The mammals of Jasper
National Park, Alberta
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by J. Dewey Soper

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Wapiti in Jasper National Park
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Biography

J. Dewey Soper, one of Canada’s senior wildlife biologists, was born on a farm near Guelph, Ontario, on May 5, 1893. After education at Alberta College and the University of Alberta, Edmonton, he was appointed naturalist to the Canadian Government Arctic Expedition of 1923. During the next 8 years, he travelled widely on several arctic expeditions. His discovery in 1929 in western Baffin Island of the breeding grounds of the blue goose (Chen caerulescens) was subsequently honoured by the establishment of the Dewey Soper Bird Sanctuary there. After a two-year survey of Wood Buffalo National Park in the early thirties, Dr Soper was appointed, in turn, Chief Federal Wildlife Officer for the Prairie Provinces and for the Yukon and Northwest Territories. He retired from the federal service in 1952.

As a contribution to exact scientific knowledge, Dr. Soper has collected nearly 10,000 specimens of mammals and birds. He has made results of his field research available in over 100 publications, the best known being The mammals of Alberta, published in 1964 by the Government of Alberta. He was awarded an honorary LL.D. by the University of Alberta in 1960, where he presently holds an appointment as Honorary Research Zoologist.
The purpose of this volume is to present for the first time a full, systematic account of all the mammals known or suspected to occur within Jasper National Park.

Numerous expeditions, parties, and individual naturalists have visited this territory, their findings often being published in scientific journals or available in field reports submitted to the federal government. Most of these papers have been specializations and therefore related to only part of the mammalian fauna. Hence there is need for a comprehensive treatment of all the Mammalia, consolidating published and unpublished records, including scientific specimens collected in the park.

All such information is here brought together for the first time. The section "References and selected bibliography" includes more than 100 published items concerning wildlife and related matters in Jasper National Park. The list is far from exhaustive, since for the present purpose only the more pertinent and useful papers have been selected. Most of this scientific knowledge has been acquired since the park was established in 1907.

Fifty-two forms of native mammals have been listed for the park. Five other species are hypothetical — pygmy shrew, big brown and hoary bats, woodchuck, and brown lemming. It is possible that all or most of the latter species will eventually be found in the park.

Direct references have been made to published field results wherever possible. Often, however, this could not be done as the information was contained in unpublished memoranda, catalogues, field-notes, and personal correspondence. Examples are the frequent references to specimens collected by I. McT. Cowan in 1930 and 1943–46; by A. L. Rand in 1945; and by A. W. F. Banfield, 1946–52, for the National Museum of Canada, Ottawa. The same applies to specimens taken in Jasper Park by Robert Lister and Edward Moore in 1952, and to those by the present author, all of which were deposited in the permanent research collections of the University of Alberta, Museum of Zoology, Edmonton.

In the "Systematic accounts of mammals" each species is given an English vernacular name, followed by the scientific name of current usage. Most of the former names are taken from Hall's (1957) *Vernacular names for North American mammals north of Mexico*. Arrangement of species and most of the scientific names follow *The mammals of North America* by Hall and Kelson (1959). The departures are few. As Dr. A. W. F. Banfield, National Museum of Canada, has pointed out, the following changes are called for by recent monographic treatment: *Arvicola richardsoni* instead of *Microtus richardsoni*; *Vulpes vulpes* instead of *Vulpes fulva*; *Mustela nivalis* instead of *M. rixosa*; and *Odocoileus hemionus* and *Odocoileus virginiana* instead of *Dama hemionus* and *Dama virginiana*. Some other changes have been suggested, but as not all American authorities agree on them the terminology of Hall and Kelson is retained in these cases.

Average measurements are given in millimetres for total length, length of tail vertebrae, and length of hind foot. Weights are given in grams for the smaller species and in pounds for the larger ones. Figures given in parentheses after these averages show the extremes found in the specific series collected.

Measurements, weights, comments on gravid females, foetus counts, breeding records, and some other data are based on the author's own findings unless otherwise indicated. The same applies to conclusions in regard to status and habitats.

Under the heading "Reproduction", especially with reference to many fur bearers and big game animals, much of the information has been taken from the writings of such mammalogists as Seton (1925–1928), Asdell (1946), Rand (1948), Shadle (1951), Fuller (1956), and Hall and Kelson (1959). The subject is necessarily treated briefly in the present report. Much more detailed information on breeding habits and on other facts regarding species of mammals living in the park may be found in the works of the authors mentioned above, particularly in Seton's volumes on the *Lives of game animals*.

In the section "Faunal life-zones", the plant names are taken from the *Flora of Alberta* by Moss (1958).
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In connection with field work in the park the author received assistance from Mr. J. R. B. Coleman, then Director, National Parks Branch, Ottawa, and Park Naturalists Dr. G. M. Stirrett and Mr. R. D. Muir. Acknowledgements are due also to Dr. A. W. F. Banfield, then Director, Natural History Branch, National Museum of Canada; Dr. David A. Munro, then Director, Canadian Wildlife Service, Ottawa; Drs. W. E. Stevens, D. R. Flook, J. P. Kelsall, and Mr. R. H. Mackay in the Edmonton office of the latter Service; and Dr. I. McT. Cowan, University of British Columbia.

Valuable information was received from Dr. C. H. D. Clarke, Chief, Fish and Wildlife Branch, Ontario Department of Lands and Forests, Toronto; the Canadian Committee of the Hudson's Bay Company, Winnipeg; Mr. R. M. Patterson, Victoria, B.C.; Mr. Philip M. Youngman, National Museum of Canada; and Drs. Victor Lewin, William A. Fuller, and David Boag, Department of Zoology, University of Alberta.

Résumé

Le présent ouvrage constitue le premier relevé systématique de tous les mammifères dont l'existence dans le parc national de Jasper est soit connue, soit probable. Cinquante-deux espèces d'animaux y ont été nettement identifiées, tandis que la présence de cinq autres n'est qu'hypothétique.

Il fut un temps où la région renfermait une faune nombreuse et variée, mais avec l'arrivée de l'homme blanc, cette faune a été fort décimée. Toutefois, bon nombre d'espèces animales qui y foisonnaient jadis sont réapparues depuis la création du parc en 1907.

L'ouvrage comprend une revue des collections et des commentaires de trafiquants de fourrures, d'explorateurs, d'arpenteurs et de naturalistes; on y trouve également une étude de la physiographie, du climat, de la flore et de la faune du parc. Tous les mammifères identifiés sont étudiés d'une façon systématique, avec des détails sur leurs mensurations externes, le dénombrement des populations, les caractéristiques de reproduction et l'habitat. Le travail comporte une centaine de références bibliographiques.
Fur traders, explorers, and surveyors

Some of the romance of pioneer history still lingers on in the vast “mountain halls” of the Jasper Rockies. A century and more ago the valleys of the Athabasca and Whirlpool Rivers and the Miette through Yellowhead Pass saw more active travel by the fur brigades and others than any other part of the Canadian Rocky Mountains. In Alberta the Athabasca River route from old Forts Edmonton and Assiniboine to the Columbia, or the Fraser, was the most famous of them all. Apparently the first map to show the Athabasca River is the one drawn by Peter Pond in 1789. It clearly indicates the “Great River Araubaska” rising in the Rockies and flowing northeastwards to “Araubaska Lake”.

Early in the 1800’s men of the fur companies, in particular, began searching for suitable passes through the Rockies. Among those discovered was the famous Athabasca Pass which David Thompson crossed four times in 1811-12; by that time it was part of the established trade route to the Columbia. Some traffic went by way of Leather Pass, or Yellowhead Pass, to the headwaters of the Fraser and on to New Caledonia. Although this pass is 2,000 feet lower than Athabasca Pass, it led only to the turbulent and dangerous waters of the latter stream. Finally, Athabasca Pass became the one mostly or solely used by the intrepid fur brigades plying between York Factory and Fort Vancouver.

In 1813 the Northwest Company established Rocky Mountain House at the north end of Brulé Lake. Some time later Jasper Hawes (a trapper originally from Missouri) took charge, and about 1828 he rebuilt the post farther upstream near the outlet of Jasper Lake, a mile distant from Snake Indian River; the new post was named Jasper House. In 1812 Henry House was built by William Henry (a clerk with David Thompson), and was later used as a branch of the above post. In 1821 the posts were taken over by the Hudson’s Bay Company when it merged with the “Norwesterns”.

For many decades the Athabasca Valley was the scene of notable activity as fortunes in furs and great quantities of trade goods passed through it. Both the New Caledonian and the Columbia brigades travelled westward up the river to Jasper Lake where, because of the swift currents higher up, boats were beached and the cargoes unloaded. From there all goods went forward by pack-trains, large numbers of horses being kept expressly for the purpose. At the mouth of the Miette River the brigades parted; one company went via Yellowhead Pass and the other via Whirlpool River Valley to the Committee Punch Bowl at Athabasca Pass.

Concerning the latter route Patterson (1960) remarks:

Some twelve miles south of the town of Jasper, Alberta . . . the Whirlpool River flows into the Athabasca. Cars and their human freight rush past this confluence unheedingly, but the rare motorist who pauses and walks down to the water's edge may well reflect that he stands on historic ground. For it was at this spot that the old trail of the fur-traders crossed the Athabasca River and took off up the Whirlpool for the Athabasca Pass — and beyond to Wood River and Boat Encampment on the Columbia. A trail that is now rarely used, in places fallen in and hard to find, but once a highway plainly marked by the feet of hundreds of men and horses. Fur-trader and priest; botanist, artist and surveyor, they all went that way in the early days, and they travelled that rough road because they had to: there was no other practicable way to navigable water on the Columbia, and the Piegons had closed the Howse Pass to the south.

In 1824 Governor George Simpson of the Hudson’s Bay Company travelled up the valleys to Athabasca Pass and the Columbia and Fort Vancouver and returned in April 1825. He was accompanied by Alexander Ross, who wrote about the trip in *Fur hunters of the far West*. They were much impressed by the forests, lush grass, fish, and wildlife as they “pack-trained” and canoed down the Athabasca to Fort Assiniboine. The next year the zoologist Thomas Drummond travelled from the east to Athabasca Pass, where he spent several months in natural history explorations.

As time went on many travellers commented on the exhausting grind over the pass and on the regional snowfall. Patterson (1960) says:

Another commentator on the tremendous depth of snow was John McLeod who travelled east through the Athabasca Pass with the express in late April of 1826. His young son Malcolm was also of the party. They left Boat Encampment on April 27 and John McLeod notes in his diary: ‘Snow so deep obliged to cut our leather trousers into snowshoes.’ Malcolm records that the snow was fifteen feet deep at the foot of the pass and thirty at the summit. His father wrote: ‘We clomb the pathless Pass, resting at night literally, at times, on the tops of the trees.’ To the east of the Divide ‘the snow diminished fast in depth till at Jasper House it was nearly gone . . . arrived 5 May, just a week in the struggle.’

The next traveller of note was Edward Erma­tinger, then a clerk with the Hudson’s Bay Company, who in 1827 brought the York Factory Express from Fort Vancouver over Athabasca Pass and Trail to Fort Assiniboine and points east. With him was David Douglas, the renowned botanist after whom the Douglas fir was named.
The trip was made at the end of April when snowshoeing was difficult and stream fording not uncommon. Despite the hardships, Douglas carefully studied the vegetation, mammals, and birds, and commented in his journal on the presence of coal seams in the banks of streams.

Farther down the trail below the Miette the party met a leather brigade from Fort St. James on its way to secure moose hides from Fort Edmonton and other points on the North Saskatchewan River. It was because of such brigades that Yellowhead Pass was formerly known as Leather Pass.

In this region powerful winds were by no means rare. As a result early travellers sometimes suffered considerable difficulties and hardships. Violent storms swept down the Athabasca and over Jasper and Brulé Lakes. In October 1846 the artist Paul Kane arrived from the east to find Brulé Lake lashed by a wild storm. Boats had to be relinquished while the party waited in increasing cold and snow for horses to continue up the valley. Ultimately they reached Jasper House, which, according to Kane, then consisted of three miserable log huts. The dwelling house had but two rooms — one "used by all comers and goers" and the other occupied by Colin Frazer (who had once been George Simpson's piper), his Cree wife, and their nine children.

In the late summer and early autumn of 1859 the Earl of Southesk (1875) travelled west and undertook a hunting trip along the east slope of the Rockies north of the Bow River. The party reached its "farthest north" along the upper Brazeau River and in Cairn and Southesk Valleys, territory that is now in Jasper Park. Much later the Southesk River was named in the Earl's honour. He appears to have been the earliest sportsman to reach this part of the Rocky Mountains. His account gives a lucid picture of game conditions at that period.

About this same time several groups of settlers travelled the Jasper route and through Yellowhead Pass into British Columbia. One of these in particular is chronicled by "The Old-Timer" (1964), who says in part:

The first big party known to pass through Fort Edmonton on its way west was led by one Pierre Dumonais. He was the leader of twenty-three families of Red River settlers who were seeking new lives on the far side of the Great Divide . . . . This party, according to George Simpson, formed a column a mile long while on the trail. Each settler's family had two or three carts, a band of horses and several dogs. The men and boys travelled in the saddle while the women and children rode in carts . . . . Travelling time on these early journeys averaged about 20 miles per day.

Evidently the largest single party to pass this way was the Overlanders of 1862. It was composed of about 150 men, women, and children who wended their way westward to join the gold rush in the Cariboo country of British Columbia. Most of them journeyed by cart from Red River Settlement to Fort Edmonton and thence by pack-train through the Rockies. The wilderness track was then very rugged and shot with difficulties in the way of mud, muskegs, fords, and windfalls. Eight to ten men were required to go ahead with axes to clear the trail. A French-Indian, André Cardinal, guided the company through Athabasca and Miette Valleys and Yellowhead Pass to Tête Jaune Cache.

