Steller Sea-Lions inhabits Bogoslof Island, Alaska, living almost in the shadow of that celebrated volcano. Twice they have been photographed for moving pictures.

In October, 1903, the New York Zoological Society's agents succeeded, after many fruitless efforts, in capturing six young specimens in the sea off San Miguel Island, California, and safely transporting them to New York. The expectation that these animals would prove to be more hardy in New York than the California Sea-Lion was not realized. They all died within six months, of pneumonia—the curse of Sea-Lions in captivity in fresh water.

THE FUR-SEAL,[1] which yields the beautiful and costly fur so highly prized for ladies' garments, is not a true seal, but a sea-bear or sea-lion, quite similar in form, size, and general habits to the California species already described. It is found on the Pribilof or Seal Islands, in Bering Sea, where during the Russian occupation it was twice nearly exterminated for its fur; on Copper and Robben Islands, off the coast of Siberia; and in the open sea from the Pribilof Islands southeastward to the thirty-fifth parallel, thence northward along the coast, back to the Seal Islands.

[1] *Cal-lo-ta'ri-a ur-si'na.*

The size of the Fur-Seal has been carefully observed by Mr. Henry W. Elliott, and recorded as follows:

MALES AND FEMALES

	LENGTH	GIRTH	WEIGHT
At birth (June 20)	12 to 14 in.	10 in.	6 to 7½ lbs.
At six months	24 "	25 "	39 "
At one year	38 "	25 "	39 "

MALES ONLY

	LENGTH	GIRTH	WEIGHT
At two years	45 in.	30 in.	58 lbs.
At three years	52 "	36 "	87 "
At six years	72 "	64 "	280 "
At 8 to 20 years	75 to 80 in.	70 to 75 in.	400 to 500 lbs.

The Fur-Seal has two kinds of hair. Its outer coat is long, stiff, coarse, and gray in color. In preparing skins for market, all this is plucked out and thrown away, leaving only the fine, soft, brown under-fur, which before manufacture is dyed a rich, blackish-brown color. Fur-Seal garments vary in price from $200 to $700.

The Fur-Seal has strange and interesting habits. It spends about two-thirds of each year far at sea, making a circuit of 6,000 miles in the open ocean without touching land. For some strange reason, the herd in American waters has chosen the two Pribilof Islands, St. Paul and St. George, as the only spots in our waters whereon they are willing to land and bear their young. To these favorite breeding places, on these islands known as "hauling-grounds," the Fur-Seal millions were wont to repair in the early summer of each year, to bear their young. The returning herd begins to arrive between May 1 and 15, the breeding-season is over by September

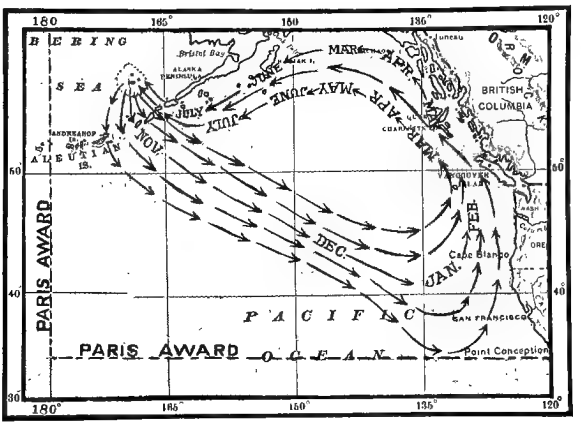
Drawn from life by Henry W. Elliott, July 19, 1872.

FUR SEALS ON ST. PAUL ISLAND.

The "Polavina Parade," looking south from Little Polavina Rookery, St. Paul Island.

15, and by the end of November all the Seals are gone on their great winter cruise southward into warmer waters. By a long series of inquiries the winter cruise of the herd was first mapped out by Henry W. Elliott, and is shown herewith.

On the breeding-grounds, each large and hard-fighting old male gathers round him a harem of from six to ten females,



ANNUAL WINTER MIGRATION OF THE FUR-SEAL HERD.

fights off all rivals, young or old, and elects himself the head of an imposing family. In the days of the Fur-Seal millions, the three-year-old male Seals—called "bachelors"—were killed for their fur, to the number of about 100,000 each year. The females bear only one "pup" annually, immediately after landing in May.

The mother Seals leave their young, go to sea in search of food, remain several days perhaps, or even a fortnight, then return and go straight to their own respective offspring. It was the killing of the mothers at sea that produced an enor-

mous falling off in the number available each year. The persistent slaughter of mothers will exterminate any animal species, no matter how numerous.

The accompanying map graphically illustrates the remarkable seagoing habits of the Pribilof Fur-Seal herd after the close of the breeding-season and during the intensely cold and fearfully windy winters that annually render life on the Seal Islands a serious task.

The combined political and commercial importance of the Fur-Seal demands a brief summary of the most important facts of its rise to favor, its decline, its fall, and now the beginning of its restoration.

A REVIEW OF FUR-SEAL HISTORY

For more than twenty-six years the Fur-Seal was to the United States, England, and Canada a source of well-nigh constant anxiety, contention, and at times irritation. Inasmuch as the fate of that animal is still pending, it seems desirable to set forth the most important facts in its case in chronological order. The history of the Fur-Seal since our acquisition of Alaska is divided into three periods, one of revenue, one of contention, and one of restoration.

The Period of Revenue

1867.—When Alaska became a United States possession, by purchase from Russia at a cost of $7,200,000, the fur of the Fur-Seal was almost unknown to fashion, and outside of Russia was neither used nor particularly desired.

1870.—The United States leased to the Alaska Commercial Company, for twenty years, the exclusive right to kill each year, on the Pribilof Islands, 100,000 young male Fur-Seals, receiving therefor, annually, the sum of $317,500.

1872.—The Alaska Commerical Company began to expend $100,000 in cash, chiefly in London, in making the wearing of sealskin fashionable. This effort was entirely successful.

1873.—After a careful survey of the Pribilof Islands, and an elaborate computation of the number of Fur-Seals then inhabiting them, Mr. Henry W. Elliott, a special agent of the Treasury Department, announced the total number of Seals to be 3,193,420. He says: "No language can express adequately your sensations when you first stroll over the outskirts of any one of those great breeding grounds of the Fur-Seal on St. Paul's Island. . . . Indeed, while I pause to think of this subject, I am fairly rendered dumb by the vivid spectacle which rises promptly to my view. It is a vast camp of parading squadrons which file and deploy over slopes from the summit of a lofty hill a mile down to where it ends on the south shore. Upon that area before my eyes, this day and date of which I have spoken, were the forms of not less than three-fourths of a million seals, moving in one solid mass from sleep to frolicsome gambols, backward, forward, over, around . . . until the whole mind is so confused and charmed by the vastness of mighty hosts that it refuses to analyze any further." ("Our Arctic Province," p. 313.)

Some observers estimated the number of Seals at a figure higher than Mr. Elliott's. Others have recently contended that it must have been less.

1880.—"Pelagic sealing" means the killing of Fur-Seals, male or female, in the open sea, by means of guns or spears. It is an exceedingly wasteful and destructive method, but it had been going on in a quiet way for many years. On land, only male Seals are killed. In the sea, about four females were killed to every male taken, and the pups on shore were left to starve. In 1880 the total number of Seals taken at sea in Bering Sea was only 8,418; but from that time on the killing increased rapidly and became fearfully destructive.

1882.—Up to this time the great Seal herd of Bering Sea was in a state of equilibrium, and yielded on the islands its annual quota of 100,000 "bachelor" Seals without sensible variation. The number killed at sea in 1882 was 15,551.

The Period of Contention

1886.—The catch of Seals at sea rose to 28,494. Of the large fleet of vessels then hunting Seals in Bering Sea, a number were seized by the United States Government vessels which were guarding the islands. These were chiefly Canadian schooners, but some were American.

1887.—The pelagic sealing fleet was increasing each year. The United States began negotiations with six foreign governments with a view to securing co-operation in saving the Seals from the extermination which threatened them at the hands of the "poachers."

1890.—The lease of the Alaska Commercial Company terminated, and the North American Commercial Company bid successfully for the new lease of the Seal-taking privilege on the Pribilof Islands. According to the calculations of Mr.

Elliott, the Seals on the islands now numbered 959,455. From 1871 to 1889, except for four years, over 100,000 male Seals had been taken annually, on the islands, and paid for. The total revenue derived by our Government during that twenty-year period was $6,350,000. In 1890 the Seals killed and secured at sea numbered 40,814, while the number killed and lost was unknown.

1891.—An agreement called a *modus vivendi* (or way of living in peace) was made between England and the United States, for three years, designed to close Bering Sea to pelagic sealing pending the result of the Paris Tribunal. Practically, it amounted to nothing.

1893.—The case of the pelagic sealers was tried before the Paris Tribunal, and through the ineffective management of our case we lost on practically all our contentions. The pelagic sealers emerged from the contest with full license to kill Seals at sea everywhere outside a sixty-mile radius of the Pribilof Islands. Because Japan, China, and Russia were not parties to the tribunal, the people of those nations were not bound by the award which kept American, Canadian, and English sealing vessels sixty miles away from the Seal islands!

1894.—In this year 61,838 Seals were killed at sea and secured, while an unknown number were killed and lost.

1895.—Mr. J. B. Crowley (member of Congress in 1903), as a special agent of the Treasury Department, assisted in counting the dead bodies of about 30,000 Fur-Seal "pups," on the Seal islands, which had starved that year by reason of the killing of their mothers while at sea in search of fish. (*Congressional Record.*) There were 56,291 Seals killed at

sea by the eighty-one vessels engaged in pelagic sealing. On land the number killed was, by order of the Government, reduced to 14,846.

From 1890 to the end of 1895 (six years) the cost to the United States Government of its patrol of the waters of Bering Sea, with war vessels and revenue cutters, in order to protect—as far as possible—the Seal herd from complete annihilation, was $1,410,721. Besides this, the Government expended $227,163 on its Treasury agents, and $473,000 was paid, by the decision of the Paris Tribunal, as "damages" to the men who stole our Seals and were caught in the act!

1897.—The number of dead pups counted on the breeding-grounds, by Dr. Frederic A. Lucas and others, was 21,750, and in October the number of seals remaining alive of our herd was estimated at 343,746. (D. S. Jordan, "Report, Fur-Seal Investigation," 1896–7, p. 100.)

1898.—By a law passed December 29, 1897, all citizens of the United States were absolutely prohibited from killing or capturing Fur-Seals at sea elsewhere in Bering Sea, the Sea of Okhotsk, or elsewhere north of the 35th parallel of north Latitude. The ownership of any Fur-Seal skins taken in those waters was also prohibited, under severe penalties. All skins from female Seals, either raw or dressed, were also excluded from our markets. From that date (December 29, 1897) pelagic sealing ceased to be an *American* industry.

1903.—By this date the situation of the Fur-Seal had grown desperate. The number then alive was about 200,000. While Americans could not engage in pelagic sealing under our flag, and no Canadians might inside the sixty-mile limit, dozens of

well-equipped sealing vessels were sent out from Yokohama and other ports in Japan, under the Japanese flag, *which hunted seals within three miles of the Pribilof Islands!* Canadian sealers were still hunting outside the protected zone, and killing many Seals annually.

Up to this date our Government had done everything in its power to prevent the extermination of the Fur-Seal and afford it a just measure of protection. England could go no farther without giving grave offence to Canada. But in England about $2,000,000 of capital was invested in the business of dyeing and dressing Fur-Seal skins, and this work employed between two thousand and three thousand operatives. It had always been impossible for sealskins to be satisfactorily dyed and dressed in America.

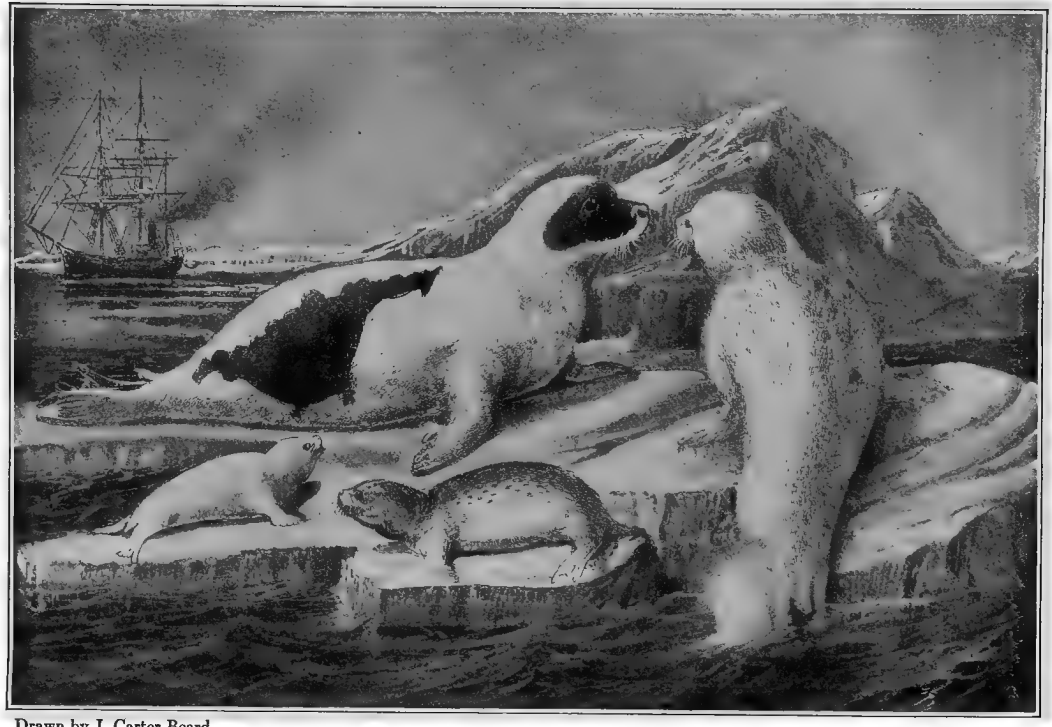
Prior to 1910 the insurmountable obstacle to the protection of the Fur-Seal was its fatal habit of going to sea, far from its hauling-grounds, coupled with the belief of a large number of Canadians and Americans that a Seal at sea was the lawful prize of him who could take it. Patriotism, and the desire for the greatest good of the greatest number, did not enter into their calculations. The American or Canadian pelagic sealer claims that the open sea is his, and he cares only for the $20 or $40 that each raw skin is worth. England could not reasonably be expected to quarrel with Canada because of our desire to perpetuate our Seal herd, and derive from it a revenue of a million dollars a year,—which is the sum that the Fur-Seals would yield to-day but for the slaughter of 1,000,000 females at sea and starvation of 1,000,000 pups at sea and on shore.

The Period of Restoration

1910.—Down to this date the misfortunes of the unhappy Fur-Seal herds had steadily increased. About thirty-five Japanese sealing vessels annually visited the Pribilof Islands, and formed a cordon in front of the breeding-grounds of the herds. Through that dead-line of boats and hunters, the nursing mother Seals had to pass in order to reach their fishing grounds, and to return from them to their young. On shore about 15,000 male Seals were being annually slaughtered by the leasing parties (the North American Commercial Company), and at sea about an equal number of Seals were killed and secured, of which from 70 to 80 per cent were females! The number of females killed at sea and lost never will be known.

For several years prior to 1910 the United States Government had been losing money on the Fur-Seal industry, chiefly through costly but futile efforts to protect the herds. By that time the total loss during the previous twenty years amounted to about $6,000,000, not counting the loss of the Seals themselves. In 1909 the lessees were unable to secure, even by the closest driving, their full quota of 15,000 Seals.

In the summer of 1910 the Camp-Fire Club of America decided that it was time for private citizens to intervene at Washington, in an effort to induce Congress to take action of a nature calculated to save the Fur-Seal industry from permanent ruin, save the species from practical extinction on our islands, and end a long-standing international disgrace. Accordingly, in December of that year three specific demands



Drawn by J. Carter Beard.

THE HARP SEAL.

Young and old specimens, showing changes in pelage at different periods.

were laid before Congress through Senator J. M. Dixon, and the Senate Committee on the Conservation of National Resources. These demands were: (1) The immediate abolition of the leasing system for the killing of Fur-Seals on our islands, (2) the making of international treaties (with England, Russia, Japan, and Mexico) for the total suppression of Seal killing at sea, and (3) a long close season (of five or ten years) for the recuperation of the shattered herds.

The response of Congress was prompt and far-reaching. On April 30, 1911, the leasing system of killing was forever terminated, and the management of the Fur-Seal industry was placed under the control of the Department of Commerce. In 1912 treaties for the suppression of pelagic sealing were successfully negotiated with England, Russia, and Japan. The terms of those treaties provided that each of the nations named should restrain its subjects from pelagic sealing, and in return would receive a share in the annual proceeds of the Fur-Seal industry. The United States Government was specifically empowered to suspend killing operations on land for such period or periods as the best maintenance of the herds might require. It was stipulated in the treaties that when killing operations were conducted on a commercial basis, Japan should receive 15 per cent. and England 10 per cent. of the proceeds. It was also stipulated that during any close season which the United States might find it necessary to enforce for the recuperation of the herds, the United States should annually pay to England and Japan the sum of $10,000 each. These treaties were ratified.

In 1912, after prolonged deliberation, Congress decided

to give the Fur-Seal herds a five-year close season, for rest and recuperation, which was done.

1913.—A committee of the House of Representatives sent to the Pribilof Islands two agents, Henry W. Elliott and A. F. Gallagher, to count the living Seals on the islands and report upon the general condition of the herd. Their enumerations, estimates, and calculations led them to submit the following report:

Census of Fur-Seals on the Pribilof Islands in 1913

Old bulls, 8 to 15 years old (breeders)		1,400
Young bulls, 6 to 7 years old (next breeders)		150
Cows, 2 years of age, and above		80,000
Pups, under 1 year		70,000
Yearlings, sexes undeterminable	("a vague estimate")	30,000
Males, 2 years old	" " "	6,000
Males, 3 years old	" " "	3,000
Males, 4 years old	" " "	400
Total Fur-Seals of all ages, in 1913		190,950

Conclusion.—At last the long-standing disgrace and irritation of the Fur-Seal situation has been happily terminated. Pelagic sealing has ceased, and the five-year close season now in force may possibly rehabilitate the herds so effectually that by the end of that period killing operations for commercial fur can be resumed on a large scale, at satisfactory profits to all the nations concerned. It is to be noted, however, that there is an alarming scarcity of males between the ages of three and six years, and that of the "next breeders" there are only 150!

THE SEAL FAMILY

Phocidae

THE LITTLE RINGED SEAL[1] is the Seal of the Farthest North, and the friend of the northern Eskimo all round the pole. It is the smallest North American species, and looks very much like the common harbor seal. It goes as far north as it can find breathing-holes. Nansen found it on May 31, at 82° 21′, or within 460 miles of the pole, living in the narrow lanes of water that were then forming in the great polar ice-pack. It was a BEARDED SEAL,[2] however, which, on June 22, afforded the brave explorers a good supply of food when men and dogs were almost starved. And, true to its nature, an old polar bear, with two small cubs, was closely following up the seals as they worked north through the ice-pack.

THE COMMON HARBOR SEAL,[3] of both our ocean coasts, is a good representative of the Seal Family, chiefly because it is the species most frequently seen. It ascends rivers far above tidal influence, and has been taken in Lake Champlain. In the Columbia River a closely related species has been taken above The Dalles, 200 miles from the sea.

THE HARP SEAL[4] is not only one of the handsomest of all seals, but it is also the species most valuable to man. It is found on both sides of North America, but always in cold waters. In the year 1900 five sealing steamers of Newfoundland took nearly 100,000 seals, mostly Harps, on the

[1] *Pho'ca foe'ti-da.*
[2] *Er-i-gnath'us bar-ba'tus.*
[3] *Pho'ca vit-u-li'na.*
[4] *Pho'ca gro-en-land'ic-a.*

coast of Labrador and northward thereof, and the value of the catch was over a quarter of a million dollars.

This species passes through several strongly marked changes of pelage and color. The baby is covered from nose to flipper-tips with a thick coat of long, woolly hair of snowy whiteness. This, when shed at six months after birth, is replaced by a coat of bluish-gray hair, with light trimmings. On reaching adult age, in its fifth year, this animal is very strikingly marked by black or dark-brown patches grouped together on the sides and back, on a white or yellowish ground-color suggestive of the shape of a harp. This seal is also called the SADDLE-BACK and the GREENLAND SEAL.

HEAD OF HOODED SEAL.

THE HOODED SEAL[1] of the North Atlantic is a large species, often attaining 8 feet in length. The old males are distinguished by the possession of a flexible bag of skin on top of the nose, which is capable of being inflated with air until it forms a lofty and remarkable excrescence on the creature's face. This sac is sometimes 10 inches long and 6 inches high. The color of this seal is dark bluish gray, marked with irregular light spots. It once came as far south as New Jersey.

