A PRELIMINARY SURVEY OF THE RODENTS AND LAGOMORPHS IN
CENTRAL AND SOUTHERN ALBERTA

W. S. Haynes

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THE UNIVERSITY OF ALBERTA

A PRELIMINARY SURVEY OF THE RODENTS AND LAGOMORPHS
IN CENTRAL AND SOUTHERN ALBERTA

A DISSERTATION
SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF SCIENCE

FACULTY OF ARTS AND SCIENCE
DEPARTMENT OF ZOOLOGY

by

William Sterling Haynes

Edmonton, Alberta.

October, 1951.

Thesis
1951
#50

UNIVERSITY OF ALBERTA

Faculty of Arts and Science

Department of Zoology

The undersigned hereby certify that they have read and recommend to the School of Graduate Studies for acceptance, a thesis entitled "A Preliminary Survey of the Rodents and Lagomorphs in Central and Southern Alberta", submitted by William Sterling Haynes, B.Sc., in partial fulfilment of the requirements for the degree of Master of Science.

PROFESSOR Wm Rowan.....
PROFESSOR J.E. Moore.....
PROFESSOR J. H. Brown,,.,.,.

DATE

ABSTRACT

In the summers of 1950 and 1951, a survey was made of the Rodentia and Lagomorpha in central and southern Alberta.

Mechanical traps were set every night, when weather permitted, and these were checked every morning. All animals were identified and recorded by the author. The dead animals were then chloroformed and the ectoparasites were scraped from the skin and hair. These parasites were sorted, preserved and labelled for expert identification. The animals in the best condition were measured, skinned and labelled. The animal skins are now in the Department of Public Health museum.

The tentative range of most rodent and lagomorph species in Alberta was mapped from all available data and correlated with vegetation and settlement areas.

Most animals either shot, trapped or found dead were autopsied. If enlarged buboes were noted, sections of lung, liver and spleen were sent to the Dominion Virological Laboratory at Kamloops, B. C., for bacteriological testing.

During the summer of 1951, two new records of rodents were procured by the author. The pocket mouse (Perognathus fasciatus) and the harvest mouse (Reithrodontomys megalotis), trapped in southeastern Alberta, can now be added to the growing list of this province's mammals.

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A PRELIMINARY SURVEY OF RODENTS AND LAGOMORPHS
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INTRODUCTION

"The rodents present a vast array of mammals. About 345 genera, containing 6,400 forms, are listed in a recent monograph prepared in the British Museum." (A. L. Rand, 1948).

The older taxonomists include the *Simplicidentata*¹ and the *Duplicidentata*² as suborders of the order Rodentia. More modern American authors have split the order Rodentia in two. The *Simplicidentata* now constitute the order Rodentia and the *Duplicidentata* the order Lagomorpha.

In Alberta, there are 26 genera and 40 species of Rodents with a number of recognized and doubtless some unrecognized subspecies. The lagomorphs are a small group which include 3 genera: of these the varying hare is cyclic periodically attaining vast numbers.

¹Simplicidentata means that the mammal has 2 upper incisors.

²Duplicidentata means that the mammal has 2 pairs of upper incisors. The smaller pair is situated behind the larger pair.

The variations in size, form and habitat are striking. This partly perhaps due to the fact that Alberta occupies about 255,285 square miles and thus affords great differences in environment within the province. A pocket mouse, which weighs approximately one-third of an ounce, is dwarfed completely by a beaver, which may weigh over 3,360 times as much. Included are the arboreal squirrels, the semivolant "flying" squirrels, the fossorial ground squirrels and pocket gophers, the semi-aquatic muskrats and beavers and the kangaroo-like jumping mice. These mammals are all furred but the American porcupine also has quills. The only general common feature is the type of dentition.

Rodents include some species which are of great economic value but others are unmitigated pests. The trapping of fur-bearing animals and fur farming are profitable Alberta industries. In the fiscal year 1947-48, there were 463,193 wild muskrats alone taken in Alberta which yielded \$1,097,767.41 to the trappers; wild squirrels were second at \$819,059.01 and beavers next at \$251,665.20. Apart from wild fur, there were 14 licensed beaver farms and 9 muskrat farms. Fur-bearing carnivores may depend on rodents and lagomorphs for sustenance and many of these predators feed almost entirely on mice, ground squirrels and rabbits. Thus, these mammals are contributing in dollars and cents to the revenue of Alberta.

In the debit column, however, hay fields, orchards, gardens, irrigation ditches and golf courses are damaged by burrowing spermophiles, pocket gophers and field mice. The method of controlling each species depends on its habitat and habits.

The Norway rat, which has now emigrated to Alberta from Saskatchewan, constitutes another menace, first as a destroyer of grains, cereals and other food-stuffs, and secondly, as a threat to public health. The rat, as well as the Richardson ground squirrel, acts as a reservoir for sylvatic plague.

Since the original records made of some of the animals in the Prairie Provinces by Sir John Richardson in the 1820's there have been numerous biological surveys conducted in Western Canada. Capt. Palliser (1863) records Arctomys richardsonii (Citellus richardsonii) and Arctomys hoodii (Citellus tridecemlineatus) on his westward journey from Fort Ellice (near Carlton Sask.). In the early part of the 20th Century biological surveys were conducted (in Alberta) by the U. S. Division of Biological Investigations.

The following men, Americans and Canadians, have conducted comprehensive surveys of the mammals in Alberta: E. A. Preble, N. Hollister, J. D. Soper, P. E. Crowe, F. W. A. Banfield, J. E. Moore and J. H. Brown.

The present survey was made while the author was employed by J. H. Brown to assist with the disease studies on small mammals. From April 24th to September 12th, 1950 and from April 26th to September 8th, 1951 as junior man on Mr. Brown's public health survey crew, I recorded, observed, collected and skinned rodents and lagomorphs from various sections of central and southern Alberta. Part of the time was spent on a provincial rat survey but most of the time was devoted to the sylvatic plague, tularaemia and Rocky Mountain spotted fever surveys.

The methods used in collecting material were adapted from R. M. Anderson's publication, "Collecting And Preserving Vertebrate Animals" (1948), with further improvements later suggested by Mr. J. H. Brown, Mr. J. Dewey Soper of the Federal Wildlife Division, Dr. J. ^{E.} B. Moore and Mr. Robert Lister of the University of Alberta.

The animals were caught in a variety of traps; the numbers 00 and 1 steel spring traps, the large rat and weasel snap traps, the standard mouse traps and museum special mouse traps were used. The traps were all baited with a mixture of rolled oats, peanut butter and oil of aniseed with a few drops of oil of valerian added.

The date, location, trap nights and species were recorded and are to be found in Appendix B. A catalogue of the animal skins may be found in Appendix A.

In all collections made in southern and central Alberta during the summers of 1950 and 1951, it was impossible to make subspecific determinations. These can be made only if the collector has opportunity to compare his skins with a vast series of type specimens.

PART I. ORDER RODENTIA

SECTION I. DESCRIPTION AND DISTRIBUTIONAL NOTES

In Alberta eight families of the Order Rodentia are recognized. The forty species which are included in these families are identified by a number of key characteristics. Most species mentioned are described according to these characteristics. Whenever enough data are available, detailed maps as well as notes on rodent distribution are included.

Vegetation types give fair indications of animal distribution. Moss' map (1932) gives a rough picture of the chief types of vegetation (the Cypress Hills area is, however, omitted) (refer to Map 1). The soil zones of Alberta are classified as follows: the northern forest with gray soil; the poplar area with black soil; the parkland area with black soil; the northern prairie with dark brown soil; the southern prairie with brown soil. The tentative distribution boundaries for most rodent species, herein after used, will be in accordance with the various vegetation areas set out by Moss.

Family 1. Sciuridae (The squirrels, "flying" squirrels, ground squirrels, marmots and chipmunks)

The total length of these rodents varies from

Map 1.

The Vegetation Areas of Alberta (after Moss, 1932).

200 mm. in the least chipmunk to about 750 mm. in the hoary marmot. The tails of the Sciuridae are hairy and often bushy. Postorbital spines are always present on the frontal bones. The skull is not strongly flattened. There are no external cheek pouches.

Genus Marmota

Marmota monax (Canadian woodchuck or ground hog)

Color: The dorsum is rust-colored and the guard hairs are tipped with white. Melanistic forms occur in Alberta in which the pile hair is black but the guard hairs are silver-tipped (Plate 1).

Measurements: Total length 468 mm.; tail length 119 mm.; hind foot length 62 mm. (one Alberta specimen).

Special markings: Dark brown head, tail, fore and hind legs.

According to Rand (1948), the subspecies occurring in Alberta is Marmota monax canadensis (Erxleben).

Distribution: This animal is found in wooded areas. Rand (1948) states the animal in Alberta to be in "the northern part of the province, south at least to Entrance (Crowe), Red Deer River (Howell) and the vicinity of Islay and Edmonton". Soper (1948) reports it to be "distributed in varying degrees of abundance" in the Grande Prairie-Peace River region.

Marmota caligata (Hoary marmot, whistler or siffleur)

Color: The stout body is covered with black and white hair which is shaded with buff, thus giving the animal a grizzled appearance.