The following year the same trail was used again by a small party of emigrants, and also by Lord Milton and Dr. Cheadle, who had come from England. In June 1863, after a three-week ride from Edmonton, they entered the mountains near Bedson Ridge and travelled on to Jasper House, where they engaged a descendant of the Iroquois trappers as a guide to see them through Yellowhead Pass.

As exploration and development of the Pacific Coast led to the trade of New Caledonia flowing increasingly westward the importance of the Rocky Mountain passes gradually decreased. In 1872, when surveys were being run through the mountains for the Canadian Pacific Railway, life at Jasper House was slowly ebbing away. At that time Walter Moberly was operating a survey crew from Fiddle Creek to Yellowhead Pass, and met Sir Sandford Fleming by appointment at Jasper House. There they spent a night in a room of "the wretched little log cabin" with about a dozen Iroquois men, women, and children to keep them company. In later years Moberly left a humorous account of a Christmas "feast" he provided for the survey crew. It went as follows:

I paid a visit on Christmas Eve to the survey camp to have a talk and smoke with the staff, some of whom were bewailing the lack of a dinner on the following day. So I invited them down to partake of the luxuries in my camp, about two miles away.

My stores consisted at that time of some pemmican, flour, and tea, without sugar. I had several courses prepared, the first being pemmican raw, the second pemmican boiled, and in due season the dessert which was pemmican fried and my guests looked somewhat disappointed when I informed them they saw all the luxuries before them, and the only thing we could do was to have a good smoke, as I had plenty of tobacco, and try to keep warm.

Jasper House now went gradually into eclipse. From an important marshalling and trading depot
it was first reduced to an outpost and then finally abandoned in the late 1870’s.

As “The Old-Timer” (1961) remarked:

Into this picture Lewis James Swift stepped in the summer of 1892. He entered the Athabasca Valley by way of the historic trail from Edmonton with plans to set up a post, which he would operate as an independent trader.

Swift decided to make do with what was left of the old HBC installations at Jasper House. Only one of the three original buildings was standing and it was badly in need of repair. The new-comer fixed it up as well as he could and went into business.

Before very long Swift discovered a place more to his liking just below The Palisades, near Henry House. He filed homestead papers covering 160 acres there and built a house.

Thirteen years later, in 1907, the federal government set aside the territory for Jasper National Park. Ottawa was then confronted with the problem of a legal homestead existing in the heart of a national park and wildlife sanctuary.

Year after year Swift refused to be bought out. He married and raised a family, fenced the property, did some irrigating, and grew vegetables, oats, wheat, and barley. His establishment became a noted stopping place for travellers. He kept cattle and pack and saddle horses, and was thus equipped to help any parties that wished to hire equipment, such as the expeditions of J. Alden Loring (1895–96) and of the Alpine Club of Canada (1911; Hollister and Riley). For 43 years Lewis Swift lived an active life on his homestead until he sold out to a private buyer in 1935 and moved into the town of Jasper, where he died in 1940. In the early 1960’s the federal government finally succeeded in acquiring the old Swift ranch and thus eliminated the only privately owned land within Jasper Park.

It may be mentioned that the Canadian Pacific Railway discarded Sir Sandford Fleming’s choice of the Yellowhead route through the Rockies in favour of the route by way of Calgary, Banff, and Kicking Horse Pass. Later, however, the Canadian Northern substantially followed the old CPR survey west of Edmonton to Yellowhead Pass and on to Prince Rupert.

By 1911 the end of steel had gone past Hinton to Old Entrance and the eastern boundary of Jasper Park. In succeeding years the line was laid to Jasper, Yellowhead, Tête Jaune Cache, and the Pacific Coast. Soon the picturesque pack-trains, wagon trains, and mule skinners became only a memory.

Since the arrival of steel at Jasper many naturalists have visited the park and added to our knowledge of the regional wildlife. These developments are dealt with in the next section.
Naturalists past and present

The first professional naturalist to reach this region was Thomas Drummond, who was attached to the second Sir John Franklin expedition, and was for some time associated with Dr. John Richardson. His chief aim was to collect natural history data and specimens in the regions traversed. He arrived in the Canadian Northwest during the summer of 1825 and spent the following winter at Baptiste River, a tributary of the Athabasca.

He left these winter quarters about April 10, 1826, and travelled up the Athabasca River to what is now park territory. He collected specimens at Jasper House and subsequently spent many weeks on faunal work at and around Athabasca Pass. Evidently his were the first scientific specimens taken in that area. Several of the mammals collected by him at Jasper House and Athabasca Pass were new to science, so these two points became type localities. The specimens were later described by Swainson and Richardson in their celebrated work, *Fauna Boreali-Americana*, 1829–31. Drummond remained at Athabasca Pass until August 10, after which he travelled north through the mountains, reaching the headwaters of the Peace River on September 24 (Drummond, 1830).

The next zoologist on the scene was J. Alden Loring of the U.S. Biological Survey, Washington, D.C. In 1895 and 1896 he examined much of the ground covered by Drummond, and secured desirable topotypes and a wealth of other material. On his first pack-train trip to the Rockies he left Edmonton on August 10, 1895, and collected for a time at Jasper House. From there he went into the high mountains about 20 miles to the west. When the lateness of the season made it very difficult to do much work there, he returned to Edmonton in early November.

In 1896 Loring was able to make much wider explorations. Leaving Edmonton on May 25 he travelled directly to Jasper House, and after some local work moved up the valley to Henry House, where he spent some time. He then went about 15 miles farther south into lowlands and high mountains, doing much collecting there from July 3 to 21. In the latter part of August he returned to Jasper House, thence along the east bank of the Snake Indian River and over the passes to the Smoky Valley, 50 miles from Jasper House. From there he worked north and east to Grand Cache Lake and the Muskeg and Simonette Rivers. He halted near the mouth of the Muskeg River, his most northerly point, to collect specimens.

He took a different general southerly course back to Athabasca River and Jasper House, reaching the latter on October 8. After a rest the party then set out on a collecting trip to “Caribou Basin”, 10 miles west of Henry House (valley near Monarch Mountain?). Then they proceeded west another 10 miles to a depression in high mountains that Loring called “Rodent Valley” (near the headwaters of the Miette River?), because of the abundance of small mammals. They left for the east on October 18 and, following the regular horse trail, reached Edmonton early in November. Loring never published the results of these expeditions, but Preble (1908) utilized them in his *North American Fauna No. 27*.

The well-known Canadian naturalist William Spreadborough worked in the Jasper country during the summer of 1898. He collected for the old Natural History Section of the Geological Survey Branch, Ottawa, and that season was attached to the James McEvoy survey party that traversed the Rockies. Throughout the summer Spreadborough collected mammals, birds, and plants along Athabasca and Miette Rivers to and beyond Yellowhead Pass. A highlight of the season was his capture of a least weasel — to this day the one and only record for Jasper Park.

Thirteen years later an important expedition moved into the heart of Jasper Park and through the Yellowhead to the Mount Robson district. This was a scientific undertaking by the Alpine Club of Canada. Two members of the party were qualified zoologists — Ned Hollister and J. H. Riley, both from the staff of the United States National Museum, Washington. Extensive observing and collecting were carried out in Athabasca Valley from Brulé Lake to and up Miette and Moose Rivers and over to Moose Pass, head of the Smoky River, Alberta. They returned via Miette and Athabasca Valleys to the end of steel at Brulé Lake. The expedition was in the field from late June until September 22, 1911, and added greatly to knowledge of mammals and birds in this part of the Canadian Rockies. For instance, several races of mammals taken at Henry House and Moose Pass proved to be new to science. The following year Hollister published the mammal results in the *Canadian Alpine Journal*.

In 1917 Spreadborough returned to Jasper Park as a member of a natural history party led by the Dominion botanist, James M. Macoun. The party arrived at Jasper Station on July 23 and set up camp across the Athabasca near Beauvert Lake,
working there until August 11. The party camped near the mouth of Cavell Creek from August 12 to 20, then at the foot of Cavell Lake until September 6. They then moved to the lower altitude of Athabasca Valley near the mouth of the Miette River, where the party collected industriously until September 13. During the above period Spreadborough took 59 specimens of mammals representing 16 species, as well as a number of birds.

Again with J. M. Macoun, Spreadborough resumed collecting in Jasper Park from June to September 1918, and once more in June and July 1919. Much was accomplished in the way of new locality records. At Shovel Pass exciting natural history findings were daily experiences up to altitudes of well above 7,000 feet (see Taverner, 1933). All of Spreadborough's numerous collections were deposited in the Victoria Memorial Museum, Ottawa, later renamed the National Museum of Canada.

The next collector in the park was Ian McT. Cowan who made extensive investigations during June, July, and August, 1930, and took more than 100 mammal specimens at Astoria, Snaring and Rocky Rivers, Prairie Creek, Talbot Lake, Henry House, Merlin and Jacques Passes, Jasper, and Tonquin Valley. In August 1938, I made observations at Medicine Lake, at Mt. Edith Cavell, and in the Hudsonian and Arctic-Alpine Zones at Mt. Wilcox, along the flank of Athabasca Glacier, and around Sunwapta Pass (Soper, 1947). No collecting was done at that time.

In the summer of 1938 R. M. Anderson made widespread inquiries in the southern part of Jasper Park, chiefly with reference to big game animals and predators. He also made sample catches of small rodents at Medicine Lake and Tonquin Valley (Anderson, 1938a). During August and early September 1939, he went on a long pack-horse journey through the northern reaches of the park, in several places close to the northern boundary. His route led up the Snake Indian Valley to Willow Creek, then by a devious westwardly course to Deer and Blue Creeks, Topaz and Indigo Lakes, Byng and Snake Indian Passes, Twintree Lake, thence southwards along the upper Smoky River to Carcajou Creek and Adolphus Lake, Robson Pass. The fruits of his journey included observations on the occurrence and relative abundance of big game and fur-bearers and a valuable collection of small mammals.

From March 2 to April 16, 1941, C. H. D. Clarke (1942) went on a big game reconnaissance trip in the park's southeastern sector for the National Parks Bureau. He made investigations in the main Brazeau River drainage area and along the Southesk, Cairn, and Rocky Rivers and Athabasca Valley, and also up the Snake Indian River and northwest to the head of Blue Creek.

In the latter part of August 1943, I made wildlife observations in the Brule Lake–Roche à Perdrix locality up to 5,000 feet and then south to Jasper, the Whirlpool River, Athabasca Falls, Sunwapta and Wilcox Passes (Soper, 1947); there I studied the alplands fauna at several points between 6,900 and 7,000 feet.

During the season of 1943 Cowan returned to Jasper Park to conduct further wildlife inquiries for the National Parks Branch. His investigations were carried out in three phases: the latter part of April in the Athabasca–Miette Rivers drainage; July 27 – August 7 from Nigel Pass to Jonas Pass, Brazeau Lake and River, Isaac Creek, Cairn Pass, Rocky Forks, Jacques and Medicine Lakes and Maligne River; and August 13 – September 13, up Snake Indian River to and across the northern districts of the park to Adolphus Lake, with subsequent studies at Moberly Flats, Devona, and along the Fiddle, Miette, and Sunwapta Rivers. Cowan continued this work for the government during various periods from 1943 to 1946, collecting a total of 220 study skins of mammals and visiting additional tracts such as Maligne Lake, Tonquin Valley, Emigrants Peak, Little Heaven Summit, and Eagle Pass.
In the first part of September 1945, A. L. Rand collected 28 specimens of small mammals for the National Museum of Canada at Miette River, Medicine Lake, and Maligne Canyon.

At times from 1946 to 1953, A. W. F. Banfield made small collections of rodents at Jasper; Medicine, Pyramid, Cavell, and Talbot Lakes; Whistler, Willow, Beauty, and Poboktan Creeks; Brazeau River; and Elysium and Sunwapta Passes. He also picked up a grizzly bear skull at Devona in the spring of 1951; a wapiti skull at Henry House in the spring of 1952; and a mountain sheep skull at Mt. Wilcox on May 23, 1953.

In 1945 it was decided that certain range conditions in Athabasca Valley and adjacent territory should be studied in detail. I. McT. Cowan and E. W. Pfeiffer (1948) made such investigations during periods in the summers of 1946 and 1947 and for several weeks in the winter. They studied soils, existing plant growth, and factors affecting plant growth, and submitted recommendations for improving range conditions.

The following year H. D. Fisher and F. Camp conducted an 18-day big game reconnaissance in the park's southeastern sector; the route adopted was practically the same as that followed for the same purpose by Cowan in 1943. In June 1952, Robert Lister and J. E. Moore made a collection of small mammals at Medicine, Pyramid, Cabin, and Honeymoon Lakes and Sunwapta Pass for the Museum of the Department of Zoology, University of Alberta. On a special patrol of the south boundary in September 1952, F. J. McGuire (1952) gathered information on prevailing big game numbers and range conditions. The data were useful for comparison with the results obtained by Fisher four years earlier.

On February 19 and 20, 1953, Banfield made an aerial survey of the numbers, local ranges, and over-all distribution of bighorn sheep, mountain goats, and elk in Jasper Park. His flights covered the best big game territory in the whole of the eastern half of the park. During the following August he completed a game patrol with horses through the southeastern district over the route from Jasper to Poboktan Creek and Pass; the Brazeau, Cairn, and Rocky Rivers; Jacques, Beaver, and Medicine Lakes; and back to Jasper. Robert Webb also made range studies in Jasper Park in 1953.

In September 1953, L. McGuire and N. Hooper (1953) carried through a big game survey in the ranges flanking the southeastern boundary of the park. They travelled by way of Beaver and Jacques Lakes as far as Arete, via the Rocky, Medicine-tent, Cairn, and Brazeau Rivers, and returned by the same route.

