MAMMALS

Of the Navajo Country

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Dorothy Morris, Ruth Morris

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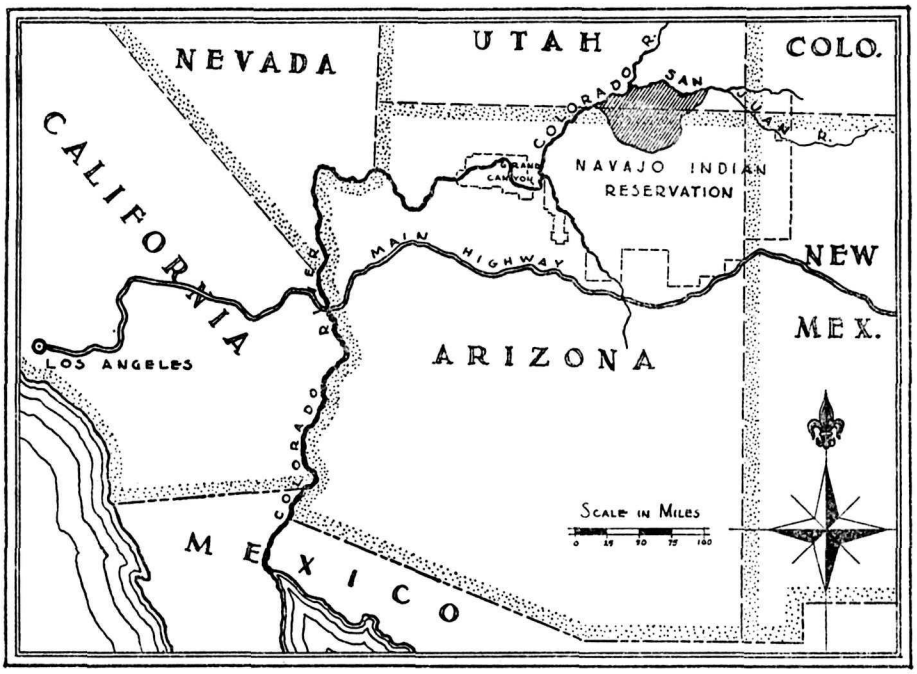
National Youth Administration
(Project 6677-Y)

Berkeley, California

1937



Map Showing Location of Navajo Indian Reservation

Shaded portion indicates area where mapping and scientific field studies are being carried on by the Rainbow Bridge-Monument Valley Expedition.

Foreword

This is one of a series of bulletins on the northern Navajo country, produced under Project 6677-Y of the National Youth Administration, Berkeley, California. In its inception the project had for its main objective the publication of scientific data made available by the Rainbow Bridge - Monument Valley Expedition, resulting from four years of field work in the northern Navajo country.

Dr. Theodore H. Eaton, Jr., who has served as a member of the Expedition's biological staff in the field, was chosen N. Y. A. project director to supervise the assembling, editing and publishing of this fund of knowledge in some form in which it might be useful to the layman or student. As the work progressed it was decided to widen the scope of the project to include information from all reliable sources with a view to producing a usable scientific manual of the Navajo country. This necessitated a research program pursued mainly among publications in the library of the University of California and that of the Expedition.

Acknowledgment is due to a number of agencies and individuals without whose cooperation the production of these bulletins would not have been possible; to the Alameda County Free Library for the earlier sponsorship of the project; to the National Park Service for space necessary for the work; to the University of California for furnishing published material, collections, and space for investigators; to the trustees of the American Exploration Society (under which the Rainbow Bridge - Monument Valley Expedition operates) for unpublished scientific data collected in the field and for contributions in cash toward publication expenses; and - most of all - to Arthur M. Yale, Frederick S. Clough and other administrative officers of the National Youth Administration, who have recognized the importance of this work and have assisted in many ways toward its completion. To all these, and to all the other individuals who have assisted without recognition here, the undersigned, sponsor of the project, expresses his sincere thanks.

Ansel F. Hall

Berkeley, California
April 10, 1937

Arizona Porcupine

TABLE OF CONTENTS

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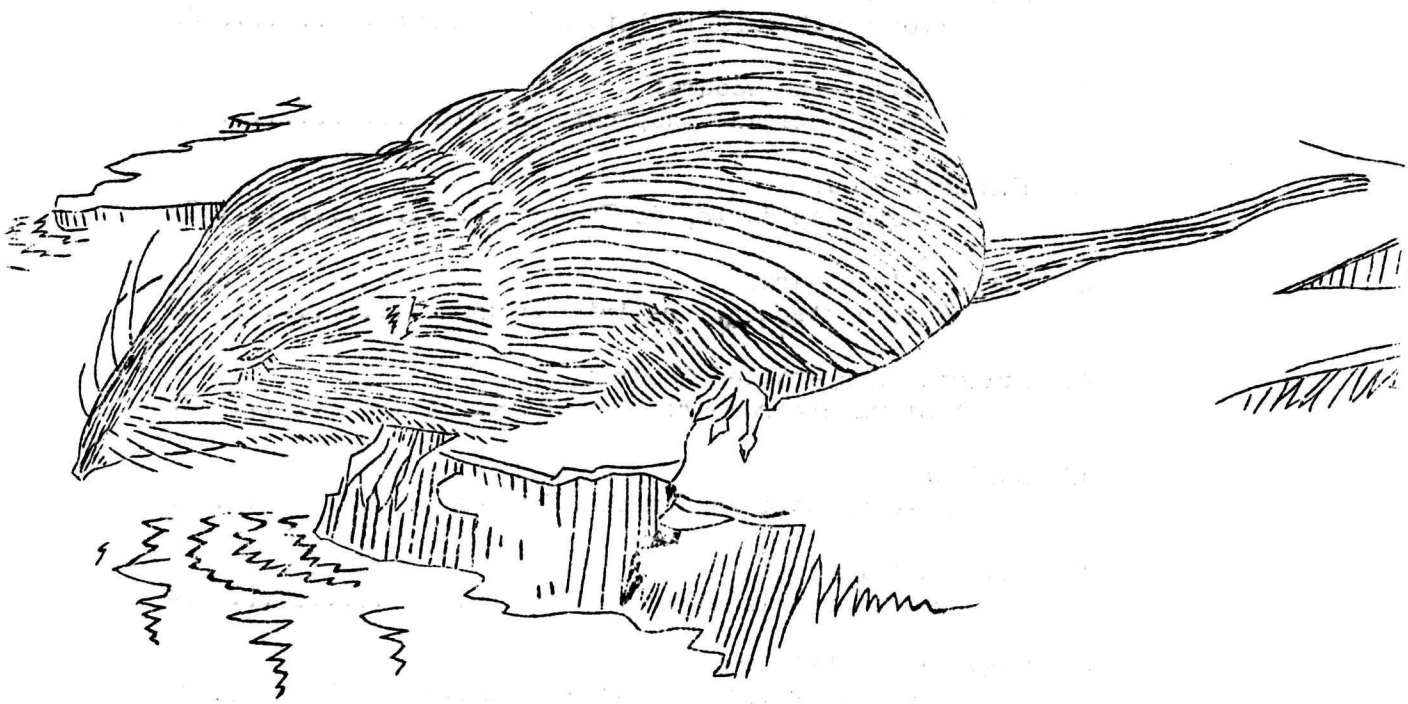

Fig. 1 White-chinned Shrew

Sorex leucogenys (Osgood)

(About twice natural size)

INTRODUCTION

I

The mammals described here include all those so far reported from the Navajo region, that is, the northeast quarter of Arizona and adjacent corners of Utah, Colorado and New Mexico. Each summer, beginning in 1933, the Rainbow Bridge - Monument Valley Expeditions, organized by Ansel F. Hall of the National Park Service, have explored a portion of this little-known land. These expeditions have made maps and careful surveys where none were made before, they have discovered and excavated numerous prehistoric ruins, they have contributed to our knowledge of the Navajo and Paiute Indians, and they investigated the plants and animals. From their reports and from other published sources we drew the information given here. We follow the natural classification of mammals, by which they are divided into Insectivores, Bats, Carnivores or Flesh-eaters, Rodents, Lagomorphs (Rabbits), and Ungulates or hoofed animals. We have kept the descriptions brief and simple, giving only enough in most cases to distinguish each species from others that might be confused with it. The common names are those given by H. E. Anthony in his Field Book of North American Mammals (1928), except those of species described more recently. For the latter we used the original description.

In both text and introduction we lay most emphasis on the lives and peculiarities of the animals. The Navajo Country provides so many different habitats that it is important to study the adaptations made to these by each species.

A special acknowledgment is due to the artists, Walter Merritt, Marion Harter, Harold Apones Jr., and Charles Delameter. They have illustrated the most important species, thereby simplifying the descriptions. The drawings are based largely on specimens in the Museum of Vertebrate Zoology at the University of California, and we are indebted to the authorities of the museum for the opportunity to use this material.

Theodore H. Eaton, Jr.
Dorothy E. Morris
Ruth M. Morris

II The Zones of Life

In the Navajo country of northeastern Arizona and southeastern Utah there are many strikingly diffenent kinds of scenery and climate found within short distances of one another. It is as if a bit of rich cool forest from Canada were set down together with a scorched, barren desert taken out of Mexico, some rocky plateaus from Colorado, warm moist canyons from the southern Rocky Mountains, fertile river-bottoms from the west coast, and liberal helpings of cliffs, gorges and peculiar formations out of the Grand Canyon. The spectacular scenery resulting from this mixture is spread over an immense area, largely uninhabited except by Indians with their occasional wandering flocks of sheep and goats, and consequently it is little known, not even accurately mapped. One can, however, easily see that a certain orderly arrangement prevails among these many types of landscape and climate. The key to this order is in the altitude. From the lowest parts to the highest, a fairly regular sequence of changes occurs. One may climb almost 7,000 feet in the Navajo country, from the hot canyon of the Colorado river at about 3,500 feet to the high, cool summit of Navajo Mountain at 10,416 feet. In this climb, if one visits the north and south-facing slopes, the dry flats, the rocky plateaus and canyons, he will have experienced all the varieties of climate afforded by the Navajo region.

We may, for example, take the canyon of Rainbow Bridge for our starting point in an excursion through the life zones or climate zones. In the summer, the canyon bottom is dry, dusty, and hot. Birds and mammals are scarce. The only mammals so far recorded in Rainbow Bridge Canyon are two species of bats, the Hopi chipmunk, two kinds of pocket mice, three of white-footed mice, and two of woodrats.*

With all the heat and barrenness of the canyon, there is one condition which makes the climate less rigorous. That is the shadow cast by the high south wall of the canyon. Even in the middle of the day there are some places where the sun does not reach the stream bed, and consequently, the average temperature is several degrees cooler, the humidity is higher, and plants which require coolness and moisture grow in these sheltered places. The bottom of Rainbow Bridge Canyon, therefore, is in itself a mixture of different environments.

Going to other parts of the reservation, such as the valley of the San Juan river or the Painted Desert, we find an open, barren, and hot desert, which is likewise characteristic of the lower elevations. This extensive hot belt is called the Lower Sonoran Zone. It also includes Monument Valley and all of the lower portions of the Colorado Canyon.

*Benson, 1935.

A little higher, as in the canyons of Tsegi and Black mesas, and certain open valleys such as the one in Marsh Pass, we reach a milder climate with a great variety of plant life, and corresponding abundance of animals. This zone, the Upper Sonoran, also occurs over a large part of the plateaus, up to and between 7,000 and 8,000 feet. Animals characteristic of the Upper Sonoran Zone are: spotted skunk, badger, gray foxes, mountain lions, ground squirrels, antelope squirrels, grasshopper mice, jackrabbits, and cottontails.

By this time it will be clear that these life zones are definitely related to temperature and rainfall, and to the exposure and slope of a given locality, so that they necessarily follow a fairly uniform elevation. But at the same time, as in the bottom of Rainbow Bridge canyon, in unusual circumstances (the cool, shadowed canyon bottom) the zones may occur out of normal order. Thus we may find Upper Sonoran plants or animals marooned in a Lower Sonoran territory.

To go higher, the next zone above the Upper Sonoran is the Transition. It is found on the slopes of Navajo Mountain, on the higher parts of the mesas, and here and there in the cool shady heads of the higher canyons. In this zone grow Douglas firs, yellow pines, oaks, willows, and a great variety of other plants generally found in more northern states.

The highest zone in the Navajo Country is the Canadian. It is found only on top of Navajo Mountain and on the Chuska and San Francisco Mountains. The Engelmann spruce and trembling aspen form a thick forest in these isolated spots.

A life zone is recognized by certain combinations of animals and plants which live in it, and usually not by any one kind, because very few species are themselves limited to a single zone. A few animals like the badger are so hardy and indifferent to climate that they may be expected anywhere, regardless of elevation. The opposite extreme is represented by the white-cheeked shrew, which is known only from elevations between 7,300 and 8,700 feet in Arizona and Nevada. The majority of kinds fall between these two extremes, and are limited to two or three life zones.

Immediately one will see that a high point like the top of Navajo Mountain contains plants and animals typical of the more northern United States and Canada, while in the lower, hot desert the life is more like that of Mexico. It is easy to see that the more southern animals can reach the Navajo region by traveling through lower valleys or deserts and that they will be stopped only when the elevation becomes too great. On the other hand animals from the north find the low country an impassable barrier. Why then does an isolated mountain peak have any northern animals on it at all? Why do the life zones show a regular change according to altitude regardless of whether a given zone breaks up into islands when it occurs among mountains?