The three subspecies occurring in Alberta are, according to R. M. Anderson (1946):

1. Marmota caligata vivaria Howell
2. Marmota caligata okanagana (King)
3. Marmota caligata oxytona Hollister

No specimens of this rodent were taken in Alberta because suitable traps were not set in the higher mountain regions.

Distribution: This is a mountain animal. Soper (1935) has taken specimens from Banff, Mount Forget-me-not and Torrens River, and noted this animal at Louise, Moraine and Consolation Lakes in the Rocky Mountains. Banfield (1950) reports this species "in the Rowe Lakes, Carthew Lakes and Tivin Lakes areas" in Waterton National Park.

Marmota flaviventris (Buff-bellied marmot)

J. E. Moore has one official record of this species from Aden.

Genus: Citellus

Ground Squirrels:

The ground squirrels of Alberta present a

Map 2.

The dotted parts show the Alberta Land Settlement areas.

curious distribution problem, i.e., they are not found in the Peace River country (refer to Map 2). This, I believe, can be explained by the fact that the vast, heavily wooded muskeg areas, which extend from Smith to High Prairie, form an effective geographical barrier to the dispersal of the spermophiles.

Citellus richardsonii (Flickertail or Richardson ground squirrel)

Color: This species shows a great variation in hair color in different localities throughout the province, but this is possibly due to the fact that the pelage may become worn or bleached throughout the summer. The animal is sandy-brown on top and light brown underneath, but true albino skins have been seen (Plate 3).

Measurements: Total length 275 mm.; tail length 69 mm.; hind foot length 44 mm. (average from three specimens).

Special markings: The belly and underparts are whitish. The tail is a grizzled brown and black.

Sex: On examination of Mr. J. H. Brown's data from the sylvatic plague survey, the following sex ratio can be recorded.

Year	Male	Female	Sex Ratio
1950	204	302	1 M : 1.48 F
1949	241	396	1 M : 1.66 F
1948	458	677	1 M : 1.48 F

Thus, the average sex ratio for three years for Richardson's ground squirrel was 1 male to 1.54 females or approximately 2 males to every 3 females.

The only subspecies present in Alberta is Citellus richardsonii richardsonii (Sabine) according to Anderson (1946).

Distribution: The Richardson ground squirrel ranges widely over Alberta. The distribution is affected by land settlement areas (Map 2). As land is cleared, the ground squirrels advance to the newly cultivated land. Lawson in 1922 stated that this animal 'is found characteristically over all the open prairie country of the southern part of the province as far north as the Battle River'. In 1950 and 1951, numerous animals were seen, trapped and shot as far north as Westlock, Smoky Lake and St. Paul de Metis, Alberta. Thus, this species, in a period of twenty-nine years has moved north more than seventy miles and new colonies have become established in an area exceeding ten thousand square miles in the cleared farm areas.

Map 3.

The distributional records of Citellus tridecemlineatus,
C. franklini and C. lateralis.

The flickertail has never been recorded north or west of the Athabasca River. Therefore, the tentative range follows the public land settlement area except from Whitecourt to Smith, Alberta, where it is found on the south bank of the Athabasca River. This animal is not found in the Empress area between the Red Deer and South Saskatchewan River. Whether or not the disappearance here and also in certain other areas is due to its chief predator, the rattlesnake, is not known.

This animal can be seen living in the same territory as the Columbian ground squirrel in the eastern Waterton area.

Map 4 shows the Alberta distribution of Citellus richardsonii. The range was worked out from the unpublished records from some sylvatic plague investigations from 1944 to 1950, carried on by J. H. Brown for the Alberta government.

Citellus franklinii (Franklin's ground squirrel or bush gopher)

Color: The top of the head, neck, feet and underparts are light gray in contrast with the dorsum, which is dark gray, speckled with yellow (Plate 3).

Measurements: Total length 390 mm.; tail length 131 mm.; hind foot length 53 mm. (average of 2 specimens).

Map 4.

The distributional records of Citellus Columbianus
and C. richardsonii.

Special markings: The tail is long and bushy with a white marginal and a black submarginal band.

Anderson (1946) states the animal occurring in Alberta is Citellus franklinii (Sabine).

Distribution: (Refer to Map 3). The Franklin ground squirrel is found in the northern part of Southern Alberta. It occurs in the cordilleran forest and in the poplar area. As more and more land is cleared in Alberta and land settlement increases, this animal will, I believe, become a great deal rarer. Like the thirteen-striped ground squirrel, this animal has never been seen north or west of the Athabasca River.

Citellus columbianus (Mountain gopher, picket pin or
Columbian ground squirrel)

Color: This mountain ground squirrel has a dun-colored back vermiculated with black. The underparts are cinnamon-colored and are quite diagnostic.

Measurements: Total length 304 mm.; tail length 93 mm.; hind foot length 46 mm. (average from 2 specimens).

Special markings: The upper parts of the feet and face are brick red.

The subspecies found in Alberta is Citellus columbianus columbianus (Ord) according to Rand (1948).

Disribution: (Refer to Map 4) This species is a mountain animal but it is also found in the foothills in Western Alberta.

Citellus lateralis (Mantled ground squirrel, mantled gopher or big chipmunk)

Color: The ventrum is light red and each side has two black stripes which enclose a light-colored stripe. The tail is dark brown with a yellow margin (Plate 3).

Measurements: Total length 267 mm.; tail length 96 mm.; hind foot length 46 mm. (1 specimen).

Special marking: The black-bordered white line on each side is quite diagnostic.

The subspecies occurring in Alberta is Citellus lateralis tescorum Holloster according to Anderson (1946).

Distribution: (Refer to Map 3). The range of this animal is limited to the higher mountain regions.

Citellus tridecemlineatus (Thirteen-striped gopher)

Color: The upper parts have a series of six light stripes and five dark stripes. Each light stripe alternates with a dark stripe. Each dark stripe has a series of dots which usually number thirteen and they extend from the nape to the base of the tail (Plate 3).

Measurements: Total length 267.5 mm.; tail length 89.5 mm.; hind foot length 34.5 mm. (from 2 specimens).

The two subspecies recorded by R. M. Anderson (1946) are:

1. Citellus tridecemlineatus tridecemlineatus (Mitchill)
2. Citellus tridecemlineatus pallidus (Allen)

Map 5.

The distributional records of Eutamias minimus,
E. amoenus and E. ruficaudus.

Distribution: (Refer to Map 3). This animal is found in isolated colonies in Central and Southern Alberta. It always seems to occur in semi-wooded areas. I have never seen this animal north or west of the Athabasca River.

Genus Eutamias

Eutamias minimus (Least chipmunk)

Color: The sides and back are grayish-brown with five black stripes interspaced by two lateral white stripes and two median gray stripes. The head is brown with a blackish line running through the eye. This black line is flanked by two white lines which border on black (Plate 4).

Measurements: Total length 210 mm.; tail length 101 mm.; hind foot length 29 mm. (average of 3 specimens).

Special markings: The key characteristics are the brown rump, shoulders and hind legs and the white belly.

The two subspecies listed by A. L. Rand (1948) are:

1. Eutamias minimus borealis Allen
2. Eutamias minimus oreocetes Merriam

Distribution: (Refer to Map 5). This species is widespread in Alberta and is to be expected everywhere in the northern and southern prairie regions. J. E. Moore, however, has taken a specimen in the wooded Cypress Hills area.

Eutamias amoenus (Allen chipmunk)

Color: The color is similar to the least chipmunk except that the hind legs and the rump are gray. This mammal usually has a grayish belly (Plate 4).

Measurements: Total length 214.5 mm.; tail length 97 mm.; hind foot length 30 mm. (average from 4 specimens).

There are two subspecies listed for Alberta by Rand (1948). They are the buff-bellied form, Eutamias amoenus luteiventris Allen and the light-bellied form, Eutamias amoenus ludibundus Hollister.

Distribution: (Refer to Map 5). The Allen chipmunk is found in the mountain regions of Alberta. Banfield (1950) states that in Waterton it is the common chipmunk of the lower elevations of the Park.

Eutamias ruficaudus (Rufous-tailed chipmunk)

Color: The markings are similar to the least chipmunk but the underparts are white except for the tail which is rufous-colored (Plate 4).

Measurements: Total length 231.2 mm.; tail length 106.2 mm.; hind foot length 35 mm. (averages from Howell, 1929).

The subspecies recorded in Alberta by Anderson (1946) is Eutamias ruficaudus ruficaudus Howell.

Distribution: (Refer to Map 5). The range of this animal is limited to the Waterton area in the mountains

at higher altitudes. Banfield (1950) says this animal occurs in an altitude range of 5,800 to 7,000 feet and is well distributed in the Park.

Tamiasciurus hudsonicus (Red squirrel)

Color: The dorsum and tail are reddish-brown but the tail has a marginal black band. There is a lateral black band and the underparts are white (Plate 2).

Special characteristics: The red squirrel has stubby, curved climbing claws on both fore and hind legs.

The three subspecies thought by Rand (1948) to be present in Alberta are:

1. Tamiasciurus hudsonicus preblei Howell
2. Tamiasciurus hudsonicus columbiensis Howell
3. Tamiasciurus hudsonicus richardsoni Backman

Distribution: The red squirrel is found commonly in the northern cordilleran forest and the poplar areas wherever there are large stands of conifers.