From July 18 to September 27, 1955, Donald Flook (1956) made a wildlife survey in the southeastern territory, penetrating far to the northwest of Brazeau River. His trails were nearly the same as those used by Cowan in 1943, but he devoted much time to valuable side-trip observations up to and beyond Brazeau Lake; along the Southesk River to Southesk Lake; upstream to the headwaters of the Rocky River; and up Deception and Blackface Creeks. The following November he appraised the wapiti situation in Athabasca River Valley and vicinity.

Finally, I made faunal investigations for the University of Alberta in the four summers of 1960 to 1963. The work covered 21 study areas, with an average size of between four and five square miles. The total sample area, which was more or less intensively probed on foot with binoculars and extensive traplines, amounted to about 90 square miles. In addition, I obtained much information from wardens and while en route from one unit area to another. The areas examined are listed by seasons as follows:

1960: (June-August). Snaring (altitude 3,300 ft.), Derr Creek (3,500 ft.), Ranger Creek (4,200 ft.), Sunwapta River (5,000 ft.), Rocky River (3,300 ft.), Geraldine Lookout (5,600 ft.), Whirlpool River, near Moab Lake (4,000 ft.), Whirlpool River, Sixth Meridian (4,200 ft.), Cottonwood Creek (3,800 ft.).

1961: (June-July). Sunwapta Pass (6,700-7,200 ft.), Shale Banks, Snake Indian River (4,000-4,200 ft.), Snake Indian Falls (4,400 ft.), Signal Mountain (6,600-7,200 ft.).

1962: (August-September). Fiddle Creek (3,240 ft.), mouth of Astoria River (3,800 ft.), Celestine Lake (4,200 ft.).

1963: (May-July). Roche Miette Creek (3,300 ft.), The Palisades (3,400 ft.), Medicine Lake (4,800 ft.), Maligne Lake (5,500 ft.), Bald Hills alplands (6,800-7,400 ft.).

Mammals collected during the above period totalled 421, and birds 185. The acquisition of these measurably increased our knowledge of subspecific criteria, distribution and relative abundance; the inquiries also revealed many facts regarding reproduction, habits, and preferred habitats.
Physical geography
Jasper National Park is the largest mountain reservation in Canada, with an area of 4,200 square miles. It lies entirely on the eastern watershed of the Rocky Mountains, with the Continental Divide delimiting the western boundary. It stretches east to the farthest high mountain ranges, excluding the foothills; its average width is about 45 miles. Its length from Starlight Range (53°28'N) at the northern boundary to Sunwapta Pass in the south is about 130 miles. Sunwapta Pass is the dividing line between Jasper and Banff National Parks and also between the great drainage systems of the North Saskatchewan and the Athabasca Rivers.

In general, the mountain ranges have a northwest-southeast trend. They are massive and more or less continuous, the principal interruption being the broad trench where the Athabasca River cuts across the formations to make its escape into foothills and plains to the northeast. The easternmost ranges generally rise to sweeping alplands and jagged peaks between 7,500 and 9,000 feet in height. Farther west the tendency is to higher and more spectacular peaks as far as the Continental Divide, where the mean altitude is about 10,100 feet.

The most impressive sector includes part of the Columbia Ice-field. In its neighbourhood about two dozen peaks exceed 10,000 feet in height; the giants among them are Snow Dome (11,340 ft.), Mt. Athabasca (11,452 ft.), The Twins (11,675 and 12,085 ft.), Mt. Alberta (11,874 ft.), and Mt. Columbia (12,294 ft.). Along the divide to the northwest the altitudes diminish somewhat, except in the Mt. Robson district where many peaks rise to heights of over 10,000 and 11,000 feet. Near the northwestern park boundary Mt. Robson rears its icy head to 12,972 feet — the highest peak in the Canadian Rockies.

The Columbia Ice-field not only occupies part of the Saskatchewan, Athabasca, and Dome Glaciers. Much of the vast ice mantle lies at a height of about 10,000 feet, but some tongues of ice, such as the Athabasca Glacier, extend down valleys to altitudes below 7,000 feet. All the large glaciers are noteworthy for great depths of ice, deep crevasses, ice-cascades, and rugged terminal moraines. The Angel Glacier at Mt. Edith Cavell is well known and easy to reach. Many other localized ice masses are found along the Continental Divide as far as Chown Glacier and Resthaven Ice-field at the northwestern extremity of the park.

Practically all of Jasper National Park drains into the Athabasca. About 95 miles of the course of that river lies in the park, from its headwaters at Columbia Ice-field to its exit near the south end of Brulé Lake. The extreme upper reaches are wild and steep, but — especially below the Miette — the valley then becomes broad and flat and cradles many beautiful lakes. The principal tributaries from the south are Sunwapta, Whirlpool, Maligne, and Rocky Rivers; from the west, the Miette River; and from the north, the Saring and Snake Indian Rivers. After the fashion of mountain streams, they are nearly everywhere swift and turbulent.

Small feeders are legion with origins in tarns, springs, and snow-fields. An exception to the Athabasca drainage is the Brazeau River in the southeast, which runs into the North Saskatchewan River. Another exception, in the extreme northwest, is the Smoky River, a tributary of the Peace. Nearly all rivers in the Rockies are typically picturesque with multitudes of white rapids, cascades, and waterfalls. In Jasper Park the Sunwapta, Athabasca, and Snake Indian Falls are particularly attractive.

The valley of Maligne River is of exceptional interest. The discharge of Medicine Lake passes through a subterranean channel for some distance and upon surfacing becomes the Maligne River. About nine air-line miles below the lake, the river has cut a fantastic gorge through Devonian limestone, known as Maligne Canyon. After a series of step-like descents in the form of cascades and "punch bowls" the canyon is hundreds of feet deep, yet in places the vertical walls are only a few feet apart.

The mountain passes have many remarkable features. Often, because of their great height at or near timber line, they display impressive scenery and the singular elements of the alplands; some, such as Athabasca Pass (5,724 ft.), are of great historic interest as routes over the mountains. Sunwapta Pass, carrying the inter-park highway at nearly 7,000 feet, gives access to a world apart. One of the most interesting defiles is Yellowhead Pass. Not only does it provide a main corridor for the railroad and highway to the west, but it is unique because of its history and because, at only 3,711 feet elevation, it is the lowest pass across the Rockies anywhere on the continent. Aside from these major examples, scores of other
inviting passes lie scattered through the cordillera.

With respect to the geology, MacKay (1952) remarks:

Practically every feature of geological interest of Banff Park has its counterpart somewhere in Jasper Park, but the development of most of the geological features in Jasper is on a much more colossal scale than in Banff. There is both a similarity and a diversity in the mountain structure of these areas. In the eastern part of Jasper Park the ranges are carved from a corresponding series of fault-blocks composed of sediments mainly of Devonian and Carboniferous ages that have been uplifted and thrust eastward for many miles, but the strata over most of the eastern part of Jasper Park are much more highly folded than are those in the eastern part of Banff Park, and numerous examples of tightly folded anticlines and synclines occur, such as Roche Miette at the north end of Miette Range and Roche à Perdrix on the north end of Fiddle Range and on Rocky River.

West of Rocky River is a belt 10 miles wide in which the ranges are carved out of tightly folded Devonian and Carboniferous strata. To the east of this is the Palisade, a narrow, westwardly dipped fault-block formed of early Palaeozoic sediments characterized by a steep joint-controlled east face and a gentle west slope conforming to the bedding planes. To the west of the Palisade the mountains are carved out of Cambrian and Precambrian sediments that are less severely folded and in places flat-lying.

Incredible as it may seem, many millions of years ago the ocean surged across this region. The materials of which the Rockies are composed once lay flat on the bed of the sea; as the earth shrank folds developed, which became higher and higher. Through aeons of time the upthrust was at an average rate of about one foot a century; during this action the strata were gradually uplifted, tilted, twisted, and distorted into vast mountain ranges.

Pressures were sometimes so great that the earth’s thick crust was heaved into the vertical, as may be seen at the Colin Range. It was only moderately tilted at Mt. Edith Cavell, but farther east it was violently bent into acute anticlines in such masses as Roche à Perdrix and Roche Miette. The latter, with its vertical north face, is a notable landmark six miles from East Gate.

Many of the limestones and other marine sediments contain fossils. Many beds of marine fossils about seventy million years old, among which trilobites are characteristic, have been found in Jasper Park. Fossilized sea-fans exist in the alp­lands at an elevation of around 9,000 feet. Of much interest are Coal Age club-moss fossils that lived about eleven million years ago; much smaller relatives survive to this day in some wooded areas of the park.

The duration of the great Pleistocene Ice Age in the cordillera appears to have been at least 100,000 years. When the ice was at maximum depth it filled all the valleys and covered the mountain ranges except for the highest peaks. The present-day ice-fields are the surviving remnants of that colossal ice blanket of long ago. Glaciers leave many unmistakable tell-tale signs such as transported boulders, striations, moraines, and rock carving. Ice movement gouged out valleys, shattered and pulverized rock, and deposited boulder clay and other detritus to a depth of 200 to 1,000 feet. Since the great Ice Age the mountains have been further altered through the slow and steady sculpturing of atmospheric erosion.

Climatic conditions

The climate of a region exerts profound influence on plant and animal life there through temperature, humidity, precipitation, sunshine, and many other factors. The effects of all these variables on soil, vegetation, drainage, erosion, etc., determine the kinds of environment that prevail and the types of habitat for various animal species.

In the mountains the four seasons come and go as in other western districts, but the climate has aspects, especially during the summer months, that set the region apart from less spectacular parts of the province. Daytime summer temperatures are usually pleasant, and uncomfortable heat is relatively infrequent.

The spring season may be said to last from mid-March until mid-May. Temperatures steadily moderate as the sun swings higher above the ranges. Snow starts to melt by late March, although cold spells may cause temporary setbacks. The snow mantle usually shrinks rapidly in April, and rivers and creeks carry greater volumes of water. April has an average high temperature of 51°, but night frosts still occur. Early May ushers in advanced spring weather with temperatures 10° to 30° above freezing. Early flowers then begin to bloom; the hardier bird migrants return; and the “sleepers” among the mammals emerge from winter hibernation.

The summer season lasts from mid-May to mid-September. This is normally an enjoyable period of warmth, sunshine, flowers, and singing birds. Full seasonal maturity and the warmest weather prevail in July and early August. Average maximum temperatures in the Athabasca Valley at Jasper are: June, 68°; July, 74°; and August, 71°F (Table 1). By mid-September the average day-time warmth has declined by about eight degrees. Temperatures drop consistently with an
Table 1 Weather data for Jasper townsite

<table>
<thead>
<tr>
<th>Month</th>
<th>Daily mean min. temp., °F</th>
<th>Daily mean max. temp., °F</th>
<th>Avg. rainfall, ins.</th>
<th>Avg. snowfall, ins.</th>
<th>Total mean precipitation, ins.</th>
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<td>9.03</td>
<td>40.3</td>
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</table>

increase in altitude: in the high country near timber line night frosts may occur until at least mid-June, and snow may fall periodically on the lofty peaks and glaciers throughout the summer. The amount of summer sunshine is relatively high — apparently about 190 to 250 hours per month. During the summer the mean rainfall is approximately 1.62 inches per month.

Autumn lasts for two months, from mid-September until the middle of November. Early autumn contains many summer-like days. By early October the foliage reaches supreme colouring in dramatic reds and golds. The mean maximum temperature for October is 51° and for November, 35°. By October night frosts occur constantly and the first snow flurries whiten the landscape, but generally disappear within a few hours. The major snowfalls of the season usually arrive some time in November.

Winter may be said to begin definitely in the latter part of November. The season persists until March, often modified by mild spells, almost in the nature of chinooks. January is the coldest month, with a mean maximum of 22° and a mean minimum of 4°; in this respect December and February are nearly alike and average around two to eight degrees milder than January. Total snowfall during the winter varies between 30 and 40 inches. Occasional high winds scour most of the snow from mountain slopes and pile it into deep layers in alpine basins and river valleys.

The precipitation figures given in Table 1 are close to a long-term average for much of the park territory. The driest section of the region is in the east, for instance in Athabasca Valley between Henry House and Miette. Precipitation is heaviest in western areas, especially along the 220 miles of the Continental Divide forming the western boundary of the park.

**Faunal life-zones**

Wildlife environments and distribution are strongly affected by regional physiography, especially in cordilleran territory. Vegetation, habitats, seasons, and climate, and hence the general character of the faunal complex, vary markedly with altitude.

Mammal distribution, for example, is more complex in the mountains than on the plains, for in the former terrain species and individuals are dispersed both horizontally and vertically. In the Rockies many mammals inhabit diverse kinds of environment through a vertical range of several thousand feet. Naturally, such great differences in elevation imply marked variation in living conditions and need for adaptation. Such factors as kind and quantity of cover, temperature, availability of food, predator - prey relationships and, with a number of species, the length of winter hibernation are involved.

Of great advantage in the study of wildlife distribution is the system of faunal life zones worked out on the basis of latitude, temperature, and types of forest and other key vegetation. This classification was first proposed by Dr. C. Hart Merriam in 1893, and — with many revisions, called for by a constant increase in available
data — is now widely accepted by naturalists in connection with the occurrence and distribution of mammals and birds. While in some respects this biogeographical system still falls short of perfection, it has the great advantages of being simple, direct, and easily understood.

Of the four life-zones existing in Alberta — the Transition, Canadian, Hudsonian and Arctic-Alpine — the last three are represented in Jasper Park. A short account of each of these is given below:

**Canadian Life-Zone** — This zone lies between the Transition (parkland-prairie) Zone and the Hudsonian Zone. It is a close equivalent of the phytogeographic zone called by botanists the Boreal-Cordilleran Transition Region. In Jasper Park the Canadian Zone occupies all the lowlands (3,235–3,500 feet) and extends over hills and benches and up mountain slopes to an approximate altitude of 3,800 to 4,200 feet. It is rich in both animal and plant life, and provides suitable habitat for most of the fur-bearers and a high percentage of big game mammals.