The answer given by the biologist is that climate rather than the order of zones has changed during prehistoric times. When the glacier came southward over Canada and the northern United States the northern forms of life were driven south while the southern forms were replaced or driven still farther south by the cooler climate. Thus even the lowlands in the southern states had forests of Canadian trees and a population of Canadian birds and mammals. After thousands of years the glacial age gradually passed and the country grew warmer. The forests and their inhabitants moved by degrees northward, or higher in the hills, where hills occurred. At the same time animals and plants from the south began to fill the lowlands as the climate became milder. Thus on the mountain ranges or peaks the glacial kinds of life became marooned. They were cut off in these cool spots and gradually forced higher and higher, not by competitors but simply by their old adaptation to that kind of climate. As areas became more and more restricted for them, many of the larger species, needing plenty of space, became extinct. In the mountains of the Navajo country, therefore, we now find only remnants, at the very highest altitudes, of the life which was distributed uniformly over the lowlands in the glacial period.

III How Mammals Are Fitted To Their Surroundings

With the idea of life zones and different environments before us, we may now look at the ways in which animals fit their zones, and how they are adapted to the special conditions normally met during their lives. Some, like the bats or the pocket gophers, are so modified that, while successful in a special mode of life (flying or digging in the ground) they are entirely helpless anywhere else. Others, like the coyote, have no great peculiarities in their make-up, but a combination of useful traits (feet and legs adapted for running, teeth for snapping and cutting, a keen sense of smell, and ability to learn by experience) which makes them successful in a variety of places. Any special equipment, then, possessed to an extraordinary degree by a certain kind of animal, usually means two things: (1) that this animal is highly successful in one mode of life where it has few competitors, and (2) that in any other situation it would be exposed to dangers which it could not escape. Likewise, the lack of remarkable equipment usually means a corresponding versatility, so that the animal fares well under many conditions. In any given habitat, therefore, we may expect to find some restricted and some versatile animals, the former being limited to the one habitat, and the latter found in several.

In the open desert, for instance, where little grows but cactus, yucca and creosote bush, a certain characteristic population of mammals will be found. There are, first, those that live on dry seeds or other parts of the desert vegetation, and second, the ones that prey on these plant eaters. The first group contains pronghorns, jackrabbits, cottontails and kangaroo rats, all of which rely on speed for escape and have developed remarkable running and leaping powers. Other vegetarians which are less specialized and depend upon concealment for escape, are the antelope ground-squirrels, woodrats, pocket mice, and white-footed mice. Practically all desert mammals are nocturnal in habits because the heat of the day is too great and also because the hunted ones find greater safety abroad at night. Since their prey is nocturnal, the hunters, as coyotes and bobcats, must come out at night to find it. So the balance is kept up. The majority of desert animals are of a pale, sandy color, matching the dry vegetation and bare ground. The advantage of this to the hunted ones is obvious, and to the hunters it is no less useful for it permits a close approach to the prey. Only an easy-going, more or less omnivorous animal like the skunk, which pursues nothing and, for a very good reason, is not pursued, has a bold, contrasting pattern of black and white.

In the Upper Sonoran canyons and mesa-tops, where plant life is richer, we find pocket gophers, bushy-tailed ground squirrels (or rock squirrels), and, in certain places, prairie dogs, besides the general run of mice, woodrats and other animals which we have

called "versatile". Here in the Upper Sonoran zone the gray foxes and ring-tailed cats occur. Deer and mountain lions formerly ranged through this territory but are now greatly reduced, as is the pronghorn of the desert and the bighorn of the mesas and canyons.

In the heads of a few narrow canyons among the Tsegi mesas lives an animal, normally successful and wide-ranging, but here, on account of changing climate, making its last stand in an extremely limited area. This is the Beaver, web-footed, house-building, eater of cottonwood bark, one of the few carpenters and engineers among the wild animals. Its habits and structure put it in the class of restricted animals; that is, it must have a running stream to dam up, cottonwoods, aspens or alders to use for building the dam and their bark to use for food. It builds the well-known dome-shaped house in its artificial pond, with entrances under water. If the water fails, so that the house is no longer isolated, then weasels and other predatory animals can enter. If the particular trees on which the beaver depends are too limited, than a beaver colony will cut them all down and starve for want of bark to eat. Both of these difficulties are threatening the small population in the canyon heads, and it is a matter of only a few years, probably, before they go the way of the bighorn sheep.

This fact of limited area accounts for the absence of any characteristic large animals of the Transition and Canadian zones in the Navajo country. There are no elk or bears and few deer or mountain lions. Undoubtedly these were plentiful some time in the past, and probably within two or three centuries, along with the bison and pronghorn of lower zones. But all of them needed a considerable space in which to travel freely, and as their natural zones were restricted to a few square miles here and there, their populations declined below the point of survival. Man himself must have played a large part in their extermination, and he was aided by the same fact of limited area, for it was possible to go directly to the place where the animals occurred and find them easily.

The Navajo country today is, therefore, rich in available habitats for a great variety of mammals, but, on account of increasing warmth and aridity during the last few thousand years, as well as the coming of man, certain of those habitats are relatively poor in actual numbers of species. The kinds of animals in which prehistoric man was not interested are, in general, the ones that survived. These include the rodents and small carnivores, and a few which were either too clever, too swift or too secretive to catch, such as the coyotes and foxes, bats, and rabbits.

MAMMALS

WHITE-CHINNED SHREW

Sorex leucogenys (Osgood)

The Shrew is a very small, highly organized and extremely sensitive animal, seldom seen in the day, not as much because it does not come out as because it can hide easily and quickly. Characteristic points of the Shrews of the genus Sorex are their small size, (3-4 inches) a very sharp muzzle, tiny eyes, and slender form. The upperparts are a pale brownish drab; the sides slightly lighter. The chin and side of face below the eye to the end of the nose is a pure creamy white. The tail is light brownish above, and white below. Although there is some variation the total length is about 4.3 inches.

Specimens have been found in the following localities; Sawmill Springs, 7300 feet, 8 miles southeast of Mormon Lake, Coconino County, Arizona; Rose Peak, 8700 feet, Greenlee County, Arizona; and War God Spring, 8400 feet, Navajo Mountain, Utah.

In spite of its little nervous body, the Shrew is very courageous, and will not hesitate to attack animals several times its own weight. It will eat a Mouse if they are enclosed together. Because of its rapid rate of digestion, it will starve to death if deprived of food for even a few hours. Shrews live mostly on insects. They do not hibernate. As a group Shrews are highly successful and adaptable, some species being found north of the Arctic Circle. Evidently the young keep close to their nests because an immature one is seldom seen.

LITTLE BROWN BAT

INTERIOR LONG-LEGGED BAT

Lyotis volans interior (Miller)

A small Bat, about 3 2/3 inches long. It has small, dusky ears and a rich, chestnut brown fur. The wing membranes are dusky.

This Bat is found in the Canadian, Transition, and Upper Sonoran Zones, and, in this part of the country, at around 6000-8000 feet elevation.

It flies rapidly and is largely a forest dweller, coming out only at dusk. Its food consists of insects.

LITTLE LONG-EARED BAT

Myotis evotis chrysonotus (J. A. Allen)

This is a small Bat (about 4 inches long) with relatively large ears that reach beyond the tip of its nose. On the back and head it is golden brown. The underparts are buffy or whitish, and the wing membranes are blackish.

Living in the drier parts of the country in the Sonoran and Transition Life Zones, these Bats like to roost in the small dark caves and crevices of rocky walls. According to Miller and Allen (1928), they are more frequent about ranch buildings, etc., than about cliffs, and are not very common. They appear in the evening.

Miller says, "It is to be found in Austral and Transition Zones from the Pacific Coast to the eastern edge of the Rocky Mountains; south to Vera Cruz, Mexico."

PIGMY BAT

LITTLE CANYON BAT

Pipistrellus hesperus hesperus (H. Allen)

This is the smallest North American Bat, with a length of less than three inches. It is a pale buffy gray animal with a bluntly rounded body and very small ears with black, naked membranes.

The general range is in the Sonoran Zones in the western United States from southern and western Texas to the Pacific Coast. They are quite numerous in Water Lily Canyon (Clark, 1935). Benson (1935) writes, "Collected at Rainbow Bridge, at Navajo Mountain Trading Post, and 5 miles south of Navajo Mountain. Seen at every locality visited."

They may be observed flying low and with irregular motion over the washes in the bottom flats shortly after sundown. The night is spent in caves, rock crevices, or hollow trees. For food they catch midges and other night-flying insects. Rarely found far from the rocky walls of canyons or cliffs, these Bats are more canyon-dwellers than any other species.

BIG BROWN BAT

COMMON BROWN BAT

Eptesicus fuscus fuscus (Beauvois)or E. f. pallidus (Young)

A rather large Bat, the body length being four to five inches. The color is a smooth brown, with the hairs blackish at the base. The underparts are somewhat paler than above. Blackish on the skin and ears.

This species is probably common throughout the region of Water Lily Canyon (Clark, 1935) at about 6750 feet elevation. General distribution: "Austral, Transition, and lower edge of Boreal Zones throughout the greater part of the Unites States and adjoining British Provinces." (Miller) The race pallidus is reported from Navajo Mountain Trading Post by Benson (1935).

The Big Brown Bat flies at dusk and later; it catches insects. During the day it roosts in caves and hollow trees.

LUMP-NOSED BAT

Corynorhinus rafinesquii pallescens (Miller)

The peculiar lump-like, warty outgrowth on the muzzle of this bat, and its very large ears distinguish it from other species. The ears, much longer than the head, with narrow tips, are joined across the forehead. The nostrils open upward. They are surmounted by glandular masses. The tail is less than half the total length of the Bat. The hair is a soft, pale pinkish buff. The underparts are a pale ochraceous buff. The base of the hairs are gray everywhere except on the mid-throat, where the color is uniform from base out. Back of the ear is a whitish spot. The total length is 4.1 inches.

The Lump-nosed Bat is found in western United States from western Texas, Colorado, and South Dakota to the Pacific coast of southern California.

These Bats prefer to live in caves, although they may use any deep, dark recess such as abandoned mine shafts, and tunnels, or even buildings. In July or earlier, one young is born.

A most interesting fact is that when in their winter sleep, their ears are curled up in spiral coils, like a ram's horns.

PALE BAT

PALLID BAT

DESERT PALLID BAT

Antrozous pallidus pallidus (Le Conte)

This Bat can be recognized by its large, broad ears, reaching beyond the end of the nose when laid forward, crossed by nine or ten fine lines, and narrowly rounded tips; and by the nostrils, which are surrounded by a ridge. Its muzzle is quite blunt, its feet large and strong; its naked wing membranes strong and tough. The upperparts are a pale drab gray with some dark brownish-gray tipped hairs. The hair is light at its base. The sides are lighter, although some of the hairs are tipped also, but the underparts are even-colored and more pale. Both sexes are colored alike, with no seasonal variation.

The Pale Bat is found in the arid parts of the western and southwestern states and Mexico. It extends from western Texas, southern Colorado, Nevada, and Oregon south to Queretaro, on the Mexican table-land, and to the southern end of the peninsula of Lower California. Vertically distribution extends from sea level to at least 5000 feet altitude.

Their food is composed of insects and their enemies are the Owls. By day they live in the roofs of buildings, in darkened corners of barns, churches, and also in crevices and caves in cliffs. Sometimes they become a nuisance because of their fondness for habitations in use by people. The young, varying from one to three, are born about June first.

Although rapid, their flying is not as erratic as that of most Bats. "There is evidence to show that these Bats catch some of their prey, such as the Jerusalem Crickets, upon the ground, also that they are to some extent, at least, migratory." (Benson)

MEXICAN FREE-TAILED BAT

Tadarida mexicana (Saussure)

The Free-tailed Bat is instantly recognized by the mouse-like tail which projects beyond the back or wing membrane, and by its narrow wings. It is of medium size, with broad, tough ears starting from one point on the forehead, the upper lip wrinkled. There are stiff, bristly hairs on its face, and long hairs on its toes. The upperparts are brown, the underparts more pale. The hair is soft and dark. These are the most rapid flyers of all the North American Bats.

They are found in southwestern United States in Colorado, south into Mexico, and from the Pacific coast to the middle of Texas.

In San Antonio, Texas, municipal bat roosts have been erected to encourage these Bats to live there, in order to fight the mosquito. Dr. Charles Campbell of San Antonio has written a book on municipal bat roosts. Although he believes them an asset, Dr. E. W. Nelson, formerly Chief of United States Biological Survey, and other observers question the value of Bats as a mosquito control. These Bats are "house" Bats, and live in dark nooks of buildings.

RING-TAILED CAT

CACOMISTLE

BASSARISK

Bassariscus astutus arizonensis (Goldman)

This small, trim cat-like animal is closely related to the Raccoons. Its color pattern is quite different, with the exception of the tail, which is ringed with black and white. The body is smaller, more slender, with softer, shorter fur. The tail is longer-about as long as the head and body, and bushy. The head is small, with large, thinly haired ears; the body sleek and lithe. There are five toes on each foot, with semi-rectractable claws. The sexes are alike in color; the upperparts grayish brown, made by the combination of buff, brownish black, and gray. The back is the darkest, the sides being a yellowish gray. The hair at the base is dark gray. The males are about 32 inches long, the females somewhat smaller.

The Cacomistle is found in the southern United States, from Texas west.