Glaucomys sabrinus (Flying squirrel)

Color: The color above is slaty-gray and the fur is long and fine. The belly is white in color.

Special characteristics: The fold of skin between the front and hind legs and the flat, wide tail are diagnostic of this species.

No specimens of this mammal were taken but A. L. Rand (1948) has listed three subspecies:

1. Glaucomys sabrinus sabrinus Shaw
2. Glaucomys sabrinus alpinus Richardson
3. Glaucomys sabrinus bangsi Rhoads

Distribution: Rand (1948) states that this animal is found in the coniferous forests of the northern and central parts of the province, and the mountains of the west.

Family 2. Geomyidae (Pocket gophers)

The presence of external, fur-lined cheek pouches, the medium size (250 mm.) and chunky appearance are distinctive. The legs are short and stout, the forelegs being heavily clawed. The tail is short and sparsely haired.

Thomomys talpoides (Pocket gopher or mole)

Color: The pile hair on the back is usually gray-tipped with brown, with a black ear patch on mature animals. The underparts are grayish, as is the tail (Plate 5).

Measurements: Total length 203 mm.; tail length 65 mm.; hind foot length 25 mm. (average from 7 specimens).

Special characteristics: The short, sparsely haired tail, the external, fur-lined cheek pouches and the large claws on the fore legs set this animal apart from other species.

Anderson (1946) lists the following races:

1. Thomomys talpoides talpoides Richardson
2. Thomomys talpoides andersoni Goldman
3. Thomomys talpoides loringi Bailey

Map 6.

The distributional records of Thomomys talpoides.

Distribution: (Refer to Map 6). The pocket gopher is present in parts of central and southern Alberta in a vast number of isolated communities. I have never seen pocket gopher mounds in the Peace River country. Soper (1948) makes no mention of this species in the Grande Prairie - Peace River region.

Family 3. Heteromyidae (Kangaroo rats and pocket mice)

This family is rare in Alberta but is easily distinguished by the relatively long tails and external, fur-lined cheek pouches. Only 5 specimens of the pocket mouse have been taken in Alberta and only one specimen of the kangaroo rat.

Perognathus fasciatus (Maximillian's pocket mouse)

Color: Color above is gray and on each side bears a thin, yellowish stripe. The underparts are white (Plate 6).

Measurements: Total length 116.5 mm.; tail length 60 mm.; hind foot length 15 mm. (average of 2 Alberta specimens).

Special characteristics: The auditory bullae are large and rounded; there are external fur-lined cheek pouches.

Rand (1948) states that the subspecies to be expected in Alberta is Perognathus fasciatus fasciatus Wied.

Distribution: (Refer to Map 7). This animal had not been taken in Alberta until I trapped it in the spring of 1951 at Manyberries, Alberta. Since that first animal was taken, there have been 4 other specimens collected. The tentative range is the southern prairie region in Alberta.

Dipodomys ordii (Kangaroo rat)

No specimens of Dipodomys ordii terrosus Hoffmeister were collected but R. M. Anderson (1946) reports one preserved specimen from Medicine Hat, Alberta.

Family 4. Castoridae (Canadian beaver)

These semi-aquatic animals are large in size, the total length is about 1,000 mm. and they have a typical dorso-ventrally flattened, hairless tail.

Castor canadensis.

The two subspecies known from Alberta (Rand, 1948), Castor canadensis canadensis Kuhl or Castor canadensis missouriensis Bailey, were not taken by myself as my collecting permit did not allow the trapping of these animals, but the species has a general distribution through much of the province.

Family 5. Cricetidae (Native rats and mice)

Except for the muskrats and pack rats which are approximately 500 mm. in length, the majority of the Cricetidae are small, varying from 120 to 200 mm. in total length. The tail is usually scaly or sparsely haired except for the pack rat. The teeth are 16 in number, and the cheek teeth may have two or less longitudinal series of tubercles, or with no tubercles but with complicated folds of enamel.

Cricetine rodents have conspicuous ears and

relatively large eyes. These characteristics make it easy to distinguish them from the microtine rodents, which have inconspicuous ears and relatively small eyes.

Reithrodontomys megalotis (Harvest mouse)

One female specimen has been taken in Alberta at Medicine Hat by Dr. Moore of the University of Alberta. The measurements are: total length 147 mm.; tail length 62 mm.; hind foot length 17 mm.; ear length from notch 12 mm.

A male specimen was taken by the author at Milk River on May 28th, 1951. The measurements are: total length 105 mm.; tail length 49 mm.; hind foot length 14 mm. This specimen, I believe, was the first to be taken in Alberta.

Special characteristics: The presence of grooved upper incisors, the brown inner ear patches and the small size distinguish it from Peromyscus maniculatus, which it closely resembles (Plate 7).

Distribution: (Map 8) As far as I know, there are only two authentic records for this mouse in Alberta, already mentioned. The tentative range is the southern prairie zone.

Onychomys leucogaster (Grasshopper mouse)

Color: The color of some adults is dark gray but some specimens are light brown on the back. The underparts are white (Plate 9).

Map.8.

The distributional records of Onychomys leucogaster
 and Reithrodontomys megalotis.

Measurements: Total length 140.5 mm.; tail length 42 mm.; hind foot length 19 mm. (average of two specimens).

Special characteristics: A short, 'pencil-pointed' tail is diagnostic.

The subspecies listed by Rand (1948) for Alberta is Onychomys leucogaster missouriensis (Audubon and Backman).

Distribution (Map 8): The grasshopper mouse is found in the northern and southern prairie regions.

Peromyscus maniculatus (Deer mouse)

Color: The back may vary from dark yellow to brownish-gray but the underparts are white. The tail is bicolored, the upper part is brown to black; the underpart is white (Plate 6).

Measurements: Total length 150 mm.; tail length 65.6 mm.; hind foot length 17.8 mm. (average from twenty-one specimens).

Mr. S. Downing of the Royal Ontario Museum, Toronto, Ontario, uses the following key characters in distinguishing Peromyscus maniculatus from Peromyscus leucopus:

Map 9.

The distributional records of Peromyscus leucopus and
P. maniculatus. * (and others)

Characteristic	<i>Peromyscus maniculatus</i>	<i>Peromyscus leucopus</i>
Hair on end of tail	is long in this species	is short in this species
Hair on throat, chin & forelegs	is gray at base	is white at base
Dorsal stripe	is less pronounced	is more pronounced
In the skull, the incisive foramina	are parallel sided	are in the shape of deer tracks
Tail length	is relatively longer	relatively shorter

The subspecies listed by R. M. Anderson (1946) are:

1. *Peromyscus maniculatus artemisiae* (Rhoads)
2. *Peromyscus maniculatus borealis* Mearns
3. *Peromyscus maniculatus osgoodi* Mearns

Distribution (Map 9): This mouse is one of the most common and most widespread in Alberta. It has been trapped through most of central and southern Alberta. Trapping records (Appendix B) would indicate that this species is the most numerous.

Peromyscus leucopus (White-footed mouse)

Color: The markings are very similar to *Peromyscus maniculatus*. The differences can be found in the above chart.

The subspecies found in Alberta is *Peromyscus leucopus aridulus* Osgood.

Distribution: I have never taken this animal in southern Alberta but J. Dewey Soper (1935) has taken this species from Eagle Butte, Milk River and Lodge Creek, Alberta. (Refer to Map 9).

The white-footed mouse is to be expected in the southern prairie zone but one specimen was taken southeast of Cardston, placing it in the northern prairie zone.

Neotoma cinerea (Pack rat or bushy-tailed wood rat)

Color: The dorsum is grayish-buff and the underparts are white. (Plate 9).

Measurements: Total length 366.5 mm.; tail length 170.5 mm.; hind foot length 79.5 mm. (average from two specimens).

Special markings: The extremely long, black whiskers are noticeable.

According to Rand (1948) the subspecies in Alberta are:

1. Neotoma cinerea cinerea Ord
2. Neotoma cinerea drummondi Richardson

Distribution (Map 10): This animal is common among old buildings and in rock piles in the mountain areas in Alberta. Brown (Unpublished sylvatic plague survey) took this species at Milk River. It is also reported by farmers along the Milk River ridge.

Map 10.

The distributional records of *Neotoma cinerea*.

(1. Anderson, 1946)

Microtine Rodents

Synaptomys borealis (Northern bog lemming)

"The general vole-like appearance and colour, the short tail (less than twice the length of the hind foot), in old males the white flank spots, and the tooth characters are diagnostic." (Rand, 1948).

Distribution: Soper (1948) reports one specimen from Ray Lake in the Peace River country. Anderson (1946) mentions it is found in the Edmonton district and in the Banff and Jasper National Parks.

Anderson (1946) gives the following Alberta sub-species: 1. Synaptomys borealis borealis (Richardson)

2. Synaptomys borealis chapmani Allen

Lemmus trimucronatus (Brown lemming)

This species is found in the "Rocky Mountain regions of northwestern Alberta" (Anderson, 1946).

The subspecies listed for Alberta by Anderson (1946) is Lemmus trimucronatus helvolus (Richardson).

Phenacomys intermedius (Phenacomys vole)

This animal has been taken in Jasper National Park and along eastern slopes of the Rocky Mountains to Teton County, Montana (Anderson, 1946).