Highly characteristic of this zone are heavy evergreen forests of white spruce (Picea glauca), black spruce (Picea mariana), alpine fir (Abies lasiocarpa), Douglas fir (Pseudotsuga menziesii), larch (Larix laricina), and lodgepole pine (Pinus contorta). Common or relatively common deciduous species are aspen poplar (Populus tremuloides), balsam poplar (Populus balsamifera), and paper birch (Betula papyrifera).

The Brazeau River Valley east of Brazeau Lake and the Athabasca Valley contain open, dry grasslands and stands of poplar that bear a striking resemblance to such features in the Transition Zone. The resemblance is superficial, however, as there is no direct connection with the true Transition, the western limits of which lie at least 160 miles to the east.

Other characteristic vegetation of the zone are various willows (Salix) and alders (Alnus), buffaloberry (Shepherdia canadensis), shrubby cinquefoil (Potentilla fruticosa), mountain juniper (Juniperus scopulorum), silverberry (Elaeagnus commutata), pasture sage (Artemisia frigida), bearberry (Arct...
tostaphylos rubra, red osier dogwood (Cornus stolonifera), bunchberry (Cornus canadensis), mooseberry (Viburnum edule), bilberry (Vaccinium sp.), and fireweed (Epilobium angustifolium). Black spruce bogs and their vicinity are inhabited by such plants as Sphagnum moss, the lichen Cladonia, Labrador tea (Ledum groenlandicum), bog cranberry (Vaccinium vitis-idaea), cloudberry (Rubus chamaemorus), cottongrass (Eriophorum), and horsetail (Equisetum).

Typical Canadian Zone mammals include masked shrew (Sorex cinereus), vagrant shrew (Sorex vagrans), varying hare (Lepus americanus), least chipmunk (Eutamias minimus), beaver (Castor canadensis), deer mouse (Peromyscus maniculatus), meadow vole (Microtus pennsylvanicus), Gapper’s red-backed vole (Clethrionomys gapperi), western jumping mouse (Zapus princeps), black bear (Ursus americanus), marten (Martes americana), lynx (Lynx canadensis), mule deer (Odocoileus hemionus), and moose (Alces alces).

Some Canadian Zone species also range into the Hudsonian, and a few inhabit, or casually visit, all environments from the lowest valleys to the alplands.

Hudsonian Life-Zone — In the mountains this faunal belt lies between the upper limits of the Canadian Zone and timber line, or the lower fringe of the Arctic-Alpine Zone. In Jasper Park the average width (or depth) of the zone on the mountain slopes is approximately 2,800 feet, i.e. between the altitudes of roughly 4,200 and 7,000 feet. The latter figure represents timber line, which may vary by up to several hundred feet either way owing to climatic factors.

The biotic character of the Hudsonian Zone rather closely parallels that of the territory called the Subalpine Forest Region by botanists. In the kind and quality of its plant life it is transitional between the full-fledged Canadian Zone and the treeless alplands. With increase in altitude the trees become steadily more scanty, stunted, and wind-twisted, and finally disappear altogether.

Some aspen and balsam poplar still survive along streams in the lower portions of this zone but at a little greater height all deciduous trees
thin out and disappear. The dominant tree is the Engelmann spruce (Picea engelmannii), which is often closely associated with the co-dominant alpine fir (Abies lasiocarpa) and the lodgepole pine (Pinus contorta). Higher up in some localities (5,000-7,000 feet) the limber pine (Pinus flexilis) makes its appearance; here, exposed to strong winds on dry, rocky slopes and ridges, the trees are normally stunted and distorted.

In these upper altitudes, open spaces become much more frequent and enlarged. Finally, only a few tangle, prostrate specimens of trees remain, and a few yards beyond begin the wind-swept Arctic-like meadows and rolling tundras of the alplands. During spring and early summer the upper reaches of the Hudsonian exhibit wild flower gardens of notable variety, colour, and beauty.

Among the characteristic shrubs of this zone are crowberry (Empetrum nigrum), bog cranberry (Vaccinium vitis-idaea), dwarf bilberry (Vaccinium cespitosum), rosebay (Rhododendron alboflorum), wild rose (Rosa sp.), and various kinds of willows (Salix) and alders (Alnus). Other native plants include crowfoot (Ranunculus), wintergreen (Pyrola), paintbrush (Castilleja), sandwort (Arenaria), violet (Viola), fireweed (Epilobium), and arnica (Arnica cordifolia).

Some more or less typical mammals of the Hudsonian Zone are northern bog lemming (Synaptomys borealis), heather vole (Phenacomys intermedius), long-tailed vole (Microtus longicaudus), water vole (Arvicola richardsoni), gray wolf (Canis lupus), grizzly bear (Ursus arctos), and wolverine (Gulo luscus). No single species inhabits this zone exclusively, for many of their individuals also range into the Arctic-Alpine, the Canadian, or both.

Arctic-Alpine Life-Zone — This zone lies entirely above timber line — a forlorn land of tundra, peaks, cliffs, rock-slates, snow-fields, and glaciers. Its lowest fringe at the “last trees” varies in altitude from about 6,500 to 7,500 or 8,000 feet. Its location depends upon slope exposure, latitude, and long-term weather conditions. This is the coldest of the biotic areas in the Alberta cordillera and is subjected to the longest winter. In some areas ice-fields are deep and widespread, and at the higher elevations snow remains on shaded acclivities most of the year. Vast areas are composed of naked bedrock, totally barren except perhaps for a thin skin of slow-growing lichens.

The plant and animal assemblages of this zone are in some aspects very similar to or identical with those of the true Arctic regions. In many cases the modification is very slight. This is especially true of the flora. Some Arctic-Alpine plants are also to be found in the upper limits of the Hudsonian Zone. Trees, of course, are absent; woody plants are restricted to more or less prostrate forms of willows (Salix nivalis), dwarf birch (Betula glandulosa), alpine bearberry (Arctostaphylos rubra), rhododendron (Rhododendron alboflorum), Labrador tea (Ledum sp.), and the bell-heather (Cassiope tetragona).

One of the most charming features of the summer alplands is the profusion of small, gayly coloured flowers. Many are of the same species that grow on the Arctic mainland and islands. Typical alpine species include the alpine poppy (Papaver kluanensis), mountain avens (Dryas integrifolia), purple saxifrage (Saxifraga oppositifolia); lousewort (Pedicularis arctica), alpine fleabane (Erigeron lanatus), chalice-flower (Anemone occidentalis), buttercup (Ranunculus eschscholzii), and everlasting (Antennaria racemosa).

Few mammals are confined to the Arctic-Alpine Zone. Most high-altitude species also inhabit the Hudsonian, and a few even travel all the way down to the Canadian Zone and back at different seasons of the year. Mammals that we readily visualize as alpine inhabitants are the pika or coney (Ochotona princeps), hoary marmot (Marmota caligata), Columbian ground squirrel (Spermophilus columbianus), brown lemming (Lemmus trimucronatus), grizzly bear (Ursus arctos), caribou (Rangifer tarandus), mountain goat (Oreamnos americanus), and mountain sheep (Ovis canadensis). These three ungulates and the grizzly bear are, for the most part, habitually in the alplands during the summer, but with the onset of winter may descend to the shelter of the forest at various elevations. During the heat of July and August an occasional mule deer and moose visit the alpine meadows, but such intrusions are erratic and seem incongruous in this setting.
Table 2 summarizes the species of mammals actually found in the park by orders and genera. Hypothetical species are not included.

Table 3 gives the frequency of sightings of some fur-bearers and of big game mammals in Jasper Park, from the Brazeau district in the south to the northern districts of Willow and Blue Creeks and Smoky River. All observations were made by wardens on routine patrols in the districts listed from October 1, 1961, to September 30, 1962 — the latest period for which data of this type are available. The figures given do not, of course, represent population numbers, but are of interest as indicators of relative abundance in the respective districts.

The populations of many small mammal species are not static but undergo fluctuations. Such changes are readily discovered by periodic trapping. The simplest trapping procedure for this purpose is the use of long lines of snap-traps, the results of which are expressed in the term “trap-nights”. A trap-night denotes one trap set for one night; 100 traps set for one night would mean 100 trap-nights, and so on.

Among the most obvious of “cycling” species are some Microtines, of which the common meadow vole (Microtus pennsylvanicus) is especially prominent. It can breed into a “population explosion” that quickly reaches plague proportions in affected areas. Ian Cowan witnessed such a plague in 1946 along upper Minaga Creek as far as Monarch Meadows and Barrett Pass. At the same time and place the northern bog lemming (Synaptomys boiealis) was reported as equally abundant; that was an extraordinary development, since Synaptomys is usually quite scarce or very rare.

There is reason to believe that the long-tailed mountain vole (M. longicaudus) also fluctuates to some degree, but the outcome is not as pronounced as with the meadow vole. The over-all picture is often partially obscured by the circumstance that from year to year the animals may be common in some localities, and simultaneously scarce or apparently absent in others of similar character. The population level of the red-backed vole (Clethrionomys gapperi) definitely rises and falls, but its cyclic span has not been clearly ascertained for this mountain territory.

I had long suspected that masked shrew (Sorex cinereus) numbers underwent some periodic ebb and flow, but not enough precise data were available for a clear appraisal. Now some Jasper
Table 3  Frequency of sighting of some mammals in Jasper National Park in 1961 and 1962

<table>
<thead>
<tr>
<th>Species</th>
<th>Town Area</th>
<th>Snaring</th>
<th>Pocahontas</th>
<th>Mistie</th>
<th>Willow Creek</th>
<th>Blue Creek</th>
<th>Smoky River</th>
<th>Yellowhead</th>
<th>Whirlpool</th>
<th>Athabasca Falls</th>
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<td>813</td>
<td>992</td>
<td>1644</td>
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Table 4  Species trapped in Jasper National Park in 1960

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<tr>
<th>Species</th>
<th>Snares</th>
<th>Devil Creek</th>
<th>Range Creek</th>
<th>Sunwapta River</th>
<th>Rocky River</th>
<th>Geraldine Lookout</th>
<th>Whirlpool near Moab Lake</th>
<th>Whirlpool River, Sixth Meridian</th>
<th>Cottonwood Creek</th>
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<tr>
<td>Sorex cinereus</td>
<td>0.21</td>
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<td>1.33</td>
<td></td>
<td>0.55</td>
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<td>0.71</td>
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<tr>
<td>Phenacomys intermedius</td>
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<tr>
<td>Microtus pennsylvanicus</td>
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<td>2.38</td>
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<td>1.66</td>
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<td>6.52</td>
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<td>Microtus longicaudus</td>
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<td>1.66</td>
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<tr>
<td>Zapus princeps</td>
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<td>2.50</td>
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</table>

Park data indicate that such instability does occur; those animals were fairly common in 1960, but nearly disappeared during the next three years. Vagrant shrews (Sorex vagrans) were not quite so scarce during these three years. Members of the genus Peromyscus are notable for numerical ups and downs — sometimes amazingly abundant, and then slumping almost to the vanishing point; further details appear in the annotated list. The western jumping mouse (Zapus princeps) also fluctuates from time to time. It is clear from Cowan's trapping results that Zapus was plentiful in 1930. In some areas it was common to abundant in 1960; still fairly numerous in 1961; much scarcer in 1962; and drastically reduced during the summer of 1963. The most widely known of animal cycles is that of the varying hare (Lepus americanus),
Table 5  Species trapped in Jasper National Park in 1961, 1962, and 1963

<table>
<thead>
<tr>
<th>Species</th>
<th>1961</th>
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<th>1963</th>
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<tr>
<td></td>
<td>Sunwapta Pass</td>
<td>Shale Banks</td>
<td>Snake Indian Falls</td>
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<tr>
<td>Sorex cinerus</td>
<td>0.27</td>
<td>2.00</td>
<td>0.21</td>
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<tr>
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<td>16.94</td>
<td>4.00</td>
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<td>Sorex palustris</td>
<td>1.62</td>
<td>1.39</td>
<td>1.39</td>
</tr>
<tr>
<td>Peromyscus maniculatus</td>
<td>0.87</td>
<td>0.28</td>
<td>2.00</td>
</tr>
<tr>
<td>Clethrionomys gapperi</td>
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</tr>
<tr>
<td>Phenacomys intermedius</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microtus pennsylvanicus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zapus princeps</td>
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</tr>
</tbody>
</table>

which recurs about every 10 years but not necessarily with the same intensity. While the cycle is at its low point one may walk the woods for hours without flushing a single individual. An amazing peak of abundance was reached in 1912–13, when hares swarmed throughout the foothills and at least along the outer mountain ranges. Such a super-tide of *Lepus* has not since been witnessed in that region.

Other park mammals with an approximate 10-year cycle are lynx, marten, and red fox. It is probable that most, if not all, mice and voles are subject to such variations, some of them apparently having cycles of four or five years' duration. Chipmunks and ground squirrels are perhaps similarly affected in some degree, but more research is needed to ascertain the facts about them.

Tables 4 and 5 list all the very small species I took in Jasper Park with “museum special” traps. The tables present data on the frequency of capture (catch per 100 trap-nights), thus indicating relative abundance of the various species in different years and localities. The years covered are 1960 to 1963 inclusive, and the number of trap-nights a little over 6,000.