Strictly nocturnal, they will not venture out from their dens until darkness is complete. Although timid, they are restless at night and wander in search of mice or other small game, or sometimes just to satisfy curiosity. In the Mexican table-land their inquisitive instinct often leads them to explore the streets of towns and cities during the night, even though these places are filled with dogs. They sometimes make their dens in buildings although their natural habitat is rocky places in caves and deep crevices, and sometimes in hollow trees. Three to four young are born in May or June.

As does its relative the Raccoon, the Cacomistle likes a varied diet and takes what comes its way, Wood Rats, Mice, even Bats amid their rocky haunts, and birds in bushes and low trees. Insects of many kinds, larvae and centipedes, various fruits including the pear-leaved cactus, dates, green corn and figs are also eaten. When caught they sometimes bark almost like a dog.

The Cacomistle is intelligent, easily tamed, and makes an interesting pet. During the early years of gold mining in California, many were attracted to the men's cabins because of the mice, became friendly with men, and stayed there, keeping the place free of mice.

MOUNTAIN WEASEL

Mustela arizonensis (Mearns)

This is a small, sinuous animal with a long body, slender black-tipped tail and short legs. It has a small head with the ears placed low. The fur is umber brown, except on the abdomen which is orange in summer. In winter it is a pure white to match the snow, but the tail still has a black tip. The males are larger, being over 15 inches to the females' 14 inches.

They seem to like the higher altitudes and have been found at 7,000 feet elevation near Ladder House in Long Canyon. They are characteristic of the Rocky Mountains and cool climates. General distribution: in the Sierra Nevada and Rocky Mountain region. However, it is not found north of the Siskiyou Mountains in the Sierra-Cascade system (Merriam).

Weasels are great travelers and tireless hunters, always searching for prey, of which they kill far more than they eat. They are small enough to follow a Chipmunk into its hole, persistent enough to pursue a Rabbit until it is exhausted, and agile enough to chase Squirrels and rob birds' nests in the trees.

CANYON SPOTTED SKUNK

SPOTTED SKUNK

GREAT BASIN SPOTTED SKUNK

Spilogale gracilis gracilis (Merriam)

This is a small Skunk, 13 to 18 inches in total length. It has long black fur with white spots and stripes scattered on the back, head and tail. The head is small and weasel-like, the legs are short, and the tail bushy. The sexes are alike in color, although the male is slightly larger than the female, being 13.4 inches to 16 inches. The underparts are black. Probably two subspecies will be found here: S. g. gracilis Merriam, the Canyon Spotted Skunk, at lower elevations, and S. g. saxatilis (Merriam), the Great Basin Spotted Skunk, in higher parts.

They show a preference for rocky canyons, cliffs, and broken country. This species is found in northern Arizona and the desert ranges of southeastern California; south in the Sierra Madre to Jalisco and Michoacan (Howell).

Insects, such as beetles and grasshoppers, varied with small mammals, birds, eggs, lizards, salamanders and occasionally fruit make up their diet.

Because of their musk defense, they are fairly free from molestation by predatory creatures, but sometimes one is caught by a Great Horned Owl or Bobcat. They seldom go about during the day. They have from two to six young and average about five. In rocks, hollow logs, or in a self-made burrow or adopted one, the Spotted Skunk has its maternal den.

AMERICAN BADGER

Taxidea taxus berlandieri (Baird)

A robust, heavy bodied, short legged animal belonging to the weasel family. It is about 30 inches long and has a short, thick bushy tail and very long, loose and shaggy hair. The head is broad and flat and comparatively small, with black and white stripes and spots of much shorter hair than that of the body. There is a narrow whitish patch on the face below the eyes and ears, the sides of the muzzle, a spot in front of the ear and the top of the head. The dusky gray ears are rounded and placed low on the head. The legs are short and powerful and the feet have five heavy claws, those on the forefeet being over an inch in length. The body is a silvery gray grizzled with black.

It is possible that more than one subspecies occurs in northeastern Arizona. Badgers are widely distributed in the open or sagebrush country where Ground Squirrels, Mice, and Prairie Dogs are common. Benson (1935) gives a record from Navajo Mountain Trading Post.

A voracious hunter of rodents, powerful digger, and fierce fighter, the Badger wanders from place to place in search of good hunting grounds. It is tough and strong, both in its meat and in its habits, so it has few enemies other than man. Its large burrows are familiar in Prairie Dog country, but it does not live in them permanently; they are usually made in pursuit of prey. The Badger's food consists of small mammals, such as Ground Squirrels, Prairie Dogs, Mice, Pocket Gophers, etc., birds and their eggs, and sometimes insects. It has few enemies, for it is fierce enough to drive off all but the largest carnivores. Although of the Weasel family, the badger is so slow-footed that when it is occasionally found abroad by day a man on foot can easily overtake it. When brought to bay, it charges man or dog with such vicious power and desperation that nothing its own size can overcome it. It is savage and morose, and has nothing of the playfulness found in many of its relatives.

LONG-TAILED RED FOX

Vulpes macroura (Baird)

Characteristic of this Red Fox are its small, sharp nose, its slender, dog-like build, large ears standing erect, and its long, bushy tail. The upperparts are a golden yellow, the rump sprinkled lightly with white, and the head reddish yellow. The forefeet and ankles are black. The tail has a black spot on the upper surface near the base. The rest of the tail is a yellowish color mixed with black. The underparts are white. Very young specimens are a dull yellowish brown or drab color. Adult males average 41 inches, the females are smaller.

The Red Fox has been found in the upper San Juan Valley in New Mexico by Bailey. Benson (1935) reports it on Navajo Mountain, Utah. The general distribution includes the mountains of Colorado, Utah, and Wyoming.

The Red Fox is keen and alert. There are many stories of its ability to outwit pursuers or prey. It apparently mates for life and lives in self-dug dens or among rocks, always having two or more entrances opening in opposite directions. The young are carefully tended to by both parents, and number up to eight or nine.

ARIZONA GRAY FOX (ANTHONY)

SCOTT'S GRAY FOX (WARREN)

Urocyon cinereoargenteus scottii (Mearns)

This is a typical Fox in appearance, its muzzle long, ears erect, a long, bushy tail, and a concealed mane of stiff hairs. The soles of its feet are furry, the pupil of the eye elliptical. In coloring, the Gray Fox doesn't vary much with the season, being a grizzled gray and black, lighter on the sides, and a decided reddish brown about the ears. The cheeks and inside of the ears are white, the muzzle blackish, and the tail heavily marked with black. The average length is 39 inches.

Gray Foxes are most abundant in the Upper Sonoran Zone, but are also found in the Lower Sonoran and Transition Zones. They do not go much above 8,000 feet. Since they do not have the fleetness of the plains foxes, they stay close to the cliffs and rocky or timbered country, where they can take refuge quickly. The range in the United States is from the region of the Great Lakes east to the Atlantic seaboard and south to Texas; westward the species reaches the Pacific Coast and northward to Wyoming.

Its diet consists of small mammals, birds, reptiles, fish, and also of fruit, berries, acorns, and mushrooms, although they are largely carnivorous.

The Gray Fox likes the rocky ledges along the gulches and canyons where it lives in holes and caves. The young are rarely found until they are old enough to come out and hunt for their own food, because they are born and reared in safe retreats among the rocks or in hollow trees. They are usually three or four in number and are born in the spring.

These Foxes hunt in pairs. The male takes his share in the care of the family and is very devoted to his family.

DESERT COYOTE

Canis estor (Merriam)

A small, pale Coyote with a total length of 42 inches. The upperparts are buffy with a light sprinkling of black hairs. The muzzle is a pale yellow, and the nape and ears an ochraceous buff. The legs are a bright, deep buff, the underparts whitish, and the long hairs of the throat are black-tipped.

This is an Upper Sonoran animal, and has been found in Long Canyon and upon the talus slopes of the Tsegi Drainage area. Found in "Lower Sonoran deserts of eastern California, Nevada, and Utah." (Miller)

Coyotes apparently thrive all the better with the advance of civilization. They go after rubbish buried by men, indicating that they have adapted themselves to human habitation. They are very cunning, and are seldom seen in the day. They also show a great deal of curiosity, but are cunning enough to avoid ordinary traps of the hunter. They will not attack a man. They feed on small mammals, birds, fruits and berries of the canyon walls and canyon beds.

The Indians throughout the west regard the Coyote with superstitious fear. To them it is an evil spirit, and it plays a prominent part in their folklore.

MOUNTAIN LION

PANTHER

PUMA

COUGAR

Felis concolor (subspecies)

The Cougar is the largest American cat, with the exception of the Jaguar. It has a long, lithe body with a small head and a long tail with a black tip. It is pale brown, weighs from 120 to 150 pounds, and is from 7 to 9 feet long. Young number from two to five. They are a paler brown than their parents, with large dusky spots on the body and dark stripes on the tail.

The Mountain Lion is not now a regular inhabitant of the Navajo region. No other American mammal had in early times a range as large as the Mountain Lion. Originally it inhabited both North and South America from southern Quebec and Vancouver Island to Patagonia and from the Atlantic to the Pacific coasts. At one time it was quite common in the Adirondacks of New York, but has been killed off. It is still, however, to be found in the Rocky Mountains of the West.

The Mountain Lion is a tireless wanderer, often covering as much as 20 miles during the night hunting fawns, rabbits, and other mammals. Although powerful, it is really very shy and remains hidden if humans are near. Its loud, weird cry is described as like that of a terrified woman. The stories of Mountain Lions attacking people are fiction, for it is apparently impossible to verify them.

The Cougar catches its prey by silently stalking close to it, taking advantage of every cover until within striking distance. Then, with one or more powerful leaps, it dashes the victim to the ground, throwing all of its stunning weight upon it.

BAILEY BOBCAT

PLATEAU WILDCAT

BOBCAT

Lynx baileyi (Merriam)

This is a fairly large Wildcat whose coloring consists of buffy browns and soft grays somewhat similar to that of the Canada Lynx. In winter it is yellowish gray, and in summer a pale yellowish color. The male is 36 inches, the female 34 inches in length. It looks like an ordinary house cat, but larger, with heavier legs and a bobtail and longer hair on the sides of the face.

It is found in the Upper Sonoran, Transition, and occasionally in the Lower Sonoran valleys. It has been seen near Navajo Mountain Trading Post (Benson, 1935). Bobcats are most often found in the half-open juniper and nut-pine forests of the plateau country. General distribution; the southeastern half of California, Arizona, and New Mexico, north into Colorado, and east into Texas and Oklahoma.

They are shy and furtive and seldom seen, but when startled can run with great speed for a short distance, with a bounding gait. The Wildcat helps the ranchers by killing Rabbits and small rodents, although it sometimes kills Fawns and Sheep. This animal does not attack people, though popular belief often credits it with such action. The Wildcat feeds mainly on such small prey as Rabbits, Mice, Squirrels, Foxes, and Birds. Although an excellent tree-climber, it spends most of its time on the ground, where it ordinarily hunts.

The young are four in number. They have been proven to make gentle house pets.

COLORADO ROCK SQUIRREL

Citellus grammurus grammurus (Say)

This is a large grayish or brownish Squirrel (about 18 inches) with rather small ears and a long, flat and bushy tail narrower than that of the tree Squirrels. It is grayest on its shoulders, upper back and sides, and brownest from the rump to the middle of the back. The upperparts are a grizzled gray with a somewhat dappled effect. The top of its head is light brownish, and the hands and feet light buffy. The underparts are more yellowish. The first upper

premolar is small and peg-like in appearance.

The Colorado Rock Squirrel lives at elevations between 6000 and 7500 feet. It has been found in the districts of Kiet Siel, Water Lily, Bubbling Spring, Long and Tsegi Canyons. It has not been observed in canyon flats.

Under large rocks of the talus slopes or canyon walls their nests have been discovered frequently. The Rock Squirrel's diet consists of seeds, nuts, acorns, grain, fruits, green vegetation and some animal food.

CINNAMON GROUND SQUIRREL

RUSTY ANTELOPE SQUIRREL

WHITE-TAILED GROUND SQUIRREL

Ammospermophilus leucurus cinnamomeus (Merriam)

This small Squirrel looks much like a Chipmunk, with its short ears and tail, its chubby body, and a white stripe down each side. There is a bright shade of brown on the back; the upperparts in general are grayish fawn color in summer, and bright cinnamon dusted with gray in winter. Beneath it is white, and the tail, jerking frequently as the Squirrel sits up or runs about, flashes its white underside. The total length is 8.5 inches.

The Antelope Squirrel lives mostly among the greasewood and sagebrush of the Upper Sonoran Zone. Its burrows run close beneath the surface, but are often protected by rocks, thorny bushes or cactus, on top of which the owner may sit to keep watch. Occasionally it will give a shrill chipper or trill, but most of the time it is quiet.

It is found in northern Arizona, northeastern New Mexico, southwestern Colorado, and southern Utah.

In the Tsegi area the nests and burrows are made in the sand flats of the canyons near the beginning of rocky slopes. On the mesas they often occur among old stumps, logs or brush piles.

The Antelope Squirrel eats seeds, grain, and green vegetation. Sometimes it catches insects, and will even eat meat, if mouse-traps with their victims are left out during the day.

Snakes, Hawks, and many of the carnivorous mammals prey upon Antelope Squirrels.

ZUNI PRAIRIE DOG

Cynomys gunnisoni zuniensis (Hollister)

This is a short-tailed, heavy-bodied Ground Squirrel with dark cinnamon or buffy below. It is from 13 to 15 inches in length and weighs (male) 2 pounds. It is somewhat larger than the typical gunnisoni, with larger hind feet.