The subspecies listed by Anderson (1946) for Alberta is Phenacomys intermedius levis A. B. Howell.

Phenacomys ungava

Anderson (1946) says this species extends "west to south-central Alberta". He lists the subspecies as Phenacomys ungava soperi Anderson.

Microtus longicaudus (Long-tailed meadow vole)

This animal, which usually occurs in the mountains, is similar in color to Microtus pennsylvanicus but is easily distinguished by the relatively long tail. Soper (1946), however, trapped two specimens, one at Milk River and the other at Eagle Butte.

The subspecies listed by Anderson (1946) are:

1. Microtus longicaudus mordax (Merriam)
2. Microtus longicaudus vellerosus J. A. Allen

Microtus xanthognathus (Leach) (Chestnut-cheeked vole)

This species occurs in the northern part of the province (Rand, 1948).

Microtus richardsoni (Water vole)

This large vole "ranges at high altitudes in Alberta from Waterton Lakes National Park north at least to Jasper Park" (Anderson, 1946).

The subspecies in Alberta listed by Anderson (1946) is Microtus richardsoni richardsoni (De Kay).

Pedomys minor Merriam (Upland vole)

The range of this animal according to Rand (1948) is "the southeast part of the province, north to Edmonton". Soper (1921) took five specimens from Islay.

Map 11.

Distributional records of Clethrionomys gapperi and
Lemniscus curtatus. ★ (and others).

Although extensive trapping was done for the microtine rodents mentioned above, no specimens were taken.

Clethrionomys gapperi (Red-backed mouse)

Color: The back is reddish-brown fading into a light brown on the sides and the underparts are white (Plate 10).

Measurements: Total length 131.5 mm.; tail length 39 mm.; hind foot length 17.5 mm. (average from four specimens).

The subspecies listed by A. L. Rand (1948) are:

1. Clethrionomys gapperi athabasca Preble
2. Clethrionomys gapperi loringi Bailey
3. Clethrionomys gapperi galei Merriam
4. Clethrionomys gapperi saturatus Rhoads

Distribution (Map 11): This species is widespread in southern and central Alberta but there are no records from the southern prairie zone. Soper (1946) has records for this animal from the Cypress Hills.

Microtus pennsylvanicus (Short-tailed meadow vole or meadow mouse)

Color: The back may vary from light brown to black-brown. The pile and guard hairs are dark gray at the base and tipped with brown. This gives the animal an overall grizzled appearance (Plate 10).

Measurements: Total length 149.5 mm.; tail

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Map 12.

The distributional records of Microtus pennsylvanicus.

length 40 mm.; hind foot length 17 mm. (average from twelve specimens).

The subspecies found in Alberta are, according to Rand (1948):

1. Microtus pennsylvanicus drummondi Audubon and Backman

2. Microtus pennsylvanicus insperatus Allen

Distribution (Map 12): This species is found throughout Alberta in long grass along roads or in grassy meadows. It is possible that it is more numerous during summers in which there is a great deal of rainfall. For instance, the increased precipitation greatly increased the amount of rank grass during the summer of 1951. I saw some road ditches teeming with these voles.

Lemmys curtatus (Pallid vole)

This animal is now thought to be fairly common in Alberta. I have never taken it in southern Alberta in over 3,000 trap nights, but Dr. J. E. Moore and Mr. R. Lister took twelve specimens in the summer of 1951.

Color: The back is brownish-gray and whitish underneath (Plate 10).

The race listed for Alberta by Anderson (1946) is Lemmys curtatus pallidus Merriam.

Distribution (Map 11): I have never taken this animal in Alberta but Dr. J. E. Moore, University of Alberta, tells me that it is fairly abundant in certain localities.

It appears to be confined to the northern and southern prairie region.

Ondatra zibethica (Muskrat or mushrat)

Color: It is brownish-black or cinnamon, depending on the race in Alberta. The belly is light brown (Plate 8).

Measurements: Total length 424 mm.; tail length 230 mm.; hind foot length 75 mm. (from one specimen).

Special characteristics: It has large hind feet with a fringe between and surrounding the toes. The tail is quite diagnostic, being practically hairless and oval in cross section.

The races of Alberta, according to Rand (1948) are:

1. Ondatra zibethica spatulata Osgood
2. Ondatra zibethica cinnamomina Hollister

Distribution: This species is common in Alberta in most waterways and marshes which are lined with palatable herbaceous vegetation.

Family 6. Muridae (Introduced rats and mice)

These introduced forms are characterized by the presence of three longitudinal series of tubercles on the molars.

Mus musculus (House mouse)

Color: The dorsum is dark brown and the underpart is dark gray (Plate 12).

Map. 13.

The distributional records of Mus musculus and Rattus norvegicus.

Measurements: Total length 160 mm.; tail length 78 mm.; hind foot length 17 mm. (average from six specimens).

Special characteristics: The long, sparsely haired tail is diagnostic.

The race present in Alberta is Mus musculus domesticus Ruddy according to Rand (1948).

Distribution: The house mouse ranges throughout the greater part of settled Alberta. It is the most common animal in areas surrounding towns or city garbage disposal areas. Occasionally it is trapped in barley or wheat fields. (Refer to Map 13).

Rattus norvegicus (Norway rat or brown rat)

Color: The coarse fur is brownish-gray on top and gray underneath. The long, scaly tail is diagnostic (Plate 13).

Measurements: Total length 243 mm.; tail length 117 mm.; hind foot length 30.5 mm. (average from three specimens).

The animal listed by Anderson (1946) is Rattus norvegicus (Erxleben).

Distribution (Maps 13 and 14): The invasion of Alberta by the Norway rat constitutes a serious agriculture and public health problem. Until 1950, Alberta was the only rat-free area in North America. On July 13th, 1950, at the Van Sickie farm at 26-1 W4M, rat burrows and

The Migration of Rattus norvegicus into Alberta (1950)
Alberta Sylvatic Plague Areas (1950)

Map 14.

The spotted areas show the migration of Rattus norvegicus and the Alberta sylvatic plague areas.

black scats were observed around the barn and chicken house, and the establishment of a rat colony seemed likely. On July 15th, 1950, the first Norway rat was caught beside the chicken house. Previous to finding this colony on the Van Sickle farm, the only rats taken in Alberta were either found dead or killed around railroad yards and the assumption was that they were brought in on railroad box-cars but had not become established. In the winter of 1951, the grain elevator agent at Sibbald, Alberta, reported to Mr. J. H. Brown the presence of rats and rat burrows in and around his grain bins. This positive evidence shows that Alberta is no longer rat-free.

The movement of rats in the three Prairie Provinces is an interesting problem. Between the years 1900 and 1909, the Norway rat was found to be established in Morden and Emerson, Manitoba. Since the turn of the century, the rat has been moving westward, until now large colonies are established in southern Manitoba, southern and central Saskatchewan and a few isolated colonies in eastern Alberta. Thus, in a period of approximately fifty years, this animal has moved westward over five hundred miles and established itself in colonies over thousands of square miles in the Prairie Provinces.

Perhaps the movement of rats can be explained in this manner. The rats first colonize the new locale. When a certain reproduction rate is reached and the carrying capacity of the area is exceeded, the rats are

forced to move in order to survive. With thousands of rats established in Saskatchewan, it seems likely that the rat could, by this method, colonize Alberta completely.

Rattus rattus (Black rat)

Color: This species is slenderer and smaller than the Norway rat. The hair is black on the back and slatey to black underneath.

The subspecies listed by Anderson (1946) is Rattus rattus rattus (Linnaeus).

Distribution: This species was introduced accidentally into Alberta. Wm. Lawrence in July, 1947, trapped four specimens in a boxcar in Calgary. It is apparently not established in the province.

Family 7. Zapodidae (Jumping mice)

These mice are approximately 250 mm. in total length, with long hind legs adapted for jumping. The forelegs are reduced and the tail is much longer than the head and body. The upper incisors are grooved.

Zapus hudsonius (Meadow jumping mouse)

Color: The back has a dark brown stripe approximately 2 cm. wide and the sides are yellowish-brown. The pile hair and guard hairs are gray at the base, the pile hair is yellow-brown at the tip but the guard hairs are tipped black. The white belly is separated from the yellowish-brown sides by an orange-yellow line (Plate 11).

Map. 15.

The distributional records of Zapus hudsonius, and Zapus princeps. x(Zapus princeps)

Measurements: Total length 216 mm.; tail length 132 mm.; hind foot length 30 mm. (average from three specimens).

The race listed by Anderson (1946) for Alberta is Zapus hudsonius hudsonius Zimmerman.

Distribution (Map 15): I have taken three specimens in Alberta in the northern forest and poplar area. The jumping mice are rare and it is only occasionally that one is collected.

Zapus princeps (Rocky Mountain jumping mouse)

Color: The color is similar to that of the meadow jumping mouse. This species has heavier molar teeth and a longer incisive foramen than Zapus hudsonius.

Measurements: Total length 221 mm.; tail length 132 mm.; hind foot length 29 mm. (from one specimen).

The two races listed by R. M. Anderson (1946) are:

1. Zapus princeps idahoensis Davis

2. Zapus princeps minor Preble

Distribution (Map 15): This species is to be expected in the Rocky Mountains and in northern and southern prairie zones, but only one specimen from Blairmore, Alberta, was personally collected.