THE RIBBON SEAL, or HARLEQUIN SEAL,[2] in its color pattern is the most remarkable of all living Pinnipeds, and there

[1] *Cys-toph'o-ra cris-ta'ta.*

[2] *His-tri-o-pho'ca fas-ci-a'ta.*

THE RIBBON SEAL.

are many persons who consider it the most beautiful member of its Order. On a smooth ground-color, either of blackish brown or yellowish gray, Nature has sportively arranged several yards of broad, yellowish white ribbon. One strip goes around the neck and ties under the throat. From a point low down on the breast, another starts upward, curves gracefully over the shoulder, drops down in front of the pelvis, where it comes together, then turns and crosses over the body. In many specimens the uniformity of the width of the ribbon is remarkably well maintained.

This seal is from 4 to 6 feet in length. Its home is on the eastern shore of Bering Sea, and in the fresh waters of Lake Iliamna, in the upper end of the Alaskan Peninsula.

THE WALRUS FAMILY

Odobenidae

Of all living monsters that ever move upon land, the PACIFIC WALRUS[1] is one of the most wonderful. A full-grown male is a living mountain of heaving flesh, wrinkled, furrowed, and seamed, ugly as a satyr, and as strange in habits as in appearance.

Its form is that of a sea-lion with a neck enormously thickened. Its upper jaw is provided with two long, strong tusks of ivory, and its skin is almost destitute of hair. A full-grown male measures from 10 to 12 feet in length from nose to tail, the top of its head is about 5 feet from the ground, the girth of its neck is from 12 to 14 feet, and it weighs from 1,800 to 2,000 pounds. Its skin varies from half an inch to

[1] *O-do-ben'us o-be'sus.*

two inches in thickness; it is of a dirty yellow color, and lies on a mass of fat which often is six inches thick. The largest pair of tusks now known to the author measure 36¼ inches in length, and are in the National Collection of Heads and Horns, of the New York Zoological Society.

The Pacific Walrus eats more or less of aquatic-plant food, but its principal food is shell-fish and crustaceans. These it digs up from the muddy bottoms of the broad, shallow bays along the coast, crushes between its powerful jaws, and swallows in great quantities, shells and all! Crabs and shrimps form a pleasing variety, and for salad it devours the bulbous roots and tender stalks of marine plants which in summer grow in its home waters.

In former times the Pacific Walrus existed in great herds on the coast of Alaska, from the north shore of the Alaskan Peninsula northward through Bering Strait, and thence eastward as far as Point Barrow. There the herds encountered the edge of the great permanent ice-pack, and could go no farther. In winter the Walrus herds float about on the ice-fields, retreating southward as the edge of the ice advances. In the open sea the sleeping posture of the Walrus is floating bolt upright in the water. He grunts and bellows, and many times vessels have been warned off dangerous, fog-hidden rocks by the Walrus lying upon them.

On land the Walrus is the most clumsy and helpless of all land animals, and is easily approached and killed. In the water it becomes a danger to be avoided, on account of its proneness to wreck small boats. A full-grown Walrus has never been seen in captivity, but there is now (1914) ex-

THE PACIFIC WALRUS.

An old male of the largest size. Drawn from a mounted specimen in the United States National Museum.

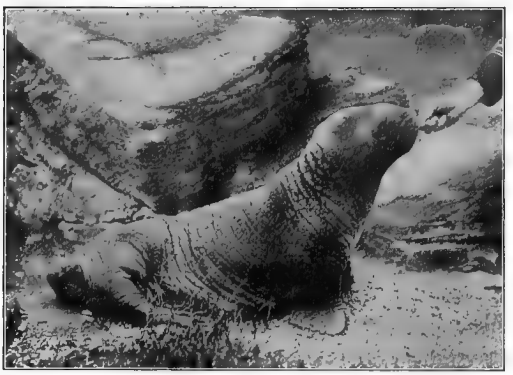
hibited in the New York Zoological Park an Atlantic walrus four years old that weighs 406 pounds, and is in perfect health.

Heretofore steamers bearing gold-miners to Cape Nome passed through herds of Walrus in Bering Sea, and many of the animals were killed, wastefully and wantonly, by passengers firing from the decks, with no possibility of securing a single victim. As elsewhere, the instinct of man in the far North is to slay and slay, and preserve no living thing.

The Walrus has been hunted so diligently for its oil that to-day very few remain, and the natives who once depended solely upon this animal for food, fuel, lights, boats, dog harness, and leather for all purposes now are on the verge of starvation, and are really kept alive by public bounty. Previous to our purchase of Alaska, about 10,000 Walrus were killed annually by the Eskimo, and utilized. In the long, hard winter of 1879–80, when the sea was frozen all around St. Lawrence Island, for many miles in every direction, the Walrus herds were forced to remain so far away that all the inhabitants of the island, save one small settlement, died of starvation.

At present (1914) there is grave cause for alarm concerning the ultimate fate of the Pacific Walrus. Owing to the unfortunate fact that Bering Sea, and the Arctic Ocean north of it, are waters open to the game-hogs of all nations, the herds are at the mercy of all those who choose to slaughter them. They are being attacked viciously, at many different points, always with great slaughter. The latest news is to the effect that the Norwegian whalers are now in Bering Sea

killing Walruses for commercial purposes; and it is difficult to foresee how the species can be saved. To make treaties for Walrus protection with all the maritime nations would be so long a matter it is likely that the Walruses would all be killed before protection by treaty could be made effective. We greatly fear the Pacific Walrus will be utterly exterminated within a very few years.



YOUNG ATLANTIC WALRUS.
Captured by Commander R. E. Peary, and exhibited in the New York Zoological Park.

THE ATLANTIC WALRUS[1] is of about the same length as the Pacific species, but it has a shorter and much smaller neck. Its tusks, also, are much smaller. It is still found in considerable numbers in Smith's Sound, and is quite abundant north of Franz Joseph Land, where Nansen photographed and killed many. Its most northerly latitude is 82°. A specimen killed by Commander Robert E. Peary was 9 feet in length, and weighed 1,569 pounds. The skin alone weighed 220 pounds.

Professor L. L. Dyche has kindly furnished the measurements of the largest male Walrus out of eighteen taken by him on the coast of northern Greenland:

Length (straight line), end of nose to end of body, 129 inches.

[1] *O-do-ben'us ros-ma'rus.*

Tail, exposed, none.

Length of rear flippers, 26 inches.

Girth of animal when suspended by the neck, 129 inches.

Exposed length of tusk, 19 inches.

Circumference of tusk at base, 8¼ inches.

The largest cow Walrus measured 116 inches in length, 113 in girth, exposed tusk, 10¾ inches.

CHAPTER V

ORDER OF MOLES AND SHREWS

INSECTIVORA

IN the dark and cold embrace of Mother Earth, away from the cheering sunlight, and the beautiful upper world that we enjoy, there dwells a group of mammals so strange, and yet so useful to man, that they excite our admiration for the wise purpose which developed and placed them there. Pass not unthinkingly the moles and shrews, for they have been most cunningly designed to serve a definite and important purpose in the economy of Nature.

In farming countries the top soil of the earth is a vast incubator for the development of destructive insect larvae. In soil that is rich and productive, "grubworms," "cutworms," and "wireworms" abound; and in regular rotation they greedily devour the seeds, roots, and leaves of growing crops. But for the enemies which keep them in check, there would be a hungry grub for every sprouting seed.

And how can man wage war successfully against insect life in the soil? Impossible. To meet this difficult proposition, we need a vigorous living creature with a nose like a gimlet, sharp-pointed teeth, soft fur, feet specially designed for digging, and eyes so small that to them sunlight is an unnecessary luxury. Such animals are found in the moles

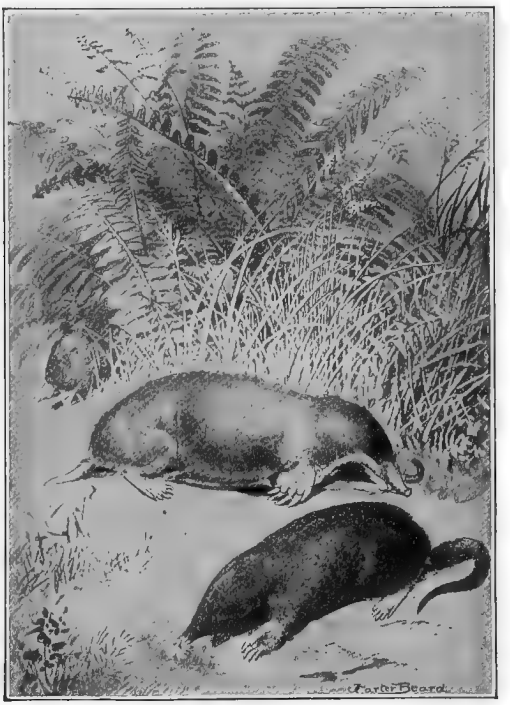
and shrews, of the Order Insectivora, humble but faithful workers in man's interest. Neither the horse nor the ox is more diligent in our service than are these toilers of the soil. Yet what is their reward?

In his mole-like blindness, man frequently discovers things that are not true. Often a perfectly honest farmer concludes that a mole is eating his seed corn in the ground, or the vegetables in the garden; and straightway the mole is killed. His accuser has found a runway following up a row of newly planted corn, and when the seed fails to sprout, the mole is accused of having eaten it!

In all such cases, the mole is a victim of circumstantial evidence, and suffers through the lack of counsel to cross-examine the witnesses for the prosecution. Did any one ever find much vegetable food in a mole's stomach? Not often. Did any one ever see a mole eat vegetable food? Probably not. A mole placed in a box and supplied with vegetable food alone soon starves to death. Moles do not eat seed corn, or garden vegetables; but they do visit corn hills to eat the grubs that come to devour the corn.

Every naturalist must learn early what constitutes *direct evidence*. Far too long have the mole and shrew been convicted and slain on circumstantial evidence. Meadow-mice sometimes attack seed corn by utilizing the runways that have been made by moles in reaching the corn hills to secure the grubs that attack the seeds; and almost invariably the testimony is that the moles have done the damage. In France the value of the mole is recognized by law, and the killing of one is punishable by a fine of five francs.

The shrews and moles not only find their food underground, but live the entire cycle of their lives in subterranean darkness. Moles seek their food by digging tunnels in ground that is loose and dry, the roof being raised into a ridge which



1. COMMON MOLE. 2. STAR-NOSED MOLE.

in smooth lawns is an annoying disfigurement. Gardeners are apt to forget that they always work where insect larvae are thickest, and the need for their help is most urgent. The tunnel-makers are driven from lawns by persistently trampling down their runways.

The Order Insectivora is represented in the United States

by two Families, the members of which are easily recognized by the following well-marked characters:

THE MOLES have pointed heads; *extremely large spade-like front feet*, that always are held with the outer edge up; no neck; the front legs are exceedingly short; there is no external ear, and no external eye; the body is short, thick, and clumsy, and the tail is hairless.

THE SHREWS have pointed heads, but *small, rat-like feet;* there is a very small eye, an external ear, and a distinct neck. The body is rather slender, and as a whole, the animal looks much like a short-tailed mouse.

THE MOLE FAMILY

Talpidae

This Family contains eleven full species, all quite interesting. Their skins and skulls have been studied closely, but our information regarding their habits is very meagre. As a rule, moles are larger than shrews. The largest of all is an Oregon species, which measures 7 inches in length of head and body, with a tail of 1½ inches,—an unusual size for a mole.

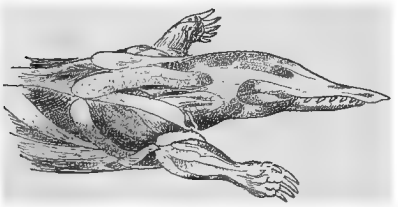
On all moles the fur is fine, thick, very soft and velvety, and faultlessly smooth and clean. All these creatures love sandy soil, through which they can easily burrow.

THE COMMON MOLE[1] is known to the majority of country dwellers by its upheaved tunnels on the surface of the ground. In appearance the animal is a flattened, oblong ball of fine, soft, shimmering gray fur, 6¼ inches long, to which the naked, little pink-white tail—which looks like a small angleworm—

[1] *Sca'lops a-quat'i-cus.*

adds 1¾ inches. Its nose projects half an inch beyond its mouth, and on the end it feels as hard as if it contained a bone. It terminates in a broad, flattened point, shaped quite like a rock-drill.

The fore foot is three-quarters of an inch wide, but less than an inch in length, including the claws, which measure half an inch. In your hand, a Mole is a wriggling, restless creature. Place it upon ground that is not packed hard, and in about one second it has found a suitable spot for an opening. Its nose sinks into the earth as if it were a brad-awl, with a combined pushing and boring motion, and in three seconds your Mole's head is no longer in sight.



DIGGING MUSCLES OF A MOLE.

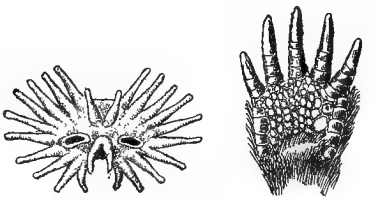
Up comes the powerful right foot, sliding close along the side of the head, edgewise and palm outward, to the end of the nose. The living chisel cuts the earth vertically, and then with a quick motion it pries the earth sidewise from its nose. Instantly the left foot does the same thing on the other side, while the brad-awl nose goes right on boring. In ten seconds, by the watch, the Mole's body has entirely disappeared, and in three minutes our Mole will tunnel a foot, unless interrupted.

When skinned for dissection, it is found that the eye is merely a small, dark speck under the skin, suitable only to distinguish light from darkness. The eyeball is about the size of a pin-head. The arm and forearm is a big, hard bundle

of tough muscles and powerful tendons, shaped like an Indian club, of enormous size in proportion to the creature's body.

The Mole is a wonderful example of energy and power. Desiring to observe their methods of working when undisturbed, I once placed one in a five-acre clover field, at 11 o'clock A. M. During the first seven hours it had tunnelled twenty-three feet, in a zigzag line. During the next seventeen hours it dug thirty-five feet, and during the next hour, ten feet more. The total work consisted of sixty-eight feet of main line, and thirty-six and a half feet of branches, making in all one hundred and four and a half feet.

An observing farmer boy, named Lawrence Miller, once gave me a clear and intelligent description of a Mole's burrow which he uncovered and observed closely. It was a dome-shaped hole, two feet below the surface of the ground, reached from above by a hole that ran down slanting into its top. The burrow was a foot wide at the bottom, where three small galleries ran off about six inches, in different directions. Near the top of the chamber was a sort of shelf, supporting a bed of soft material, and on this lay a Mole. The young are usually two in number.



End of nose. Left forefoot.

STAR-NOSED MOLE.

Besides the Common Mole, of the eastern United States generally, we have the *Prairie* or *Silver Mole* of the prairie regions of the Mississippi Valley; the *Hairy-Tailed Mole* of the eastern United States, and the *Oregon Mole* of the Pacific

slope. The *Star-Nosed Mole*, of the northeastern United States and Canada, is quickly recognized by the remarkable star-like appendage of eighteen ray-like points, with four more between them, on the end of its nose.

THE SHREW FAMILY

Soricidae

North of Mexico, this Family contains about thirty-five full species, distributed throughout nearly every portion of North America south of a line drawn from the mouth of the Mackenzie River to Labrador. With most cheerful indifference, they inhabit mountains, plains, swamp-lands and sandy seacoasts, hot countries and cold. Everywhere, however, their noses are long and sharp, their eyes and ears minute, and the colors of all species are very sober, ranging from dull gray to brown, and ending in black. There are two species which are so widely distributed they may well be taken as types of the entire thirty-five.

COMMON SHREW. SHORT-TAILED SHREW.

THE COMMON SHREW[1] is found on the Atlantic coast, from New England northwestward to Alaska, and southward through the Appalachian Mountains to Tennessee and North Carolina. Its color is brown above, and dull gray under-

[1] *So'rex per-son-a'tus.*

neath; head and body, 3¾ inches long, tail, 1⅝ inches. The ground-plan of its skull is a perfect triangle spreading thirty-five degrees, and is very flat. Although very soft and fine, its fur is not so velvety as that of a mole. This creature is very small, and quite mouse-like in appearance.

Unlike the mole, Shrews occasionally emerge from their burrows, and wander about near their entrances. But they are exceedingly shy, and although they are frequently thrown out by the spade or plough, they are very rarely seen moving about. Above ground they are very helpless, and being unable to run rapidly, they try in a feeble way to hide. When taken in the hand, the musky odor they emit is rather disagreeable.

The Short-Tailed Shrew[1] is another type worthy of special mention. It is readily recognized by its very short tail, only 1 inch in length, while its head and body measure 4 inches. Its color is smoky brown above, and dull gray underneath, and in size it is the largest of the shrews. It is found from the eastern edge of the Great Plains to the Atlantic coast.

[1] *Bla-ri'na bre-vi-cau'da.*

CHAPTER VI

ORDER OF BATS

CHIROPTERA

THE strange wing-handed, flying mammals composing this Order exhibit differences in form that are fairly bewildering. They range all the way from the beautiful to the fantastic and the hideous, and some of them are well worthy of study.

The great majority of bats are useful to man in destroying the insects which, were it not for the birds and beasts, would very soon overwhelm him. The harmful species are those which destroy fruit and a few which suck the blood of domestic animals.

Owing to certain natural conditions, the members of the Bat Order as a whole are almost as little known as the whales and porpoises of the deep sea. Our lack of acquaintance with bats is due chiefly to their nocturnal habits, and the consequent difficulty in observing them. To-day bats are so little known that there are perhaps a million persons who only know that they fly at night, and are "awful things to get into your hair."

I have seen thousands of bats, flying in many different places, but never yet saw one alight upon a woman's hair; and I believe they are no more given to doing so than are

Drawn by J. Carter Beard. From a specimen in the Philadelphia Academy of Sciences.

BORNEAN NAKED BAT.

The young are carried in two dorsal pouches, from one of which, under the left elbow, a small head protrudes.

humming-birds. From the bats of the United States, there is nothing to fear, for their claws and teeth are pitifully weak. One cross old "bumblebee," angrily bumbling, is more dangerous to a peaceful community than all the bats of our country taken together. In some portions of South America, however, the vampire bats cause serious trouble.

Little is known concerning the habits of bats, and much remains to be found out. These creatures are therefore excellent subjects for original investigation.

SKELETON OF PALE BAT.
Antrozous pallidus.

The Order of Bats as a whole contains about four hundred and fifty species, but it is safe to say that three-fourths of them are known only by their dry skins and skulls, and that their habits are quite unknown. The questions are,—Why do bats live? Upon what do they feed? Are they useful to man, or injurious? What are their friends and their enemies? Do they migrate, and at what times? Where do they nest, or take shelter; and what are the facts about their young? What parasites and diseases have they?

Although the bat is a true mammal, it is almost as wide a departure from the ordinary, four-legged, land-going type as is a whale or manatee. Its hand reveals an extreme degree of what is called "specialization." For a mammal, the arms are of great length. The bones of the fingers are enor-

mously extended, and connected with hairless skin as flexible as india rubber, to form a wing for flight. This wing membrane is extended on up the arm to the body and the legs, and is continued between the legs and tail, where it forms a supporting parachute in flight.

The thumb of a bat is very short and free; and its nail is developed as a hooked claw, by the aid of which the creature can comfortably climb about or support itself. The favorite position of a bat at rest is hanging by its feet, head downward.

To be "as blind as a bat" is not to be blind at all, but rather to possess powers of vision that are uncommonly good in semidarkness, or at night, and fairly good even in the broad light of day. When disturbed at midday, all the bats I have ever seen alive (perhaps twenty species in all) have flown away to places of security as briskly and successfully as so many swallows. The eyes of all night-flying bats are small, jet-black, and look like tiny black beads, but those of the day-flying fruit-bats are very much larger in proportion.

The teeth of bats of different species show wide variation. In nearly all of the four hundred and fifty species, the canine teeth are as strongly developed as in the cat, and in some bats their proportions are really formidable. A careless examination of a bat's skull might easily lead one to believe that it belonged to a carnivorous animal. But the molar teeth will always tell the true story.

The insect-eating bats, which far outnumber all others, have cheek-teeth which terminate in sharp points, and are specially designed for cutting to pieces the hard parts of hard-

shelled insects. The fruit-bats, however, have molars of a very different sort, with rather smooth crowns, for crushing instead of cutting. The blood-sucking vampire bats of South America have very large canine teeth with sharp, cutting edges, and even the molar teeth are formed with scissor edges, very much like the teeth of cats.

The teeth and skulls of bats exhibit many interesting and even extraordinary variations, but it is impossible to enumerate them here. The species illustrated on page 172 is fairly typical of the bats found in the United States.

As previously remarked, very little is known regarding the habits of bats, chiefly because their nocturnal habits make it very difficult to find them, or to observe them. We know that in winter some of our species live in caves, in a semi-dormant condition. Dr. C. H. Eigenmann says, of the thousands that inhabit Mammoth Cave, "they fly readily if disturbed in summer, but in winter they hang apparently dead. If disturbed, a few respiratory movements may be seen, and they may utter a few squeaks, when they again remain apparently lifeless. If knocked from the roof some of them fall to the bottom of the cave and flap about, others fly away. I have seen them leave a cave in midwinter, after being disturbed, but fly no further than a hundred yards, then turn and enter the cave again."