They inhabit chiefly the Upper Sonoran, but also the Transition Life Zone. Distribution covers southwestern Colorado, northwestern and west-central New Mexico, north-central Arizona, extreme southeastern Utah, and southwestern Colorado.

Prairie Dogs live in colonies or "towns" in open grassy country. They dig deep holes and pile the earth in low mounds about the entrances. On these mounds they will often stop and sit erect and motionless to watch the approach of a man or another enemy, and at the last moment dive into the hole. Over most of their range there is no permanent water within reach of the Prairie Dog towns, and in dry periods they must be forced to go for months without a drink. But this doesn't seem to bother them, although after a shower they are often seen drinking at the little pools. The old theory that Prairie Dogs dig wells to a subterranean water supply has been proved to be without foundation. The juice of their green food and occasionally of cactus and other plants enables them to keep up the necessary supply of moisture for their bodies.

The number of young varies from 4 to 6. In most cases their winter hibernation holes reach to a depth of from 6 to 8 feet. The Black-footed Ferret follows Prairie Dogs into their burrows, and the Badger, by enlarging the hole, can do likewise. Against these enemies the Prairie Dog has little defense. Only its powers of reproduction keep its numbers up in spite of such attacks.

HOPI CHIPMUNK

Eutamias quadrivittatus hopiensis (Merriam)

This Chipmunk varies widely in richness of coloration and size; from light yellowish brown to chestnut, and from 7.1 to 8.9 inches in length. It has dark stripes on its head and back which vary from light chestnut to almost black.

The Hopi Chipmunk is the most common marmal found on the mesas of the Tsegi Drainage with the exception of the Mice, It is a brightly colored, tawny race of quadrivittatus in which the dark dorsal stripes are mainly tawny instead of black. Its eyes have small blackish patches around them. The shoulders are a pinkish tinge of cinnamon.

This species is found in the Upper Sonoran and Transition life zones. It has been seen on the mesas, talus slopes and canyon beds of the Tsegi drainage area. The sand flats of the canyon beds it rarely visits, and it stays in the range of 5800 to 7800 feet. The general distribution runs from southwestern Colorado into New Mexico and Northern Arizona, and north into southern Utah. (Anthony)

The Hopi Chipmunk eats fruit of many varieties, seeds, nuts, buds of grass, shrubs, juniper nuts, insects, and birds' eggs. The Snakes, Weasels, Foxes, Coyotes, and Wildcats are its enemies.

KIABAB SQUIRREL

Sciurus kaibabensis (Merriam)

The most interesting feature of this striking Squirrel is the large, rabbit-like ears (See illustration). The underparts are mainly black mixed with some gray, and the tail mostly white all the way around. The upperparts are a dark, grizzled gray. It has a dorsal band of rusty red, and a black nose.

This Squirrel is found only in the Kaibab forest, north of the Grand Canyon, in Coconino County, Arizona, and therefore is not strictly a resident of the Navajo region.

This species may be seen in numbers by any visitor to the North Rim. It has a bark similar to the Eastern Gray Squirrel. This species lives in hollow trunks or decayed knot-holes. The nests are large, and built of leaves, pineneedles, twigs, etc. The young number three to four to a litter, with probably two litters to a season. The food consists of seeds of conifers and acorns, and bark from twigs, mushrooms, young birds, and eggs.

POCKET GOPHER

Thomomys bottae alexandrae (Goldman)

Gophers are robust, broad-headed, short-legged burrowing rodents with fur-lined cheek-pouches opening on the sides of the head. The forefeet are strong, with powerful claws for digging. The tail is short, thick, and has little hair. The eyes and ears, on account of the underground life, are very small, and the fur is fine and soft. The race alexandrae was described by Goldman (1933) as a distinct species on the ground that his specimens did not show intergradation with any others. Benson (1935) concluded, with more material, that it is a subspecies of bottae, produced by isolation in the vicinity of Navajo Mountain.

The animal is small (9 to 10 inches), cinnamon-buff, darkened somewhat on upper parts by black-tipped hairs. The middle of the face is blackish, and black spots encircle the ears. The feet and tip of the tail are whitish.

This race is apparently restricted to the plateau between the Colorado and San Juan Canyons, bounded on the south by Navajo Creek and east by Paiute Creek. This region is mainly an arid, brush-covered plain lying at about 6500-7500 feet, with Navajo Mountain rising still higher. The type locality is at 8600 feet, south of the summit of the mountain.

The Gopher is a burrowing animal, seldom seen above ground, and is destructive to grass and cultivated crops. Piles of earth, usually without an open hole in the center, mark the progress of the animal beneath the surface. When the Gopher wants green food it makes an opening to the outside world and reaches out part way to drag in whatever plants it can find, but is careful not to give itself away by a pile of dirt.

The enemies of the Gopher are Weasels and Snakes, which can pursue it through its tunnels, Badgers, which can dig down from above, Coyotes, Foxes, Hawks and Owls, which pounce on it when they chance to see it at the surface, and most of all, man, who must continually trap and gas Gophers to keep them from his fields.

PAINTED DESERT POCKET MOUSE

Perognathus flavus hopiensis (Goldman)

This Mouse was found near Navajo Mountain and at Navajo Mountain Trading Post. Its life zones are the Upper and Lower Sonoran from northeastern Colorado and western Nebraska to northern Mexico, extending westward in central Arizona and eastward to western Texas.

In appearance, this Mouse is rather small (about 4½ inches), has a short tail, and a very soft fur. The Upperparts are pinkish buff with light sprinkling of black, darkest on its back. The lateral line does not stand out very sharply. Behind its ear is a prominent buffy spot. (See drawing.) The cheeks have fur-lined pouches for carrying extra food.

In habit, this Mouse is nocturnal. Its enemies are Snakes, Owls, Weasels, Foxes, and other small predatory mammals. (Anthony)

APACHE POCKET MOUSE

Perognathus apache apache (Merriam)

The color of this beautiful Pocket Mouse at once distinguishes it from all other species of its genus. Above it is bright buff, finely lined with black; underparts are white. Some specimens have been found to be a little different, being almost black on the back, with clear r-fous-tinged buff on the sides. The tail is thinly haired. The cheeks have fur-lined external pockets. This Mouse is about 5½ inches long.

Widely distributed in sandy desert patches of canyon beds, its range is found to be in elevations of 6500 to 6700 feet in the Navajo Country. Specimens have been taken from Long Canyon, Water Lily Canyon and Dogoszhi Biko in the Tsegi Mesas. Distribution in general runs from eastern Arizona to western New Mexico, and southern Utah (Osgood).

These Pocket Mice make small burrows and pathways over the sand. In Long Canyon they were found in burrows made by Kangaroo Rats (Clark).

POCKET MOUSE

Perognathus longimembris arcus (Benson)

This is a new subspecies of the longimembris group, collected by Seth B. Benson in 1933. It is very much like the P. l. arizonensis, except that it has a longer tail (averaging 85mm. instead of 73mm.), larger ears, and is slightly paler in color. The total length is 145 mm., and the weight is 8.5 grams. It lives chiefly on seeds.

INTERMEDIATE POCKET MOUSE

Perognathus intermedius intermedius (Merriam)

This Pocket Mouse is found in several scattered localities in the Sonoran Zone of Arizona, New Mexico, and northern Mexico (Osgood). It is a medium-sized Mouse, dark in color. Its upperparts are drab mixed with black. The narrow lateral line is pale fawn. Its tail is blackish at tip, and white underneath.

This race of Mice eats seeds chiefly. Its enemies are Snakes, Owls, Weasels, Foxes, and small predatory mammals.

PAINTED DESERT KANGAROO RAT

Dipodomys ordii longipes (Merriam)

This is a small Rat with a robust body, large head, and large eyes. It gets its name from the long hind legs with which it leaps like a Kangaroo, the long tufted tail straight out behind and the reduced forelegs against the chest. This Kangaroo Rat has round external fur-lined cheek-pockets. It has a beautiful fur--long and soft, and with a very distinctive color pattern. The upperparts are a bright orange-buff, finely sprinkled with black, this color pattern not varying much with the season. Average length is 10.8 inches.

The Painted Desert Kangaroo Rat is common in the Tsegi country, inhabiting both the canyon beds and the mesas. Collections were made in Water Lily Canyon and Dogoszhi Biko (Clark). General distribution: Painted Desert, Coconino County, Arizona; and adjacent portions of New Mexico, southeastern Utah, and southwestern Colorado. (Anthony)

These Rats live in colonies which are often widely separated from each other. They burrow in sandy flats. They make many openings to these burrows, usually under the rabbit brush and shrubs, or on the sides of small washes. They are extremely industrious in constructing their subterranean runways and nests. One of these burrows when dug out was found to consist of over 100 feet of runways and chambers with 65 openings. Also, many dead-end chambers had been made, and two large compartments containing nests had been constructed. The nests are made about 4 feet below the ground.

The Painted Desert Kangaroo Rat generally eats seeds and grain, though sometimes it feeds on green foliage. Its enemies are Snakes, Owls, Coyotes, Weasels, Badgers, and Bobcats.

This Rat is extremely cautious and elusive in its movements and hard to trap. It will not try to eat the bait until the trap has been seen so often (2 to 4 days) that it has become a familiar part of the landscape. Kangaroo Rats are creatures of the night, with big eyes like many other nocturnal mammals. One can sometimes see them hopping about on a moonlight night.

BROAD-TAILED BEAVER

Castor canadensis frondator (Mearns)

The Beaver is the largest of North American rodents (up to 45 inches long)and one of the best-known. The Broad-tailed Beaver of the southwest is larger, paler, and has a broader tail than the typical Canadian Beaver. The upperparts are light chestnut, the sides wood-brown and the feet burnt sienna; these colors become slightly darker in winter. The ears are short and the hind feet webbed, for the Beaver spends most of its life in the water. The tail is not used for digging or carrying mud, but serves as a rudder when the animal is swimming or diving, and to strike the surface of the water a resounding slap as a danger signal.

The Broad-tailed Beaver is found in the southwestern, but not the Pacific, states from Mexico north to Wyoming and Montana. The only ones known in the Navajo country are isolated in the heads of a few of the deep, narrow canyons in the Tsegi mesas, where their dams may be seen in the stream beds among aspens, cottonwoods and Douglas firs. Here, as elsewhere, they make artificial ponds, building their dome-shaped houses in the middle, safe from Weasels or Coyotes, and they cut and fell nearby trees which are dragged into the water so that the bark and twigs may be devoured. The mud used by Beavers in building dams and houses is scooped up and carried against the breast, the front feet being used like hands.

Beavers mate permanently and have from two to five young each year.

From what is known of the past conditions of the Navajo region, there must have been a good deal more water in the canyons, and the Beavers as well as the vegetation were probably much more widely distributed. Apparently with a decreasing supply of water they have nearly reached the vanishing-point.

GRASSHOPPER MOUSE

SCORPION MOUSE

Onychomys leucogaster pallescens (Merriam)

Rather sturdily built, this Mouse has large forefeet and a rather short tail, which is thick and tapering. The length is about 6.5 inches. Its hair is full and silky. The color pattern is sharply bicolor, white below and dark brown on top. At the bases of its ears are woolly, pure white tufts. Sometimes occurring in a melanistic phase, this animal is then glossy brownish black above and only slightly lighter below, some of the white being retained as blotches. (Anthony)

For food the Grasshopper Mouse likes insects, vegetation and seeds, and occasionally other Mice. Characteristic animals of the arid and semi-arid treeless plains, plateaus, and foothills of the west, their range extends from Minnesota and Kansas west to the Cascades and to the Pacific coast of southern California, and in the North, from the plains of the Saskatchewan southward to San Luis Potosi, on the tableland of Mexico.

This race of Mice is rather scarce and inhabits the sandy patches in the Transition and Upper Sonoran Zones. They live in holes. Sometimes they dig for themselves, and at other times take over abandoned holes of other animals. They excavate much for themselves, however, as their strong forepaws are well fitted for digging. They breed in the spring and early summer, 3 to 6 being born in a litter.

This race of Mice may be regarded as beneficial, since they do not seem to injure crops and they destroy harmful insects. When obtainable, grasshoppers are one of their favorite foods, and it is from this that they received their common name. In Colorado they are sometimes called "Scorpion Mice" because of their fondness for scorpions. When eating they sit upright on their haunches and hold the insects in the front paws, eating them head first. Oddly enough, when captured this Mouse may be very friendly with its captor.

TAWNY WHITE-FOOTED MOUSE

ARIZONA WOOD MOUSE

Peromyscus maniculatus rufinus (Merriam)

This is a richly colored, tawny Mouse, with underparts creamy white. The ears are covered with short, silky hairs, usually with a small tuft of white hairs at the end. The ears are short, and the tail is distinctly shorter than the head and body. The immature Mice are bluish or slaty gray. In size they range from 5.8 to 6.8 inches.

Most frequently found in the Upper Sonoran Zone, the Tawny White-footed Mouse lives also in the Transition and Canadian Zones at elevations of 6500 to 7800 feet in the Tsegi Drainage area. It occurs in the canyons and on the mesa tops. The general distribution includes scattered peaks and ranges in Arizona, eastern Utah, the greater part of western and central Colorado and higher parts of New Mexico.