Family 8. Erethizontidae (American porcupines)

This animal is furred but the upper parts of the back and tail are covered with enormous numbers of quills. The infraorbital foramen is large.

There are 5 subspecies widespread in Alberta.

Anderson (1946) lists the following:

1. Erithizon dorsatum dorsatum (Linnaeus)
2. Erithizon dorsatum bruneri Swenk
3. Erithizon dorsatum epixanthum Brandt
4. Erithizon dorsatum myops Merriam
5. Erithizon dorsatum nigrescens Allen

PART I.

SECTION II. ECTOPARASITES

The ectoparasites were collected from all species and preserved in methyl alcohol and ethanol, 70%. They were sent to specialists for identification. The following chart is based on their identification and on records from 1938 to 1951 assembled by J. H. Brown, Alberta Public Health Entomologist.

Rodent Host	Ectoparasite	Identification Made by
	<u>Chiggers</u>	
Citellus richardsonii	Trombicula sp.	J. M. Brennan
Citellus richardsonii	Euschongastia sp.	J. M. Brennan
Peromyscus maniculatus	Euchongastia criceticola	J. M. Brennan
Citellus richardsonii	Euchongastia oregonensis	J. M. Brennan
Microtus sp.	Trombicula microti	J. M. Brennan
Clethrionomys gapperi	Trombicula microti	J. M. Brennan
Peromyscus sp.	Trombicula sp.	J. M. Brennan
Clethrionomys sp.	Trombicula microti	J. M. Brennan
Peromyscus maniculatus	Trombicula microti	J. M. Brennan
Mus musculus	Trombicula montanensis	J. M. Brennan
Citellus richardsonii	Trombicula montanensis	J. M. Brennan
	<u>Anoplura</u>	
Microtus pennsylvanicus	Hoplopleura acanthopus	W.L. Jellison

Rodent Host	Ectoparasite	Identification Made by
Microtus pennsylvanicus	Hoplopleura acanthopus	W.L. Jellison
Peromyscus sp.	Hoplopleura hesperomydis	W.L. Jellison
Citellus richardsonii	Neohaematopinus laeviusculus	W.L. Jellison
Thomomys talpoides	<u>Mallophaga</u> Geomydoecus thomomyus	A.L. Wilk
Citellus richardsonii	<u>Ticks</u> Dermacentor andersoni (nymph)	G.M. Kohls
Peromyscus sp.	Dermacentor andersoni (nymph)	G.M. Kohls
Citellus columbianus	Dermacentor andersoni	J.D. Gregson
Citellus tridecemlineatus	Dermacentor andersoni	J.D. Gregson
Microtus pennsylvanicus	Dermacentor andersoni	G.M. Kohls
Clethrionomys gapperi	Ixodes angustus	G.M. Kohls
Microtus pennsylvanicus	Ixodes angustus	J.D. Gregson
Zapus sp.	Ixodes angustus	J.D. Gregson
Peromyscus maniculatus	Ixodes angustus	G.M. Kohls
Citellus richardsonii	Ixodes kingi	G.M. Kohls
Citellus richardsonii	Ixodes sculptus	G.M. Kohls
Citellus tridecemlineatus	Ixodes sculptus	J.D. Gregson
Citellus franklini	Ixodes sculptus	G.M. Kohls
Peromyscus maniculatus	Ixodes sp.	G.M. Kohls
Thomomys sp.	<u>Siphonaptera</u> Dactylopsylla (Foxella) ignota albertinsis	J.H. Brown
Thomomys sp.	Hystrihopsylla gigas	J.H. Brown
Citellus richardsonii	Neopsylla inopina	J.H. Brown
Clethrionomys gapperi	Neopsylla inopina	J.H. Brown
Citellus richardsonii	Oropsylla (Opisocrostis) bruneri	J.H. Brown

Rodent Host	Ectoparasite	Identification Made by
Citellus columbianus	Oropsylla (Opisocrostitis) bruneri	J.H. Brown
Citellus tridecemlineatus	Oropsylla (Opisocrostitis) bruneri	J.H. Brown
Citellus columbianus	Oropsylla tuberculata	J.H. Brown
Citellus richardsonii	Oropsylla tuberculata	J.H. Brown
Citellus richardsonii	Oropsylla (Oropsylla) idahoensis	J.H. Brown
Eutamias sp.	Oropsylla (Oropsylla) idahoensis	J.H. Brown
Citellus columbianus	Oropsylla (Oropsylla) idahoensis	J.H. Brown
Citellus columbianus	Tamiophila grandis	J.H. Brown
Citellus richardsonii	Tamiophila grandis	J.H. Brown
Citellus tridecemlineatus	Thrassis gladiolis	J.H. Brown
Citellus columbianus	Thrassis petiolatus	J.H. Brown
Eutamias sp.	Trichopsylla (Trichopsylla) eumolpi	J.H. Brown
Eutamias sp.	Trichopsylla vison	J.H. Brown
Tamiasciurus hudsonicus	Trichopsylla vison	J.H. Brown
Peromyscus sp.	Trichopsylla wagneri	J.H. Brown

Holland (1946) lists the following fleas of Alberta not noted by Brown.

Siphonaptera	Rodent Host
Catallagia decipiens	Thomomys talpoides
Ceratophyllus niger	Tamiasciurus hudsonicus
Corrodopsylla curvata curvata	Zapus spp.
Ctenophthalmus pseudagyrtes	Clethrionomys gapperi Citellus richardsonii Eutamias minimus Tamiasciurus hudsonicus
Epitedia wenmanii	Citellus richardsonii Peromyscus maniculatus
Hystrihopsylla dippei	Citellus richardsonii
Malareus euphorbi	Peromyscus maniculatus
Malareus penicilliger dissimilis	Clethrionomys gapperi
Megabothris abantis	Neotoma cinerea Zapus spp.
Megabothris asio	Citellus richardsonii
Megabothris lucifer	Citellus richardsonii
Megabothris quirini	Citellus columbianus Eutamias minimus borealis Zapus spp.
Megarhroglossus abantis	Microtus longicaudus mordax
Megarhroglossus divisus divisus	Microtus longicaudus mordax
Monopsylla wagneri	Citellus richardsonii Zapus princeps minor
Opisocrostis bruneri	Marmota monax

Siphonaptera	Rodent Host
Opisodasys keeni	Clethrionomys gapperi
Opisodasys pseudarctomys	Glaucomys spp.
Oropsylla arctomys	Marmota caligata Marmota monax Marmota spp.
Orchopeas caedens caedens	Citellus franklinii Tamiasciurus hudsonicus
Orchopeas caedens durus	Eutamias amoenus Glaucomys sabrinus Neotoma cinerea
Peromyscopsylla selenis	Citellus richardsonii Clethrionomys gapperi Microtus longicaudus mordax Peromyscus maniculatus Synaptomys borealis borealis
Rectofrontia fraterna	Citellus richardsonii Onychomys leucogaster Peromyscus maniculatus borealis
Tarsopsylla coloradensis	Tamiasciurus hudsonicus
Thrassis bacchi	Citellus richardsonii Citellus tridecemlineatus
Thrassis spenceri	Marmota monax Marmota caligata

PART I.

SECTION III. ALBERTA RODENT-BORNE DISEASES

Sylvatic Plague

Plague is primarily a disease of rodents. The causative organism of this disease is Pasteurella pestis. This bacillus is usually transmitted from species to species by fleas. Alberta plague in Citellus richardsonii, which is the animal reservoir, often appears as a pathogenic epizootic.

There are two main methods whereby the disease can be transmitted to man. While the flea is feeding on a human host, it may regurgitate blood or deposit feces on the skin, and the infected blood or feces may be rubbed into a lesion in the skin. The second method, by which plague is transmitted to man, is by direct inhalation of infected droplets into the lungs. This causes pneumonic plague.

Plague has been found in the Richardson ground squirrel in the following areas in Alberta (refer to Map 14):

1. The Youngstown area
2. The Brooks area
3. The Gleichen area
4. The Suffield area
5. The Lomond area

The invasion of the Norway rat (Rattus norvegicus) into Alberta constitutes a serious public health problem. The Norway rat can carry Pasteurella pestis and as the rats move westward into the Youngstown ground squirrel plague area, it seems likely that the bacillus and infected fleas could be passed to the rat. As the rat lives in close association with man, the threat of plague in humans will be increased.

The following list shows the rodent hosts from which plague vectors have been recovered. (Brown, 1944).

1. Citellus columbianus

Vectors: Oropsylla (Oropsylla) idahoensis
Oropsylla (Opisacrostis) tuberculata
Thrassis petiolatus

2. Marmota flaviventris

Vector: Thrassis acamantis

3. Thomomys sp.

Vector: Oropsylla (Oropsylla) rupestris

4. Citellus richardsonii

Vectors: Oropsylla (Oropsylla) idahoensis
Oropsylla (Oropsylla) rupestris
Oropsylla (Oropsylla) tuberculata

5. Eutamias sp.

Vectors: Oropsylla (Oropsylla) idahoensis
Trichopsylla (Trichopsylla) eumolpi

6. Neotama cinerea

Vector: Orchopeas sexdentatus

7. Citellus tridecemlineatus

Vector: Thrassis gladiolis

Tularaemia

"Rabbit fever or tularaemia is a disease of man, transmitted to man by the bite of an infected blood-sucking fly or tick, (in Alberta by Chrysops discalis and Dermacentor andersoni) or by the contamination of the hands or conjunctival sac with the internal body fluids of infected rodents, flies or ticks." (Zinsser Bayne-Jones, 1939).