In central Montana, where there are no trees, I once found a large colony of bats inhabiting a cave that a subterranean stream had washed under the prairie. In Arizona there is a cave which is said to contain "a million" bats. Once while hunting elephants in the Malay Peninsula, the

attention of my companion and myself was arrested by a strange, pungent odor which filled the air. Upon investigating the cause of it, we discovered a large cave of a very interesting character, inhabited by thousands of bats, and floored with a layer of bat guano a foot or more in depth, representing the accumulation of a century.

In warm countries bats inhabit hollow trees. But do they inhabit such homes, and actually *hibernate in them in winter*, in the temperate zone? On this point direct evidence is desirable. Dr. C. Hart Merriam has proved that some bats of the North American temperate zone do migrate as birds do, going south in winter and returning in spring.

The conditions of wild life in the temperate zone are rather unfavorable to the development of large bats, and for this reason none of the bats of the United States are of large size or commanding importance. The large fruit-bats, or "flying foxes," can exist only where they can procure a good supply of fruit all the year round; and for this reason they are mainly confined to the tropics. During our northern winter, a true vampire bat could indeed prey upon the blood of domestic animals; but in zero weather, the naked wings of such a creature would freeze stiff in a very few moments. The large vampire bat of India, for some reason called the "false" vampire (*Meg-a-der'ma ly'ra*), which devours small frogs, fishes, small birds, and even bats smaller than itself, could live in our southern and southwestern states, but it would be impossible for it to go far north of the frost line. All bats inhabiting the colder regions of the temperate zone, within the snow limit, must either hibernate in winter or migrate.

Owing to the great number of species of bats, and to the many groups into which they have been divided, it is desirable to mention here only a few examples with which every intelligent person should be acquainted.

The bats have been divided by Nature into two Suborders, and six Families, as follows:

THE ORDER OF BATS

Order Chiroptera

SUBORDER OF INSECT-EATING BATS: *Mi-cro-chi-rop'ter-a*

FAMILIES		EXAMPLES
LEAF-NOSED BATS	*Phyl-los-to-mat'i-dae*	Leaf-Nosed Bat. Blainville's Bat. Javelin Bat. Great Vampire.
FREE-TAILED BATS	*Em-bal-lo-nu'ri-dae*	Bonneted Bat. Naked Bat.
COMMON BATS	*Ves-per-til-i-on'i-dae*	Red Bat. Gray Bat. Big-Eared Bat.
FALSE VAMPIRES	*Meg-a-der-mat'i-dae*	False Vampire.
HORSESHOE BATS	*Rhi-no-loph'i-dae*	

SUBORDER OF FRUIT-EATING BATS: *Meg-a-chi-rop'ter-a*

FLYING FOXES	*Pter-o-pod'i-dae*	Flying Fox. Hammer-Headed Bat.

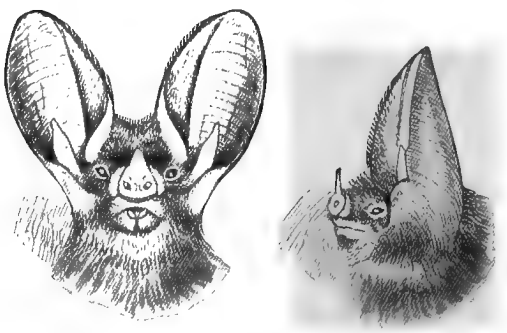
THE FAMILY OF LEAF–NOSED BATS

Phyllostomatidae

The members of this Family bear on their noses thin leaves of naked skin that stand erect behind, or partly around, the nostrils. These wonderful nose-leaves are pear-shaped, heart-shaped, wedge-like, and of many other forms. The ears are large, or very large; the wing membrane reaches

down to the foot; the tail is long, and sometimes extends a short distance beyond the interfemoral membrane. On the whole, the bats of this Family form an astonishing exhibit of facial oddities. All save a few species are confined to South America.

The California Leaf-Nosed Bat[1] may be taken as a very modest example, because it bears what is really a very simple form of nose-leaf. It is found in southern California and Mexico, and its pelage is very light-colored.



CALIFORNIA LEAF-NOSED BAT.
(After Harrison Allen.)

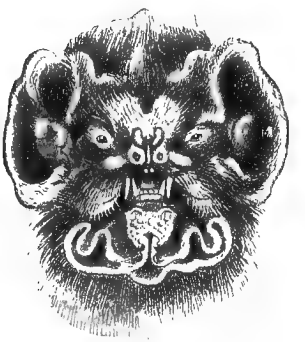
The most remarkable of all bat faces is that of a small, brown-colored West Indian species known as Blainville's Bat.[2] As a sport of Nature it stands fairly unrivalled, and shows what is possible in the fashioning of skin into ornamental forms. The ears are large and of most fantastic form, the chin is bedecked with a highly convoluted bib of skin, and the eyes and nostrils are almost lost amid the leaves and tubercles which cover the muzzle. As a whole, the appearance of the face of this bat suggests a highly complicated flower, like a double pansy. The skull is only five-eighths of an inch in length. This species is quite uncommon, and practically nothing is known of its habits.

[1] *O-top'ter-us cal-i-for'ni-cus.*

[2] *Mor'moops blain'vill-ii.*

In fashioning the noses and ears of bats, Nature has done some very odd and curious work. The flowers of orchids are not more oddly fashioned than the heads and faces of some species.

Let it not be supposed, however, that these queer facial appendages and long ears of the leaf-nosed bats are purely ornamental. Dr. George E. Dobson, one of the greatest authorities on bats, has pointed out two very curious facts. (1) The bats with small ears and *no nose-leaves* fly most in the early twilight; and many, such as the fruit-bats, fly in the day-time. (2) The long-eared and leaf-nosed bats prefer darkness, and seek their food only at night.



BLAINVILLE'S FLOWER-NOSED BAT.
(After Peters.)

Let us see if we can find a reason for this. A cruel investigator of the eighteenth century, named Spallanzani, once destroyed the eyesight of several bats, then suspended many silken threads from the ceiling of a room and liberated the creatures. Although totally blind, the bats flew to and fro between the threads, without once striking them, and were equally successful in avoiding branches of trees that were introduced. It now seems certain that some bats possess a sixth sense, of which at present we know nothing, by which they are able to fly in total darkness, and avoid even the smallest obstructions.

It seems quite probable that the long ears and nose-leaves of the night-going bats aid their owners in guiding their

flight; but the precise manner in which it is done remains to be discovered.

THE TRUE VAMPIRE BATS.—By this name we seek to distinguish the bats which actually suck the blood of living creatures from the so-called vampires which live on fruit. In South America there are five species of true vampires, three of which are known as the javelin bats, the others as the short-nosed vampires. The centre of abundance of these creatures appears to be the valleys of the Amazon and the Rio Negro, and the adjacent regions; but one of the species ranges all the way from Chile to Mexico.

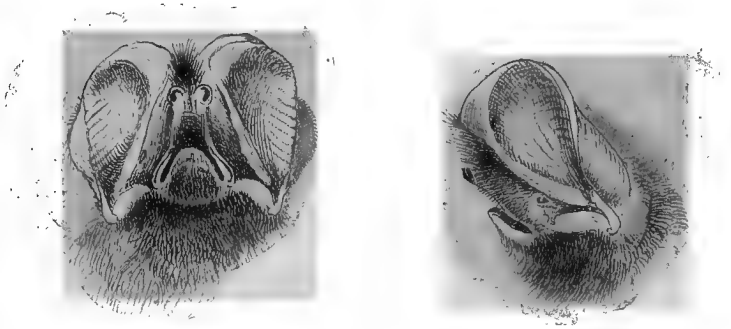
Of the true vampires, the JAVELIN BAT[1] is the one which is most aggressive, and most dreaded. It bites horses and cattle, usually on the shoulders, neck, or hind quarters, and makes a wound in the skin of sufficient depth to cause blood to flow freely, even after the bat has flown away. Naturally, an animal that is thus preyed upon soon grows thin in flesh, and becomes visibly weakened. On the island of Mucina, in the delta of the Amazon, the serious injuries inflicted by the Javelin Bats upon domestic animals have long been known.

But where true vampires are abundant, they do not confine their attacks to domestic animals. Human beings are occasionally called upon to pay blood tribute to the small wing-handed demons of the air. Men are bitten at night, when asleep, usually either upon the nose or the feet. With its sharp-edged teeth, the creature makes a very small round hole in the skin, and by means of mouth suction which must

[1] *Phyl-los'to-ma has-ta'tum.*

be quite powerful, the blood is soon flowing freely. Fortunately, blood-poisoning is not an attendant evil of the vampire's bite, and the wound seldom becomes painful.

The common Javelin Bat measures a little less than 4 inches in length of head and body, and in color is reddish brown. All the other true vampires are smaller, and all are



BONNETED BAT.
Promops californicus. (After Harrison Allen.)

practically tailless, the parachute membrane stretching between the legs, quite down to the feet, without the support of tail vertebrae. Naturally, these creatures are widely known; for any bat which lives upon warm blood, always drawn from a living fountain, is bound to acquire wide notoriety and a very evil reputation. The skull of a Javelin Bat, seen in profile, looks very much like the skull of a miniature wolf.

In order to illustrate once more how easily a harmless animal can acquire an evil reputation, and further emphasize the necessity of taking direct evidence before pronouncing a verdict, we introduce a 28-inch bat from South Amer-

ica, most unjustly called the GREAT VAMPIRE,[1] but not really belonging to the genus of bloodsuckers. Mr. H. W. Bates, the "Naturalist on the Amazon," lived for a time where this species was quite abundant, and of it he wrote in his book as follows:

"Nothing in animal physiognomy can be more hideous than the countenance of this creature when viewed from the front; the large, leathery ears standing out from the sides and top of the head; the erect, spear-shaped appendage [nose-leaf] on the tip of the nose, the grin, and the glistening black eye, all combining to make up a figure that reminds one of some mocking imp in a fable. [The very savage-looking canine teeth might well have been mentioned, also.] No wonder that imaginative people have inferred diabolical instincts on the part of so ugly an animal. The Vampire, however, is the most harmless of all bats." Mr. Bates opened the stomachs of a number of specimens, and found that "they had been feeding chiefly on fruits," and wild fruits, at that, obtained by honest hunting in the depths of the forest.

Moral: Never make an affidavit on the food habits of wild animals without first examining the stomachs of several specimens.

THE FAMILY OF FREE-TAILED BATS

Emballonuridae

The bats belonging to this Family have no nose-leaves, and the tail is partly free from the membrane between the legs, either rising from its upper surface, or projecting be-

[1] *Vam-py'rus spec'trum.*

yond its end. The muzzle is rather blunt, and the nostrils open beyond the upper lip.

THE BONNETED BAT,[1] of California and Mexico, is one of the largest of our species of free-tailed bats. Above the shoulders it looks like a rat wearing a poke bonnet. Its head-and-body length is 2¾ inches, tail 1¼, total length of ear, 1⅝ inches. One-half the tail is free.

THE NAKED BAT,[2] of Borneo, Java, and Sumatra, is one of the most remarkable species of the entire Order of Bats, and in some respects is the widest departure from the typical bat. In the interior mountains of Sarawak, Borneo, I once secured ten fine specimens, and to me they are as wonderful to-day as when handled for the first time.

As its name implies, this bat is practically destitute of hair, the only hair noticeable being a few stiff, black bristles on the neck, and a little microscopic fuzz on the breast and hind quarters. The skin is thick and leathery, lying in numerous creases and folds, and on the living animal it is very elastic. There is no nose-leaf, and the lips are very thick and fleshy. The tail is free of parachute membrane for two-thirds of its length, and is quite like the tail of a mole. On the joint at the base of the thumb there is a large, callous tubercle, which indicates that this bat is much given to crawling about on "all fours," on rocks and tree-trunks.

Around the neck the skin lies in two thick folds, and in these, directly under the chin, is situated a deep gland or sac which secretes a gummy substance with an odor both

[1] *Pro'mops cal-i-for'ni-cus.* [2] *Chei-ro-me'les tor-qua'tus.*

strong and disagreeable. Clearly, like the scent-gland of the skunk, it is for defence.

The most wonderful feature of the Naked Bat is yet to be noticed. On seeing this species for the first time, one's first thought is, how do the young bats cling to the parents during flight?

Nature, ever wise and provident, has answered this question by placing under each arm of this bat *a deep, wide pocket of rubber-like skin, in which the young are carried until they are able to fly!* The mouth of this pocket is on a line between the elbow and the knee, and it extends upward and backward, over the entire shoulder, quite to the back-bone, where the two sacs are separated by a thin partition of skin. The pouch is 1¾ inches deep, and in its lower portion, against the ribs, is located the mammary gland. On the whole, this is the most wonderful infant-pouch possessed by any living creature, not even excepting that of the marsupials, which is much more simple.

My largest specimen of this bat had a head-and-body length of 5½ inches, tail 2 inches long, and a wing expanse of 22 inches. In the skin were many curious folds. The face of the Naked Bat is coarse and ugly, and the body is quite devoid of grace and beauty; but ere one has time to scoff at such homeliness, the creature seems to say,—"Study me; for I am fearfully and wonderfully made!"

This bat lives upon fruit and vegetation, and nests in hollow trees, rock crevices, or in holes in the earth. The illustration on page 157 was drawn from one of my Bornean specimens.

THE FAMILY OF COMMON BATS

Vespertilionidae

These are the bats that are the most numerous and the most widely known. Dr. E. L. Trouessart recognizes more than 200 species. They range over all portions of the world that are habitable by small bats.

The distinguishing characteristics of the members of this Family are chiefly negative. There are no nose-leaves, the nostril openings are simple, and the tail does not extend far beyond the interfemoral membrane.

All the bats of the United States are of small or medium size, and the majority of them belong to this Family. Along the Atlantic coast they are so common that nearly every person living beyond the confines of the great cities is personally acquainted with at least one species. The commonest is the beautiful little RED BAT[1] which appears in the early twilight, gliding on swift yet noiseless wings up and down the shaded streets and roads, and occasionally making a friendly diversion into an open window, or through your veranda, partly for business purposes, and partly as an evidence of friendly regard.

In midsummer sharp eyes sometimes find this bat hanging close in amongst the leaves of a chestnut-tree, its delicate fur as red as the brightest iron-rust. Touch it ever so gently and whisk! it is off as swiftly as a swallow, to seek another and a better hiding-place.

From sunset until it grows quite dark, it is very busy,

[1] *Las-i-u'rus bo-re-al'is.*

and constantly on the wing. The Red Bat is a swift flier, and much more of an aerial gymnast than any bird I know. In its flight it can turn abruptly with marvellous precision, and to me it is a constant source of wonder that it can fly so

THE RED BAT.

rapidly, turn and double so quickly, and dart in all possible directions without striking something. Almost any bird attempting to fly over the course of a Red Bat, and at the same speed, would probably come to grief in a very short time.

The only mistake that Red Bats are prone to make is in flying into houses through open windows, and instantly forgetting the location of the means of escape. Once in a room,

the bat flies slowly, and frequently is so bewildered by the sudden change from semidarkness to light that it strikes a wall, and falls to the floor. Although many persons are nervous about bats, I have noticed that whenever one flies in, some kind-hearted and sensible person generally cries out: "Don't kill it!"

While crossing the Atlantic quite recently, a British LONG-EARED BAT was found on board the steamer, thirty miles from the nearest land, clinging to the rail, wet and weary. At that time there was no breeze from the land.

When taken into the library, its wet fur soon dried, and it began to fly to and fro. In a short time the room was well filled with passengers, who watched the exhibition with great interest. When caught and held for close examination, it did not squeak shrilly and protest as the Red Bat usually does. After having served as a useful object-lesson for a large number of young people, our strange visitor was brought safely to New York harbor and liberated.

THE GRAY BAT[1] is one of the largest and handsomest species inhabiting the northeastern United States and Canada. It is also found throughout the middle West from Ohio to California and from Manitoba to New Mexico. This is a species well worth looking for. It has small ears, a head-and-body length of 3 inches, tail 2 inches, and it is readily distinguished by its dark-brown hair tipped with silvery white.

THE BIG-EARED BAT[2] of the south Atlantic states has ears of incredible height and width for a creature so small. In comparison with the size of the wearer, these ears are the

[1] *At-a-la'pha cin'e-re-a.*

[2] *Co-ry-no-rhi'nus ma-cro'tis.*

largest worn by any American mammal. They are one-half as long as the entire head and body, being 1¼ inches in height and nearly 1 inch wide, while the head and body measure only 2½ inches.

THE FAMILY OF FALSE VAMPIRES
Megadermatidae

This Family is absent from America, but is mentioned here to fill what otherwise would be a gap. The members of one genus, *Megaderina*, are noted for their carnivorous habits. The most noteworthy species is well worthy of mention.

THE "FALSE" VAMPIRE BAT, of India and Burma, bears a name which is quite misleading; for in its habits this creature is far from being a "false" Vampire. It devours frogs, small fishes, bats smaller than itself, and even small birds. It has very large ears, an elaborate nose-leaf, a head-and-body length of 3 inches, and a wing expanse of 16 inches.

THE FAMILY OF HORSESHOE BATS
Rhinolophidae

This Family contains thirty species of small bats, all of which are restricted to the Old World.

THE FAMILY OF FRUIT-EATING BATS
Pteropodidae

The members of this Family are bats of very large size, with foxlike heads, dense and abundant pelage, large eyes, and free tails when tails are present. They are quite diurnal

FRUIT-EATING BATS, OR FLYING "FOXES."

in their habits, and feed almost exclusively upon fruit. They inhabit India, Ceylon, the Malay Archipelago, and eastern Australia, and are almost the only bats that find their way into captivity for exhibition purposes. They are very sociable in their habits, and live in colonies of from five to fifty individuals.

THE FLYING "FOX."[1]—The largest of the bats which we ordinarily see darting through the gloaming with irregular, jerky flight, are about as large as purple martins—tiny creatures, weak, and quite incapable of offence. In the East Indies, however, and also in Australia, there are bats of enormous size. These are known as FRUIT BATS, or FLYING "FOXES." Some of those shot by the author in Ceylon had wings which spread forty inches.

On one occasion I found the top of a small tree, about fifty feet high, filled with these animals. They hung head downward from the upper branches, in places so thickly as to crowd each other—quarrelling, squealing shrilly, and climbing about. To see nearly a hundred bats of such huge size hanging in one tree-top, quite at home in the broad glare of a tropical afternoon sun, was a strange and impressive sight. I had been asked to procure and preserve for American museums six dozen specimens of that species, and when after long observation I finally fired into the bunch, the black and brown cloud of giant bats that rose in the air, and slowly flapped away, was one of the most gruesome sights I ever saw in animal life. Of all creatures that fly, none are so thoroughly uncanny when outlined against the sky as the big,

[1] *Pter'o-pus ed'wards-i.*

black-winged, half-naked Flying "Foxes." They suggest demons and calamities.

The Flying "Fox" derives its name from the resemblance of its head to that of a very small fox. It feeds wholly upon fruit, and when it inhabits well-settled districts it is cordially disliked by every person who owns a fruit-tree. In some portions of Australia, these creatures have done great damage to fruit, and energetic measures, such as the explosion of dynamite among them, have been resorted to for their destruction.

HAMMER-HEADED BAT.
(After Joseph Wolf.)

Some of the fruit-growers of California are so apprehensive of this creature, and so fearful that it may be "introduced," that they have secured the passage of a law by which the importation of the Flying "Fox" is prohibited so rigidly that not one specimen can be imported, even for exhibition in a zoological garden. As a matter of fact, this fear of the presence of the Flying "Fox" in the United States is quite as groundless as the old fear of being quill-shot by Canada porcupines. It certainly would be very difficult to introduce that species, and keep it from being exterminated, except possibly in some of our insular possessions.

In the Flying-"Fox" Family is found another remarkable variation in bat physiognomy, the HAMMER-HEADED BAT,[1] a species discovered in the land of the gorilla by Du Chaillu.

[1] *Ep-o-moph'o-rus.*

The head of the animal is of large proportions as compared with the body, and the muzzle is enormously enlarged. In general outline, the head in profile is much like the head of a moose. This is quite a large bat, its wing expanse being 28 inches.

CHAPTER VII

ORDER OF GNAWING ANIMALS

GLIRES, OR RODENTS

THE Order of Gnawing Animals contains a great many species, and to persons who have not studied it with some attention, it is a chaotic jumble of living creatures. This unsatisfactory condition is entirely unnecessary. A few hours' diligent study—under helpful conditions—will give any intelligent person a fair knowledge of the chief subdivisions of this Order, and an acquaintance with a sufficient number of examples that each strange North American rodent met with can be referred to its proper Family.

The list of families, and the number of species recognized in each by Dr. D. G. Elliot on July 1, 1905, is shown below. Since the date mentioned, a few additional forms have been described.