It is doubtful whether these Mice dig burrows for themselves. They usually make their homes underground under rocks, in hollow trees or logs, in camps, cabins, old buildings, or in the surface of the ground under dense cover. They like cover in a dry place for a nest in the summer and a well-protected and warm, dry home in the winter. The Mice make their nests of very fine, soft, and dry grass stems and plant fibers and often line them with wool, feathers, or the silky down of various plants. The nests are very neat and carefully lined, especially those in which young Mice are found. In newly settled districts this Mouse has been found to make itself very much at home in the houses. It will eat another Mouse that is caught in a trap.

For food they eat seeds, grains and dry vegetation, occasionally insects and any fresh meat they can get. Some of the seeds they store, though they are active in winter and do not hibernate. Their litters average from 4 to 8.

SONORAN WHITE-FOOTED MOUSE

Peromyscus maniculatus sonoriensis (Le Conte)

This Mouse is rather large, being from 6 to 7 inches long. Its upperparts are ochraceous buff finely mixed with dusky. The dusky ears have a broad white edging, at the base of which is a tuft of buffy-colored hair.

The Sonoran White-footed Mouse is found in the Upper Sonoran Zone. It is one of the most plentiful and widely distributed Mice in this part of the country. This species breeds in caves, ruins and crevices near the base of cliffs, and may be found on rocky slopes of canyons and mesas. It is found in the Great Basin region in general, northern Sonora, southern and western Arizona and Utah, with the exception of the higher mountains; southern and eastern California east of the Sierra Nevada, practically all of Nevada, and parts of southeastern Oregon and south-central Idaho.

The diet of this Mouse consists of small seeds and nuts and dry vegetable foods. Its principal enemies are Owls, some of the Hawks, Weasels, Foxes and practically all of the small carnivorous mammals and Snakes. This Mouse has an extended breeding season, the litters varying from 4 to 6.

ROWLEY WHITE-FOOTED MOUSE

ROWLEY'S DEER MOUSE

Peromyscus boylii rowleyi (Allen)

There is considerable variation in color, markings and size in this race of Mice. In general it may be said that the upperparts are dull brownish-gray; the lower parts and feet are white. This Mouse differs from the next species by a shorter ear. The total length is 7.2 to 8.3 inches.

The habitat of this Mouse is in the Upper Sonoran Zone. It will be found in plentiful numbers in the canyons, though none on the mesas. It likes rocks and low open forests of juniper, nut pines and blue oaks instead of sandy flats. The general distribution includes the mountains of southern California, nothern Lower California, southern Nevada, Utah, Colorado, Arizona, New Mexico, western Texas, and south in Mexico (Osgood).

Rather than burrow in the ground, these Mice appropriate a cavity that offers concealment; this is their protection from nocturnal birds and mammals which prey upon them. Several litters of young are born each season, these Mice being prolific breeders.

TRUE DEER MOUSE

TRUE WHITE-FOOTED MOUSE

Peromyscus truei truei (Shufeldt)

This Mouse has ears as long as its hind feet. Its tail is about half its total length, which is about 7.5 inches. Its mustache is long, and the eyes are large and prominent. The adult Mouse is rich buff, back slightly darker buffy brown, while its feet and lower parts are white. The hair is long and soft, the feet being densely haired for about two fifths of their length.

The True Deer Mouse is rarely found far from rocks, cliffs or canyon walls--elevation 6,000 to 7,800 feet in the Navajo region. Its general distribution runs from southern California across southern Nevada, Utah, Arizona to west central New Mexico.

One seldom sees it in the daylight. This Mouse is a typical seed eater. Once in a while it will eat a little fruit or insects. Enemies of this Mouse are many,among them being Owls, Foxes, Skunks, Weasels, and Coyotes. Even in the coldest weather this Mouse does not hibernate.

LONG-NOSED WHITE-FOOTED MOUSE

LONG-NOSED DEER MOUSE

COLORADO CLIFF MOUSE

Peromyscus nasutus nasutus (Allen)

Though large and long-eared, this Mouse does not actually appear to have a long nose. The term refers to its skull only. Its total length is 7.2 to 8.4 inches. In color it is very dull, being dark buffy gray, with feet and underparts white; tail blackish.

The Long-nosed Deer Mouse eats seeds, grain, and dry vegetation. It usually lives around rocks. Throughout the Tsegi Drainage it is sparsely distributed on mesa tops and canyons. Near Colorado Springs it lives as high as 8000 feet. Its habitat is the Upper Sonoran Zone. It is found in the mountains of eastern Arizona, New Mexico, western Texas, and Colorado.

BUFF-BREASTED CANYON MOUSE

Peromyscus crinitus auripectus (Allen)

This Mouse can be distinguished from other species by the buff-colored patch on its white breast. As the Mouse gets older, its color changes from light gray to pale brown, which is darkest on its back, caused by a slight mixture of dark hairs. The feet and underparts are white. The tail is black and heavily haired. In length it varies from 6½ to 7 inches.

This Mouse seems to be restricted to the Upper Sonoran Zone, not going much higher than 7,000 feet. It lives exclusively among rocks and is a very good climber. The general distribution runs from northeastern Arizona and southeastern Utah to parts of Colorado and New Mexico.

WHITE-THROATED WOODRAT

Neotoma albigula laplataensis (Miller)

The exact racial identity of this pale buffy Woodrat is still in question, because it varies greatly over a rather small territory and the lines of separation of the subspecies have not been well determined. The hair is rather long and soft, the color above a dull pinkish buff.

This species occurs in the Upper and Lower Sonoran Zones, finding shelter in the caves, ruins and crevices of the cliffs in the Tsegi canyons. It has been collected also on the plateau south of Navajo Mountain, at Rainbow Bridge and in the Little Colorado Desert (Benson, 1935).

These Woodrats live either in rough, rocky places or among logs, brush, cactus patches or in old buildings. Within these shelters they accumulate, little by little, as much as 20 to 50 bushels of rubbish, added to by each generation, and forming a peaked dome several feet high. Anything the Rats can carry goes into such a house; they are notorious camp robbers, seeking and carrying off miscellaneous articles to pile on their nests.

This Woodrat is very ready to test any new kind of thing that might be edible. They eat not only fruits and seeds, but also many vegetables. They like especially the green pulp of cactus plants. When there isn't much else to eat, they often damage the cactus. None of the Woodrats hibernate.

Hopi Indians kill and eat them and consider their flesh a delicacy. Captain Martinez, of the Army Engineer Corps of Mexico, says that doctors of Northern Mexico often order broth made from the Woodrat for the patient, just as our doctors order chicken broth and beef tea.

CHUSKA MOUNTAINS WOODRAT

Neotoma mexicana incpinata (Goldman)

The upperparts of this Woodrat are light ochraceous buff, the underparts white. Its ears are dusky with a narrow edging of gray. The tail is sharply bicolor, being brownish with a slight mixture of dusky above, and white below. The young ones are paler and more gray in general tone.

The Chuska Mountains Woodrat is found in northeastern Arizona, northwestern New Mexico and southwestern Colorado, at between 6000 and 9000 feet altitude.

A favorite habitat of this Woodrat is the talus slopes among the rocks, pinyons and junipers just above the flats of the canyon beds. They can be found among the oaks near springs in the canyons. Specimens have been taken at War God Spring, Navajo Mountain, and Long and Betatakin Canyons.

THOMAS'S WOODRAT

Neotoma lepida lepida (Thomas)

This is a silky-haired, fuzzy-tailed creature. The upperparts are bright, buffy gray, the lower parts buff or whitish, often a pure white growth, or with a median white stripe on the throat. The tail is a clear gray all the way around or sometimes slightly lighter below. Thomas's Woodrat is about 11.5 inches long.

Found in the Upper Sonoran Zone, these Rats breed in the caves, ruins, and crevices near the base of the cliffs in the Tsegi area--elevations 6500 to 7000 feet. Specimens were also collected at the base of the canyon walls, among the oaks farther down in Transition Zone, and in rabbit brush in the sand bottoms of canyons.

Thomas's Woodrat is a desert species, ranging from southeastern California through Nevada to northern Arizona and western Colorado.

Sometimes this Rat is found living about the bases of juniper trees and in cactus patches in the open fields. Their nests are built entirely of cactus, several bushels of spiny pads being heaped in one place.

STEPHENS'S WOODRAT

Neotoma stephensi relicta (Goldman)

This Woodrat has been described by E. A. Goldman (1932). The total length is from 12 to 12½ inches. The upperparts are orange cream, and pale buffy gray on the middle of the face. A wash of black spreads over the top of the head and back, and the ears have a grayish brown wash. The feet and underparts are white. The tail is bicolor--grayish brown above and dull white below.

The type is from Keams Canyon, Navajo County, Arizona. The general distribution includes the plateau region of northeastern Arizona, north of the Little Colorado River, and northwestern New Mexico south to Gallup, grading to the southward into Neotoma stephensi stephensi Goldman. Benson (1935) states that one was collected at Rainbow Bridge, four at Navajo Mountain Trading Post, and four on the mesa 5 miles south of Navajo Mountain. All were taken among rocks.

ARIZONA BUSHY-TAILED WOODRAT

Neotoma cinerea arizonae (Merriam)

This subspecies resembles cinerea, but is smaller, its tail is less bushy, and its color is brighter. The length is about 14 inches. The upperparts are ochraceous buff, thinly sprinkled with dusky, the sides being brighter than the back. The feet are white. The tail is grayish brown above and white below.

The Arizona Bushy-tailed Woodrat is found in the Upper Sonoran Zone in northeastern Arizona and southeastern Utah, and probably northward along the Green River Valley, southwestern Colorado and northwestern New Mexico (Goldman). Birdseye says they make their nests among the rocks. These nests are composed of flat pieces of sandstone often 4 or 5 inches across, actually heavier than the Woodrat, as well as of cattle and horse manure, bones of various animals, and stems of plants, some being the spiny branches of saltbrush and some cactus. The nests are often built under fallen rocks at the base of cliffs or in crevices of the walls.

The Woodrats or Pack Rats have an acquisitive disposition and seem possessed of a collecting instinct. Whenever they see some small object lying about a camp, especially something of metal, they carry it off to their nests. These Woodrats do not hibernate, but are active through the year.

MEXICAN VOLE

Microtus mexicanus navaho (Benson)

This is a race of Mexican Vole or Meadow Mouse limited, as far as yet known, to Navajo Mountain.

It is small (total length 5 to 5½ inches) and pale gray in color. Its snout is heavy.

This Mouse is more active in the daytime than at night. It inhabits thickets, only one family usually being found in each system of runways. Small earth cores were found on the surface of the ground where snow had lain, proving that the Mice work in winter under the snow.

ARIZONA PORCUPINE

Erethizon epixanthum couesi (Mearns)

The Arizona Porcupine, like its relatives elsewhere, climbs trees and gnaws the bark. It is a large, heavy rodent, slow-moving, because it has no need to run from an enemy. The dense coat of long quills on its back and tail makes it practically invulnerable to other animals. It should be rigidly protected for it is the one animal that a hungry man, lost in the woods, can kill with a stick. The quills are tipped with brown, and the muzzle, feet and underparts are brownish. It has long hairs tipped with whitish.

The Arizona Porcupine is found in the Transition and Canadian Zones in the nut pine and juniper areas and heavily timbered mountains of Arizona.

During the winter or when greens are scarce the Porcupines strip the bark from the trees in long sections. Sometimes, if the snow is deep, one will stay in a single tree all winter. During the summer they graze on a variety of green vegetation--seeds, berries, bulbs, nuts, roots, and foliage, and in autumn they like pine bark.

They are usually silent, but at times utter a curious squealing cry, and in addition have a variety of snuffing, growling, and chattering noises. They are sluggish, stupid animals, with poor sight. They are only able to move slowly, either in a tree or on the ground. Very fond of salt, they often come to camps to gnaw anything with a salty flavor.

The young, from one to four in number, are amazingly large at birth, and fully equipped with quills. Even before they are half grown they adopt the solitary habit of the adults and wander forth to care for themselves. (Nelson)

TEXAS JACKRABBIT

Lepus californicus texianus (Waterhouse)

This species is large in size (24 inches). In color, it is a light buffy gray above with a light black wash. It has a lighter gray rump patch. The underparts are white. The upper surface of the tail and tips of the ears are black.

This Jackrabbit lives mainly in the Upper Sonoran Zone but extends also down into Lower Sonoran and in summer upward to the border of the Transition Zone. Found in northeastern Arizona, southern part of Colorado, western Texas, and New Mexico.

Often this Jackrabbit is most abundant where there is no water for a long distance. It can live on water found in the food plants--alfalfa and grass. In times of drought, it relies largely upon cactus and the bark of desert shrubs for food. The number of young in a litter varies from 2 to 4, and sometimes more.

ROCKY MOUNTAIN COTTONTAIL

Sylvilagus nuttalli pinetis (Allen)

This is a rather large, heavy Cottontail with short ears and tail. The upperparts are creamy buff to dark pinkish buff, yet it appears darker because of a blackish cast or wash over it. The underparts are white, tail brownish grizzled with gray. The front and sides of the forelegs are bright rusty rufous, while the back and outside of the hind legs is more of a cinnamon brown. Total length of the animal is from 15 to 16 inches.

This species of Rabbit lives mainly in the Transition and lower edge of the Canadian Zones, though itis sometimes found as low as 6000 feet and high as 11,500 feet. In winter it migrates down to the Upper Sonoran Zone. The general distribution is in the pine forests of mountains from central Arizona and middlewestern New Mexico, north through Colorado except through the northwestern corner. (Nelson). It was reported in thickets on Navajo Mountain by Benson (1935).

There is nothing unusually characteristic about the habits of this species; its food includes a great variety of plants and green vegetation, like that of other species of Cottontails.