Tularaemia, which is caused by Pasteurella tularensis, has been found in the following animals: ground squirrels, woodchucks, pocket gophers, porcupines and chipmunks.

From 1940 to 1942, Bow and Brown (1943) have reported nine human cases of tularaemia from the Seven Persons Coulee in southeastern Alberta. The vector was thought to be Dermacentor andersoni and the reservoir could be Citellus richardsonii or Lepus townsendii.

Equine Encephalomyelitis

This virus disease is thought to be transmitted by mosquitoes and the virus is thought to be present in very small amounts in the brains of diseased Citellus richardsonii in Alberta. (Gwatkin and Moynihan, 1942).

Rocky Mountain Spotted Fever

This rickettsial disease is caused by the bite of an infected tick (Dermacentor andersoni). This is primarily a tick disease but certain rodents may act as hosts and disease reservoirs in the tick's complicated life cycle. Brown (1946) lists the following rodents as

hosts: Tick adult stage: Porcupines

 Tick nymph stage: Squirrels, ground squirrels, mice, chipmunks, wood rats, marmots

 Tick larval stage: Squirrels, ground squirrels, mice, chipmunks, wood rats, marmots

Haplosporangium parvum

A fungus disease caused by Haplosporangium parvum has been isolated in Alberta rodents by Dr. S. Keeping. This disease of the lungs has been isolated from the lungs of Peromyscus sp. in southeastern Alberta. Over 100 smears and lung collections were made by the author in 1950 and 1951. One positive was obtained from Foremost in a Peromyscus sp. in 1950. The number of diseased lungs in 1951 has not been determined. This disease is thought to be feebly pathogenic.

PART II. ORDER LAGOMORPHA

SECTION I. DESCRIPTIONS AND DISTRIBUTIONAL NOTES

Family Ochotonidae (Pikas)

The roundish ears, the small size, the relatively short hind legs and the absence of a tail distinguish this family from the following family.

Ochotona princeps (Coney or pika)

Color: The upperparts are "grayish or buffy, the hairs slate colored at base, color variable with the individual and ranging from the pinkish buff, clay color or ochraceous tawny to fuscous or grayish mixture," (Anthony, 1928). The underparts are "whitish varying to cinnamon-buff; soles of feet buffy white, brownish or fuscous." (Anthony, 1928). The subspecies according to Rand (1948) are:

1. Ochotona princeps princeps Richardson
2. Ochotona princeps lutescens Howell
3. Ochotona princeps levis Hollister

Map 16.

The distributional records of Lepus americanus, Lepus townsendi and Sylvilagus nuttallii.

Distribution: (Refer to Map 16). This animal is limited to the higher reaches in the Rocky Mountains.

Family Leporidae (Hares and rabbits)

The long tapering ears, the presence of a stubby tail and long hind legs are characteristic.

Lepus americanus (Snowshoe rabbit or varying hare)

Color: The summer pelage is a grizzled brown above and whitish underneath. The dark upperside of the tail is a salient characteristic. In the winter season, the animal is white with black-tipped ears.

Measurements: Total length 460 mm.; tail length 43 mm.; hind foot length 143 mm.; (average of 3 specimens).

Anderson (1946) lists the following subspecies in Alberta:

1. Lepus americanus americanus Erxleben
2. Lepus americanus bairdii Hayden
3. Lepus americanus columbiensis Rhoads
4. Lepus americanus macfarlandi Merriam

Distribution: (Refer to Map 16). The distribution of this species varies in Alberta. As the species reaches its numerical peak, in its ten year population cycle, the range will increase also.

The snowshoe rabbit has been seen and recorded in Central Alberta but never has been seen by the author in the northern and southern prairie zones. This hare

has been reported by farmers in the valleys of the Milk, South Saskatchewan and Red Deer Rivers in southeastern Alberta.

Lepus townsendi (White-tailed jack rabbit)

Color: In summer, this animal is sandy above but pile hair is whitish throughout. The underparts, the tail, the nape and the underside of the ears are whitish. The tips of the ears are black throughout the whole year.

Measurements: Total length 552 mm.; tail length 88 mm.; hind foot length 130 mm. (average of 5 specimens).

The subspecies listed by Rand (1948) for Alberta is Lepus townsendi campanius Hollister.

Distribution: (Refer to Map 16). The jack rabbit is primarily an animal of the plains but has been recorded north at least to Fawcett and west to Coleman. As land settlement increases, I believe this animal will move even further north. At the present time, it is fairly common in the southern and northern prairie regions, the parkland and in the poplar region. It seems to be abundant in the Eastern Irrigation District.

Sylvilagus nuttallii (Cottontail rabbit)

Color: The dorsum is light brown, the neck and the upper parts of the legs are a rich brown. The throat is brown but the underparts are white.

Measurements: Total length 364.5 mm.; tail length 43 mm.; hind foot length 85.5 mm. (average of 2 specimens).

The subspecies listed by Anderson (1946) is Sylvilagus nuttallii grangeri.

Distribution: (Refer to Map 16). This animal is found in the southern prairie region. It can be found along the banks of creeks and rivers in southeastern Alberta where there are willow and rose bush thickets.

PART II.

SECTION II. ECTOPARASITES

The ectoparasites are scraped from the animal and placed in methyl hydrate or 70% ethanol. All identifications have been made by experts.

The following records of ectoparasites have been assembled by J. H. Brown.

Lagomorph Host	Ectoparasite	Identification Made by
	<u>Ticks</u>	
Lepus townsendi	Dermacentor andersoni	G.M. Kohls
Ochotona princeps	Dermacentor andersoni	J.D. Gregson
Lepus americanus	Haemaphysalis leporis-palustris	G.M. Kohls
Lepus townsendi	Haemaphysalis leporis-palustris	G.M. Kohls
Lepus townsendi	Otobius lagophilus	R.A. Cooley
	<u>Siphonaptera</u>	
Lepus sp.	Cediopsylla inaequalis	J.H. Brown
Lepus sp.	Hoplopsyllus (Euhoplopsyllus sp.)	J.H. Brown
Lepus sp.	Hystrihopsylla gigas	J.H. Brown
Sylvilagus sp.	Odontopsyllus	
	multispinosus	J.H. Brown
Lepus sp.	Oropsylla (Opisocrostis)	J.H. Brown

Holland (1949) lists the following fleas not recorded by Brown:

Siphonaptera	Host
Amphalius necopinus	Ochotona princeps princeps
Catallagia decipiens	Ochotona princeps
Hoplopsyllus glacialis lynx	Lepus americanus
Megabothris quirini	Sylvilagus nuttallii grangeri
Monopsyllus vison	Ochotona princeps
Odontopsyllus dentatus	Sylvilagus nuttallii grangeri
Orchopeas caedens durus	Ochotona princeps
Rectofrontia fraterna	Ochotona princeps

PART II.

SECTION III. ALBERTA LAGOMORPH-BORNE DISEASES.

Tularaemia is the chief disease of rabbits that can be transmitted to man but the fact that the nymph and larval stages of the spotted fever tick (Dermacentor andersoni) have been found attached to the skin of snowshoe and jack rabbits shows that these 2 species may be important in the spread of Rocky Mountain Spotted Fever as well as Tularaemia.

Tularaemia

The snowshoe, the jack and the cottontail rabbit are known carriers of Pasteurella pestis. The disease can be transmitted by the bite of an infected deer fly (Chrysops discalis) or tick (Dermacentor andersoni) or by handling diseased animals (Brown 1943).

CONCLUSION

In this preliminary survey, I have attempted to give a general picture of the species of rodents and lagomorphs in Alberta, their distribution, their ectoparasites, and finally, the effect of these mammals on the health and welfare of man. It has been difficult to do enough field work in Alberta to give a fair picture of the animal communities studied. The vast number of species, the huge territory to cover, the complexity of rodent and lagomorph communities and the actual labour involved in catching, autopsying and skinning the animals collected poses a serious problem to the surveyor.

This paper, I believe, will be a fairly useful field guide to future field men who will be doing further survey work on sylvatic plague, tularaemia and Rocky Mountain spotted fever in Alberta. It is of prime importance for the surveyor to know the names of the common species in the area he is working in, the environment where these animals are to be expected, and finally, the ectoparasites which are scraped from the mammals.

"Animal ecology is building up from basic surveys a science whose aim is the complete analysis

of animal behaviour, numbers and distribution. It has only recently progressed far enough to make close contact with the economic problems. It still has a long way to go." (Elton, 1946).

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Plate 1.

Marmota monax (the lower specimen is melanistic).

Plate 2.

The upper rodent is Glaucomys sabrinus (U. of A. specimen). The lower rodent is Tamiasciurus hudsonicus.

Plate 3.

Reading from left to right: Citellus richardsonii,
C. tridecemlineatus, C. lateralis, C. franklinii
and C. columbianus.

Plate 4.

Reading from left to right: Eutamias minimus, Eutamias amoenus (tentative identification) and Eutamias ruficaudus (U. of A. specimen).