A type locality is one in which a designated type specimen of an originally described species or race was first collected. Type specimens are of great value for comparative studies, and type localities are always of great interest to zoologists. Related specimens subsequently taken in such a locality are called topotypes and are next in value to the type specimen itself. All the type localities listed below are located in Jasper National Park, with the possible exception of those having to do with *Lemmus t. helvolus* and *Ursus hylodromus*. The following list is derived essentially from R. M. Anderson (1947, p. 202–203): Athabasca Pass, headwaters of Whirlpool River: *Ochotona princeps princeps* Athabasca River, Rocky Mountains, on headwaters of: *Ursus canadensis rungiusi* Henry House, Athabasca Valley: *Myotis lucifugus pernix* Jackpine River, head of, near Mt. Bess, close to B.C. boundary: *Ursus horribilis dusorgus* Jasper House, north end of Jasper Lake: *Glaucomys sabrinus alpinus* Neotoma cinerea drummondii *Microtus richardsoni richardsoni = Arvicola r. richardsoni* *Microtus pennsylvanicus drummondii* *Ursus latifrons* Jasper House region, or between there and one of the southern tributaries of Peace River: *Lemmus trimucronatus helvolus* Moose Pass branch of Smoky River, head of: *Marmota caligata oxytona* *Citellus lateralis tescorum = Spermophilus l. tescorum* *Rangifer arcticus fortidens = Rangifer tarandus caribou* Rocky Mountains, western Alberta; no exact locality: *Ursus hylodromus*
Systematic accounts of mammals

Class Mammalia
Order Insectivora
Family Soricidae
Masked Shrew Sorex cinereus
Subspecies: Sorex cinereus cinereus Kerr. External measurements (average of 10 specimens by Soper and Cowan): total length 97.2; tail vertebrae 41; hind foot 12.1 mm (range 91–110, 39–44, 12–12.5). Weight: 3.7 grams (2.9–4.2).

Status — These little insectivores appear to be widely distributed over the region, but seldom, if ever, become very common. All naturalists who have collected in Jasper National Park agree on this point. My over-all rate of capture for over 6,000 trap-nights was .87 (.21–1.74) per 100 trap-nights (Tables 4, 5). The population appeared to be at a particularly low ebb in 1962 and 1963.

Habitat — Various ecological niches throughout the Canadian and to a lesser extent in the Hudsonian Life-Zone. The creatures seem to favour somewhat damp ground at the lower altitudes, under cover of trees, shrubs, and logs in the general vicinity of water. A few resort to the higher terrain in aspen woods, mossy-floored coniferous forest, alder swamps, and fringes of sphagnum muskegs. Their vertical range extends from the lowest valleys up to at least 7,000 feet, their numbers gradually diminishing with increasing altitude.

Reproduction — It appears probable that during some seasons an occasional breeding pair may have more than one litter. I have taken gravid females with from six to ten foetuses from late spring until the latter part of July, but these shrews are known to produce young until October (Hall and Kelson, 1959). Very little is known about breeding within the park; pregnant females are seldom captured there.

General Remarks — From published and other accounts it is clear that various collectors have taken specimens (but not very many) in the park. Some visiting naturalists failed to secure any specimens. In 1896 Loring (Preble, 1908) collected the species at Stony Creek, 25 miles northwest of Jasper House, and at “Rodent Valley”, 25 miles west of Henry House (near Miette Pass?).

Hollister (1912) took two specimens at Henry House in early July 1911. Spreadborough (Anderson, 1918) collected one at the mouth of Cavell Creek on August 17, 1917; one at Shovel Pass (7,000 feet) on August 15, 1918; and another near Jasper station on June 27, 1919. Because of the close proximity of Jasper Park it may be mentioned that Crowe (1943) lists specimens taken by Donald Carter in 1935 at Entrance (3,000 feet) and Thoral Creek (5,500 feet). In 1944 Cowan secured four specimens at Devona, Willow Creek, and Maligne Lake (3,300–5,490 feet).

I first found the species along Wildhay River, near the park’s eastern boundary, in the autumn and early winter of 1913. My Jasper Park specimens were trapped at Snaring, Geraldine Lookout, Whirlpool River (Sixth Meridian), and Cottonwood Creek, 1960; Celestine Lake in 1962; and Roche Miette Creek in 1963.

Vagrant Shrew Sorex vagrans

Status — This shrew may be regarded as fairly common locally. It is often more numerous than the preceding species. The animals were markedly scarcer from 1961 to 1963 than during the summer of 1960. The mean rate of capture for all occasions per 100 trap-nights was .95 (.21–2.19). In several work areas they appeared to be absent.

Habitat — This shrew inhabits much the same kinds of environment as S. cinereus. In fact, the two are frequently found sharing identical niches and are sometimes thus captured in the same trap on alternate nights. As a rule the vagrant shrew is not found much above 6,000 feet, but a few go as high as alpine meadows.

Reproduction — Unfortunately, I failed to capture pregnant females that would have provided a foetus count and a close estimate of breeding time and birth of progeny. It is known, however, that the species has up to five or six young to the litter (Davis, 1939), which may be born almost any time in June and July. I have taken half-grown juveniles (2.0–2.9 grams) by the latter part of July and the first week of August.

General Remarks — Most naturalists who have operated trap-lines in this region have made some reference to the vagrant shrew. The first appears to have been Loring (Preble, 1908), who collected two at Henry House in the autumn of 1885; in 1886 he took a few specimens 15 miles south of Henry House (at or near Prairie de la Vache) on July 8 and 9, and at Snake Indian River on August 26. Hollister failed to find the species within the park in 1911, this probably signifying a period of extreme scarcity.
Anderson (1918) mentions that Spreadborough trapped a male at the mouth of Cavell Creek on August 17, 1917, and also collected five in mid-August at Shovel Pass (7,000-7,500 feet). On July 12 and 14, 1930, Cowan secured two specimens in Tonquin Valley at approximately 6,500 feet. In 1935 Carter took specimens at Entrance and Thoral Creek near the eastern limits of the park (Crowe, 1943).

On September 19, 1922, I collected a female at Rocky Pass, altitude 6,500 feet (Soper, 1947). My operations in 20 park localities from 1960 to 1963 disclosed the presence of this shrew at Snares; Derr, Cottonwood, and Ranger Creeks and Whirlpool River in 1960; at Sunwapta Pass in 1961; at Fiddle Creek in 1962; and at Maligne Lake in 1963. It was either extremely scarce or lacking in 11 other work areas.

**Water Shrew Sorex palustris**


**Status** — This shrew undoubtedly ranks among the scarcest of Jasper Park mammals. Down the years it has seldom been found by anyone in this territory. My own experience covers many thousands of trap-nights along a multitude of waterways, with the final capture of a single individual (Table 5).

**Habitat** — As its name implies, this shrew is a confirmed lover of water and seldom found far from it. It normally haunts the margins of brooks, creeks, ponds, and lakes, in evergreen or mixed-wood forest. Most of its habitations are located in the Canadian Zone, but it has also been found in Hudsonian Zone situations and along the lower Arctic-Alpine water courses flanked by grass and dwarfed, overhanging shrubbery. Local vertical distribution extends from the lowest valleys to about 7,000 feet.

**Reproduction** — There is little or no local knowledge on this score, as no gravid females were obtained. From other localities, however, it is known that the animals have from five to seven young (Rand, 1948); they may be born at almost any time from late spring until at least early August.

**General Remarks** — Preble (1908) states that Loring collected a specimen (apparently the first taken in this territory) near Henry House on September 6, 1895. The species was not detected within the park by Hollister, Rand, Banfield, or Lister and Moore. On July 20 to 23, 1919, Spreadborough took three specimens near Jasper, one of which was a juvenile. In 1935 a single specimen was collected by Carter along the Athabasca near Entrance (Crowe, 1943).

During the summers spent in the park I devoted much effort to setting trap-lines along watercourses in 19 study areas, but I secured only one water shrew, at Maligne Lake on July 29, 1963. It was captured on the inner fringe of a sandy beach overhung with grasses, dwarf willows, and other plants, at an altitude of 5,490 feet.

**Order Chiroptera**

**Family Vespertilionidae**

**Little Brown Bat Myotis lucifugus**

Subspecies: *Myotis lucifugus pernox* Hollister. External measurements (average of nine males): 90.1, 34.2, 11.7 mm (range 82-95, 30-38, 11.5-12.5); ear 14.1 mm; tragus 6.8 mm; forearm 39.9 mm; wing-spread 248 mm. Weight: 10.3 grams (9.4-11.6). Mean length of the skulls is 15.05 mm; in the nominate race the skull length averages only 14.2 mm.

**Status** — As recorded by Hollister (1912), J. H. Riley shot two of these bats on the evening of September 6, 1911, at Henry House. They represented a race new to science, and were recorded and described by Hollister (1911) shortly after his return to Washington, D.C. Henry House was designated the type locality. According to my experience in the mountains these bats or any kind of bats are uncommon, capriciously distributed, and seldom sighted.

**Habitat** — The type locality at Henry House lies deep within the Canadian Zone, embraced by the river flats of Athabasca Valley and flanked by high mountains. The forest consists mainly of lodgepole pine, spruce, and scattered stands of Douglas fir. Some areas have a semi-open park-like aspect while other tracts run to thickets, dense forest underbrush, and occasional swampy areas. The altitude is 3,334 feet. Bats may occur up to about 7,000 feet.

**Reproduction** — No breeding data for the park exist. The species is believed to have but one young at a birth (Rand, 1948), which may occur in either June or July. The progeny are well developed and independent some weeks before winter hibernation. The latter takes place in...
hollow trees, rock crevices, and caves.

General Remarks — Very little has been learned about this subspecies. At present it is known to occur only in the upper Athabasca drainage area, southwards from Entrance in Jasper Park and along the nearby east slope of the Rockies to Cadomin. It also probably ranges up Miette River Valley into British Columbia and up the Sunwapta towards Banff Park. In both instances it would eventually intergrade with M.l. alascensis. Naturalists before Hollister and Riley failed to take any specimens.

Between July 11 and September 4, 1918, Spreadborough collected five specimens in the vicinity of Jasper. After that year the next were taken by Carter just outside the park near Entrance (32 miles from the type locality); they were shot during the summer of 1935 while they were flying over a horse corral in association with big brown bats (Crowe, 1943). Nine males in the University of Alberta collection, taken in a cave high up on the mountainside near Cadomin (6,200 feet) have been referred to M.l. pernox. Their point of capture is 30 miles due east of the type locality. These were prepared by me, but were collected by Dr. R. W. Nero on November 5, 1960.

On August 31, 1960, I saw a few small bats, apparently “little browns”, at Cottonwood Creek. During the same period Warden Norman Young saw several small bats that probably belonged to this species in the Snaring-Devona territory. On three evenings in the second week of August 1962, I noted two swiftly zig-zagging small bats, also probably of this species, at Fiddle Creek.

Long-eared Bat Myotis evotis
Subspecies: Myotis evotis pacificus Dalquest. External measurements: Averages as published by Cameron (1951) are 87, 40, 9 mm. Forearm is approximately 38 mm. Weight not known, but estimated at about 8 or 9 grams.

This bat is apparently a rare visitor in Jasper Park. So far as is known there is but one authentic record for this area — a male (NMC No. 3329) taken by Spreadborough on July 29, 1918, somewhere in the vicinity of Jasper. Probably the few that travel from the west past the Continental Divide in this latitude do so through Yellowhead Pass. For adjacent Banff Park, Banfield (1958) lists two specimens taken at Banff in 1900 and 1909, respectively. Anderson (1947) cites specimens of M.e. pacificus from this region and remarks that they are somewhat intermediate in

[racial characteristics with M.e. evotis (H. Allen).]

In passing it may be mentioned that Anderson saw a bat, possibly of this species, on August 10, 1939, at Willow Creek. Warden George Foley informed Anderson that bats were rare in that locality.

Long-legged Bat Myotis volans
Subspecies: Myotis volans longicrus (True). External measurements: Cameron (1951) gives average measurements as 89, 41, 8.6 mm. Rand's (1948) corresponding figures are 97, 42, 8 mm; forearm 37 mm, and wing-spread about 240 mm. Weight is similar to that of Myotis lucifugus.

The first Alberta specimens of Myotis volans were collected by J. H. Riley at Henry House on the evening of September 5, 1911. They were originally described as Myotis altifrons in a paper by Hollister later the same year. Hollister refers to the collecting episode as follows:
During the stay near Henry House, through the early and middle parts of September.... Riley and I saw several small bats flying late in the evenings in the shelter of the Douglas fir groves bordering the valley. Three specimens were shot by Riley, and much to our surprise two distinct species were represented and both were new to science.... Whether the species breeds at Henry House, or whether the specimen secured was a migrant, is a matter of conjecture.... Mr. Swift told us that bats are rare in the vicinity of Henry House.

One of the bats referred to was *M.v. longicrus* (True). The Hollister record is apparently the only one extant for Jasper Park. Doubtless the species is rare in this territory. Probably only a very few travel from the west over the Continental Divide to the east slope of the Rockies. Ostensibly the few that reach Athabasca Valley make the approach through the low Yellowhead Pass and down Miette River.

Banfield (1958) does not list this bat for Banff Park, nor does Crowe (1943) for the Entrance and Thoral Creek localities. Besides the Henry House record, the only other one for Alberta is a male (91, 39, 11.0 mm) taken by me at Dried Meat Lake, August 14, 1937, about 200 miles from Jasper Park.

**Silver-haired Bat Lasionycteris noctivagans**

No subspecies: *Lasionycteris noctivagans* (Le Conte). External measurements, from Cameron (1951): 106, 42, 10 mm. Rand (1948) gives forearm as 39 mm, and wing-spread as about 280 mm. Estimated weight: 12–13 grams.

Like some other Alberta bats, this species is evidently quite scarce in Jasper Park. Preble (1908) states that Loring took two specimens at Henry House in early October 1895, which are also recorded by Miller (1897). On August 30 and September 4, 1918, Spreadborough secured two specimens at or near Jasper townsite.