On the mountain it is found living in the timber and fallen logs.

COLORADO COTTONTAIL

Sylvilagus auduboni warreni (Nelson)

This is a large Rabbit of the auduboni group, from 15 to 16 inches in length. The upper parts are a dark, creamy buff with a heavy black wash on the back, while the sides are grayer, becoming more buff towards the belly. The throat is a dark buff. The rump has a distinct patch of iron gray.

Although it inhabits mainly the Upper Sonoran Zone, the Colorado Cottontail is also found in the Transition and Lower Sonoran Zones, from below 5000 to 8000 feet. It likes the open sage brush and rabbit-brush valleys, and the nut pine and juniper slopes around the base of the mountains. The general distribution is from Colorado into the northwestern corner of New Mexico and northeastern Arizona.

Both white men and Indians like Cottontails as food. In the summer the Cottontail eats grasses, foliage, and the bark of trees, but during spring and autumn, when it is not so dry, it finds green vegetation. In this territory breeding apparently extends over most of the summer. In regions where agriculture has progressed, rabbits are numerous and often injurious to the fields, gardens, and orchards, although they have considerable value as game.

ROCKY MOUNTAIN MULE DEER

Odocoileus hemionus hemionus (Rafinesque)

This species is heavier in build and more robust than the White-tailed Deer. The ears are larger and the tip of the tail is black instead of white. Its antlers have sharp branching tines. Both sexes being alike in color, the summer fur is from a tawny to a yellowish brown with a large patch of white on the rump. The forehead has a dark patch, the sides are darker, and the inner sides of the legs and throat white. The tail is naked on the underside. In winter the Mule Deer is dark gray instead of brownish. The young are spotted with dull white. The males average 68 inches in length, the females less, about 48 inches.

Mule Deer are found in the plains, foothills, and mountains from central Alberta, central Manitoba, and eastern British Columbia to Mexico, and from about 95° longitude to California. Within these limits they inhabit different types of country; forests, chaparral-covered hillsides, and the thickets of mesquites, acacias, and cactuses on the hot and arid plains.

Their food consists of grass, twigs, foliage of young trees and shrubs, fruits, plants and acorns. They do not feed as much on grass as some Deer do. Fawns are born in May or June. Hornaday says this species nearly always has two young at a birth. Their principal enemies besides man are the Mountain Lion or Cougar and the Gray Wolf. Bobcats pick up a fawn occasionally, and it is likely that the Coyotes do the same.

The gait of a Mule Deer when alarmed is "a series of stiff-legged bounds, all four feet leaving and striking the ground at the same time." (Roosevelt) The thump, thump, thump thus produced can be heard for some distance along the ground, and gives warning of danger to any other Deer within hearing. Another alarm-signal is a sudden "Chuf!" made by blowing through the nose, and may be given when the Deer is uncertain whether to run or to stand still. A doe, especially in the spring, may be brought to within a few feet of a person by the latter blowing on a blade of grass to make a shrill wailing bleat like a fawn in distress. These Deer are not good runners in the open, and like rough, broken country.

AMERICAN PRONGHORN

Antilocapra americana americana (Ord)

Both sexes bear horns that are slightly curved and simple in form, carrying one lateral prong which is shed annually, the new horns forming on the permanent bony cores. This animal is light and graceful, of a running, plains type with large pointed ears. Its coloring is a reddish brown or tan with a darker brown or blackish mane which runs along the neck.
Its chest, belly, and inside of legs are white or creamy white. The underside of the neck is crossed with two broad white bars. The females are usually less brown or black than the males, and males are larger, about 54 inches in length. On the buttocks there is a curious white area that is covered with long hairs which the animal can raise at will. When this is done in the bright sunlight the buttocks shine like a light and can be seen a great distance. It is no doubt used as a danger signal or at least a recognition mark. The Pronghorn runs with great speed, probably exceeding that of any other North American animal.

These animals have been introduced to the Grand Canyon at Indian Gardens. Since they are a plains animal it will be interesting to see whether or not they can adapt themselves to the confined quarters of the narrow canyon. They depend upon flight to escape from enemies. The general distribution runs from the Mexican boundary northward.

The American Pronghorn is highly polygamous, and in autumn when the horns are well hardened they begin to show signs of excitement. They battle fiercely and then the victors go to the does, which are guarded in a herd until the rutting season is over. This is usually during or after October.

The young, usually two in number, are born in May with a comparatively smooth coloring which helps to conceal them.

Although now a rare species, and entirely absent from the Navajo Country, the Pronghorn formerly ranged in great numbers all through the Great Basin and western plains. Its near-extinction, like that of the Bison, was caused by the wasteful slaughter which accompanied "the winning of the west." The Pronghorn, often called American Antelope, is not a true Antelope, and is not closely related to any other living animal.

ROCKY MOUNTAIN BIGHORN SHEEP

Ovis canadensis canadensis (Shaw)

This is a large, wild Sheep, the males of which have immense dark brown horns that curl back and out. The females have small, slender, and slightly curved horns. The fur is not woolly, but hairy, although there is a fine wool near the skin. The eyes are from amber to golden yellow and the chin is beardless. The tail is short; the feet have four black hoofs on each foot. The upperparts are a brownish to a grayish brown in the spring, and a very dark drab gray in the fall and winter. They are darkest along the back of the neck, legs, and tail, with a creamy white patch on the tail. The total length is about 60 inches.

Above timber line on the high ranges in Utah and Colorado they may be seen. They occur in bands numbering up to 18 along the Zion Mount Carmel Highway and in the valley behind Bridge Mountain. They have probably been extinct in most of the Navajo region for forty or fifty years, although they are said to occur in the canyons near the Colorado River (Benson, 1935).

The Rocky Mountain Sheep, like other species, appears to feed on nearly every plant in its habitat. Their one great protection from enemies is their sure-footedness and skill in climbing. In winter, however, they are sometimes forced to come down into lower country where they may be killed by the Coyotes, Wolves and even Cats, which could not follow them at another time. In a well-settled

region, strict protective laws must be enforced if they are to survive.

DESERT BIGHORN

NELSON BIGHORN

Ovis canadensis nelsoni (Merriam)

The Desert Bighorn is much paler than the typical *canadensis*. It is smaller and has smaller molar teeth. The horns of the males curl back, out and up. The females have small horns. Both are brown.

This species is common along cliffs in the Sandrock area, Grand Canyon National Park. General distribution: In the mountains of southern Nevada, southern California, and northern border of Lower California.