Plate 5.

Thomomys talpoides

The specimen on the right shows the external cheek
pouches. (greatly distended)

Plate 6.

Perognathus fasciatus

Plate 7.

Reithrodontomys megalotis

Plate 8.

Ondatra zibethica

Plate 9.

Reading from left to right: Neotoma cinerea, Onychomys leucogaster and Peromyscus maniculatus.

Plate 10.

Reading from left to right: Microtus pennsylvanicus,
Clethrionomys gapperi and Lemmings curtatus (U. of A.
specimen).

Plate 11.

Zapus hudsonius

Plate 12.

Mus musculus on the left and Rattus norvegicus on
the right.

APPENDIX A.

CATALOGUE OF MAMMAL COLLECTIONS

Date	Species	Locality	Measurements (mm.) and Sex
Aug. 4/51	<i>Citellus columbianus</i>	Waterton	303-98-46 F
Aug. 6/51	" "	"	305-88-46 F
Aug. 4/50	<i>Citellus franklinii</i>	Camrose	387-131-52 M
Aug. 9/61	<i>Citellus lateralis</i>	19-5 W5M	267-96-46 M
June 28/50	<i>Citellus richardsonii</i>	28-1 W4M	No data
July 15/51	" "	11-4 W4M	270-67-47 M
Aug. 6/51	<i>Citellus tridecemlineatus</i>	Waterton	270-83-33 F
Aug. 16/51	" "	Baptiste Lake	265-96-36 F
Aug. 17/50	<i>Clethrionomys gapperi</i>	Lac La Biche	151-46-18 F
Aug. 10/51	" "	R. Mtn. House	131-36-17 F
Aug. 18/51	" "	Faust	127-39-18 F
Aug. 19/51	" "	Peace River	117-36-17 F
Aug. 3/51	<i>Eutamias amoenus</i>	Waterton	196-88-29 M
Aug. 7/51	" "	Waterton	222-107-29 M
Aug. 9/51	" "	Gorge Creek	218-97-30 M
Aug. 30/51	" "	Banff	222-96-32 F
Aug. 21/50	<i>Eutamias minimus</i>	Athabasca	220-106-34 M
Aug. 19/51	" "	Faust	201-96-27 M
Aug. 19/51	" "	Grande Prairie	209-100-27 F
June 22/51	<i>Lepus townsendii</i>	Brooks	530-131-88 M
May 30/50	<i>Microtus pennsylvanicus</i>	Medicine Hat	196-45-16 M
June 12/50	" "	Oyen	149-38-19 F
June 27/50	" "	28-1 W4M	162-42-14 F
July 20/50	" "	Compeer	156-37-18 F
July 20/50	" "	Compeer	128-36-19 M
May 22/51	" "	Aden	157-45-19 F
May 27/51	" "	Milk River	124-32-18 M
June 11/51	" "	Monarch	171-44-16 M
July 5/51	" "	Lomond	162-41-17 F

Summary of results

Year	Area	Population	Area	Population
1950	1000	1000	1000	1000
1951	1000	1000	1000	1000
1952	1000	1000	1000	1000
1953	1000	1000	1000	1000
1954	1000	1000	1000	1000
1955	1000	1000	1000	1000
1956	1000	1000	1000	1000
1957	1000	1000	1000	1000
1958	1000	1000	1000	1000
1959	1000	1000	1000	1000
1960	1000	1000	1000	1000
1961	1000	1000	1000	1000
1962	1000	1000	1000	1000
1963	1000	1000	1000	1000
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2014	1000	1000	1000	1000
2015	1000	1000	1000	1000
2016	1000	1000	1000	1000
2017	1000	1000	1000	1000
2018	1000	1000	1000	1000
2019	1000	1000	1000	1000
2020	1000	1000	1000	1000

APPENDIX A. (Cont.)

Date	Species	Locality	Measurements (mm.) and Sex
July 23/51	Microtus pennsylvanicus	Oyen	143-45-19 M
July 30/51	"	Hanna	126-41-17 M
Aug. 21/51	"	High Prairie	123-36-16 F
June 5/50	Mus musculus	Empress	149-77-15 M
June 27/50	"	28-1 W4M	166-73-14 F
July 13/50	"	28-1 W4M	165-79-18 M
July 20/50	"	Compeer	169-84-18 M
July 20/50	"	Compeer	141-72-17 M
Aug. 4/50	"	Camrose	187-81-20 M
Aug. 5/51	Neotoma cinerea	Waterton	333-154-41 F
Aug. 5/51	"	Waterton	400-187-38 M
Aug. 30/50	Ondatra zibethica	Edmonton	424-230-73 M
July 20/50	Onychomys leucogaster	Hanna	138-43-20 M
July 3/51	"	Compeer	143-41-18 F
May 11/51	Perognathus fasciatus	Manyberries	130-65-15 M
June 30/51	"	Medicine Hat	103-55-15 F
June 1/50	Peromyscus maniculatus	28-1 W4M	134-52-17 M
June 5/50	"	Schuller	155-57-17 F
June 5/50	"	Hilda	135-56-17 M
June 27/50	"	28-1 W4M	158-66-17 F
June 27/50	"	28-1 W4M	160-68-19 F
July 1/50	"	Altsask (Alta.)	152-65-19 M
July 19/50	"	Compeer	135-56-17 M
May 20/51	"	Milk River	160-73-17 F
May 25/51	"	Milk River	152-66-17 M
May 25/51	"	Milk River	137-57-15 M
May 25/51	"	Milk River	138-58-20 F
July 12/51	"	Empress	127-64-17 M
July 15/51	"	Empress	159-61-17 F
July 23/51	"	Oyen	149-68-20 M
July 23/51	"	Oyen	148-64-18 F
July 30/51	"	Hanna	153-72-17 M
Aug. 6/51	"	Waterton	198-88-18 M
Aug. 30/51	"	Banff	167-81-20 M
Aug. 30/51	"	Banff	155-78-21 F

APPENDIX A. (Cont.)

Date	Species	Locality	Measurements (mm.) and Sex
June 26/50	<i>Rattus norvegicus</i>	28-29 W3M	265-133-33 M
June 28/50	"	28-29 W3M	218-106-27 M
June 30/50	"	28-29 W3M	No data
July 1/50	"	28-29 W3M	247-113-33 M
July 15/50	"	26-1 W4M	Preserved
May 28/51	<i>Reithrodontomys megalotis</i>	Milk River	105-49-14 M
June 30/51	<i>Sylvilagus nuttallii</i>	Medicine Hat	422-40-95 F
July 16/51	<i>Thomomys talpoides</i>	Medicine Hat	205-67-25 F
July 17/51	"	N $\frac{1}{2}$ 11-5 W4M	200-63-28 F
July 17/51	"	Empress	186-61-23 M
July 18/51	"	Empress	213-64-24 M
July 19/51	"	Empress	185-58-20 F
Aug. 7/51	"	Waterton	207-71-26 F
Aug. 9/51	"	Gorge Creek	227-69-28 M
Aug. 23/51	"	Camrose	No data
Collected by W. Skaskow			
Aug. 16/50	<i>Zapus hudsonius</i>	Cold Lake	212-124-30 M
Aug. 17/50	"	Lac La Biche	220-140-30 M
Aug. 17/50	"	Westlock	216-133-29 F
Aug. 8/51	<i>Zapus princeps</i> (?)	Blairmore	221-132-29 M
Sept. 27/50	<i>Marmota monax</i> Collected by C. Ward	Chip Lake	468-119-62 M (melanistic)
Dec. 9/50	<i>Lepus townsendii</i> Collected by A. Oeming	Edmonton	619-101-155

These mammal specimens are now housed in the C.I.B.D. Laboratory, Terrace Building, Edmonton, Alberta except the last two on the list which are in the University of Alberta collection.

Table 1

Description		Amount		Total	
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APPENDIX B.

MAMMAL COLLECTIONS FOR 1950-51

Date	Location	Trap Nights	Species
<u>1950</u>			
May 5	Medicine Hat	50	3 Peromyscus maniculatus
6	Medicine Hat	48	1 Peromyscus maniculatus 3 Microtus pennsylvanicus
8	Medicine Hat	54	7 Peromyscus maniculatus
9	Manyberries	26	None
10	Manyberries	50	3 Peromyscus maniculatus
12	Manyberries	20	2 Peromyscus maniculatus
13	Foremost	20	1 Mus musculus
14	Foremost	27	None
15	Foremost	30	2 Peromyscus maniculatus 1 Peromyscus sp. (?)
21	Coutts	10	1 Mus musculus
21	Milk River	12	1 Peromyscus maniculatus
21	Warner	10	1 Mus musculus 1 Peromyscus maniculatus
26	Lethbridge	21	4 Peromyscus maniculatus
26	Lethbridge	29	None
26	Lethbridge	50	1 Microtus pennsylvanicus 3 Peromyscus maniculatus 2 Mus musculus
30	Medicine Hat	50	1 Microtus pennsylvanicus 3 Peromyscus maniculatus 2 Mus musculus
June 1	Medicine Hat	12	6 Mus musculus
1	Medicine Hat	50	None
2	Medicine Hat	30	1 Mus musculus
3	Schuler	48	14 Peromyscus maniculatus
3	Schuler	5	3 Citellus richardsonii
4	Hilda	43	6 Peromyscus maniculatus
4	Hilda	3	None
7	Empress	30	16 Peromyscus maniculatus
8	Empress	23	None
8	Bindloss	30	1 Mus musculus 4 Peromyscus maniculatus
10	Oyen	61	1 Peromyscus maniculatus
12	Oyen	43	5 Peromyscus maniculatus
13	Oyen	22	None
27	Alsask (Alta.)	32	2 Microtus pennsylvanicus 2 Mus musculus 3 Peromyscus maniculatus

APPENDIX B. (Cont.)