ORDER GLIRES, OR RODENTIA

(NORTH OF PANAMA)

	NORTH AMERICAN FAMILIES		FULL SPECIES IN 1905	SUBSPECIES IN 1905
I.	SQUIRREL FAMILY	*Sci-u'ri-dae*	125	124
II.	SEWELLEL FAMILY	*Ap-lo-don'ti-dae*	4	2
III.	BEAVER FAMILY	*Cas-tor'i-dae*	1	3
IV.	RATS, MICE AND VOLES	*Mu'ri-dae*	383	180
V.	POCKET GOPHERS	*Ge-o-my'i-dae*	84	24
VI.	KANGAROO RATS	*Het-e-ro-my'i-dae*	93	57
VII.	JUMPING MICE	*Za-pod'i-dae*	11	9

NORTH AMERICAN FAMILIES			FULL SPECIES IN 1905	SUBSPECIES IN 1905
VIII.	SPINY RATS AND HUTIAS	*Oc-to-don'ti-dae*	12	3
IX.	PORCUPINE FAMILY	*E-reth-i-zont'i-dae*	6	5
X.	AGOUTI FAMILY	*A-gou'ti-dae*	8	0
XI.	PIKA or "CHIEF HARE" FAMILY	*O-cho-ton'i-dae*	7	0
XII.	HARE AND RABBIT FAMILY	*Le-por'i-dae*	50	46
			784	453

THE SQUIRREL FAMILY

In order to avoid recognizing a large number of Families for animals that are closely related, zoologists have agreed that the Squirrel Family shall contain the marmots and a number of other animals that are closely related to squirrels. To make this point clear, observe this diagram:

SQUIRREL FAMILY
(IN AMERICA)

TRUE SQUIRRELS	Tree Squirrels	*Sciurus.*
	Rock Squirrels	*Tamias*, etc.
	Ground Squirrels	*Citellus.*
MARMOTS	Prairie-"Dogs"	*Cynomys.*
	Woodchucks	*Marmota.*
FLYING SQUIRRELS		*Sciuropterus.*

All these creatures appeal strongly to persons who live in the country, or visit city parks. Go anywhere in the temperate zone, and you will find some of them, ready to greet you, and make friends with you if you choose. You have but to use your eyes, and you will see them. In the East you have the gray squirrel and chipmunk; in the Mississippi Valley the fox squirrel; on the Great Plains the ground squirrels and prairie-"dogs"; in the West the Douglas squir-

rel, and a bewildering array of chipmunks and ground squirrels. He who fails to learn their names, and make friends with them, loses much pleasure.

The members of the Squirrel Family are so widely distributed, and have grown so accustomed to man and his

GRAY SQUIRREL.

ways, that there are few persons who have not seen at least two or three wild species in their haunts. Their lives are full of incident and interest, and to the young naturalist, animal artist or sculptor they are usually the most available of all wild-animal subjects.

A very attractive book might be written about the many beautiful and interesting species of squirrels that are found throughout North America, the number of which is surprisingly great. The total number of species and subspecies described is 249. Many of these, however, resemble each other so closely that their differences are too slight for our

consideration; and there may be a number that are not entitled to stand as independent forms.

Nature has divided the many species of North American squirrels into three easily remembered groups, as follows:

TREE SQUIRRELS, which live in the tree-tops. Example: Eastern Gray Squirrel.

ROCK SQUIRRELS, which live in rocks, fences, and among the roots of large trees. Example: the Common Chipmunk.

GROUND SQUIRRELS, of prairie countries, which burrow deeply in the earth. Example: the Striped Spermophile.

In each of these three groups there are several important types which must be noticed.

The Tree-Squirrel Group

A patch of timber or a wood-lot without squirrels always conveys an impression of lonesome solitude and something gone—like a country graveyard. There is no other animal of equal size that can add so much of life and cheerfulness to a hardwood forest or a meadow as a good healthy squirrel. *Why is it* that American men and boys kill them so eagerly? Surely the flesh of their little bodies is not needed as food. It has a taste so queer and rank that to many persons it is decidedly unpalatable. Americans are the only white men on earth who eat squirrels. An Englishman would as readily eat a rat!

Possibly their flesh was necessary to the hardy but hungry pioneers of the early days; but to-day we have no excuse for shooting any squirrels, save the quarrelsome red squirrel. Surely no true sportsman or right-minded boy

can find any real "sport" in "potting" squirrels out of the tree-tops.

Take the common gray squirrel, for example. It is one of the most beautiful and graceful of our native mammals. It is practically harmless, and *as soon as it learns that it is protected, it becomes so tame as to be a delightful companion on the farm.* Thousands of American farmers would fight, were it necessary, to save their squirrels from slaughter. Except the red squirrel, all tree squirrels should be protected, both by public sentiment and by law.

Excepting the chickarees, the squirrels which live in the tree-tops are considerably larger than those of other groups, and their tails are much longer. Their characteristic colors are gray, rusty brown, yellow, and black, and as a rule they are devoid of spots or stripes. They are very strong and active climbers, and keen of eye and ear.

The Gray Squirrel[1] is chosen as the leading type because it represents an average size, the most frequent color, and is widely distributed. This is the most prominent squirrel of southern Canada, New England, and the eastern and southern states, southward to Florida. It ranges westward to Minnesota, Kansas, and Texas. Above, its color is clean iron-gray, which in Southern specimens is mixed with dull yellow. The lower surface is white, varying to yellowish brown. Usually it nests in hollow trees, but when crowded for room builds an open nest of green leaves, or strippings of cedar bark made into a round ball. The young are usually five in number.

[1] *Sci-u'rus car-o-li-nen'sis.*

The Gray Squirrel frequently consents to live in city parks, and becomes quite tame. It spends much of its time upon the ground, searching for nuts, roots, or any-

SOUTHERN FOX SQUIRREL.

thing which can be eaten. A very large specimen measures 9½+8½ inches. Northern specimens are larger and have longer and finer fur than those of the southern states.

THE CALIFORNIA GRAY SQUIRREL[1] is the Pacific coast counterpart of the Eastern gray squirrel, except that it is larger, and its colors are brighter. Its color above is bluish gray and black, and underneath it is pure white. It is the largest squirrel in the far West, its maximum length being 12+10 inches. Its home extends from the state of Washington to southern California, and it is in every way a worthy product of that fertile and healthful region.

THE FOX SQUIRRELS.—We have now reached two important species, to which the reader must give close attention in order to avoid confusing them with each other, and with the gray squirrel. The Southern species will be presented first, because it has two points by which it can be recognized at a glance.

THE SOUTHERN FOX SQUIRREL[2] is the only squirrel in America which has a *pure white nose* and *white ears*. No matter how much the remainder of the animal may vary in color from the standard, in adult specimens the white nose and ears are constant. Typical specimens of this species are colored as follows: top of head, black; upper surface, blackish brown; lower surface, lighter brown; tail, dark brown, margined with black.

Variations occur, of every shade from the above to jet black all over the body, head, and tail; but the ears and nose still are white.

This animal measures 13+12 inches. Its home is east of the Alleghanies from Virginia to Florida, and westward along the Gulf coast to Louisiana. On the map its range

[1] *Sci-u'rus gris'e-us.* [2] *Sci-u'rus ni'ger.*

looks like an arm bent around the range of the next species.

THE NORTHERN FOX SQUIRREL[1], or CAT SQUIRREL, is smaller than the Southern species (12+11 inches), but very much like it in color, save that its nose and ears *never* are *white*. The standard color is rusty-brown, washed with black on the upper surface, and bright brown underneath.

VARIATIONS.—This squirrel is the most variable in color of all our species, and in fifty specimens it may be difficult, or even impossible, to find two exactly alike. Often it has a beautiful gray coat, and looks like a genuine gray squirrel with a brown back and head. Often it is dark gray above, and black on the legs and under-surface,—a strange combination of colors,—and occasionally a pure-white specimen is found.

This species inhabits the Mississippi Valley from the Alleghanies to Arkansas, western Iowa, and northward to Michigan and New York. In captivity it seems to be more hardy in winter than the gray squirrel. In the New York Zoological Park it blithely runs about in the snow when the latter takes pains to avoid it. Often the Northern Fox Squirrel will be out when none of the other occupants of the rodents' cages are visible. It seems to me, however, that the Fox Squirrels are not as nimble on foot, or as active and daring in the tree-tops, as the gray squirrels.

THE RED SQUIRREL, or CHICKAREE,[2] represents a large group of species containing the smaller of the tree squirrels. Its length is 7⅝+5½ inches, weight 7½ ounces. What it

[1] *Sci-u'rus lu-do-vi-ci-an'us.* [2] *Sci-u'rus hud-son'i-cus.*

lacks in size it makes up in courage and activity. In New York and New England it often drives all the gray squirrels out of any grove which they have undertaken to inhabit as tenants in common. Many observers believe the habits of the Red Squirrel to be so bad that the species deserves to be exterminated; but to this we are not prepared to agree. The complete destruction of any species of mammal or bird is a doubtful experiment, and never should be entered upon without most careful investigation.

In its normal colors, this little animal is readily recognized by its brown upper surface and outer surface of its legs, and its white under-parts. It must be remembered, however, that it undergoes important seasonal changes in pelage,—from winter coat to summer coat, and the reverse,—and sometimes its standard colors are greatly changed.

Its legs are long and thin in proportion to the size of its body, and its form is not as graceful as that of the gray or fox squirrels. It is readily recognized by its markings, and the fact that it is the smallest of our northern tree squirrels.

Three species and eighteen subspecies of Red Squirrels are recognized, and their combined ranges cover about two-thirds of North America, from Alaska and Labrador to North Carolina and southern Arizona.

In California and Oregon this group is represented by the sprightly and interesting DOUGLAS SQUIRREL,[1] showing a mixture of colors,—dark gray, yellowish, and black. This is the most familiar squirrel of the great coast forests, in which it uses the sides of the giant spruces and redwoods as play-

[1] *Sci-u'rus doug'las-i.*

grounds. In Colorado and Utah occurs the third full species, known as FREMONT'S SQUIRREL,[1] which is colored gray, yellowish brown, and white, much mixed.

Of the forty-three species and races of squirrels inhabiting Mexico and Central America, the most conspicuous is

EASTERN RED SQUIRREL.

the RED-BELLIED SQUIRREL.[2] Its upper surface is pale grizzled-gray, and its under-parts bright rusty-red. It inhabits the forests of eastern Mexico, ascending the high mountains to an elevation of 8,000 feet.

The *largest squirrel* in the world is the great MALABAR SQUIRREL[3] of southwestern India, which is yellowish brown above, reddish brown or black below, and measures, head and body, 17 inches, tail, 14½ inches, and it weighs 4½ pounds.

[1] *Sci-u'rus fre-mont'i.*
[2] *Sci-u'rus ery-thro-gas'ter.*
[3] *Sci-u'rus mal-a-bar'i-cus.*

The *most beautiful* squirrel in the world is PREVOST'S SQUIRREL[1] of the Malay Peninsula, a species about the size of a small gray squirrel. Its colors form a beautiful pattern of gray, brown, black, white, and buff.

Rock Squirrels, or Chipmunks

Next below the tree squirrels comes a large group of small squirrels which live on the ground, preferably amongst rocks, in which they find refuge from their enemies. In the absence of rocks, they live along fences, where any exist; but their favorite nesting places are in hollow trees which can be entered directly from the ground.

These little creatures are about one-third the size of large tree squirrels, and inasmuch as their small size renders them secure from the deadly attentions of man, they have become the most tame and confiding of all the wild mammals of civilization. They are graceful in form, beautiful in color markings, and exceedingly pert and quick in their movements. When fully protected, as they are in some public parks, they become so tame and confiding that they dart about on the walks in search of food, and often allow persons to pass within three feet of them.

For convenience and clearness, we shall designate all the chipmunks as ROCK SQUIRRELS, because of their well-known preference for rocks, whenever any are available. It is a mistake to call these animals "ground squirrels." That name does not properly apply to them, but belongs to the next group.

[1] *Sci-u'rus pre-vost'i.*

THE EASTERN CHIPMUNK[1] is widely known, and will serve admirably as the key to the group. When you walk in the country, almost anywhere in the eastern states, this pretty little creature darts in front of you like a flash of brown

EASTERN CHIPMUNK.

light, and says "Chip, chip, chip, chip!" most gleefully. If you stop to observe him, he pauses and looks at you very intently, wide-eyed and with ears erect, and, save for the quick heaving of his tiny sides, remains as motionless as a stuffed squirrel.

To him every fence is a fortress. Whether it be of stone

[1] *Tam'i-as stri-a'tus.*

or wood, the Chipmunk knows its best runs when danger threatens, and carries in his active little brain a complete check-list of burrows and hiding-places. When pursued by dog, boy, or wild animal, he darts swiftly along the top or the lower rails of his stockade, until he reaches a satisfactory hiding-place, when a flash of brown fur shoots into it, and he is seen no more.

When hard pressed, Chipmunks frequently climb tree-trunks up to the lower branches, but such situations are very dangerous for them, because they are so seriously exposed to attack. Next to the birds of prey, the weasel, mink and fox are their worst enemies. The weasel is the worst of all, because it follows them into the remotest recesses of their burrows, and kills every inhabitant without mercy.

Although the Chipmunk burrows in the ground below the frost line, and has roomy cheek-pouches in which it carries astonishingly large quantities of grain and small nuts, it is more nearly related to the tree squirrels than to the true ground squirrels. In the autumn it stores in its burrow a quantity of grain or nuts, whichever is most abundant,—a habit which has suggested its generic name, *Tamias*, meaning a steward. It does not become dormant, but on the warm, sunny days of winter, when the rocks are free from snow, it hastens above ground to enjoy the light and warmth.

The length of an Eastern Chipmunk is 6½+4½ inches. Its ground-color is bright reddish brown above, light underneath, and along each side runs a conspicuous yellow-brown stripe between two black stripes. A black stripe runs from the head backward along the centre of the back, almost to

the tail. The home of this animal extends from southern Canada and New York to Georgia and Louisiana, and westward to Iowa.

There are eighteen full species of Chipmunks, several of which are very much alike, distributed throughout nearly the whole of the United States. The greater number are marked by two or more black lines extending along the side, frequently alternating with lines of a yellowish-gray color.

It is impossible to mention even the majority of these species without risk of confusing the reader, but it is desirable to note a few important and strongly marked types inhabiting widely separated localities in the United States.

THE CALIFORNIA CHIPMUNK[1] is a merry-hearted little elf, particularly pert and beautiful. Its high, sharp-pointed ears and harlequin stripes of white give it a very roguish and saucy look. To judge by the lively actions of this little creature, it seems to regard life as a long play-spell. There are many in the Zoological Park, and in some respects they are the most satisfactory of all our burrowing rodents. Only the severest weather drives them into their burrows, and in the dead of winter, when a thick blanket of snow keeps all other animals of the Burrowing Rodents' Quarters snug under ground, the first hour of clear sunshine will see half a dozen of the California Chipmunks above ground, and sunning themselves on their logs. Having an abundance of room, they enjoy their life in the Park, and are much interested in visitors who notice them.

This species could easily and safely be introduced in any

[1] *Eu'tam-i-as spe-ci-o'sus.*

region suitable for it. Its home is in the San Bernardino and San Jacinto Mountains, California, but the limits of its range are yet to be defined. It is one of the smallest species of its genus, its total length being 6 + 3 inches.

Photo. by E. D. Warren.

SAY'S SPERMOPHILE. (*Callospermophilus lateralis.*)

WESTERN CHIPMUNK. (*Eutamias quadrivittatus.*)

The Antelope Squirrel[1] is readily recognized by the broad and conspicuous band of white, which extends along the middle of the side, and its pale-buff color. It has the pale colors of a desert animal. It is found in the desert regions of the Southwest from western Texas to southern California, and northward to Nevada and Utah.

It is larger than the Eastern species, and is strikingly different in appearance from all other chipmunks.

[1] *Am-mo-sper-moph'i-lus leu-cu'rus.*

Ground Squirrels

We have now reached a large group of burrowing squirrels which to the farmers west of the Mississippi are of very serious importance, on account of the grain they destroy. All these animals may be known under the name of Sper'mophiles. The word Spermophile means "seed-lover"; and as this very appropriate general term implies, the animals which bear it feed chiefly upon seeds or grain.

No ground squirrel, or spermophile, ever should be called a "gopher," as is frequently done in the Dakotas and Minnesota. The latter name should be reserved for the clumsy, burrowing pocket gophers, of the genera *Geomys* and *Thomomys*.

Ground squirrels live by preference on prairies, and burrow deeply in the ground. They seldom frequent rocks, and seldom climb trees. They are essentially dwellers in open country, where they can range freely, and behold a goodly portion of the world about them. Even fields of standing grain are distasteful to them, and they move to the open country around their borders.

Of spermophiles north of Mexico there are thirty-one full species and forty-two subspecies, or races. Going westward, they are first found in western Indiana and Michigan, from which they spread northwest and southwest, throughout the whole western half of the United States, save the timbered areas. They also range into Mexico, Canada, and Alaska. They are at home on the rich, rolling prairies of the Dakotas, the level, floor-like plains of Nebraska, the alkali flats of

Utah, the hot deserts of Arizona and the dry valleys and mountain regions of California. They seem to be most numerous in California and the Dakotas, where they do much damage to crops.

All the ground squirrels have cheek-pouches, dig deep burrows (unless the earth is too rocky), store quantities of grain in the autumn for winter food, and in cold latitudes live all winter in their burrows. If forced to do so, they will live amongst rocks, and it is surprising to note how they can live in situations both high and low, dry and wet. Their favorite food is grain, seeds of every description, green grass, and hay, and their worst habit is digging up seed grain.

Some species eat quantities of destructive insects, such as grasshoppers, beetles, cut-worms and crickets, and in this way partly compensate the farmer for the grain they devour. In fact, from all observations made thus far it seems that in the insect season, insects form a considerable proportion of the daily food supply of these industrious little animals. Not only do they eat all kinds of ground insects, but they also devour mice and almost any other flesh that comes within their reach, particularly dry meat adhering to the bones of large animals which have died near their holes.

Ground squirrels are prolific, and bring forth from seven to ten young in each litter. Their enemies are coyotes, foxes, badgers, skunks, hawks, and owls.

The spermophiles of North America are so wide-spread, so numerous and so important that it is necessary that two or three of the leading species should be specially noticed.

THE THIRTEEN-LINED, or LEOPARD SPERMOPHILE,[1] is the most familiar and widely distributed species, and although one of the smallest, it is also the most strangely marked. Nature was in a sportive mood when she decorated the back and sides of this little creature with seven broad stripes of dark brown, then laid between them six narrow stripes of pale yellow, and finally marked each of the seven brown stripes with a row of large, pale-yellow spots. The yellow spots on the brown lines are the first feature of the color scheme to catch the eye, and they distinguish this animal almost as far as it can be seen. Its under-parts are pale yellow, and its size is $6\frac{1}{2}+3\frac{1}{2}$ inches.

THIRTEEN-LINED SPERMOPHILE.

Do not call this animal the "Striped" Spermophile, because that name would apply to several other species, and be worthless; and do not call it the "Striped Gopher," because it is not a "gopher" *of any kind.*

The Thirteen-Lined Spermophile inhabits about one-third of the United States, extending from Fort Wayne, Indiana, southwestward to Fort Worth, Texas, and northwestward to the plains of the Saskatchewan. Its western limit is the Rocky Mountains, but nowhere does it live in timbered regions, being strictly a prairie animal.

Its burrow is a hole about two inches in diameter, which

[1] *Ci-tel'lus tri-de'cem-lin-e-a'tus.*

descends quite steeply into the earth until it passes below the frost-line (two to three feet), after which it runs off in a more or less horizontal course for ten or fifteen feet farther. If the burrow is an old one and much used, it is a long and difficult task to dig to the end of it, and few boys undertake it more than once.

As in the case of nearly all burrowing rodents of cold latitudes, nature has so adjusted the life of this animal that it survives the long and dreary winter in the strange, half-dead condition called *hibernation*. To make this possible, the young are born early in the year and mature early, and during summer and autumn take on a great quantity of fat. At the approach of winter, it curls up in its burrow for a sleep of from three to four months' duration.

By the investigations of Dr. P. R. Hoy, it has been discovered that in the case of the Thirteen-Lined Spermophile, the action of the heart is reduced from two hundred to only four feeble beats per minute, the temperature is reduced from 105° to 58°, and there is no visible breathing. The circulation of the blood was so feeble that when a limb was amputated, only a few drops of blood slowly oozed from the wound, while the nerves showed no sensitiveness. In fact, the animal was in a condition of suspended animation, as if under the influence of chloroform. In the northern portions of its range, this spermophile hibernates from about November 20 to April 1.

FRANKLIN'S SPERMOPHILE[1] looks very much like a slender-bodied, short-tailed tree squirrel; and very often it is called

[1] *Ci-tel'lus frank'lin-i.*

the *Gray Ground Squirrel.* It should *not*, however, be called the *Gray Gopher*, or *Scrub Gopher*, for both these names are erroneous. It is best to call each animal by a name peculiarly its own, even though the beginning of correct naming involves a little trouble.