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COMMON NAME INDEX

INDEX OF SCIENTIFIC NAMES

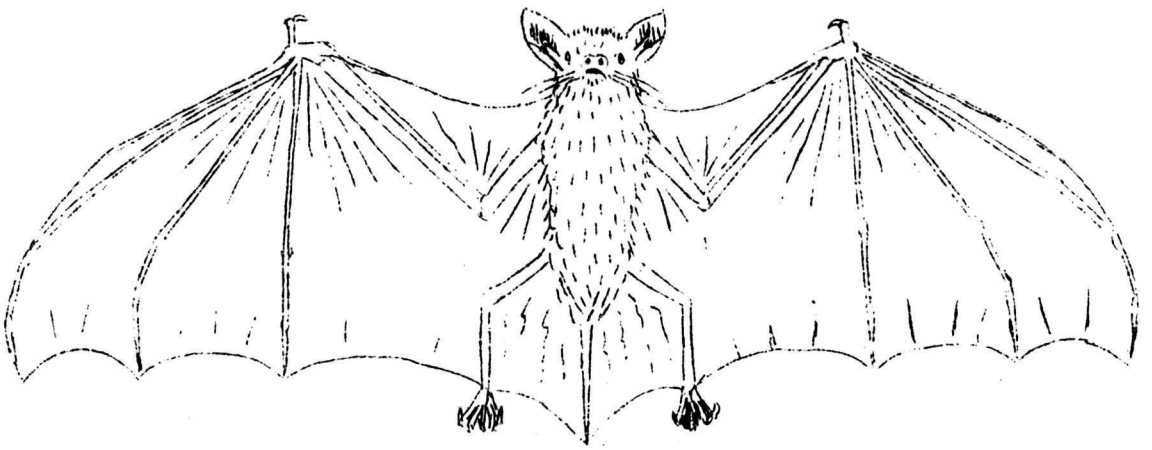

Fig. 2. Little Brown Bat

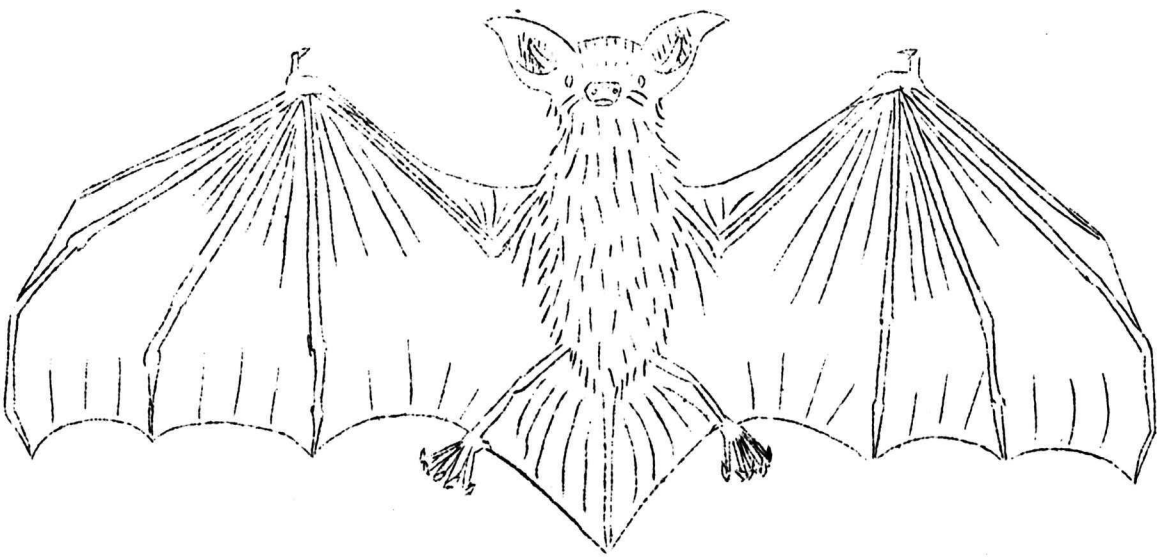

Fig. 3. Canyon Bat

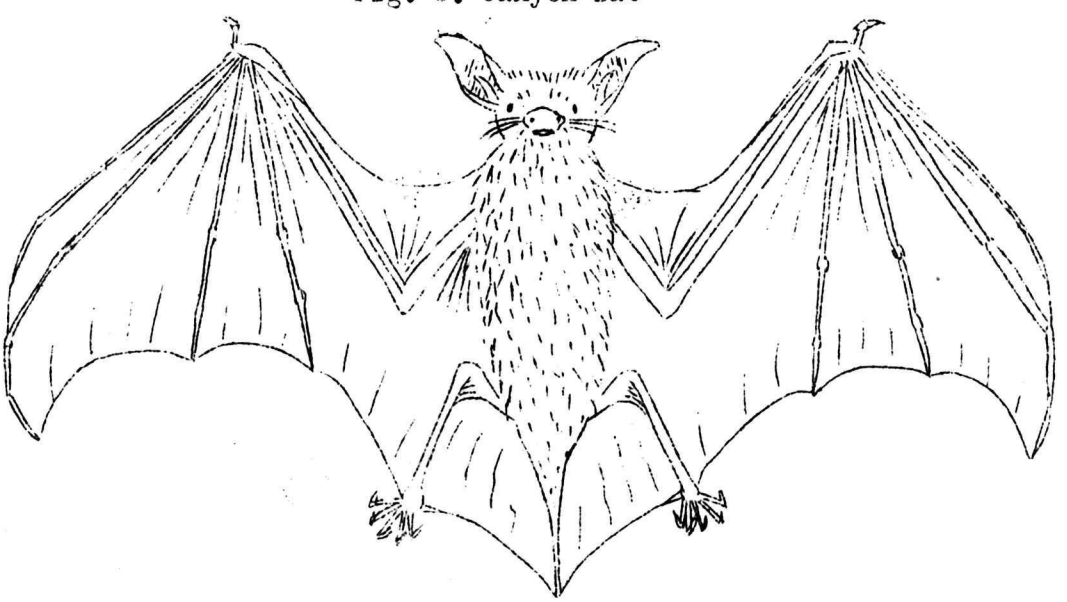

Fig. 4. Big Brown Bat

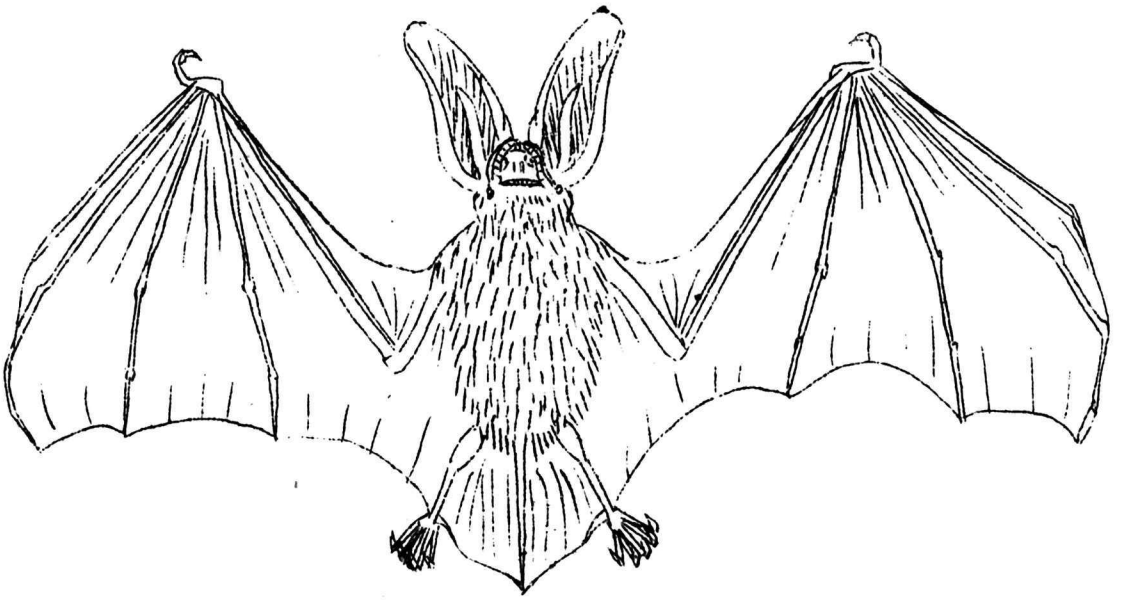

Fig. 5. Lump-nosed Bat

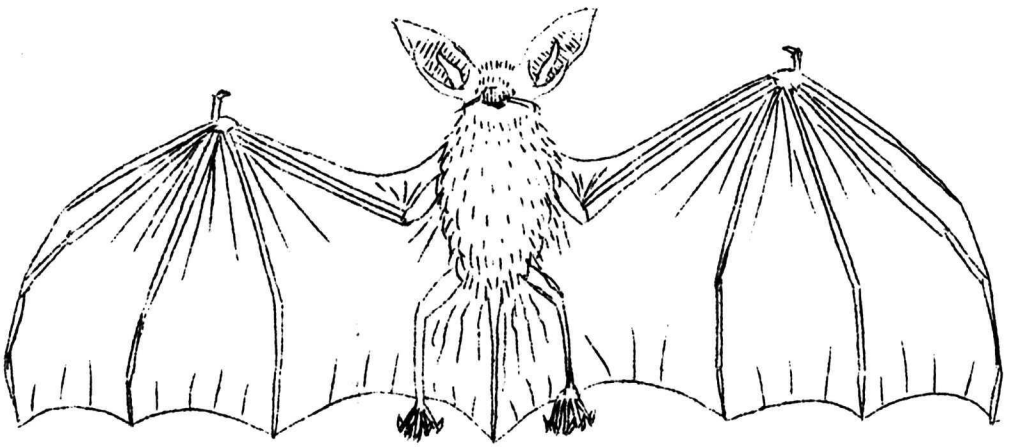

Fig. 6. Pallid Bat

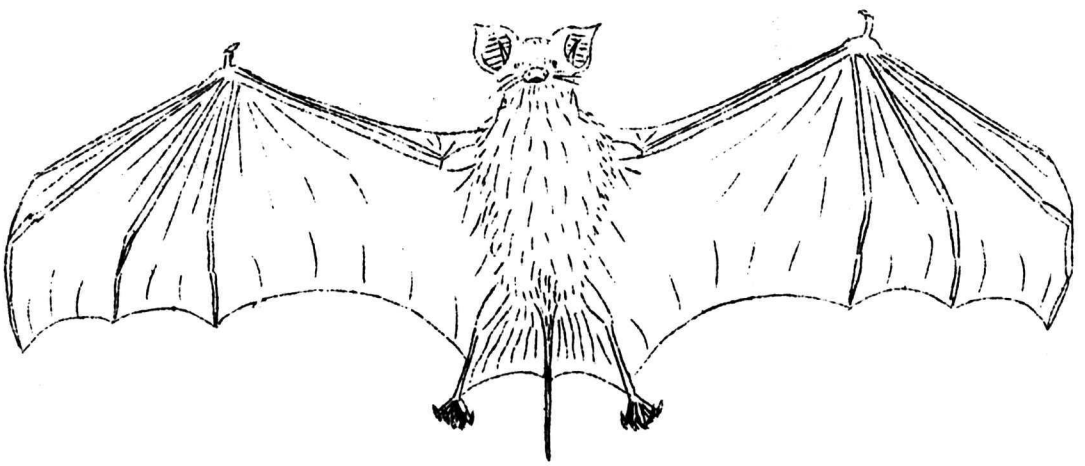

Fig. 7. Mexican Free-tailed Bat

Fig. 8. Ring-tailed Cat

Fig. 9. Mountain Weasel

Fig. 10. Canyon Spotted Skunk

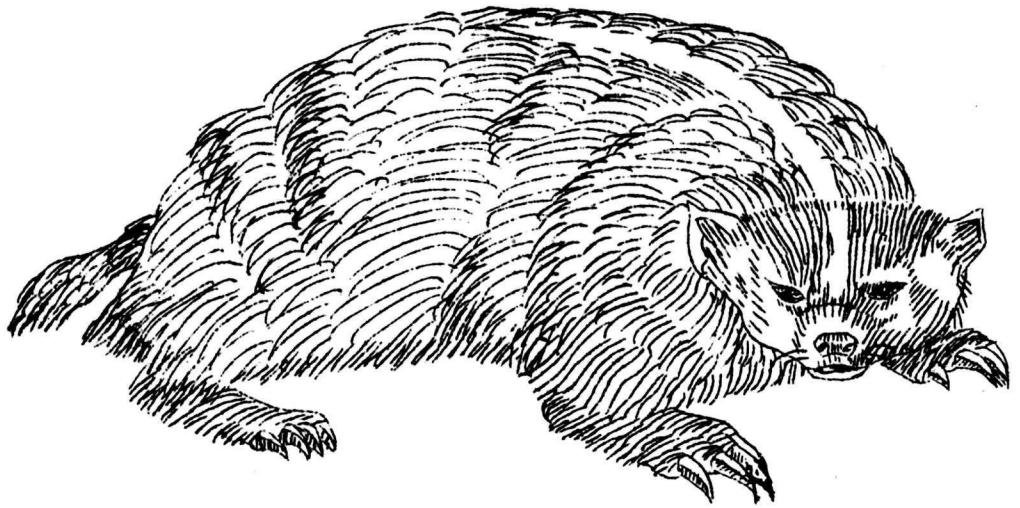

Fig. 11. American Badger

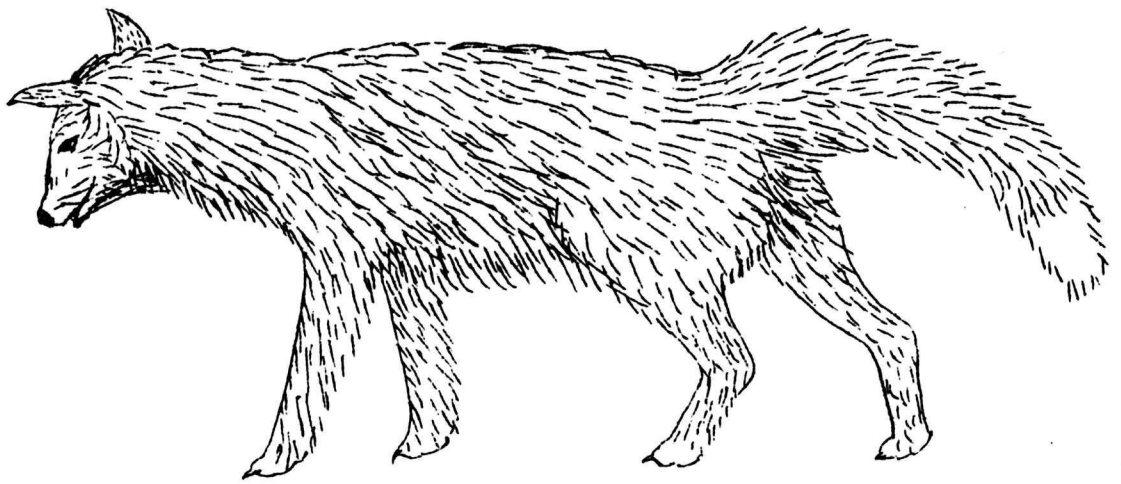

Fig. 12. Long-tailed Red Fox

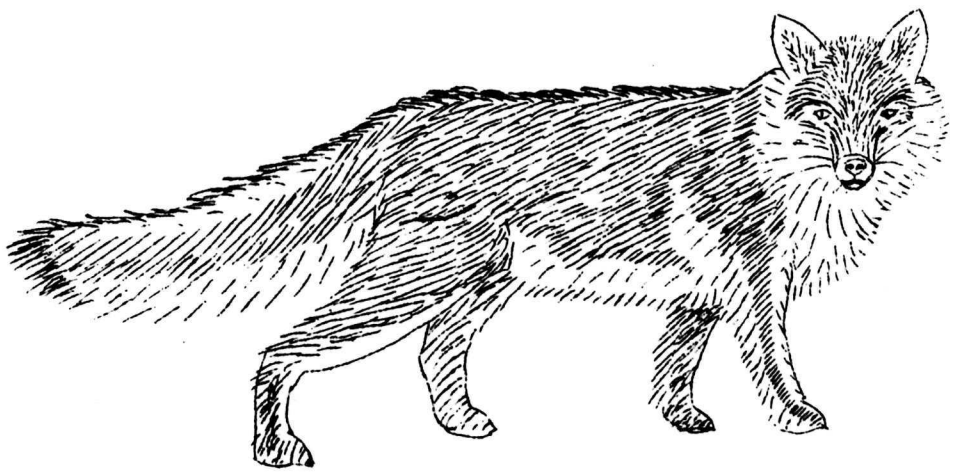

Fig. 13. Arizona Gray Fox

Fig. 14. Desert Coyote

Fig. 15. Mountain Lion

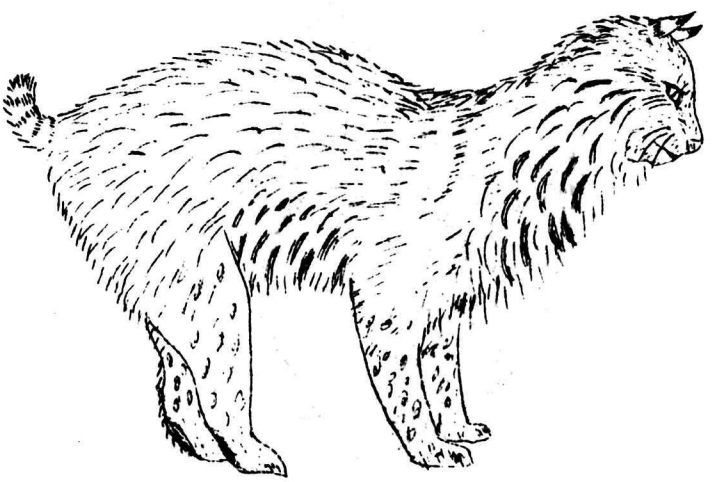

Fig. 16. Plateau Wildcat

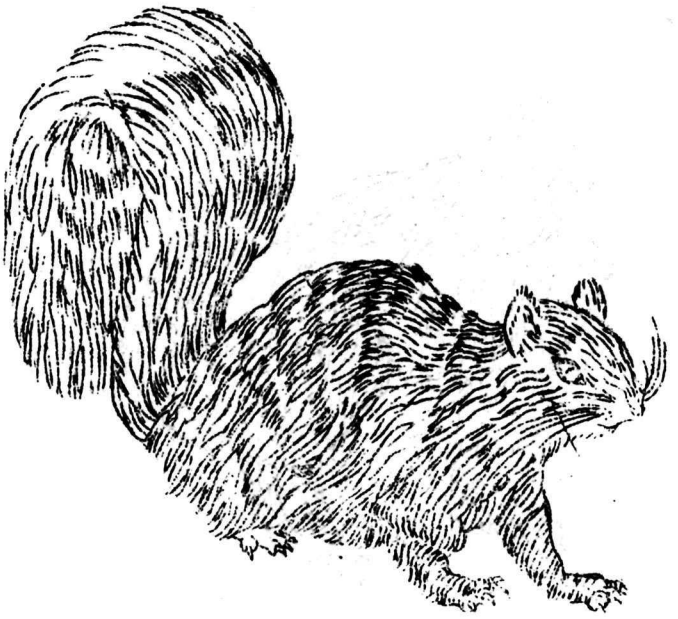