Since then the species has gone virtually undetected by the succession of zoologists who have worked in the park. The only exception is a female taken by Cowan near the town of Jasper on September 2, 1945. Banfield (1958) lists three specimens taken in neighbouring Banff Park since 1900, at Banff and Goat Creek. It is quite possible that more of these bats inhabit, or migrate through, Jasper Park than the scanty records indicate; they are scattered and normally fly rather late in the evening or at night, and consequently are often hard to see. Hall and Kelson (1959) remark that this species has one or two young born in June or July.

**Order Lagomorpha**

**Family Ochotonidae**

**Pika Ochotona princeps**

Subspecies: *Ochotona princeps princeps* (Richardson). External measurements (average of 15 specimens): 191, 14.7, 30.5 mm (range 172–202, 11–18, 30–32.5). Weight: 166.6 grams (127.8–227.2).

**Status** — Pikas are widely distributed in the various mountain ranges of the park from the easternmost ramparts to the Continental Divide. Over extensive local tracts the animals are totally lacking owing to the absence of suitable terrain, but in suitable habitats they are quite common. When quietly examining a rock-fall on a fine, sunny day one may see as many as a half dozen of them at one time.

**Habitat** — Pikas live in old, well-stabilized rock-slides on mountain slopes facing in various directions, in the several Life-Zones from the middle Canadian to the Arctic-Alpine. Some habitats are located rather low in the Canadian Zone (to at least 4,700 feet), where the rock-slides are flanked by thick coniferous forest, as at Medicine Lake. Pikas also range upward to the ultimate limit of succulent vegetation in the bleak and treeless alplands. Their average vertical range covers some 2,500 feet, that is, from about 5,000 to 7,500 feet of altitude. In some highly favourable localities the latter limit may be exceeded by a few hundred feet.

**Reproduction** — Young appear to be born at various times from late May or early June, until some time in August. A litter numbers three or four (Rand, 1948). Care of the progeny is noticeably prolonged. Northern collectors seldom secure juveniles until they begin appearing in the open when around two-thirds to three-quarters grown — that is, with body weights of from 115 to 140 grams. In Jasper Park I have taken such individuals very sparingly from the third week of June until early July. By the last week of July immatures reach weights of from 135 to 160 grams, and by the third week of September approximate average adult weights prevail.

**General Remarks** — The type locality of *Ochotona p. princeps* is located at the headwaters of Whirlpool River, Athabasca Pass, Jasper Park. Drummond collected the first specimens there in 1826; these were described in 1828 by Dr. Richardson as *Lepus* [Lagomys] *princeps*. In 1895 and 1896 Loring found the animals common on the higher ranges of the region and
preserved nearly 50 specimens. He took a few in the early autumn of 1895 near Henry House, and a good series during July 1896 in high terrain to the south, apparently in the latitude of lower Astoria River (Preble, 1908). Hollister (1912) collected six specimens in early August 1911 at the head of Smoky River, Moose Pass (6,570 feet), Alberta.

Anderson (1918) reported the taking of three specimens on August 12, 1917, near the mouth of Cavell Creek (5,200 feet), by Spreadborough, who stated: “I saw signs of Pika in nearly all the rock slides from the Athabasca River at Jasper to above timber-line. They store away a great quantity of grass and plants for winter use.”

Cowan took 11 specimens at Tonquin Valley in July 1930 and eight specimens at Mt. Edith Cavell, Maynard Pass, Tonquin Valley, and Emigrants Mountain in June, July, and September of 1944 to 1946. In late July 1939, Anderson took three specimens in a rock-slide at Byng Pass. Rand took one near Miette River on September 7, 1945, and Banfield took four at Brazeau River and Medicine Lake in the summers of 1946, 1948, and 1952. Lister and Moore took specimens at Medicine Lake on September 10, 1952. The National Museum of Canada has 21 specimens from this region. Wardens have reported “coneys” in high country flanking Snake Indian River and westward to Byng Pass, Twintree Lake, and other localities. In the summer of 1955 Flook (1956) saw pikas in a rock-slide north of Brazeau Cabin at an elevation of about 7,500 feet.

During my investigations in Jasper Park in 1938 (Soper, 1947) and during parts of the summers of 1960 to 1963, I saw pikas at or near Athabasca Glacier, Mt. Athabasca, Sunwapta Pass, Maligne and Medicine Lakes, Bald Hills, Mt. Edith Cavell, and Signal Mountain. All were located between the altitudes of 5,000 and 7,200 feet, where I collected the 15 specimens mentioned at the beginning of this section.

The animals continue to be diurnally active over the naked rock-slides until well on in the autumn. During a mild season, some scurry about and feed until at least early October. In 1922 I collected specimens at Rocky Pass near the end of September (1923), at which time they were still running about every day; “hay-making” was actively engaged in until at least the middle of that month.

**Family Leporidae**

**Varying Hare or Snowshoe “Rabbit” Lepus americanus**

*Subspecies: Lepus americanus columbiensis* Rhoads. External measurements (average of three adults): 452, 45, 139 mm (range 428-470, 38-52, 128-150). Weight: 3.1 pounds (2.5-3.5).

*Status* — From 1912 to 1914 the region as a whole was so over-run by these hares that to this day old residents recall the astonishing numbers. That development was recorded in some detail by me (1921, 1947) and by Banfield (1958); at the peak there were apparently a thousand or more to the square mile.

During my many periods of wildlife investigations in the park since then hares have invariably been scarce, sometimes remarkably so. That was the prevailing condition in 1922, 1938, 1941, and in all seasons from 1960 through 1963. In many study areas not a single hare was seen. Even in the most promising tracts only two or three were flushed during a full week or ten days of field work. In my experience hares have always appeared to be scarce deep in the mountains, sometimes when simultaneously building up to marked abundance in adjacent foothills and forest districts farther east (Soper, 1964).

*Habitat* — Hares range through all types of environment in the Canadian Zone, embracing

*Haymaking* — in late summer and early autumn the animals gather grass and flowering plants, which are spread out on the rocks to dry in the sun. When thoroughly dry, or “cured”, this hay is stored in chambers deep in the rock-slides to provide winter sustenance.
forests of spruce, pine, fir, and aspen poplar and thickets of alder, willow, buffaloberry, and silverberry. At times they may be found in black spruce muskegs, especially when dry weather prevails. They also inhabit parts of the Hudsonian Zone and occasionally reach the lower fringes of the alplands, but the lower mountain slopes and the valleys always attract the larger numbers. In the park their vertical range extends from 2,350 to 7,000 feet, but the majority favour environment below 5,000 feet.

Reproduction — Sufficient evidence exists to indicate that (at least when the population is rising to a peak) a female may bear two litters in a single season. The gestation period is from 36 to 47 days (Hall and Kelson, 1959). The usual litter comprises four or five young, but higher numbers have been recorded. They may be born at almost any time from May until August. Hollister (1912) took a half-grown youngster at Moose River on July 23, 1911, and another at Yellowhead Lake on September 1. Five immatures taken by Carter near Entrance from mid to late August, 1935, ranged from one-half to three-quarters adult size (Crowe, 1943). Cowan (1965) collected a female with four embryos at Blue Creek on June 14, 1945. I had a momentary glimpse of a half-grown juvenile at Fiddle Creek on August 9, 1962.

General Remarks — The present race intergrades with L.a. amerkanus in the foothills east of the park. Evidently the earliest scientific mention of these hares in this region dates back to Loring, who in the early autumn of 1895 found them locally common in the mountains. In this connection Preble (1908) remarks:

Sometimes for days few were seen; then a district was reached where they were abundant. In some places their runways were very common, and the young aspens and other tender shrubs had been cut down by them in great numbers, but the animals had departed. They were mainly found in the valleys and the foothills, few being noted in the high mountains.

Hollister (1912) found hares “exceedingly scarce” during the summer of 1911; very few were sighted or collected. Riley saw an adult near Henry House on September 12. During my nearly three weeks at Rocky Pass in the autumn of 1922 the animals were so scarce that I sighted only one. Cowan obtained a specimen at Snares River on August 3, 1930, and in 1944 remarked that “the snowshoe hare is quite common locally in the Athabasca Valley, but there have been no irruptive increases since 1915.” During 1944 he collected a juvenile at Cairn Pass on July 15 and an adult at Miette Station on December 25.

Crowe (1943) came to the conclusion that the hares collected near Entrance, while possessing L.a. columbiensis features, were probably a little closer to L.a. americanus; as for abundance he said: “The year 1941 was a bad one for the varying hares of this region for we saw only one all summer and heard only a few reports of others from natives.” That same year Clarke (1942) noted that in some localized park areas the animals were common despite great scarcity elsewhere.

Hares have been so scarce of late years that my opportunities for getting specimens were very meagre indeed. During the summer of 1960, with investigations conducted in 10 park localities, only four were briefly sighted at Snaring and Sunwapta River. I saw none in 1961. I collected two at Fiddle Creek in August 1962 and another at Roche Miette Creek on May 17, 1963. All these were on low terrain between about 3,240 and 3,400 feet; the animals seemed to be absent at higher altitudes.

Order Rodentia
Family Sciuridae
Least Chipmunk Eutamias minimus
Subspecies: Eutamias minimus borealis (J. A. Allen). External measurements (average of 18 specimens): 208, 92, 31.3 mm (range 195-217, 80-100, 30-32). Weight: 46.6 grams (37-50.3).

Status — This is one of the more familiar small mammals of the park. Its regional distribution is very extensive and fairly consistent, but in many areas it cannot be rated as common, and may actually be scarce where a habitat deficiency exists. By and large the species is fairly well represented.

Habitat — Most of the park population occurs in the Canadian Zone and the lower part of the Hudsonian. In some sections of the Rockies, however, a few may be found higher up, even up to timber line. Sunny, semi-open tracts of mixedwood forest with some undergrowth are favourite resorts for them, both in valley bottom-lands and up the sides of hills and mountains. They are also to be found in some areas of rock outcrops and boulders mixed with spruce, aspen poplar, and scattered clumps of shrubbery. Sometimes they occur on forest-flanked rock-slides that are frequented by pikas, marmots, and wood rats.

Reproduction — Breeding occurs at various times in April and May. The single annual litter usually numbers from four to seven. Several females examined between May 13 and 25 each
carried from three to seven foetuses having an average length of about 20 mm; in these cases it appeared that birth would have taken place early in June. Young are rarely seen above ground until early July. One juvenile captured on July 12 weighed only 17.9 grams — substantially less than a mature deer mouse. Between July 10 and 25 most juveniles range in weight from about 25 to 30 grams, thus averaging about half adult size. Occasional immatures approximating this weight may be taken until the first week of August; a month later most appear to be full-grown.

**General Remarks** — All observant visitors in the park will sooner or later almost certainly get acquainted with these energetic little animals. They are to be seen in a wide variety of situations and occasionally become inquisitive and fearless about camp.

Loring seems to have been the first to collect scientific specimens in this region. From September 10 to 12, 1895, he collected several at Henry House. The following season he found these chipmunks sparingly dispersed over much of the territory and took specimens as far south as about 15 miles above Henry House. Hollister (1912) states that he failed to secure this species any deeper into Jasper Park than two miles west of Brulé Lake. Two chipmunks taken by Spreadborough at Jasper on August 1 and 2, 1917, were identified and listed by Anderson (1918) as *E. m. borealis*; Spreadborough said that the animals were “fairly common” in that locality.

In early August 1930, Cowan collected nine specimens at Henry House, Snaring River, and Rock and Prairie Creeks, and in May 1944 and 1946 took three more at Jasper, at a point 10 miles east of the townsite and at Sunwapta Pass. In mid-August 1939, Anderson collected two specimens at Blue Creek and Byng Pass and saw others along the Snake Indian between Blue Creek and a point east of Calumet Peak. Rand collected three at Medicine Lake on September 5, 1945, and seven years later Lister collected one in the same locality. During the summers of 1948, 1951, and 1952, Banfield took specimens at Jasper, Brazeau River, Pobokton and Beauty Creeks, and Pyramid Lake. The species was also noted by Flook (1956) at Isaac Creek in August 1955.

From present information it is clear that the least chipmunk occupies the Athabasca River trench and tributary valleys at least as far west and south as Jasper townsite. Also to be considered are the Loring specimens, which were apparently taken somewhere in the vicinity of Buffalo Prairie. I found only the yellow-pine chipmunk in that part of the park in recent years. The picture now emerges that the local ranges of the two species overlap from about Henry House to Jasper and perhaps a few miles farther south. Apparently only the yellow-pine chipmunk occurs farther west.

In the autumn of 1922 and the summers of 1960 to 1963 I collected specimens at Rocky Pass; Fiddle and Roche Miette Creeks; Shale Banks, Snake Indian River; Medicine and Maligne Lakes; and Bald Hills. I also observed the species at Pocahontas, Miette Hot Springs, Devona, Snake Indian Falls, Rocky River, Princess Lake, and Little Shovel Pass.

The time of autumn hibernation varies somewhat with seasonal weather conditions. With a cold, inclement autumn and early winter the animals evidently disappear in the latter part of September. In a mild, prolonged autumn, however, some do not retire until the first or second week of October. Some hardy, enterprising individuals were seen on October 2, 1922, near Rocky Pass, running about in three inches of freshly fallen snow. Spring reappearance at moderate elevations in the mountains normally takes place during the second or third week of April; at the higher altitudes the event is doubtless somewhat later.
**Yellow-pine Chipmunk Eutamias amoenus**

Subspecies: *Eutamias amoenus ludibundus* Hollister.

External measurements (average of 21 specimens — Soper and Cowan): 212, 94, 32.2 mm (range 185-223, 81-100, 30-35). Weight: 52.5 grams (45.1–71.4).