Date	Location	Trap Nights	Species
<u>1950</u>			
June 28	Alsask (Alta.)	32	3 Peromyscus maniculatus 2 Microtus pennsylvanicus 1 Toad 1 Citellus richardsonii
29	Alsask (Alta.)	32	5 Peromyscus maniculatus
29	Alsask (Alta.)	32	5 Peromyscus maniculatus
July 1	In various loca- tions 5-15 miles east of Alsask, Saskatchewan	280	24 Rattus norvegicus
2	Alsask (Alta.)	34	2 Peromyscus maniculatus
3	Alsask (Alta.)	20	3 Peromyscus maniculatus 2 Microtus pennsylvanicus
4	Alsask (Alta.)	21	4 Peromyscus maniculatus
5	Alsask (Alta.)	40	5 Peromyscus maniculatus
6	28-1 W4M	54	4 Peromyscus maniculatus
7	Alsask (Alta.)	31	3 Microtus pennsylvanicus
9	Alsask (Alta.)	26	None
10	Alsask (Alta.)	50	2 Peromyscus maniculatus
15	26-1 W4M	10 rat traps	1 Rattus norvegicus (preserved)
17	Empress	28 19 rat traps	4 Peromyscus maniculatus
19	Compeer	28 19 rat traps	2 Peromyscus maniculatus
20	Compeer	25 19 rat traps	8 Mus musculus 1 Onychomys leucogaster 1 Microtus pennsylvanicus
21	Compeer	23 19 tr.	1 Peromyscus maniculatus
24	Provost	21 12 tr.	2 Mus musculus 1 Magpie
Aug. 4	Camrose	45 5 tr.	2 Mus musculus 1 Citellus franklini
11	Smoky Lake	60	6 Mus musculus 5 Peromyscus maniculatus 2 Citellus richardsonii
11	Smoky Lake	80	1 Peromyscus maniculatus
12	St. Paul	180	5 Peromyscus maniculatus 6 Mus musculus

APPENDIX B. (Cont.)

Date	Location	Trap Nights	Species
<u>1950</u>			
Aug. 13	St. Paul	15	24 Clethrionomys gapperi
			15 Peromyscus maniculatus
			5 Citellus richardsonii
		Shot	1 Citellus franklini
15	Cold Lake	372	6 Mus musculus
and 16			10 Peromyscus maniculatus
			5 Clethrionomys gapperi
			1 Zapus hudsonius
17	Lac La Biche	70	6 Clethrionomys gapperi
			1 Zapus hudsonius
			1 Lepus americanus
21	Athabasca	474	1 Ditellus franklini
22			4 Eutamias minimus
and 23			11 Peromyscus maniculatus
			3 Mus musculus
			2 Microtus sp. (?)
25	Grande Prairie	136	3 Peromyscus maniculatus
			9 Mus musculus
			2 Shrews
26	Beaverlodge	112	16 Mus musculus
			2 Peromyscus maniculatus
			1 Shrew
27	Rycroft	112	15 Mus musculus
			1 Shrew
28	Peace River	216	1 Clethrionomys gapperi
and 29			14 Peromyscus maniculatus
			3 Mus musculus
30	Faust	108	6 Clethrionomys gapperi
			2 Shrews
			1 Zapus hudsonius
31	Slave Lake	106	2 Peromyscus maniculatus
			1 Shrew
<u>1951</u>			
May 6	Medicine Hat	40	None
7	Medicine Hat	40	1 Peromyscus maniculatus
8	Medicine Hat	40	1 Peromyscus maniculatus
10	Manyberries	28	1 Peromyscus maniculatus
11	Manyberries	38	6 Peromyscus maniculatus
11	Manyberries	6	1 Perognathous fasciatus
12	Foremost	28	6 Peromyscus maniculatus
13	Foremost	28	9 Peromyscus maniculatus
16	Foremost	32	4 Peromyscus maniculatus
16	Foremost	34	9 Peromyscus maniculatus

APPENDIX B. (Cont.)

Date	Location	Trap Nights	Species
<u>1951</u>			
May 17			
18, 19	Foremost	96	15 Peromyscus maniculatus
22	Milk River	36	8 Peromyscus maniculatus
22	Aden	36	1 Microtus pennsylvanicus
			1 Peromyscus maniculatus
24, 25	2-14 W4W	64	12 Peromyscus maniculatus
26, 27	Milk River	90	1 Microtus pennsylvanicus
28			3 Peromyscus maniculatus
			1 Reithrodontomys megalotis
29	Milk River	32	None
30	Milk River	32	1 Peromyscus maniculatus
31	Lethbridge	61	None
June 1	Medicine Hat	32	1 Mus musculus
2			2 Peromyscus maniculatus
11	Monarch	33	4 Microtus pennsylvanicus
			4 Peromyscus maniculatus
23	Brooks	54	11 Microtus pennsylvanicus
24			1 Garter snake
27	Medicine Hat	26	2 Microtus pennsylvanicus
28	Medicine Hat	46	12 Peromyscus maniculatus
			2 Peromyscys sp. (?)
29	Medicine Hat	26	2 Microtus pennsylvanicus
30 and	Medicine Hat	46	24 Peromyscus maniculatus
July 1			1 Perognathous fasciatus
3	Medicine Hat	52	8 Peromyscus maniculatus
3	Medicine Hat	5	1 Sylvilagus nuttali
			2 Microtus pennsylvanicus
4, 5	Lomond	138	7 Peromyscys maniculatus
and 6			4 Microtus pennsylvanicus
10, 11			
and 12	Lomond	90	8 Peromyscus maniculatus
14	Irvine	80	3 Microtus pennsylvanicus
and 15			1 Peromyscys maniculatus
16	Medicine Hat	30	2 Thomomys talpoides
16	Medicine Hat	5	1 Peromyscys maniculatus
17	Empress	60	2 Thomomys talpoides
18	Empress	5	6 Peromyscus maniculatus
19	Empress	30	1 Thomomys talpoides
19	Empress	5	9 Peromyscys maniculatus
22, 23	Cyen	105	14 Peromyscus maniculatus
and 24			1 Microtus pennsylvanicus
25	Oyen	35	11 Peromyscys maniculatus
26	Oyen	35	3 Microtus pennsylvanicus

APPENDIX B. (Cont.)

Date	Location	Traps Nights	Species
<u>1951</u>			
July 28	Youngstown	32	3 Peromyscus maniculatus
29	Hanna	80	6 Peromyscus maniculatus
and 30			3 Microtus pennsylvanicus
31	Hanna	40	9 Peromyscus maniculatus
			1 Microtus pennsylvanicus
			1 Onychomys leucogaster
Aug. 1	Hanna	40	7 Peromyscus maniculatus
			1 Microtus pennsylvanicus
4	Waterton	200	5 Citellus columbianus
and 5		20 tr.	2 Eutamias amoenus (?)
			2 Neotoma cinerea
			12 Peromyscus maniculatus
			1 Citellus tridecemlineatus
6	Waterton	100	1 Citellus lateralis
		10 Tr.	2 Shrews
			1 Peromyscus maniculatus
7	Waterton	100	1 Neotoma cinerea
		10 tr.	5 Peromyscus maniculatus
			1 Thomomys talpoides
			1 Citellus columbianus
8	8-4 W5M	40	1 Zapus princeps
8	8-4 W5M	2	1 Eutamias amoenus (?)
9	19-5 W5M	36	1 Thomomys talpoides
9	19-5 W5M	4	7 Peromyscus maniculatus
		Shot	1 Citellus lateralis
10	39-7 W5M	36	2 Peromyscus maniculatus
			3 Clethrionomys gapperi
16	Athabasca	50	4 Peromyscus maniculatus
			7 Microtus pennsylvanicus
16	Lake Baptiste	Shot	1 Citellus tridecemlineatus
17	Faust	60	5 Clethrionomys gapperi
			11 Peromyscus maniculatus
			1 Eutamias minimus
18	Grand Prairie	80	10 Peromyscus maniculatus
			1 Microtus pennsylvanicus
			1 Eutamias minimus
			2 Mus musculus
19	Peace River	40	3 Peromyscus maniculatus
19	Peace River	5	3 Clethrionomys gapperi
			2 Microtus pennsylvanicus
			1 Mus musculus
20	High Prairie	50	3 Mus musculus
			12 Peromyscus maniculatus
			7 Microtus pennsylvanicus

APPENDIX B. (Cont.)

Date	Location	Trap Nights	Species
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<u>1951</u>			
Aug. 21	Westlock	36	1 Zapus hudsonius 2 Microtus pennsylvanicus
25, 26 and 27	Banff	120	1 Peromyscus maniculatus 12 Peromyscus maniculatus 1 Eutamias amoenus (?)