On an open prairie, especially in spring when the young grass is short, this spermophile is a conspicuous animal, and strongly resembles the gray squirrel of the East. Its upper surface is of a yellowish-gray color marked with fine, wavy, crosswise lines of black or brown. Its under surface is distinctly gray, and its hair is coarse and stiff. In size it is about 9+5 inches. Its home is the central portion of the range of the thirteen-lined spermophile. The western limit follows the eastern boundary of the arid plains northward from southeastern Kansas to the Saskatchewan, Alberta, and thence southeastward to southern Wisconsin, eastern Illinois, and northern Missouri.

Whenever numerous in farming regions, these animals are very troublesome, not only in destroying grain in the ground and in the stack, but also in destroying young chickens. They are very venturesome in locating permanently near farmhouses and barns, and sometimes they are very destructive in gardens. As an offset to the valuable farm products destroyed by these creatures, Franklin's Spermophile destroys great numbers of noxious insects, such as grasshoppers, caterpillars, beetles and also field mice. In the United States Department of Agriculture, twenty-nine stomachs were examined with the following result: animal matter present, 30.3 per cent.; vegetable, 68.5 per cent.; and undetermined, 1.2 per

cent. Out of the whole twenty-nine stomachs examined, twenty-six contained the remains of insects! Thus the grain consumed by this animal is at least partially paid for by the destruction of insects that prey upon crops; but farmers everywhere are diligent in destroying it with poisoned wheat placed in its burrow.

Richardson's Spermophile,[1] of northern Montana, North Dakota and the region immediately northward as far as the Saskatchewan, has a short body, short legs, and a short tail, and looks very much like a thin prairie-"dog." In color it is like the preceding species, except that its tail is darker; but in size it is a trifle smaller (9+3 inches). Its habits are practically identical with those of Franklin's Spermophile, but if there is any difference, it is more destructive to grain than is the latter, and consumes less insect food. It is fortunate that this species inhabits so small an area of the wheat country of the Northwest.

RICHARDSON'S SPERMOPHILE.

Marmots

The group of marmots consists of burrowing rodents which in structure are quite squirrel-like, but are distinguished by their large size and general heaviness of body. As befits their portliness of form, they are not active and lively, like

[1] *Ci-tel'lus rich'ard-son-i.*

squirrels, but live quietly and unobtrusively. By reason of the good sense they manifest in keeping out of mischief, some of them are tolerated in farming communities when more aggressive rodents would be exterminated.

The woodchuck is our most perfect type of marmot, from which the prairie-"dog," or prairie marmot, is slightly removed by the possession of a large and perfect fifth claw. It is desirable, however, that the latter should be included in the group of marmots.

The Prairie-"Dogs"

THE PRAIRIE-"DOG"[1] is a plump and sociable little rodent, not a carnivore,—well known to every dweller in the plains region of the great West, and to every transcontinental traveller. His explosive, yapping cry is the most cheerful sound of the western plains. He hates solitude, and always lives in colonies of from 40 to 1,000 individuals. Unlike most other burrowing rodents, the darkness and silence of a burrow easily pall upon his vivacious nature; therefore he spends the greater portion of his waking hours above ground, visiting his neighbors, and observing what goes on in his small world.

When no enemies are in sight, he and his fellow-townsmen roam about for short distances from their homes, and feed upon grass blades and stems. At the approach of an enemy,—man, coyote, badger, fox, gray wolf, eagle, or hawk, —the sentry cries out sharply, "*Skip! Skip! Skip!*"

Instantly every "Dog" halts, motionless and alert. If the sentry again cries "Skip!" each "Dog" scurries to his

[1] *Cy-no'mys lu-do-vi-ci-an'us.*

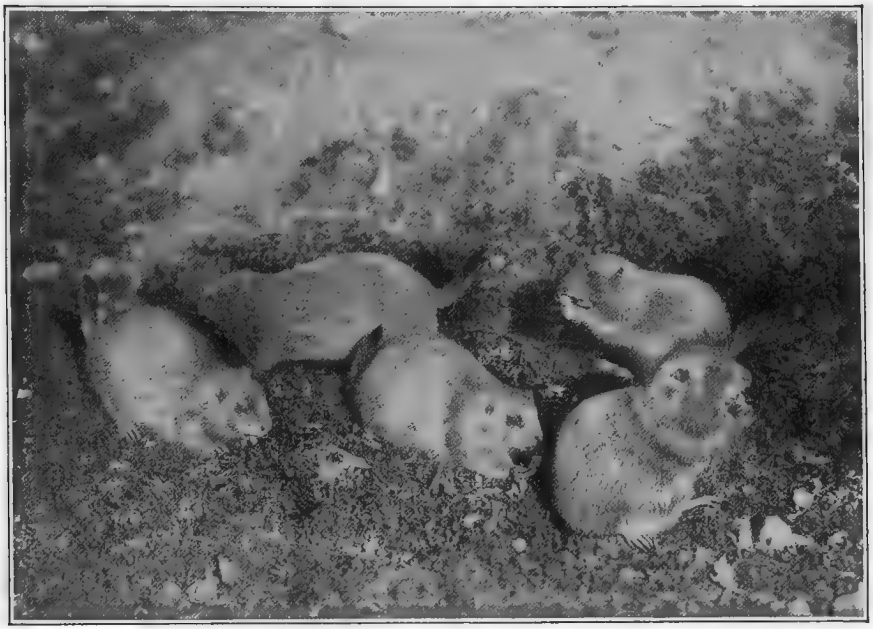
hole and poises himself over its wide mouth, in readiness for a dive to subterranean safety. If the danger approaches quite near, the alarm cry resounds shrilly from all sides, stubby tails jerk nervously as if worked by wires, and down goes every Prairie-"Dog."

Just how far down the burrows go, it is difficult to say, for they probably vary greatly in depth. The mouth of a burrow is a miniature model of a volcano,—a conical mound of bare earth, a foot high and three or four feet in diameter, with a four-inch crater in the centre, going down at a slight angle. The crater prevents water from running into the burrow.

In making a crater the "Dogs" press the earth into shape on the inside with their noses. Once when an inmate of the Prairie-"Dog" village in the New York Zoological Park incurred the hostility of four of his mates, they drove him into his burrow, filled up the mouth of it with moist earth, and with their noses tamped it down quite hard, the prisoner scolding vigorously meanwhile.

Prairie-"Dogs" are easily introduced into almost any open country where the ground is dry, but they are very difficult to exterminate. Under fair conditions they breed readily in captivity, and usually produce four young at a birth. In 1899, a free colony was established in the New York Zoological Park, in the Antelope Range, where it existed for two years, and its saucy members attracted far more attention than those confined in the fenced village. Knowing that guns and dogs are not allowed in the park, they often permitted visitors to pass within six feet of them. But it proved impossible to

keep those industrious diggers from spreading far beyond the limits fixed for them and seriously damaging walks and lawns, so they were finally caught by placing sand in boxes over their



PRAIRIE-"DOGS."

burrows, and transferred to the village, whose walls of solid masonry go down to bed-rock.

Some plainsmen claim that these interesting little creatures are able to locate their towns away from streams because they burrow down until they strike water, but Dr. Merriam points out the fact that in some regions they live where the nearest veins of artesian-well water are 1,000 feet below the surface. As a matter of fact *they can live without drinking.*

The Prairie-"Dog" is at home—where not exterminated by poisoned wheat put into his burrow—from Texas, New Mexico, and Arizona northward to the Canadian boundary, and on the western slope of the Rocky Mountains in Utah and Colorado. It is most abundant in Montana, Wyoming and western Kansas. One of the largest Prairie-"Dog" towns yet reported begins in Trego County, Kansas, five miles west of the one-hundredth meridian, and extends along the divide north of the Smoky Hill River, practically without a break, to Colorado, a total distance of about one hundred miles. This town varies in width from half a mile to five miles, and on the top of the divide the nearest water is believed to be 350 feet below the surface. (Arthur B. Baker.)

It is reported that because of the wholesale destruction of wolves and foxes, the enormous increase of Prairie-"Dogs" in Kansas, Oklahoma, Texas and Colorado has become a genuine scourge to farmers and cattlemen. The number of "Dogs" in that region is now estimated at several millions, and a general campaign against them has been begun. The method employed for their destruction is a spoonful of poisoned wheat placed in the mouth of each burrow. Beyond doubt, this will soon reduce their numbers to reasonable limits.

When he is not too numerous, I am the friend of the Prairie-"Dog." He is as bright and cheerful as the day is long, and he enlivens many a dreary landscape, but at the same time he often changes fine, grass-covered cattle-ranges into dreary wastes, and causes great losses to cattle owners. I hope, however, that he will be tolerated at least to the

extent that systematic destruction will stop short of extermination.

It is *not* true that the Prairie-"Dog" lives in peace and harmony in the same burrow with the rattlesnake and burrowing owl. The snakes would make short work of the young Prairie-"Dogs," and the latter would quickly kill the owl! It is safe to surmise that when a deadly and quarrelsome rattler invades the home of a Prairie-"Dog" family, the latter speedily seeks a home elsewhere. The burrowing owl is in the habit of taking refuge in *abandoned* burrows, and nesting in them, to save the labor of digging a burrow for itself. In the Philadelphia Zoological Garden Mr. A. E. Brown once tried the experiment of associating burrowing owls and Prairie-"Dogs." The owls were immediately killed and torn to pieces by the "Dogs."

A Prairie-"Dog" Burrow

Once a Prairie-"Dog" burrow was completely exposed by digging, and reported upon in full in one of the publications of the Biological Survey. In the "Yearbook of the Department of Agriculture" for 1901, Dr. C. Hart Merriam published a valuable paper on "The Prairie-Dog of the Great Plains," which contained the following illustrated description:

"The holes go down for some distance at a very steep angle and then turn at nearly a right angle and continue horizontally, rising somewhat toward the end. The nests are in side chambers connecting with the horizontal part of the burrow, and usually, if not always, at a somewhat higher level. (See H in figure.) Recently, at Alma, Nebraska, W.

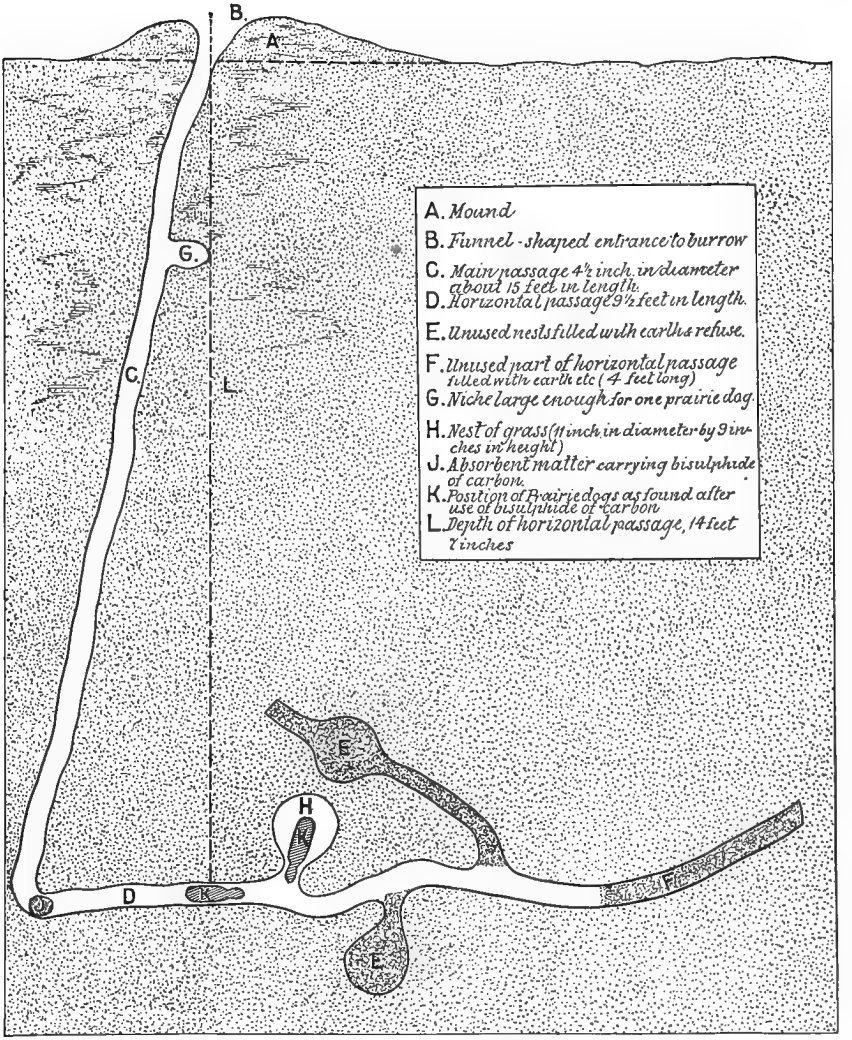
H. Osgood dug out a burrow, of which he made a careful diagram, accompanied by measurements.

"In this case the burrow went down nearly vertically to a depth of 14½ feet below the surface, when it turned abruptly and became horizontal as shown in the diagram. The horizontal part was 13½ feet in length. One-third of the horizontal part (the terminal 4 feet, F) and two old nests and passageways (E) were plugged with black earth brought in from the surface layer, which was very different from the light-colored clayey earth in which the greater part of the burrow lay.

"Four or five feet below the entrance was a diverticulum, or short side passage (G), probably used as a place in which to turn around when the animals come back to take a look at the intruder before finally disappearing in the bottoms of their burrows. It is also used, apparently, as a resting-place where they bark and scold after retreating from the mouths of the burrows. As elsewhere noted, they are often heard barking after they have gone in.

"The burrow was opened the day after bisulphide of carbon had been used for destroying the animals, and the material carrying the bisulphide was found at the bottom of the vertical part, just where the horizontal part turns off. Two dead animals were found, one in the horizontal part, the other in the nest, as indicated by the letter K in the diagram.

"The Prairie-Dog has several natural enemies which, when not interfered with by man, usually serve to hold its numbers in check. The most inveterate of these appear to be the coyote, badger, black-footed ferret, and rattlesnake."



PRAIRIE–"DOG" BURROW.

From Dr. C. Hart Merriam, "Yearbook," Department of Agriculture, for 1901.

THE WOODCHUCK, or GROUND-"HOG," [1] is tolerated on the farms of New England because as a rule he is wise enough to live on clover and other grass and let the vegetable gardens alone. Occasionally, however, he does damage in gardens that are temptingly near his woodland haunts, and invites the farmer's dog and gun.

In the East he is the only representative of the marmots. In form he is short and stout, and his flat head and beady, black eyes give him a surly look. He is not lively and cheerful in his habits, like a prairie-"dog," and it is seldom that any one speaks well of him. His favorite home is a burrow in a brushy, gravelly hillside in a "swamp lot," or woods pasture, and while he likes to come out and bask in the warm sunshine, he never ventures far from his front door.

In the autumn, instead of storing up vegetables for winter, he takes on a quantity of fat, under his skin. Early in November he blithely goes to sleep in his burrow, and does not waken until February 2,—"Ground-Hog day." Then,—so runs the popular legend,—he emerges and looks about him. If he sees his shadow, he again retires to his burrow, and sleeps six weeks longer,—which betokens a cold, wintry spring.

The eastern Woodchuck is a typical marmot, short-legged, heavy-bodied, flat-headed, and brownish-gray in color. The length of its head and body is 14 inches, and of its tail 5 inches. It inhabits the eastern United States from New York to Georgia, and westward to Kansas and South Dakota.

A much larger species, called the GRAY MARMOT,[2] or WHISTLER (22+7 inches), is an important northwestern form,

[1] *Mar-mo'ta mo'nax.*

[2] *Mar-mo'ta pru-in-o'sus.*

strongly differentiated by its light, grizzly-gray color, with certain dark markings. It is found from the Columbia River northward to about 63° North Latitude and eastward to Hudson Bay. It derives one of its names from the fact

WOODCHUCK.

that its alarm cry consists of a shrill whistle, which is repeated by the various members of the colony threatened with danger. Often it is found in rocky mountain valleys, high up, with the pika as its nearest neighbor.

THE YELLOW-BELLIED MARMOT,[1] easily distinguished by the bright-red hair on its under-parts, is a Southern species,

[1] *Mar-mo'ta flav'i-ven-ter.*

found in California, Arizona, New Mexico, and Texas. High up, on the Olympic Mountains of western Washington, is found still another species of marmot, as large as the Whistler, which is yellowish in summer, and bluish gray in winter. This is called the OLYMPIC MARMOT.

Flying Squirrels

THE FLYING SQUIRREL[1] is a very beautiful little creature, but its strictly nocturnal habits, and strong dislike to daylight, almost rob us of its acquaintance. This is to be regretted, because it is the only native tree-dwelling quadruped which has been provided by Nature with a parachute, consisting of a thin fold of skin stretched between the fore and hind legs, partly to sustain the animal in a long downward flight. Neither the Flying Squirrel nor the flying lemur of the East Indies can actually fly; but they leap from a tree-top, go sailing gently downward and outward, and when near the ground curve upward and are carried by their momentum on an ascending plane to the side of an adjoining tree. Anything like horizontal flight is quite out of the question.

The Flying Squirrel is one of the most exquisite little mammals in North America. Its legs are very delicately formed; its fur is as fine and soft as silk; and when at rest the edge of its flying membrane looks like the edge of a lace ruffle. The head and body (of the Eastern species) is about 5 inches long, and the tail 4 inches. These little creatures are quite sociable, and nest in hollow trees, where from five

[1] *Sci-u-rop'te-rus vo'lans.*

to seven young are born. They come out to play about sunset, and are as sportive as schoolboys playing tag. In captivity they are quite worthless for exhibition, for in the day-

THE FLYING SQUIRREL.

time there is nothing to be seen save a small and wholly uninteresting ball of fur.

Three species (and nine subspecies) have been described, and their range covers the eastern United States from Canada to Florida, and westward to Louisiana. On the Pacific

coast, they are found from southern California to Alaska, even to the Mackenzie River basin, but they are not found in the desert regions.

THE SEWELLEL FAMILY

Aplodontidae

THE SEWELLEL,[1] MOUNTAIN "BEAVER," or SHOWT'L of the Indians is a strange and little-known animal of the Northwest, with which at least every person in that region should be acquainted. It is reddish brown in upper color (sometimes grayish brown), and looks like a tailless woodchuck. It feeds like a beaver, fights fiercely when cornered, is sociable in habit, like the prairie-"dog," can climb bushes four feet high, and can burrow and live comfortably either in ground that is low and boggy, or high and dry. Usually it prefers wet ground! A large specimen weighs 4 pounds and measures about 13 inches in length of head and body, with a tail of a little more than an inch. Strange to say, this once rare animal has recently been discovered inhabiting the grounds of the University of Washington, at Seattle.

THE BEAVER FAMILY

Castoridae

THE BEAVER[2] easily leads the mammals of the world in mechanical and engineering skill, and also in habits of industry. Being chiefly nocturnal in its habits, it sleeps by day, and after nightfall carries on its work unmolested. It is

[1] *Ap-lo-don'ti-a ru'fa.*

[2] *Cas'tor can-a-den'sis.*

AMERICAN BEAVERS AND THEIR WORK.

The dam, and house of sticks in the middle of the pond, are exact reproductions of those works in the Beaver Pond of the New York Zoological Park, as they were at the time this drawing was made.

seldom that any one sees a live Beaver in its haunts during the middle of the day, but it is possible to do so during the hour before sunset. In public zoological gardens and parks, the persistence and success of this animal in avoiding observation are very disappointing to visitors and exasperating to directors and keepers.

This is the largest gnawing animal in North America. A huge specimen caught in Maine, in 1900, weighed a trifle over 50 pounds. A large one that once lived in the New York Zoological Park was 31 inches long, had a tail 12 inches long and weighed 44 pounds.

The American Beaver is still found in a few localities,—but in very small numbers,—from the Rio Grande in Texas throughout the Rocky Mountains, Sierra Nevada, and Cascade Mountain regions northward to the limit of trees, and southeastward through Canada to northern New England. The number now remaining in Colorado has been estimated at one thousand.

From 1907 to 1909 the average annual catch of Beaver in North America was about 80,000 skins, but in 1912 the largest fur house in London handled only 17,036. Beaver fur is now rarely seen in the United States.

The Beaver's efforts are directed toward its own preservation and comfort. It builds extensive dams of mud, grass, and sticks, in order to create ponds in which it can hide from its enemies, maintain a safe refuge close by the wood on which it feeds, and have an under-water doorway to its house or burrow. More than this, the pond serves as a refrigerator, in the bottom of which the animal stores its

supplies of food-wood for winter use, when the surface is frozen for a long period.

Sometimes when food-wood on a beaver pond becomes scarce, the animals dig canals into places where fresh supplies can be cut and floated down to the pond. These canals are usually about two feet wide.