Fig. 17. Colorado Rock Squirrel

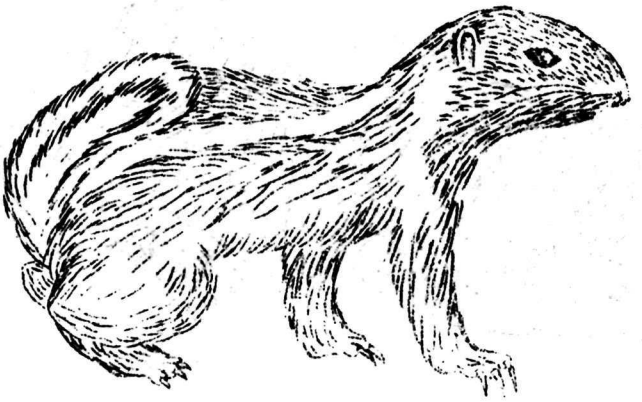

Fig. 18. Cinnamon Ground Squirrel

Fig. 19. Zuni Prairie Dog

Fig. 20. Hopi Chipmunk

Fig. 21. Kaibab Squirrel

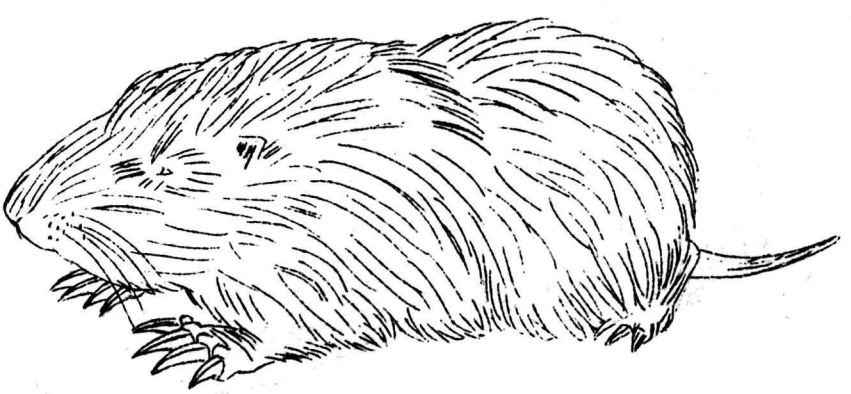

Fig. 22. Pocket Gopher

Fig. 23. Painted Desert Kangaroo Rat

Fig. 24. Intermediate Pocket Mouse

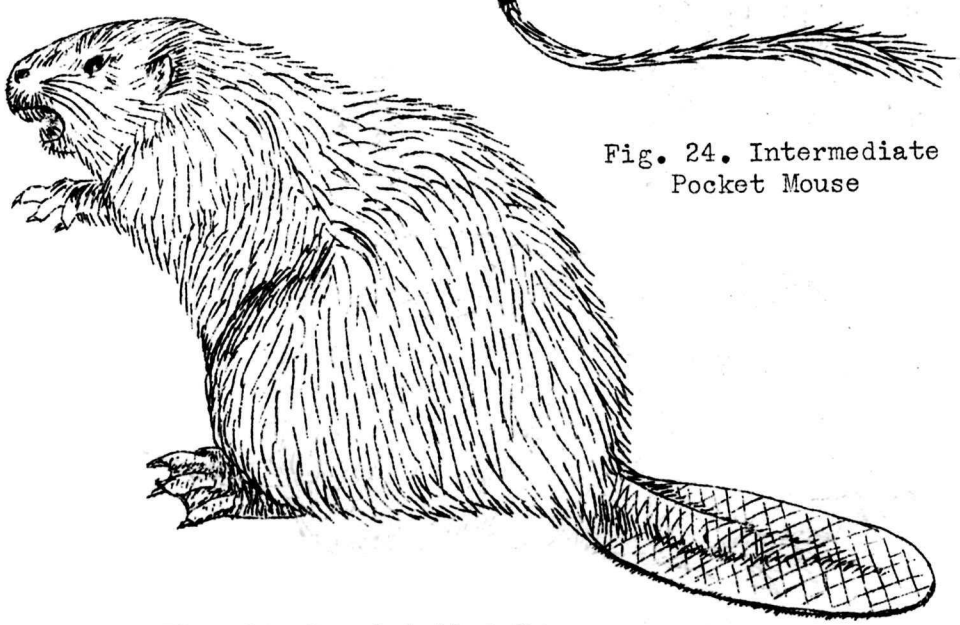

Fig. 25. Broad-tailed Beaver

Fig. 26. Grasshopper Mouse

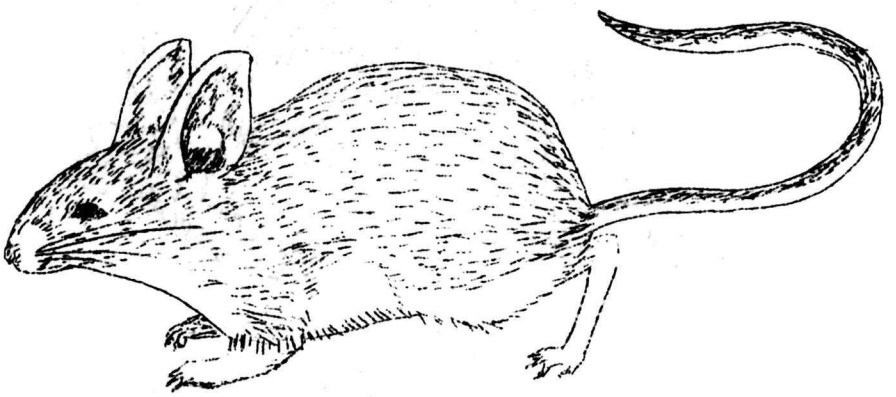

Fig. 27. True Deer Mouse

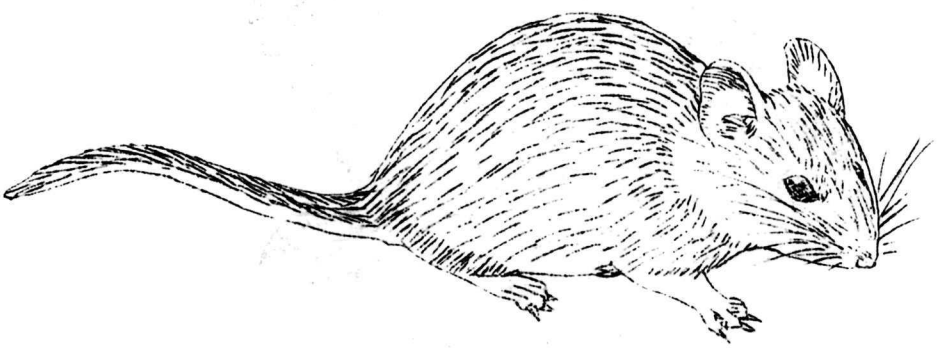

Fig. 28. White-throated Woodrat

Fig. 29 Mexican Vole

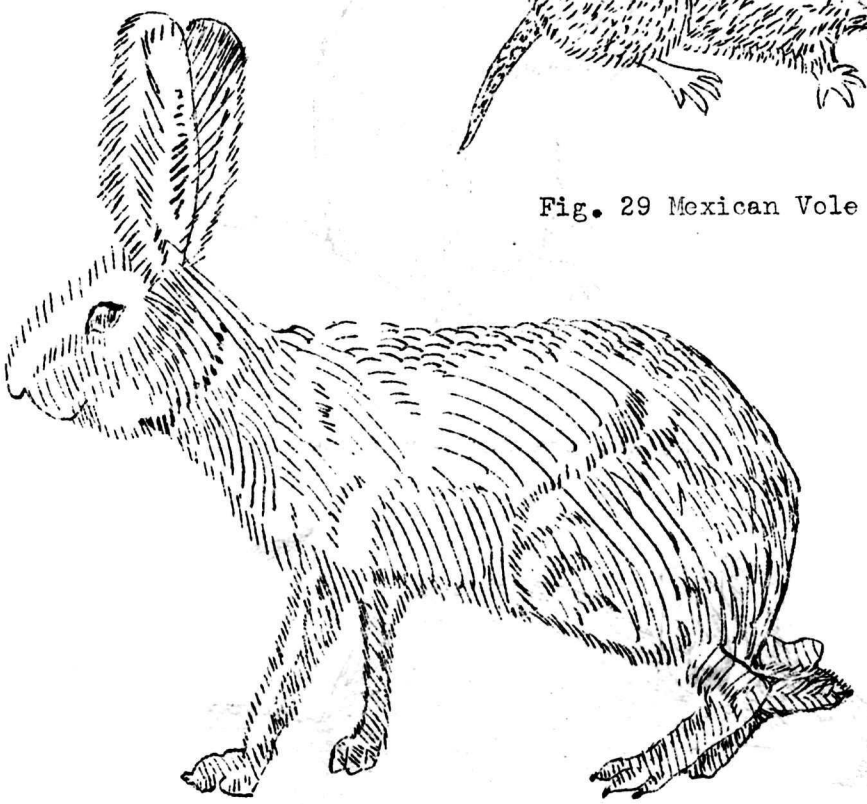

Fig. 30 Texas Jackrabbit

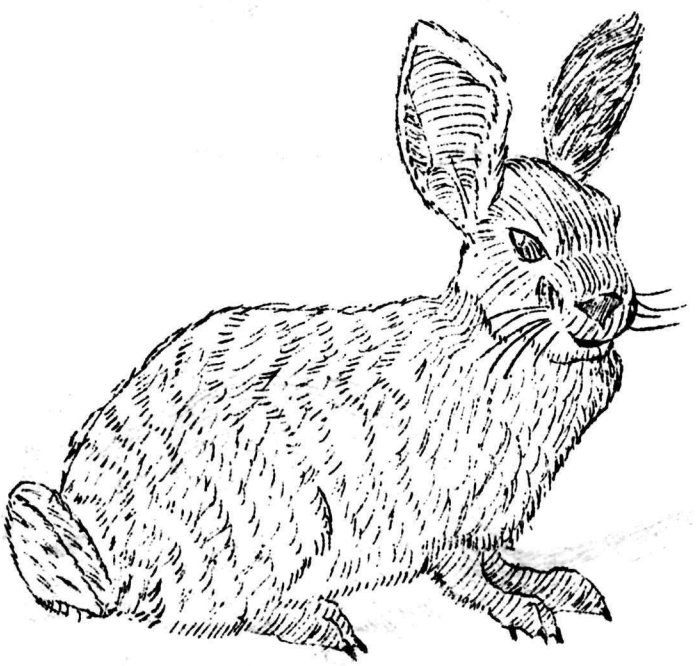

Fig. 31 Rocky Mountain Cottontail

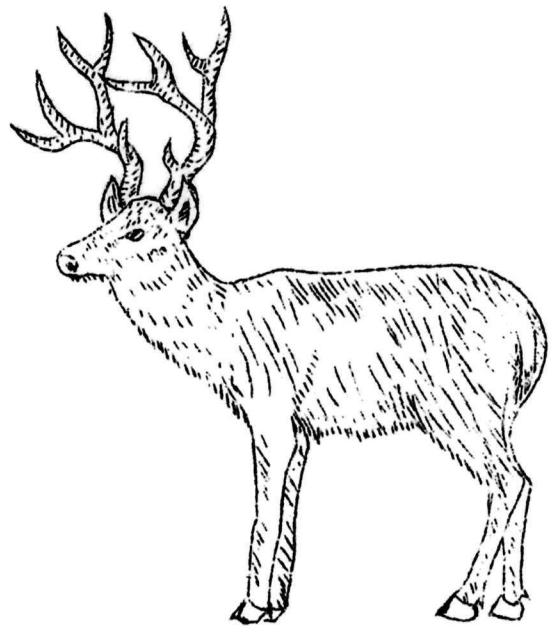

Fig..32. Rocky Mountain Mule Deer

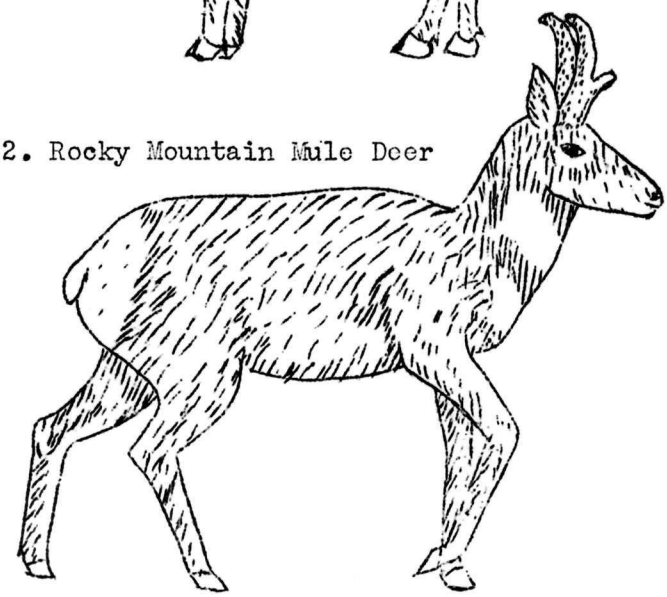

Fig. 33. American Pronghorn

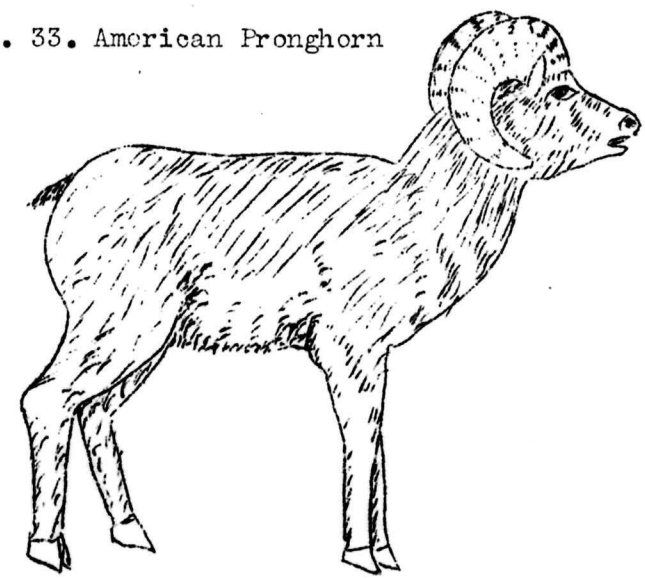

Fig. 34. Rocky Mountain Bighorn