*Status* — This chipmunk, not known to science until the early part of the century, has a substantial distribution in the northern Alberta Rockies and adjacent British Columbia. In that part of its range known to me, they appeared to occur in about the same relative abundance as the least chipmunk in other parts of the park. On the whole, however, this species is by no means abundant or evenly distributed; in some exceptional areas it was fairly common, but elsewhere was scarce or absent.

It is possible that this chipmunk was more plentiful half a century ago, as Hollister (1912) presents a different picture:

This new chipmunk was found in great abundance along the wagon road between Henry House and the mouth of Moose River, British Columbia. As we walked along they showed very little fear and often did not leave the road until we were within a few feet of them. Around the deserted camps the chipmunks were seen in great numbers, and even at the occupied sites they were running about the boxes and buildings with the greatest indifference to men and dogs.

*Habitat* — The regular and more common home sites are located in the wooded valleys and on the lower slopes of the Rockies, chiefly in the Canadian Zone. Nevertheless, a percentage of the population inhabits the Hudsonian Zone to timber line, but becomes increasingly scarcer with a rise in altitude. Hollister remarked that:

Several were seen near timberline in Moose Pass and, at our camp just over the Alberta line at the head of Smoky River, a single specimen was seen and secured at near 7,000 feet altitude. The true home of the species is somewhat lower down in the valleys of the larger mountain streams.

Their over-all vertical range is from about 3,300 to 7,000 feet.

*Reproduction* — There are few definite data on the breeding habits of this chipmunk within the park. Earlier naturalists were silent on the subject, and I have secured only one gravid female in all my operations. That female, weighing 53 grams and carrying four embryos averaging 5 mm in length, was collected at Sunwapta Pass (6,700 feet) on June 14, 1961. The litter would probably have been born between July 7 and 10.

*General Remarks* — The type locality of this form is Yellowhead Lake, B.C., only a few miles west of the park boundary. Hollister described it in a paper dated December 5, 1911. Loring makes no direct reference to this species, but in dealing with the least chipmunk Preble (1908) remarks as follows:

Some of the specimens from Henry House are larger and darker than the rest of the series from western Alberta and suggest the possibility of intergradation with *Eutamias felix*.

It seems that he was unwittingly referring to examples of *E. amoenus ludibundus*, which was described by Hollister three years later.

During July 1911, Hollister collected 46 specimens of yellow-pine chipmunks; one of these was taken at Moose Pass and 10 were added to the collection at Henry House between September 6 and 21. Anderson (1918) records a specimen taken by Spreadborough on September 8, 1917, at the confluence of the Miette and Athabasca Rivers. Spreadborough (1919), referring to that specimen, says:

I shot one in Jasper Park that had its pouches filled with timothy seed. It is wonderful to think of the time it must take them to collect such small seeds and store them for the winter. I have also seen them collecting the wild grass seed along the railway in the park and also the seeds of berries.

Spreadborough also collected several near Jasper and at Shovel Pass in August and September, 1918. Most naturalists who have worked in the western part of the park have encountered this chipmunk and collected specimens. Cowan secured a series at Astoria River and Tonquin Valley in late August 1930, and eight more in the years 1944 to 1946 in the general vicinity of Jasper and at The Palisades and Elysium Pass. Banfield took two specimens at Pyramid Lake on May 27, 1952.

I first collected a specimen of *E.a. ludibundus* at Derr Creek, Jasper Park, on June 17, 1960. During the same season others were taken at Cottonwood Creek and along Whirlpool River near Moab Lake and Sixth Meridian, and several more were sighted at close range at Lake Edith, at Geraldine Lookout, on high terrain east of Mt. Edith Cavell, and along Sunwapta River above Poboktun Creek. Several were collected at Sunwapta Pass in mid-June 1961, and two were taken near the junction of the Astoria and Athabasca Rivers on August 19 and 24, 1962.

From the above data it is to be seen that this species inhabits at least the full length of Miette River Valley, the valleys of the Athabasca and Sunwapta Rivers from Henry House to Sunwapta Pass, the valley of the Whirlpool River, and north-
ward along the Continental Divide and contiguous terrain. The approximate date and duration of the hibernation period are not known, but they are probably quite similar to those of the least chipmunk.

**Hoary Marmot Marmota caligata**

Subspecies: *Marmota caligata oxytona* Hollister.

External measurements (average of eight specimens of both sexes taken by Cowan at Byng Pass, Mt. Edith Cavell, and Tonquin Valley, 1943 to 1945): 699, 203, 101 mm (range 630-750, 180-230, 91-104), and weighed 12.5 pounds (11-15). A female that I collected at Little Shovel Pass on July 26, 1963, measured 685, 200, 98 mm and weighed 10.3 pounds.

**Status** — “Whistlers” are widely though somewhat erratically distributed in the regional cordillera. While scarce or apparently absent in some seemingly typical environments, they are quite prevalent locally on several mountain ranges. Most naturalists have found the animals common in various parts of the territory. Park wardens report marmots widely distributed in the region and familiar objects in numerous alpine and sub-alpine settings.

**Habitat** — Marmots occur irregularly on the upper slopes of the Rockies near and above timber line in upper Canadian, Hudsonian, and Arctic-Alpine Zones. The usual habitats comprise stony slopes and rock-slides, boulder-strewn alpine meadows, benches, and passes. For the most part the environment is exposed and rather forbidding. Their vertical range extends from about 4,800 to 7,500 or 8,000 feet, but some pairs are located at somewhat lower levels. Spreadborough remarks that on one occasion he saw them “in rock slides in Jasper Park at an altitude of 4,000 feet well down in the timber.”

**Reproduction** — Marmots have but one litter of young each year, the number varying from three to five (Seton, IV, 1928). Four seems to be the usual number. From what information is available it appears that the progeny are born some time in late May, or in June, evidently some four or five weeks after the adults have terminated their winter sleep. Usually the youngsters are first seen running about the home sites during the early part of July, when they are about one-third to one-half grown.

At Little Shovel Pass (7,000 feet) on July 26, 1963, I secured an adolescent that measured 460, 175, 82 mm and weighed four pounds — substantially less than half developed. Times of breeding and giving birth appear to vary markedly with different females. This conclusion is borne out by the fact that Loring collected an immature some miles west of Henry House on September 28, 1895. This certainly suggests that some late-born individuals are not fully grown until at least late autumn or early winter.

**General Remarks** — In July 1896 Loring found these marmots common at and above timber line on high mountains 15 miles south of Henry House. The first specimens to be assigned to the regional race *M.c. oxytona* were taken by Hollister in early August 1911 at the head of Smoky River, Moose Pass, Alberta. They were originally described by Hollister on February 7, 1912, as *Marmota sibila*, but that was changed to the present name by A. H. Howell in 1915. Remark ing on these marmots in the type locality, Hollister (1912) writes:

Crossing an alpine flat with its snow banks, boulders and quiet, one is often startled by a sharp, shrill whistle .... A search of the surrounding flat reveals a fat, vigilant marmot, perched on a huge rock, and watching the intruder from a safe distance. The marmots are wary creatures and at the first whistle of alarm all the animals inhabiting the flat seek a safe place near the burrow entrance, ready to retire in a flash.

From August 22 to 31, 1917, Spreadborough collected five of these marmots near the head of Cavell Creek (5,700 feet); two of them were adults, male and female, with mean measurements of 736, 206, 101 mm. After referring to their occurrence in rock-slides, he (1919) further remarks:

They are also found fairly common in the alpine meadows, where they burrow beneath large boulders. They were very abundant along the border of a large meadow just over the Shovel Pass in a rock-slide that is about half a mile wide. One could hear their long shrill whistles everywhere.

Here he collected several adults in August 1918. On August 29, 1919, C. G. Hewitt took an adult female at Goat Mountain. Anderson shot an adult female at Byng Pass on August 22, 1939, and also recorded the species at Willow Creek, in high country a few miles southeast of Snake Indian Mountain, and at a point about five miles to the southwest. Lister collected a light-weight adult near Mt. Edith Cavell on June 15, 1952, measuring 724, 208, 98 mm, and weighing only 7.5 pounds. Big, fat September adults may weigh anywhere from 10 to 17 pounds. In late July 1955, Flook recorded marmots at Cairn Pass, where they were said to be very common.
During many seasons spent in the park I have recorded marmots in varying numbers at Sunwapta Pass; Athabasca Glacier; Wilcox Peak; Miette Hot Springs; Amber, Tekarra, Cavell and Signal Mountains; The Palisades; Bald Hills; and Little Shovel Pass. The female collected in the latter locality on July 26, 1963, was already acquiring a layer of fat although hibernation still lay six or eight weeks in the future.

Columbian Ground Squirrel
*Spermophilus columbianus*


Status — Most naturalists who have spent any time in the region have reported this species in terms ranging from common to plentiful, or even abundant. Population figures depend on the nature of the locality, for vast areas in the mountains are not suitable for their needs; in such places the animals are either rare or completely wanting. In a multitude of favourable tracts they abound in large colonies, or in lesser groups and scattered pairs. Judging by their average density, perhaps a half a million or more of them live in Jasper Park. The species unquestionably ranks among the most adaptable and successful of mountain mammals.

Habitat — This squirrel occupies suitable tracts of terrain from the lowest valley bottomlands of the Canadian Zone through the Hudsonian to the tundra meadows of the Arctic-Alpine. Habitations are to be found in valley grasslands, higher treeless flats, rocky slopes and benches, subalpine forest glades and Arctic-like tundra, and slopes and terraces on mountain flanks and in rocky passes. Their altitudinal range is from approximately 3,250 to 8,000 feet.

Reproduction — According to data at hand the usual number of young per litter varies from two to five, with an occasional litter of seven. The gestation period is 24 days (Rand, 1948). Early births take place about the second or third week of May. A month to five weeks after birth, the young are capable of leaving the underground nest and nibbling various kinds of tender plants. By the first week of August two distinct sizes of juveniles are in evidence. They range from about one-third to one-half adult size with weights of around 190 to 260 grams. Many must be more or less immature when hibernation takes place.

General Remarks — In 1826 Drummond collected the first specimens to originate in this region. As Preble (1908) points out, the species was re-described by Richardson under the name *Arctomys parri var. erythroglyteia* from the specimens taken by Drummond near the source of the Athabasca River. Few mountain travellers fail to mention these quadrupeds that are so hardy, curious, and conspicuous. Sometimes they are extraordinarily shy, but again they may be bold and rather indifferent to approach and sometimes even dare to inspect the inside of camps. Perhaps their extreme wariness in some localities was the result of past and current harassment by grizzly bears.

In 1896 Loring found Columbian ground squirrels plentiful in widely separated parts of the region and took specimens of varying ages; the largest adult measured 345, 93, 53 mm. Spreadborough collected a series of specimens in late August 1917, near the source of Cavell Creek; four adults averaged 311.7, 68.5, 48 mm. He found large colonies in high alpine meadows east of Mt. Edith Cavell and in the neighbourhood of Shovel Pass (Anderson, 1918). Curiously enough, Hollister failed to see any of these animals in Jasper Park during the summer of 1911. On September 18, 1922, I saw two individuals at Rocky Pass at altitudes between 6,800 and 7,500 feet. These were regarded as very late foragers, as the rank and file start hibernation at any time between late August and September 10.

In June and July 1930, Cowan collected a specimen at Talbot Lake and another at Tonquin Valley, and in 1944 and 1946 one each at Brazeau Lake and Sunwapta Pass. Anderson shot one on August 15, 1939, at upper Blue Creek, and reported occurrences in various localities to the westward, including the upper Snake Indian River and Pass and Twintree Creek areas. Banfield collected one near Jasper on June 4, 1947. Lister and Moore also obtained specimens in the same locality during the second week of June 1952. While not uncommon in some restricted grassland flats at Jasper, the animals become increasingly scarcer down the valley until only a few stragglers get as far as Rocky River.

Flook's investigations in Jasper Park during the summer of 1955 showed that these rodents were well distributed in grassland areas, with the further remark that "They were abundant on the grass slopes north of the Brazeau Cabin and on the dry grass meadows along the Brazeau River."

My experience with the species parallels that of
some earlier investigators. In 1938 I noted the animals in many places from Jasper to the Sunwapta River and Pass; on alplands southeast of Wilcox Peak; and in the vicinity of Athabasca Glacier and the Miette River (Soper, 1947). During investigations from 1960 to 1963 I observed them near the mouth of Rocky River; at The Palisades; at Henry House; at Jasper; on Cottonwood and Derr Creeks; at Sunwapta Pass; at Signal Mountain; at Medicine and Maligne Lakes; and at Bald Hills.

In most of the latter localities they appeared in only very moderate numbers. In occasional areas, however, they were widespread and occurred in teeming colonies. On an average the species emerges from hibernation during the third week of April, and at low altitudes it normally disappears again in late August and early September. Banfield (1958) remarks: “These squirrels remain active later at higher elevations. They were seen at Egypt Lake (elevation 6,800 feet) on September 16, 1951 and September 5, 1952.” However, the same author mentions that they had already hibernated by the last day of August at Sunwapta Pass (6,675 feet) in both 1952 and 1953.

**Golden-mantled Ground Squirrel**

*Spermophilus lateralis*


**Status** — These “big chipmunks”, as they are often called, are highly characteristic of the mountain fastnesses, but are far from being as common and conspicuous as the preceding species. While the animals are widely distributed in the cordillera, they are not notably prevalent, except very locally, and in extensive areas at the lower levels they are scarce or non-existent.

**Habitat** — Their zonal range is habitually in upper Canadian-Hudsonian Zone environment, although numbers of them find congenial quarters in the alplands above. They are usually associated with rocky tracts. There their retreats are located in rugged rockfalls, talus, boulder fields of alpland meadows, subalpine glades, and stony, semi-wooded benches. In forested areas below, lacking in rocky outcrops, they are rarely seen. Scattered individuals are found in rock slides also inhabited by pikas. Their vertical distribution covers terrain from valley lowlands up to 7,500 feet or more.