A Beaver is readily recognized by its very flat, hairless, and scaly tail, which beyond the hair of the body is about 9 inches long by 4 inches wide. The tail is never used as a trowel in building dams, but only as a propeller in swimming.

Dam-building is done in two ways. With his front feet the animal digs up soft mud, holds the mass with his fore legs against his breast, and swims with it to the dam. There he deposits it where it is most needed, and pats it down with his front feet. To strengthen the structure, he brings sticks 4 or 5 feet long, and 1 or 2 inches in diameter, from which he has eaten the bark. These he usually lays upon the dam, crosswise or nearly so, and fills in between them with mud.

When Beavers have to build a dam exceeding 50 feet in length, to flood low ground, they usually lay it out with a curve up-stream. The dam built by the Beavers in the New York Zoological Park is about 40 feet long, and 3 feet high, and quite sharply curved up-stream.

In most localities inhabited by Beavers, the banks of the streams are so low that the animals cannot burrow into them, and consequently they build houses for themselves. The ordinary Beaver house is a huge pile of neatly trimmed 6-foot poles, with all spaces between the sticks plastered full of mud. The one in the Zoological Park is about 15 feet in

diameter, and 5 feet high, with a central chamber above high-water mark, and its only entrance is well under water. If a Beaver house is attacked, the occupants immediately seek refuge in deep water.

The trees which furnish bark most prized by the Beaver as food are the poplar, cottonwood, willow, birch, elm, box-

SKULL OF BEAVER, A TYPICAL RODENT.

elder and aspen. The bark of the oak, hickory or ash is not eaten.

The Beaver's front teeth (incisors) are very strong and sharp, and the muscles of the jaw are massive and powerful. It is no uncommon thing for a Beaver to fell a tree a foot in diameter in order to get at its branches. It is said by some observers that large trees are made to fall as the Beavers prefer to have them,—toward their pond. In felling a tree, they first remove the bark from a circle a foot in width, just above the spur roots, standing on their hind legs while

they work. Then, with their huge, chisel-like incisors they cut out chips, circling round the trunk all the while, until only the heart of the trunk remains, and the tree falls.

THE FAMILY OF MICE AND RATS
Muridae

When their groups and relationships are fairly understood, the wild mice and rats will be found quite interesting. They are so widely distributed it is very desirable that country dwellers should know something about them, and appreciate their good points as well as their bad ones. A moderate effort, properly aided and encouraged, will give any one a fair conception of the grand divisions of this great group; and there the general student can stop, if he so elects.

In approaching this assemblage of North American mammals, the first thought is that its members are difficult to deal with. In some respects they are, but they are by no means as difficult as might be supposed. Like many other new subjects, they yield to a little old-fashioned study. It is not necessary for the general reader to enter into the study of a large number of species. Lay the foundation first by becoming acquainted with each genus, and one typical species. Observe the following injunctions:

1. Treat this bit of study with serious attention.

2. Learn first the names of the Families and the approximate size of each Family.

3. Next learn *by rote*, in regular order, the *common names* of the typical examples given.

4. Learn some of the distinguishing characters of each example.

5. Study the comparative sizes of the various types.

6. Finally, in determining the name of a strange species, *do not feel that you must name it instantly* or be disgraced! Take time to think over it, and to "look it up." Snap judgments on small creatures have a most annoying habit of proving to be wrong. It is a wise judge who knows when to hand down a decision.

In order to make the genera of North American rats and mice clear to the student, I have procured from Dr. C. Hart Merriam, the highest living authority on these creatures, a fine, perfect, adult specimen of the best-known (or most typical) species of each genus. Figures of these skins are here reproduced to show their relative sizes, and a life-like illustration of each of these types is also given. In the text, the most striking distinguishing characters are printed in italics.

With these aids to the text, it should be possible for a clear-headed, keen-eyed student to refer any adult North American rat or mouse to its proper genus. But beware of *young* specimens! Often they are so puzzling that Solomon himself could not place them with any degree of certainty. In determining the species of mice and rats, mammalogists depend largely upon the characters of the teeth; but that is a subject too intricate for the general student.

The table on page 222 shows the various Families of rats and mice, the North American genera, and the typical species of each. It is not necessary for young students to mem-

orize the Latin names of the genera and species; but those who become specially interested in natural history will very soon desire to know them.

THE MUSKRAT,[1] which received its name from its very pronounced musky odor, is the largest native representative of the Mouse-and-Rat Family. It is readily recognized by its *flat, hairless tail, carried on its edge.* It is of large size, measuring about 21 inches in length. It is of aggressive habit, an admirable diver and swimmer, an industrious and intelligent house builder, and the only native rat whose fur is valuable. It is found from Labrador and Newfoundland to Alaska, and southward to Arizona and Louisiana.

It is very shrewd in preserving its own life, and even in the large forest parks of New York City, it refuses to be exterminated. When three bogs in the New York Zoological Park were dug out and converted into ponds, the wild Muskrats in the Bronx River found them as soon as they were completed, immediately took possession of them, and there they remained until forcibly dislodged. Being very destructive to lily bulbs, and most other aquatic plants, their presence in ornamental ponds is very objectionable.

Muskrats are rarely, if ever, found away from ponds or good-sized streams. They are quite as much at home in the water as beavers, and their habits are strictly aquatic. The tail furnishes the motive power for swimming. The feet are small and but very slightly webbed, and the body is completely covered with soft, brown fur an inch or more in length, which is much sought by furriers. When taken at the best

[1] *Fiber zibethicus.*

season, plucked, dressed, and dyed a rich brown-black, it is sold by the fur trade as seal, French seal, electric seal, Red River seal, Hudson seal, mink and sable. The price of raw skins in London has risen from 15 to 90 cents. From 1907 to 1909 the average annual catch of Muskrat skins in North America was about 8,000,000!

Muskrats that inhabit streams with high banks do not trouble themselves to build houses, but merely burrow into the banks. In rivers and ponds with low margins, however, they gather coarse grass, reeds and mud, and build dome-shaped houses, about 5 feet in diameter, which rise from 2 to 4 feet above the water. All such houses are entered below the surface of the water, so far down that ice does not close their doors, and within there is a floor raised well above the water, on which the inmates eat their food and sleep.

When too many captive Muskrats are kept in the same enclosure, say twelve in a fenced pool 30 feet square, they fight viciously, and not only kill each other, but sometimes partly devour one of the victims. Although often disputed, it is nevertheless a fact that they eat flesh on very slight provocation. They are very unsatisfactory animals to keep in captivity, no matter what the conditions may be.

The Hudson Bay Lemming[1] is worthy of special notice, because it is the most widely distributed and noteworthy rat-like animal of the far North. It is strictly a mammal of the cold northland, and like many other arctic animals, its winter coat is pure white, and its fur is dense and warm. Among

[1] *Dicrostonyx hudsonius.*

Important Groups of North American Mice and Rats

Mouse and Rat Family (*Mu'ri-dae*)

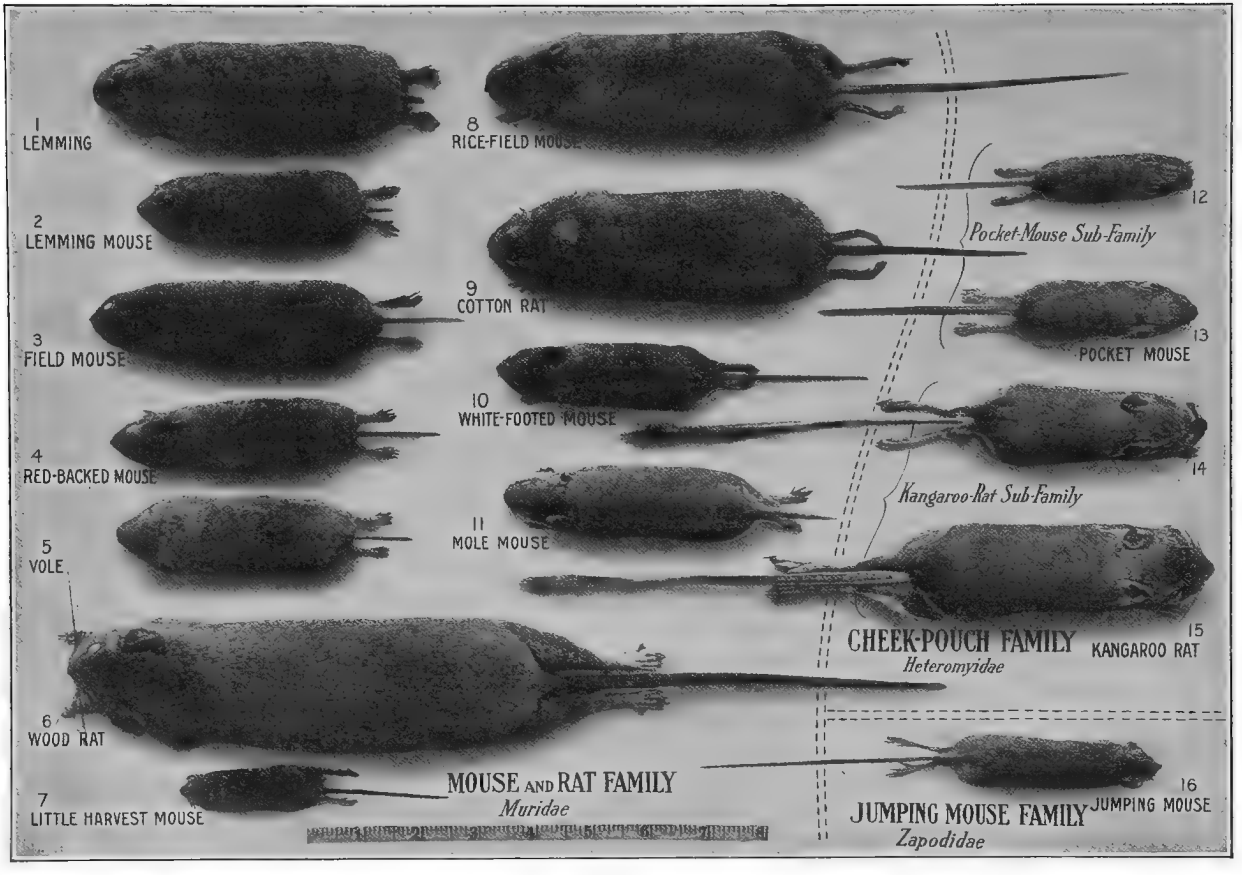
Common name of type		Scientific name: Genus	Type species	Number in 1905 of: Full species	Subspecies
Muskrat		*Fi'ber*	*zi-beth'i-cus*	5	5
Lemming	1.	*Di-crost'o-nyx*	*hud-so'ni-us*	4	5
Lemming Mouse	2.	*Syn-ap'to-mys*	*coop'er-i*	10	3
Field Mouse	3.	*Mi-crot'us* (*Ar-vic'o-la*)	*penn-syl-van'i-cus*	54	22
Red-Backed Mouse	4.	*E-vot'o-mys*	*gap'per-i*	16	6
Vole	5.	*Phe-nac'o-mys*	*o-ro'phi-lus*	9	1
Wood Rat	6.	*Ne-o-to'ma*	*flor-i-dan'a*	40	19
Harvest Mouse	7.	*Reith-ro-don'to-mys*	*le-cont'i*	33	22
Rice-Field Mouse	8.	*O-ryz'o-mys*	*pa-lus'tris*	36	9
Cotton Rat	9.	*Sig'mo-don*	*his'pi-dus*	9	18
White-Footed Mouse	10.	*Per-o-mys'cus*	*leu-co'pus*	113	56
Grasshopper Mouse	11.	*O-ny-cho'mys*	*leu'co-gas-ter*	10	9
Domestic Rat		*Mus*	*nor-veg'i-cus*	4	1

The Cheek-Pouched Family of Mice and Rats (*Het-e-ro-my'i-dae*)

Subfamily of the Pocket Mice (Species small.)	12.	*Per-og-na'thus*	*fas-ci-a'tus*	35	31
	13.	*Mi-cro-dip'o-dops*	*meg-a-ceph'a-lus*	3	1
Subfamily of the Kangaroo Rats (Species larger.)	14.	*Di-pod'o-mys*	*mer'ri-am-i*	9	13
	15.	*Per-o-di'pus*	*rich'ard-son-i*	16	6

Jumping-Mouse Family (*Za-pod'i-dae*)

Jumping Mouse	16.	*Za'pus*	*hud-so'ni-us*	11	8
				417	235



THE FAMILIES OF NATIVE MICE AND RATS, ILLUSTRATED BY SKINS OF TYPICAL SPECIES.

The scientific names of the above specimens will be found on the opposite page, against the corresponding numbers.

the west Alaskan Eskimo, skins are very common, and the children delight in using them for doll clothes.

This animal is about the size of a large mole, thick-bodied, short-legged, and sharp-nosed. *The ears are extremely*

HUDSON BAY LEMMING.
Winter and summer pelage.

short, and quite hidden in the fur; the legs are short, the feet rat-like, *and the tail is so very short that it also is half hidden by the fur.* The fur is long, fluffy, and fine; brown, brownish gray, or mottled in summer, but snow-white in winter. The length of the head and body is 4 to 5 inches, and of the tail ½ inch.

The Lemming is found from Latitude 56° northward to the whole arctic coast; in Labrador, Greenland, the arctic

islands, and on as far north as man has ever gone on land. It prefers open, dry, moss-covered uplands, and is not found in timbered regions. Often a district of acceptable ground is covered with a wide-spreading network of runways, just below the surface. Mr. C. H. Townsend, who has kept them in captivity, says they are kind-spirited and sociable little creatures, fond of attention, and much given to standing up and hopping about on their hind legs. In summer they store up supplies of vegetable food in their runways for use in winter.

The Lemming Mouse, or False Lemming, is interesting chiefly because it is a connecting link between the true lemmings and the mice. *Its ears are very small, and do not rise above the fur on the head.* The type species, known as Cooper's Lemming Mouse,[1] is only *two-fifths the size of the* Hudson Bay Lemming. It inhabits the northeastern United States, from Massachusetts to Minnesota, and southward to North Carolina, Tennessee, Indiana, and Iowa. Its color above is yellowish brown washed with black, with bluish-gray or whitish under-parts. Length, 3¼ to 4 inches; tail, ¾ inch. Other species of Lemming Mice inhabit Canada, Labrador, New Hampshire, Washington, Kansas, and Alaska.

The Field Mouse, or Meadow Mouse,[2] stands as a murine monument to scientific endeavor. Since 1798 the genus of this group—long known as *Ar-vic'o-la*—has been described under twenty-four different names, and the type species has received nineteen names besides its own! But,

[1] *Synaptomys cooperi.* [2] *Microtus pennsylvanicus.*

through a century of misnaming in Latin, its original English name, Meadow Mouse, has stood unchanged!

The trouble with this genus seems to have been due to exaggerating the importance of trivial characters, molar teeth

FIELD MOUSE.

and claws. Externally its species and varieties are so much alike that very few of them can be distinguished from the general mass.

The typical Field Mouse is a *short-eared, short-tailed, thick-set little animal.* It averages 4½ inches long, with a tail 1½ inches long. Its color above is reddish brown, while beneath it is whitish gray.

It is found from the Atlantic coast to the Dakotas, feeding on roots and grasses.

In severe winters, when the ground remains frozen for a long period, Field Mice are sometimes forced to feed on bark, and frequently kill young fruit-trees by barking them near the surface of the snow. When shocks of corn are available these mice live high, literally, feeding well, and being well housed at the same time. In husking shock corn in winter, many a nestful of Field Mice have we helped to turn out into the cold world; but the amount of grain they consumed was so insignificant we never grudged them their food.

Taken as a whole, the Field Mice of various species inhabit nearly the whole of North America north of Mexico and the Gulf, even to the remote islands of Bering Sea. I do not know of a state or province from which they have not been recorded.

THE RED-BACKED MOUSE[1] is, in form, very much like the meadow mouse, but in size it is smaller, and in habit it is quite different. It prefers to live in cool, damp woods and timbered regions, varying all the way from dark swamps and valleys to timbered mountain tops; but it is seldom found in open country.

They are found from Ontario, New England, and New Jersey westward to California, and northward through Canada and Alaska, sixteen species and five subspecies. They are all very much alike, rather slender, and more graceful in form than the field mice, and the majority are reddish

[1] Until recently this species has been considered identical with *Evotomys rutilus* of the Old World, and has been so called. Now, however, our species is considered quite distinct, and is called *E. gapperi*.

brown above and grayish underneath. The species most common in the eastern United States, often called GAPPER'S FIELD MOUSE, is found westward to the Rocky Mountains. It is 3¾ inches in length of head and body; tail, 1¾ inches.

GAPPER'S RED-BACKED MOUSE.

In scientific lists of the mammals of North America, Red-backed Mice are sometimes called Red-Backed "Voles."

THE VOLES of the genus *Phe-nac'o-mys*, are small brown mice, mostly of recent discovery, about the size of the red-backed mouse, in color usually dark brown mixed with black. Nine species are known, extending in range from Labrador westward to Oregon, Washington, and northern British Columbia, and also down to Colorado. None are found in the eastern half of the United States. There is no special mark

by which it is easy to distinguish them from their nearest relatives, the red-backed mice.

The species most widely distributed, and best known, is the NORTHWESTERN VOLE,[1] the largest member of this group, —a grayish-brown creature, with feet and all under-parts white, or nearly so. It inhabits Alberta, British Columbia, Idaho, Wyoming, Washington, and south central Oregon. Length of head and body, 4 inches, tail, 1¾ inches.

In mental capacity the WOOD RAT, PACK RAT, TRADING RAT, or BUSHY-TAILED RAT[2] is the most wonderful member of the whole Rat-and-Mouse Family, at least in North America. The true stories of its pranks are almost beyond belief. Seemingly its chief object in life is to play practical jokes on mankind; and any rat which manifests a spirit of toleration toward man surely is entitled to special consideration.

The typical Wood Rat is a large-sized, big-eyed, large-eared, and rather handsome creature, without the mean, vicious look of a common rat, with fine yellowish-gray fur, white feet, and white under-parts. In some species, the tail is covered with long hair, and by this fact alone it is possible to distinguish many members of the genus. The Wood Rats are distributed very generally throughout the southern and western parts of the United States, and are also found in British Columbia and Mexico. Frequently their presence is indicated by the huge, mound-like nests, from 2 to 3 feet high, which they build of twigs, grass, leaves, and bark.

These animals are nocturnal in their habits, and their nest-building and other work is done at night. The most

[1] *Phenacomys orophilus.* [2] *Neotoma.*

remarkable thing about them is their habit of entering houses and playing practical jokes upon the inmates. A pair of Wood Rats that I knew by reputation at Oak Lodge, in Florida, first carried a lot of watermelon seeds from the

NORTHWESTERN VOLE.

ground floor up-stairs, and hid them under a pillow. Then they took from the kitchen a tablespoonful of cucumber seeds, and placed them in the pocket of a vest which hung up-stairs on a nail. In one night they removed from a box eighty-five pieces of beehive fixtures, and hid them in another box, and on the following night they deposited in the first box about two quarts of corn and oats.

In 1907 Oak Lodge was burned to the ground by a fire that started in the attic story. Mrs. Latham, the owner,

ascribes the origin of the fire to Wood Rats and the parlor matches which they undoubtedly carried up-stairs and ignited by chewing. It is said that in Florida other houses have been burned in the same way.

Western frontiersmen, and others who live in the land of the Wood Rat, relate stories innumerable of the absurd

FLORIDA WOOD RAT.

but industrious doings of these strange creatures. In general, they are rather harmless. One of the best-known species is the Florida Wood Rat.[1] It belongs to the round-tailed group and does not have the hairy, squirrel-like tail of some of the Western wood rats. Its upper color is tan mixed with brown, feet and under-parts white. The length of the head and body is 8½ inches, tail 6¾ inches. Distribution: the southern states from the Carolinas to Texas.

The Little Harvest Mouse looks so much like a small

[1] *Neotoma floridana.*

house mouse, $2\frac{1}{2}+2$ inches long, that only an expert can readily recognize it at first sight. The ten or more species are scattered throughout the southern, southwestern, and Pacific states, but none of them are found in northeastern North America. The usual color is gray-brown above, and lighter underneath, and the best-known example is LE CONTE'S HARVEST MOUSE[1] of the south Atlantic states, from Virginia to Florida.

THE RICE-FIELD MOUSE[2] should have been called a rat, for it is 5 inches long, with a 5-inch tail. It is strictly a Southern animal, inhabiting the wet rice-fields and swamps of the Gulf states from Texas up to southern New Jersey, its northern limit. It has a long head, a sharp nose, a shapely body, prominent ears, and a long tail. Its color above is bleached brown, but its under-surface is grayish, or dull white.

This mouse is partial to the vicinity of water, especially the banks of rice-fields. It swims and dives well, and sometimes builds its nest and rears its young in interlaced marsh-grass, over water, and far from dry ground.

THE COTTON RAT, or MARSH RAT[3], is a species which any country may well be without. It is small for a rat, but courageous, vicious in temper, and voracious in appetite. It is fond of flesh, and when several are caged together the stronger ones do not scruple to kill and eat weaker rats of their own kind. In length it is the size of a large chipmunk, $6+4$ inches. The upper surface of the body and head, and outside of the legs, are dark mottled yellowish-brown, the

[1] *Reithrodontomys lecontii.* [2] *Oryzomys palustris.* [3] *Sigmodon hispidus.*

under-surface and inside of legs dull white, or brownish-gray. Cotton Rats are found from North Carolina to southern Florida, and also in Texas, Oklahoma, New Mexico, Arizona,

RICE-FIELD MOUSE.

and Mexico; and wherever found their destructiveness causes them to be cordially disliked.

The White-Footed Mouse, or Deer Mouse,[1] is well worthy of acquaintance. It is distributed over nearly the whole of upper North America, except the arctic islands and the Barren Grounds. On account of the changes it has undergone, chiefly in color shades and length of tail, natural-

[1] *Peromyscus leucopus.*

ists now recognize in the United States and Canada about *seventy species and subspecies!* But the student need not be discouraged by this fact. Every White-Footed Mouse can

COTTON RAT.

be recognized by the clean white or light-gray color on the under half of its body, head, tail, and inner surfaces of the legs, its white feet, and its long tail. The color of the back is usually gray, or brown, or a mixture of the two.

Of all the small mice of North America, I consider this the most beautiful, and one of the most interesting. In the eastern states, where small quadrupeds and birds are numerous, it attracts little attention, but on the western plains,

and in the desert regions, where animal life is very scarce (and rapidly becoming more so!) these pretty little creatures seem much more worthy of notice. I have many times found them nesting in cavernous and ill-smelling buffalo carcasses, and in the brain cavity or between the jaws of buffalo skulls from which the skin had not been removed by the hide hunters.

In some places I have lain awake at night to hate mice, for cause, and wish them all dead, by all manner of violent deaths; but on a bleak and wind-shaven Montana plain where the bleaching skulls of thousands of slaughtered buffalo lie staring heavenward in mute protest against man's inhumanity, an agile White-Footed Mouse, scurrying out of its warm nest of buffalo hair between the jaws of a buffalo skull, appeals not in vain for my sympathy and protection. Out on the Great Plains the world always seems large enough to contain us both. The great buffalo range of 1883 is now so barren of wild life that to-day even wild mice are objects of interest.

Many times in their wanderings from one buffalo carcass to another, these mice have travelled over smoothly shaven prairie divides miles away from all proper shelter. In the West, however, they are found most frequently in the brush and timber of stream valleys, where the rank weeds and grasses produce seed on which they feed. In the eastern United States they are found in nearly all agricultural regions. They are active climbers, possess a wide range of intelligence, and nest in all sorts of places, from ground burrows up to hollows in trees twenty feet from the ground.

Of all mice, they are probably the most active climbers, and in fleeing from a disturbed home the mother often carries her brood of young clinging to her body. Their food is

1. WHITE-FOOTED MOUSE.
2. LE CONTE'S HARVEST MOUSE.

seeds, small nuts and acorns, grain, and dried meat when available.

Once, in the wilds of Montana, we hauled some old logs to camp, for fire-wood. When one was cut up, we found in it a nest, made chiefly of feathers, containing five White-Footed Mice, snugly housed in the hollow. Packed close against the nest was a pint and a half of fine, clean seed, like radish seed, from some weed of the Pulse Family. While

the food store was being examined, and finally deposited in a pile upon the open ground, near the tent door, the five mice escaped into the sage-brush. Near by stood an old-fashioned buggy, which presently became a valuable piece of stage property.

Next morning, when the photographer lifted the cushion of his buggy seat, and opened the top of the shallow box underneath, the five mice, with their heads together in a droll-looking group, looked out at him in surprise and curiosity, without attempting to run away. But very soon it became our turn to be surprised.

We found that those industrious little creatures had gathered up every particle of their nest, and every seed of their winter store, and carried all of it up into the seat of that buggy! The nest had been carefully remade, and the seed placed close by, as before. Considering the number of journeys that must have been necessary to carry all those materials over the ground, and climb up to the buggy seat, the industry and agility of the mice were amazing.

By way of experiment, we again removed the nest, and while the mice once more took to the sage-brush, we collected all the seed, and poured it in a pile upon the ground, as before. During the following night, those indomitable little creatures *again* carried nest and seed back into the buggy seat, just as before. Then we gathered up the entire family of mice with their nest and seed, and transported them to New York.

The Grasshopper Mouse,[1] originally described by Au-

[1] *Onychomys leucogaster.*

dubon and Bachman as the MISSOURI MOUSE, and often called the MOLE MOUSE, is mentioned in order to caution Western observers against confusing it with the preceding

MOLE MOUSE.

species. In some respects it strongly resembles the white-footed mouse, being all white underneath, including its legs. It can readily be distinguished by its large fore claws and its *short, stumpy tail*, which is only about one-third as long as the head and body. Its upper surface is brownish gray. *Its fur is very fine and soft*, and hence it is sometimes called the Mole Mouse. Its length, head and body, is 4½ inches; tail, 1¾ inches.

CHEEK-POUCH MICE AND RATS

Family Heteromyidae

This is strictly a Family of the West and Southwest, its members being found only west of Arkansas, Iowa, and Minnesota. It does *not* contain the pocket gophers. Many of its twenty-six species are desert dwellers, even inhabiting Death Valley, California. All its members are distinguished from other North American animals (except the jumping mouse and pocket gopher) by the presence of a large and very serviceable hair-lined pouch in the skin of each cheek. Barring the two exceptions noted, this character alone is sufficient for the recognition of any American member of this Family.

As clearly shown in the full-page diagram, this family may be divided into two subfamilies, an arrangement which is very convenient and helpful. The first we must call the POCKET MOUSE subfamily and its leading genus (*Per-ogna'thus*) contains twenty-six full species, and fifteen subspecies. All are distinguished by the following characters: head large; body slender and graceful; *hind legs long, and fitted for jumping; tail long; large external cheek pouches, hairy inside, and not connected with the interior* of the mouth; hair smooth and compact, sometimes intermingled with spines. These mice are quick and active in movement, and some species leap with considerable power.

Since 1839 the TYPICAL POCKET MOUSE[1] has been described again and again, but none of its describers have

[1] *Perognathus fasciatus.*

taken the trouble to give it an English name! Hereafter, let us call it by the name given above, because it is the type of its genus. It inhabits Montana, Wyoming, and the Dakotas. Its color above is sandy-yellowish, lined with black; underneath, white; and these two color areas are divided low down along the side by a lengthwise band of pale yellow. Length, $3+2\frac{3}{8}$ inches.

KANGAROO RAT.
Showing the very large cheek-pouches.

THE KANGAROO RAT[1] subfamily, of fifteen full species, is fitly represented by an elf-like creature which is one of the most beautiful and attractive of all our native rats. In the dry and sterile regions of the great Southwest, from Oklahoma to the Gulf of California, where seemingly the deserts produce nothing but sand, cacti, yuccas, and creosote bushes, these pert little creatures hold forth. Apparently they are both fire-proof and water-proof, for no amount of heat affects them, and the absence of water does not seem to depress their spirits in the least. Like most mice and rats, they are nocturnal. Some of the species build for themselves large mounds of earth and gravel, from 1 to 3 feet high and 5 to 10 feet in diameter, which are honeycombed with burrows and runways. These dwellings are often inhabited by rattlesnakes and lizards, and doubtless the Kangaroo Rat is an important item of food in the diet of the desert rattler.

[1] Typical species, *Perodipus richardsoni,* of western Kansas and Oklahoma.

The Kangaroo Rat is very unlike the members of the Mouse-and-Rat Family; and in temper no creature could be more unlike the domestic rat. Unlike most mice and rats, they do not bite when handled, but they are so delicate that they do not live long in captivity, unless tended with ex-

1 AND 2. KANGAROO RAT.
3. TYPICAL POCKET MOUSE.

treme care and intelligence. They stand high on their hind legs, like pygmy kangaroos, and hop about with their front paws tucked up close under the chin, almost hidden by their fur. The tail is very long, has a showy tuft of long hair on the end, and is used by the animal in balancing itself when in motion. The fur is soft, silky, rather long, and of a tawny-brown color above. Length of head and body, 4½ inches; tail, 5¾ inches. The cheek-pouches are large, and are of great use in carrying sand out of burrows.

JUMPING MOUSE FAMILY

Zapodidae

THE JUMPING MOUSE[1] is one of the most remarkable of all our small animals. In form it is a *slender-bodied mouse*, with *an exceedingly long tail, kangaroo-like hind legs, and cheek-pouches*. Its average length of head and body is about 3 inches, and tail 5 inches. In color it is dark reddish-brown above, white underneath, with smooth compact hair. Although no larger than a house mouse, it can jump from eight to ten feet.

When a farmer boy is hauling in sheaves of wheat, and a small animal suddenly makes a tremendous flying leap from the bottom of the shock, he may know that he has disturbed a Jumping Mouse, and the chances are that he cannot capture it by hand. In these long jumps—perhaps the longest on record for an animal of equal size—the tail is as necessary as a stick is to a sky-rocket, to enable the little creature to preserve its balance, and go straight ahead. If the tail is cut off, the Jumping Mouse turns over and over in the air, and perhaps lands upon its back.

The Jumping Mouse is quite nocturnal in its habits, and is seldom seen in the daytime. It feeds on seeds and grain, and while it devours great quantities of weed seeds, it inflicts upon the farmer no damage worthy of mention. In the autumn it stores in the ground quantities of food for winter use, but despite this fact, under certain conditions it becomes so thoroughly dormant in winter that it seems to

[1] *Zapus hudsonius.*

be quite lifeless. It is found throughout the northern United States and Canada, in wooded regions, from New York to California, and as far north as Lake Nushagak, Alaska.

JUMPING MOUSE.

Opinions Regarding Rats and Rat-like Animals

The largest rat-like animal in America is the COY'PU RAT,[1] of Central and South America, which stands 9 inches high at the shoulders, attains a length of 19 inches head and body, tail, 13 inches, and weighs 8 pounds. It is a water-loving animal, almost as much so as the muskrat, and its thick brown fur is valuable. Under proper conditions it is easily kept in captivity.

The smallest rodent in America is the LEAST POCKET

[1] *My-o-cas'tor coy'pus.*

MOUSE,[1] of the Rocky Mountain region, which has a total length of head and body, 1⅞ inches; tail, 2¾ inches.

The best swimmer of all rat-like animals is the MUSKRAT.[2]

The best climber is the TREE RAT,[3] of southern India.

The handsomest rat or mouse in the New World is the KANGAROO RAT, of the southwestern United States, figured on page 242.

The most humorous of all rat-like animals is the TRADING RAT, described on page 230, which delights in playing practical jokes upon its human neighbors.

The meanest of all rodents is the brown-coated DOMESTIC RAT, the pest of civilization everywhere, which was sent to man as a perpetual punishment for his cruelties toward harmless wild creatures all over the world. In addition to its many other crimes and misdemeanors, it carries the flea whose bite produces the dreaded and terribly fatal bubonic plague. San Francisco has spent vast sums in ridding herself of this pest-carrying animal.

THE POCKET GOPHER FAMILY

Geomyidae

THE RED POCKET GOPHER[4] is the most important representative of a large family of burrowing rodents which does great damage to the crops and lands of American farmers. Whenever you see a brown-coated burrowing animal, the length of a small rat, but twice as thick, with a big pouch in the skin of each cheek, a swinish appetite, a set of long

[1] *Per-og-nath'us fla'vus.*
[2] *Fi'ber zi-beth'i-cus.*
[3] *Mus ru-fes'cens.*
[4] *Ge'o-mys bur-sa'ri-us.*

claws like burglar's tools on each fore foot and a most villainous countenance and temper, you may know that it is a Pocket Gopher. The pockets in his cheeks are to enable him to carry extra large quantities of stolen potatoes and seeds. When once you have learned the true character and habits of this creature, you will, without being asked, carefully refrain from calling any ground squirrel a "Gopher."

Most wild animals have some redeeming qualities, but this cannot make good a claim to one. Gophers are not only thieves and robbers, but they are so ill-tempered that they even hate each other, and the old ones usually are found living alone. When two captives are placed together, they usually fight fiercely until one is killed. Their teeth and front claws are very powerful, and working together they do great damage, in many different ways.

As a family, Pocket Gophers inhabit the whole United States west of Indiana and the lower Mississippi, and also a large part of Alabama, Georgia, and Florida. Three genera and about thirty-three species are recognized, and while some are smaller than others, and some are gray or black instead of brown, their appetites and habits are all equally objectionable. They spoil meadows by throwing up innumerable hillocks of loose earth; they devour great quantities of vegetable crops, and also corn and small grain; they eat the roots of young fruit-trees of nearly all kinds, and they destroy canals and irrigating ditches by honeycombing their banks. With incisor teeth that in sharpness and strength are like steel chisels, a Gopher can pare off all the roots from a young tree quite as neatly as a man pares potatoes.

Our type species, the Red Pocket Gopher, says Mr. Vernon Bailey, "is of much greater economic importance than all the other species combined, for the reason that its home is in the fertile prairie region of the Mississippi Valley," em-

RED POCKET GOPHER.

bracing Iowa,—which is its centre of distribution,—Illinois, Missouri, Wisconsin, Minnesota, and the eastern parts of the Dakotas, Nebraska, and Kansas. Its length is about $7\frac{1}{2} + 3$ inches. The young are either two or three in number, and there is only one litter each year.

The enemies of the Gopher are the weasel and the gopher snake.[1] Because of the damage done by Gophers, farmers generally wage war upon them with traps, strychnine, and

[1] *Pituophis.*

poisoned grain. In Iowa, Minnesota, and other states, many thousands of dollars have been paid out by county treasurers in bounties on Gopher scalps and tails. No animal in the West is more universally disliked, or more diligently destroyed.

My acquaintance with the Gopher Family began when I was a farmer boy, in Iowa, the storm centre of *Geomys bursarius*. Having trapped a few, I made the mistake of supposing that I knew more about the habits of those creatures than did my elders, who had not. In an evil moment, I announced that any strong boy could catch a Gopher by digging it out of its burrow, and my large brother offered me twenty-five cents if I could prove that claim within a week.

That evening, with mattock and spade, I repaired to my father's corn-field, into which strange Gophers were rapidly migrating and settling; and finding a fresh hole with the owner inside, I began to dig. My shepherd dog, Rover, assisted me all he could, chiefly by keeping me company, but also by digging when I rested.

We dug into the twilight, and later on we dug into the night; but the Gopher kept well ahead of us. Whenever we paused to listen, we could hear him digging hard, and to our dismay we found that he knew a thing or two about getting on in the world. With the descent of black darkness, our hopes of overtaking that Gopher descended also; and then pride, not hope of reward, was all that spurred us on. *Would* we have to give up beaten, by an ugly, pig-eyed old Gopher?

When for about the thirtieth time I paused to wipe the

accumulation of perspiration and prairie loam from my brow, Rover suddenly rushed off into the darkness. In the corn rows 30 yards away, he seized something, shook it vigorously, and a moment later came trotting back to me, carrying in his mouth a large Gopher! The beast had been migrating into the corn-field, and Rover simply caught him on the fly.

Digging operations ceased abruptly at that point. Thanking Rover for his timely assistance, I accepted his contribution, and we marched home together. When I exhibited to my brother the Gopher that we had secured "by digging," he was profoundly surprised, but promptly paid the money. Rover looked on smilingly, and said not a word; but we both knew then that in catching Gophers steel traps are better than spades.

TREE-RATS AND WATER-RATS
Family Octodontidae

Our steadily growing acquaintance with Cuba and South America renders it desirable to include here several Families of mammals that were unavoidably omitted from the original edition of this Natural History.

The Tree-Rats, or Hutias (*Capromys*), naturally challenge the curiosity of the American traveller who visits Cuba, the Bahamas, Jamaica, or Honduras. The astonishment with which I first beheld in a Cuban tree-top a perfect Jumbo of a rat, nimbly climbing through the branches, has no doubt been duplicated many times in other Americans. The common name is pronounced Hoo-te'ah, and there are nine spe-

cies, one of which (of southern Cuba) has a prehensile tail. The Cuban Hutia (*Capromys pilorides*) may well be cited as a typical species. In general form the animal looks very much like an undersized raccoon, with a long, thick, blunt-ended and almost naked tail. Its color is sombre gray, its hair is coarse and also long for a tropical animal. Its head-

COYPU RAT.

and-body length is about 19¾ inches, tail, 10 inches, and the weight of a full-grown adult is about 14 pounds. The short, thick-muzzled head is not at all rat-like, but on the contrary bears some resemblance to that of the capybara. The Hutias all live in trees, are fairly expert climbers, feed mainly on vegetable food, and wherever they are found their flesh is eaten by the natives.

The Coypu Rat (*Myopotamus coypu*) of South America is one of the largest of the rat-like animals. In appearance it looks very much like a huge muskrat with extra heavy and coarse hair. It is easily kept and bred in captivity, and

therefore is common in zoological gardens. It is highly aquatic in its habits, but, unlike the disappointing beaver, it spends about half its time on land and therefore can be seen to good advantage.

This animal has a long history. Years ago, its fur was much used in the manufacture of "beaver" hats. Because of this demand, the Coypu was, years ago, so persistently hunted that it became scarce; and then a substitute for its fur had to be found. In color it is yellowish brown, and its coarse outer hair grows through and overlies a coat of fine, soft under-fur. If the fur of this animal ever should attain a value of $10 per skin, or more (which may easily come to pass), it will pay to breed it on a commercial basis, for it breeds readily in captivity, and is quite hardy. In self-defence, however, the author now gives notice that he positively *will not* answer innumerable letters of inquiry regarding this animal—or, for that matter, any other fur-bearing animal. He has fully served his time in that line of benevolence.

Live specimens of the Coypu Rat cost $8 each, and they can be purchased of Carl Hagenbeck, Stellingen, Hamburg, Germany. In captivity it feeds on ears of corn, stale bread, cabbage, and the bark of green maple and poplar branches.

In length of head and body the Coypu Rat measures about 19 inches, and its round, naked tail has a length of about 13 inches or thereabouts. Its shoulder height is 8¾ inches, and its weight is 8 pounds. In its South American home the Coypu inhabits central Peru to central Patagonia.

THE PORCUPINE FAMILY

Erethizontidae

The Porcupine is at home either in tree-tops or on the ground, but it is always a slow-moving and dull-witted animal. It is easily captured or killed by man, but not so read-

BRAZILIAN PREHENSILE-TAILED PORCUPINE.[1]

ily overcome by wild animals. In the woods, it loves to prowl around camps, and gnaw every scrap of leather or greasy board that it can find. It is fond of the bark of hemlock, beech, and cottonwood, and often a Porcupine will remain in a good tree until he entirely strips it of its bark.

THE CANADA PORCUPINE,[2] which is black, with a gray-tipped storm-coat, is found in New England, New York,

[1] *Sphin-gu'rus pre-hen-si'lis.*

[2] *Er-e-thi'zon dor-sa'tus.*

Pennsylvania, Ohio, and thence northward and northwestward to Fort Churchill on Hudson Bay. The West and Northwest are the home of another species, known as the

Sanborn, Photo., N. Y. Zoological Park.

CANADA PORCUPINE.

YELLOW-HAIRED PORCUPINE.[1] Large specimens weigh from 25 to 30 pounds. The flesh is not palatable to white men, but is eaten by Indians.

The Canada Porcupine *never* should be called a "hedgehog," because the latter is not a gnawing animal, but a

[1] *E. ep-i-xan'thus.*

small, weak insect-eater, which does not inhabit America. A full-grown Porcupine is about twenty times as large as the common European hedgehog.

Porcupines can *not* shoot their quills, not even for 1 inch; and the idea that they can—or ever have—is entirely erroneous. When attacked, their defence consists in erecting their quills, and striking quickly a strong sidewise blow with the tail, which often drives many quills into its enemy. Strange to say, wild animals are about as lacking in original information, or "instinct," regarding this creature as dogs are. Several pumas and lynxes have been killed in a starving condition, with their mouths and throats so filled with porcupine quills that eating had become almost impossible.

THE VISCACHAS AND THE CHINCHILLAS

Family Chinchillidae

In this odd South American Family we find two forms that by systematists are usually placed next to the porcupines, but in their natural covering they are very far removed from those always inhospitable creatures.

The Common Chinchilla (*Chinchilla lanigera*) has fur as fine as silk and soft as down. The touch of it reminds me of the flying squirrel. It is much sought by the furriers, and by ladies of discernment, but in wearing qualities it is so delicate that the winds should not be permitted to visit it too rudely.

In captivity, the Chinchilla never seems to be quite rightly placed. Give it a large enclosure, and it seems defenceless and ill at ease. In a small enclosure, on exhibition,

it is perpetually seeking to retire from view, and you see little more than a pearl-gray ball of fine, silky fur in the southwest corner of the cage. It is very unlikely that this

THE VISCACHA.

delicate little creature ever can be bred in captivity, without far more trouble and expense than its fur is worth.

The Chinchilla is slightly rabbit-like in its form, its hind legs being extra long; but there the resemblance ceases, for it has large, rounded ears of great breadth and a bushy tail nearly as long as its body. Speaking generally, the adult animal (except the largest species, *Chinchilla brevicauda*) has a head-and-body length of about 15 inches, with a 10-inch tail.

There are three species, all of which inhabit the Andes from southern Chile to northern Bolivia, and live in burrows like our hoary marmot and pika. In 1912 C. M. Lampson & Co., of London, sold 11,457 skins of "Real Chinchilla."

The Viscacha (*Viscacia viscacia*, Molina) is an animal that arouses in the author painful recollections. Last winter while seated at his chaotic desk, endeavoring to burrow through a mass of undigested correspondence, his telephone bell was violently agitated by a stranger who, like thousands of others, without ceremony demanded:

"Tell me what a vicunia is, and what it looks like."

The imp that presides over the author's mental switchboard plugged in for a South American animal that begins with a V, and instantly the author responded:

"A vicunia is a South American fur-bearing animal that looks like a big, overgrown jack-rabbit with a bushy tail and a swollen head, and is covered with fine, soft fur of a mixed gray and black color."

"Oh, yes! Thankyouverymuch. Good-by!"

That was all. No telephone number, no name, no anything.

Then the author realized with horror that he had handed out a *Viscacha* instead of a big, long-legged vicunia—an animal that is very close to the *llama*, and is as large as a mule deer!

That unknown and unknowable inquirer never called again.

However, the Viscacha must be seen to be appreciated.

North America has nothing that looks at all like him. His personality is dominated by a big, overgrown head very much like that of an Australian wombat—massive, obtuse, and all-pervading. His body is massive, the front legs are short and thick, the hind legs are much too long, and the upper line of the body is much too round. The tail is short and bushy. In figures, the length of the head and body is about 22 inches and the tail is about 8 inches. The colors are an indescribable mixture of gray, black, and brown.

The Viscacha is a plains animal, and lives in colonial burrows, like the United States prairie-"dog." The colony as a whole often forms a pronounced mound that on a level plain is rather conspicuous. These animals live on grass, roots, and stems of plains-growing plants.

Of course the fur trade has not overlooked the fine, soft coat of the Viscacha, and in 1912 Lampson & Co., of London, sold 8,114 skins of this species, under the name "Bastard Chinchilla."

THE AGOUTI AND THE PACA

Family Dasyproctidae

When you are hunting in one of the dense, hot-house forests of the Orinoco delta and the dogs scare up a little animal that gives a shrill squeak of fright and goes scurrying away through the low brush with the speed of a scared rocket, all the members of the party will jump nervously and brandish their guns; and then the Venezuelan member will smile, and sang-froidedly exclaim:

"Ac-cou'rie!"

The Agouti (*Dasyprocata agouti*) looks like the tiny, hornless deer of the East Indies (*Tragulus*) that is no larger than a rabbit. It is odd that two genera of mammals should look so much alike and anatomically be so far apart.

Photographed from life in the New York Zoological Park.

THE AGOUTI.

The Agouti represents a very odd genus. The illustration renders a description of its form unnecessary. In a land reeking with ocelots, pumas, jaguars, and anacondas, the wary little Agouti, like the dikdik antelope of the East African plateau, lives by hiding in the grass and plants that cover the ground, and is very difficult to find without dogs. There are several species, inhabiting southern Mexico, Central and South America, all of which are regarded as edible. In colors they vary from a sooty brown so dark that the animal seems almost black to the beautiful bright orange-

yellow of the Golden Agouti. A sufficient number are trapped each year to keep the zoological gardens of the world well supplied. In size a typical Agouti is a little larger than a cotton-tail rabbit. Following the curves of the body, the length of an adult animal to the base of the 1-inch tail is 22 inches.

THE PACA, or SPOTTED CAVY (*Coelogenys paca*), is the Agouti's nearest relative; but it is very much larger, and more stockily built. It may be recognized at sight by its chocolate-brown body color ornamented on each side by four conspicuous horizontal lines of white blotches or spots. It inhabits nearly the whole of South America, but of course it is much more rare in some localities than in others. There are several species, and the commonest is usually to be found in every large collection of living animals.

THE CAPYBARA AND THE CAVY

Family Cavidae

THE CAPYBARA, or CHIGWIRI (*Hydrochoerus capybara*) of the South American rivers is the strangest of all rodents, and also by a long margin the largest. Its nearest relative, the Cavy, resembles it about as much as a rabbit resembles a prize hog, but no more.

The Capybara and the author are old acquaintances; also old friends. Years ago the former saved the latter from complete starvation by yielding up certain skins, skeletons, and flesh to the cause of science. In 1876, in the dryest part of the dry season, we hunted Capybaras from Sacupana, in the delta of the Orinoco, with Don Alfredo Dallycosta, of Ciudad Bolivar. It was an aquatic expedition, aided

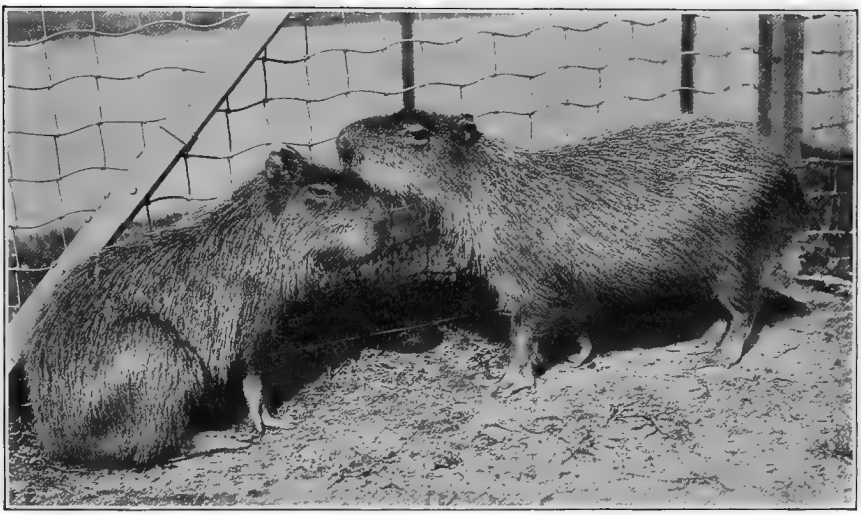
by dogs. The Capybaras fed and flourished in the tall grass along the banks of the Orinoco and its southern tributaries. The dogs ran along the shores and drove the game into the water, where it was immediately pursued by the members of our party. It was like hunting the sea-otter—chasing the victim and compelling it to dive, and keep diving, until so exhausted that it could be approached by a canoe near enough to be harpooned with a tiny harpoon, and hauled alongside. Our Venezuelan friends carefully preserved and dried all the flesh—all of it that the ever-hungry hunters did not consume on the spot.

The Capybara dives and swims remarkably well. But for that ability, it could not have survived in South America until this period. It has splay feet that make excellent paddles, and its hair, instead of being thick and impossible in water, is very thin and very coarse and absorbs no water. It is fair to suppose that the heavily haired Capybaras were easily exterminated by their enemies of the land and water.

In form and in size the Capybara suggests a species of wild swine, but it is the largest of all the members of the Order *Rodentia,* or *Glires.* Its head is large, thick, blunt on the end of the muzzle, as becomes a rodent, and its upper body line sweeps backward and downward in a perfect semicircle from the saddle to the tendon of Achilles, without any visible tail to break the line. An adult male specimen stands 21 inches high at the shoulders, measures 46 inches in total length, and weighs 105 pounds.

Of course this animal is a strict vegetarian. In disposition it is not only good-natured, but even affectionate and

fond of human attention. When pleased it utters a low clicking sound. When managed with kindness and a fair amount of animal intelligence, it thrives in captivity and



THE CAPYBARA.

lives long. A specimen now in the New York Zoological Park has lived there about ten years.

THE PATAGONIAN CAVY (*Dolichotis patachonica*) is the capybara's nearest relative, but it looks very much like a big rabbit. It inhabits Patagonia, and is rarely seen alive outside of South America.

THE PIKA FAMILY

Ochotonidae

THE PIKA, commonly called the LITTLE CHIEF "HARE," or CRYING "HARE,"[1] looks very much like a small, gray-

[1] *O-cho-to'na prin'ceps.*

brown rabbit, 7 inches long, but it is neither a rabbit nor a hare, and represents an independent family. It lives high up on the great mountain ranges of the West, from just below timber-line up to the line of perpetual snow. It finds shelter in the crevices of rugged masses of rock, and its sharp little cries often seem to come from so many different points that the hunter is completely confused. In form this strange little creature is about half-way between a gray rabbit and a guinea-pig; and it has neither speed nor activity.

THE HARE AND RABBIT FAMILY

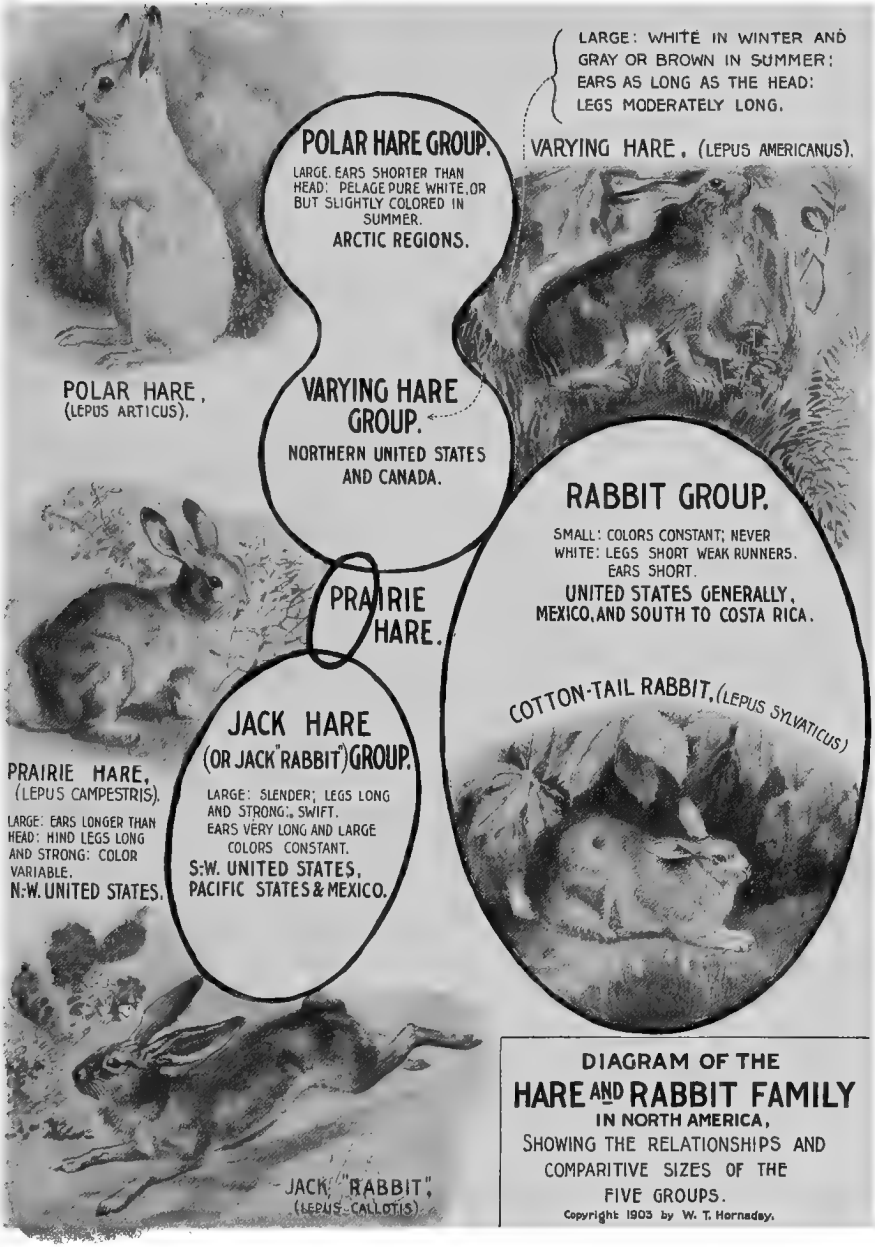
Leporidae

This group is very clearly subdivided, and there need be no confusion of ideas regarding its North American members. Nevertheless, early writers have made a confusing error in the improper adoption, for one important group, of the misleading name Jack "Rabbit." It should be Jack *Hare.*

All the American members of this family are separated into two general groups, the *Hares* and the *Rabbits.* The accompanying diagram shows these subdivisions, and their relations to each other.

A typical HARE is *big, long-eared, long-legged,* and a swift runner. Very often its color changes according to the season. It does not burrow, but rears its young in a nest or "form."

The RABBIT is *small, short-eared, short-legged,* a weak runner for a long distance, its color is fairly constant, and it lives in a burrow.


LARGE: WHITE IN WINTER AND GRAY OR BROWN IN SUMMER: EARS AS LONG AS THE HEAD: LEGS MODERATELY LONG.
VARYING HARE. (LEPUS AMERICANUS).
POLAR HARE GROUP.
LARGE. EARS SHORTER THAN HEAD: PELAGE PURE WHITE, OR BUT SLIGHTLY COLORED IN SUMMER.
ARCTIC REGIONS.
POLAR HARE, (LEPUS ARTICUS).
VARYING HARE GROUP.
NORTHERN UNITED STATES AND CANADA.
RABBIT GROUP.
SMALL: COLORS CONSTANT; NEVER WHITE: LEGS SHORT WEAK RUNNERS. EARS SHORT.
UNITED STATES GENERALLY, MEXICO, AND SOUTH TO COSTA RICA.
PRAIRIE HARE.
COTTON-TAIL RABBIT, (LEPUS SYLVATICUS)
JACK HARE (OR JACK "RABBIT") GROUP.
LARGE: SLENDER; LEGS LONG AND STRONG; SWIFT. EARS VERY LONG AND LARGE COLORS CONSTANT.
S:W. UNITED STATES, PACIFIC STATES & MEXICO.
PRAIRIE HARE, (LEPUS CAMPESTRIS).
LARGE: EARS LONGER THAN HEAD: HIND LEGS LONG AND STRONG: COLOR VARIABLE.
N:W. UNITED STATES.
JACK, "RABBIT", (LEPUS CALLOTIS).
DIAGRAM OF THE
HARE AND RABBIT FAMILY
IN NORTH AMERICA,
SHOWING THE RELATIONSHIPS AND COMPARITIVE SIZES OF THE FIVE GROUPS.
Copyright 1903 by W. T. Hornaday.

The VARYING-HARE GROUP is the key to the entire family; or, in other words, it stands on middle ground between the rabbits, the polar hare, and the jack hare, and is related to all three. Naturally this group should be studied first. Its type species is the NORTHERN VARYING HARE,[1] of northern New York, New England, Canada, and the Northwest Territories. Its name is due to the fact that its color varies according to the season, being *pale cinnamon-brown in summer*, and *white in winter*, with only a narrow back line of brown.

It is nearly twice as large as the cotton-tail rabbit, but its ears and legs are about halfway in proportionate length between those of the common rabbit and the jack hare of the Southwest. Large male specimens measure 18 inches in length of head and body, tail, 2 inches, and weigh 6 pounds.

Like the true fur-bearing animals, Varying Hares have two kinds of fur,—a dense, fine and soft under-fur through which grows a storm-coat of thin, coarse, straight hair. It is the latter which gives an animal its color. In the summer these long hairs are black, but as winter approaches they turn white.

The habits of the Varying Hares and Rabbits are so nearly the same that it is unnecessary to describe them separately. They all require brushy ground, broken rocks, rugged ravines, or tree holes in which to hide from the foxes, dogs, men, mink, martens, lynxes, skunks, and birds of prey which constantly hunt them as food. But for their keenness of sight, hearing, and scent, their swiftness in running

[1] *Le'pus a-mer-i-can'us.*

to cover, and their marvellous agility in doubling and turning when pursued, their numerous enemies would soon exterminate them.

THE POLAR HARE[1] is the most northern species of this family. Colonel Brainard found its tracks at 83° 24′, which for fifteen years remained man's "farthest North." In the southern portion of its home, this hare is gray and white in summer, but in the higher polar regions it is white all the year round, like the majority of true arctic animals—the owl, fox, bear, and wolf.

THE PRAIRIE HARE[2] of the western plains is generally supposed to be of the same species as the so-called jack "rabbit" of the Southwest; but it is not. In form, size, and color, it may be considered a connecting link between the varying-hare group and the jack-hare group, and its separate identity should be remembered. Its home is the great sage-brush plains of the Northwest, from Kansas to the Saskatchewan, and westward to Oregon, and northern California. It is gray in summer, but changes to white in winter. It is a large species (23 inches long), with ears longer than its head, long, strong hind legs, and a white tail unmarked with black, a character by which it can be readily distinguished from other jack "rabbits."

On the treeless plains of the great West, where it is often seen without any other objects to furnish comparisons, it sometimes seems of immense size, and a Prairie Hare 200 yards away has often been mistaken for an antelope supposed to be 600 yards distant.

[1] *Lepus arc'ti-cus.* [2] *Lepus cam-pes'tris.*

THE JACK HARE[1] (commonly called JACK "RABBIT") is easily recognized by his extremely large ears,—5 to 6 inches long,—slender body, long legs and athletic build, and the black mark on the upper surface of the tail. There are seven species, all very much alike, which inhabit the southwestern quarter of the United States, extend northward to Oregon, eastward to Nebraska and Kansas, and southward to Tehuantepec, Mexico. In many localities wherein wolves and foxes have been exterminated, these hares have multiplied until they have become a great pest. In several localities in California, and also in eastern Colorado, great rabbit drives are made, in which many thousand Jacks are slaughtered, and given away in large cities for food.

The Jack Hare is a very swift runner. In eastern Kansas, Professor L. L. Dyche once saw a good greyhound chase a Jack on fair ground for about 2½ miles, and in the whole distance the hound gained only about 25 yards. The hare finally escaped by running into *a hollow log* that had been left on the prairie by accident, and was the only shelter within 5 miles!

THE GRAY RABBIT, or COTTON-TAIL,[2] is a typical representative of the Rabbit Family, which contains twelve species. Throughout the extensive region which forms its home,—from New England and Minnesota to Yucatan,—it refuses to be exterminated, and is perhaps more frequently seen and more widely known than any other quadruped.

All the true rabbits are small, and for long running their legs are short and weak; but what they lack in endurance

[1] *Lepus tex-i-an'us.* [2] *Lepus syl-vat'i-cus.*

they make up in cunning and quickness. To aid in their preservation, Nature has given them colors that blend so perfectly with their surroundings that a rabbit crouching low is often compelled to run to avoid being trodden upon. When hard pressed for a nesting-place in a city, a Gray Rabbit has been known to dig a shallow hole in the smooth lawn of the Smithsonian grounds at Washington, line it with her own fur, and *rear her young in it*, within forty feet of the National Museum building and a busy roadway, without discovery by dogs or men until the mowers found the nest almost under their feet. Every year one or two pair breed in the adjoining grounds of the Department of Agriculture.

When a rabbit can have his choice of hiding-places, he chooses a burrow directly beneath a large tree, the roots of which render it difficult, or it may be impossible, for man or beast to dig him out. Crevices in rock ledges are equally good, but he often finds that hollow logs, hollow trees, and brush piles only lead to swift destruction.

He never sleeps in daylight, when enemies are afoot. If the Man-With-a-Gun approaches, he crouches low and lies as still as a stuffed rabbit, breathing seldom, winking never, but with legs all ready to spring. His keen eyes and ears measure every yard of his enemy's approach until the dead-line is crossed when—zip! Out flashes a long, gray streak,—flying over logs, and darting through openings so swiftly that in two or three seconds a snow-white signal flag waves an adieu, and disappears.

In summer hares and rabbits feed on green twigs, soft bark, buds, grass, leaves, and berries. In winter they are

forced to subsist chiefly on the bark of bushes and the berries of the wild rose. Whenever they gnaw the bark from young fruit-trees, it is a sign that they are hard pressed for food.

Rabbits breed very rapidly, often raising three litters a year, and if not kept in check by birds of prey and carnivorous animals, would soon become altogether too numerous. In Australia and New Zealand, the rabbits "introduced"[1] from Europe have multiplied until they have become a fearful scourge, and are now so numerous it is impossible even to keep them in check. Possibly the use of their flesh as food, and their skins as "fur," may lead to an abatement of the evil. The moral of the rabbit in Australia, the mongoose in the West Indies, and the English sparrow in America, is—before "introducing" a foreign species of bird or mammal into America, take expert advice,—and then don't do it! This refers to species able to live wholly by their own efforts when imported and set free.

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[1] A species transplanted from one country to another is said to be "introduced."

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