**Reproduction** — The length of the gestation period is about one month. Mating takes place at some time during April, perhaps more often at or after the middle of the month. Females carrying foetuses have been collected from around mid-May until at least early July. Litter size is usually four or five, but may go as high as eight (Rand, 1948). There is only one litter a year. Juveniles and subadults are seen fairly often in July and August. I took an unusually early juvenile that already weighed 138 grams, or more than half adult weight, at Medicine Lake on May 29, 1963.

**General Remarks** — This is another mountain mammal whose type locality is situated on the Alberta side of Moose Pass, Jasper Park. The first applicable specimens of the race were collected by Hollister in late July and early August 1911, and described by him in December of the same year as *Callospermophilus lateralis tescorum*.

Prior to this, Loring had taken two specimens at Jasper House on August 27, 1895, and during the following July he collected a few more examples about 15 miles south of Henry House. Preble (1908) listed these under an old specific name, *Citellus (Calospermophilus) cinerascens* (Merriam).

In August and September 1917, Spreadborough collected five specimens near Jasper Station and the head of Cavell Creek, and remarked: “I saw and took most of them above timber-line and as high as 8,000 feet, but I secured one at Lake Edith Cavell, altitude 5,700 feet” (Anderson, 1918). On August 10–16, 1918, he also collected a series
of adult males and a juvenile at Shovel Pass (7,500 feet). In 1919 Spreadborough wrote:

They were common in Jasper Park in 1917 and 1918. Like the chipmunk they lay up a good supply of food for the winter. I shot one last August that had fully half a teacupful of roots and seeds in its pouches.... I caught a number of them in steel traps that I had set in rock-slides for weasels and marten. The traps were all baited with meat.

Hollister (1912) seems to have seen relatively little of mantled ground squirrels in Jasper Park, except in the lofty country at Moose Pass. He does, however, mention having seen the first one at the Miette River, July 9, 1911, and others the next day near the summit of Yellowhead Pass. During the summer of 1930 Cowan collected eight specimens at Snaring River and Tonquin Valley, and 15 years later he took five others at Jasper, Sunwapta Pass, and Medicine Lake. On August 19, 1939, Anderson collected one along the Snake Indian River above Blue Creek and sighted a number of others toward Indigo Lake and in the Tintree-Byng Pass territory.

In May 1951 and 1952 Banfield collected three specimens at Talbot and Cavell Lakes and Sunwapta Pass. Lister and Moore took one at Medicine Lake on June 14, 1952, and another along Maligne River four days later. In 1955 Flook (1956) observed these squirrels at the Cairn River Cabin and along Deception Creek.

My own investigations revealed the species at Rocky, Sunwapta and Yellowhead Passes, Athabasca Glacier, Mt. Edith Cavell, The Palisades, Tangle Ridge, Miette Hot Springs, Medicine and Maligne Lakes, Bald Hills, and Signal Mountain. By late August most of them become very fat and much heavier, sometimes going to 350 grams or more.

The species normally retreats underground for the winter at a somewhat later date than the Columbian ground squirrel. Some hardy individuals hold off until late September or even early October in a warm autumn. Spring appearance takes place about mid-April, but this can vary from year to year. Doubtless emergence depends to some extent upon general weather conditions, latitude, altitude, and slope exposure.

Red Squirrel *Tamiasciurus hudsonicus*

**Status** — Red squirrels are to be seen with moderate regularity in favourable environment throughout the park. There are, however, notable differences in relative abundance. In some areas they are especially numerous and vocal, while in others they are scarce and unnaturally silent. They figure among the more common and discernible of the regional small mammals.

**Habitat** — The choicest environment embraces the Canadian Zone and lower parts of the Hudsonian Zone, but in some areas a decreasing population persists to the "last trees" at varying heights of about 6,400 to 7,000 feet. The cover supporting a maximum squirrel population consists of lowland forest of spruce, fir, pine, and poplar. The over-all habitat also includes brushy, second-growth brûlé, dry, black spruce—larch muskegs, and rocky, sparsely vegetated subalpine woods. I have frequently observed red squirrels running about on pika-inhabited rock-slides along the lower fringe of the alplands, for instance, at Sunwapta Pass and Mt. Edith Cavell.

**Reproduction** — Mating activities are apparently general during late March or early April and irregular for some time thereafter. Hall and Kelson (1959) remark that the gestation period is between 36 and 40 days. Litters averaging four or five young (3-7) are born at various times in May and perhaps until early June. In any event, the juveniles are not seen abroad until the latter part of June and early July. On an average they are then about one-third grown, with weights of around 70 to 80 grams. By early August they are about half-developed (110-120 grams), while two to three weeks later their weight is about two-thirds that of adults (145-160 grams).

**General Remarks** — According to Preble (1908), Loring appears to have been the first zoologist to collect scientific specimens of this squirrel in the Jasper Park region. In the early autumn of 1895 he found the animals common in the country about Jasper House. In 1895 and 1896 he obtained six specimens at Jasper House and one at Henry House. He also found these animals common for some 15 miles southwards in July 1896, and in the mountains west of Henry House in October. At that time they were referred to the nominate race *T.h. hudsonicus*, but in a paper dated August 22, 1936, Howell demonstrated distinctness of characters and described the present subspecies.

Hollister (1912) found red squirrels common along the route of travel up the Athabasca past
Henry House to Yellowhead Pass, and regarded them as among the most conspicuous members of the regional fauna. He remarked, however, that they were "totally absent from the higher country at Moose Pass." He took two specimens at Jasper House and 19 at Henry House.

Spreadborough (Anderson, 1918) took five specimens near Jasper Station in August 1917, seven more in the same general area during the summers of 1918 and 1919, and stated that red squirrels were "abundant in the woods along the Athabasca River, Jasper Park." The following year, Spreadborough (1919) remarked that:

... in August they are busy cutting the cones from spruce trees which they gather and place in large heaps usually in a damp place beneath a pile of brush, or in rotten wood. They also cut the cones from other trees such as jack pine, Douglas fir and balsam. Their nest is usually placed near the food supply, on the branches of a tree that has very thick foliage.

During June and July 1930, and April to December 1943-44, Cowan collected one of the better series of this race taken in the park; localities represented are forks of the Snaring and Athabasca Rivers, Merlin and Jacques Passes, Tonquin Valley, Jasper, Devona, and Topaz Lake. In August 1939 Anderson reported red squirrels as numerous at Willow and Blue Creeks, in the upper Snake Indian Valley, and at Smoky River east of Chown Glacier. Clarke (1942) found the species common in all the park localities that he reached in March and April 1941. Rand secured four specimens at Maligne Canyon in early September 1935. Like Clarke, Flook also recorded these squirrels as common in the summer of 1955 throughout the timbered areas in the southeastern portion of the park.

In the autumn of 1922 I found red squirrels plentiful in the heavy timber below Rocky Pass (six collected), and in 1938 I recorded scattered examples at the Miette River and near Athabasca Glacier (Soper, 1947). During the four seasons 1960–63 they were fairly numerous in the following localities: Fiddle, Roche Miette, Ranger and Derr Creeks; Edith, Celestine, Medicine, and Maligne Lakes; Snaring; The Palisades; Shale Banks; Mt. Edith Cavell; Geraldine Lookout; mouths of the Astoria and Rocky Rivers; the Whirlpool River (near Moab Lake and Sixth Meridian); and the Sunwapta River.

A number of specimens from the eastern part of the park bear some similarity to T.h. preblei, but seem best referred to columbiensis. Crowe (1943) states that Howell came to the same conclusion with respect to specimens collected at Entrance and Thoral Creek.

In some localities midden piles are much in evidence. Many are small, but occasionally very large ones are encountered up to many feet in diameter and two or three feet high, which have been in use for a long time. These feeding stations normally consist of the discarded scales of spruce and pine cones. At Cottonwood and Derr Creeks, however, the waste was from the cones of Douglas fir. Quantities of mushrooms are also harvested and deposited in little piles, or wedged in the branches of spruce or fir.

During much of August and September red squirrels are busy gathering such food for the winter. At the Astoria River they were very active during the second week of August, and in several instances had already accumulated heaps of these supplies amounting to several gallons. At Celestine Lake, in early September, some of the more energetic red squirrels were still snipping new cones from tall spruces in early September. These were subsequently gathered from the ground beneath and stored in piles at the base of conifers, in thickets, and beside logs and rocks. The memory of squirrels is extraordinary if they succeed in locating all such food caches under the deep snow of winter.

**Northern Flying Squirrel Glaucomys sabrinus**

Subspecies: *Glaucomys sabrinus alpinus* (Richardson). External measurements (an average of one male and two females taken at Jasper and The Palisades): 313, 141, 41 mm (range 294–330, 127–150, 39–42). Weight: 156.6 grams (127.9–173.7). Seven G.s. alpinus specimens from the Alberta Rockies (three from Jasper Park and four outside the park) average as follows: 315, 145, 41 mm (range 294–346, 127–158, 39–41.8). Weight: 146.8 grams (113.6–184.6).

**Status** — It is difficult to assess the relative abundance of these unobtrusive creatures in any region. Being nocturnal, they are rarely seen; and I have made trap-sets for them in many places without a single catch. This would naturally lead one to suppose that flying squirrels are scarce or absent over much of the mountain territory, but we know that they can be fairly common in some favourable tracts of forests. Part of the reason for their apparent scarcity may be that they are far less attracted to baited traps in summer than in winter. In winter many accidentally lose their lives in areas adjacent to the park in traps set by professional trappers for larger fur-bearers.
Habitat — Flying squirrels select the better habitats occupied by red squirrels, chiefly in the Canadian Zone. They favour the best in mixed-wood forest, embracing tall conifers, semi-open woods, and glades. While they are more common in the Canadian Zone, some individuals live at much higher levels in the Hudsonian Zone. Their vertical range extends from the lowest valleys up to about 6,500 or 7,000 feet.

Reproduction — Very little information is available on the breeding habits of these squirrels. Immediately east of the Rockies members of the nominate race are known to mate in late March and in April. The gestation period is 40 to 42 days (Soper, 1964, ref: Hampson). Litter size varies from three to six. The young are naked and sightless for about 10 days, are nursed by the mother for perhaps five or six weeks, and evidently leave the nest some time during late June or early July. A heavy 213-gram female that I captured at Big Berland River on June 14, 1964, had well-developed mammary glands that had been recently lactating. A juvenile about one-third grown (76.3 grams) was trapped on July 30. Four immatures taken by Carter at Entrance and Thoral Creek between August 24 and September 11 were still in juvenile pelage and possessed functional milk premolars.

General Remarks — The first specimens known to science were collected by Drummond in the early part of the last century. These were described by Richardson (1828) as Pteromys alpinus and by Howell (1918) as Glaucomys sabrinus alpinus. Howell remarks: "As Richardson speaks of Drummond as the discoverer of the species, the vicinity of Jasper House, on the headwaters of the Athabasca, near which place Drummond made extensive collections, may be considered the type locality."

Next in line were a male and a female collected by D. E. Noyes at Jasper House on December 15, 1896, and, therefore, topotypical (Preble, 1908). Hollister (1912) remarks that on the expedition to Jasper Park and the Mt. Robson region in 1911 he succeeded in capturing flying squirrels only in the vicinity of Henry House.

At this place Mr. Swift told me he formerly caught many flying squirrels in his marten traps, in the mountains about Pyramid Peak, west of his homestead. A line of traps set in these mountains resulted in the capture of two fine specimens the first night, September 12th, and of another September 14th. These were caught in traps placed at the foot of large spruce and fir trees in open groves and baited with cooked bacon.

During July and August 1918 Spreadborough obtained nine specimens of both sexes near Jasper and in the Shovel Pass area; regarding these he wrote: "...I opened the stomachs of some that I caught at Jasper. They were full of fruit of some kind, I think the high bush cranberry." Cowan secured one at Snaring River on July 30, 1930, and another at Jasper on June 29, 1944. Rand collected one at Maligne Canyon on September 11, 1945.

While operating in Jasper Park I tried to trap flying squirrels in 16 different localities without success. Finally, however, I took two individuals at The Palisades on May 23 and 24, 1963, at the bases of large spruce and fir trees in semi-open forest; the traps were rigged with standard combination bait, garnished with rolled oats and shreds of fresh apple.

Figure 9 The northern flying squirrel is a rarely observed inhabitant of the mountain coniferous forest, as it is normally nocturnal. Photo by Ed Cesar.
Family Castoridae

Beaver *Castor canadensis*

Subspecies: *Castor canadensis canadensis* Kuhl.

External measurements: a female taken by Cowan at Jasper, 1008, 420, 175 mm; an average by Seton (IV, 1928), 1092, 406, 177 mm; mean weight, 40 pounds (30-56), but “old and large beavers reach a weight of 60 to 70 pounds”.

**Status** — In 1895 Loring found the species very rare; he secured evidence that it had formerly been abundant in suitable areas, but had been nearly trapped out in the nineties. By the time Hollister reached the region in 1911 beavers had made a substantial recovery, although protected for only four years. They were common in some streams formerly deserted and “Owing to the protection afforded by the excellent laws . . . are apparently increasing in numbers in this region” (Hollister, 1912).

Beaver are now common in some parts of the park, but in many other parts only very old mouldering lodges, dams, and cuttings are in evidence, pointing to days of long ago when they were much more numerous. Of late the most plentiful fresh signs have been noted in backwaters of the Athabasca between Snaring and Henry House and along the Miette River west to Yellowhead Pass.

**Habitat** — This is so well known that little needs to be said. Quiet, deep backwaters of large streams, sluggish creeks, and ponds and small lakes are favourite resorts. In the latter environments the animals build lodges and also well-constructed dams on the smaller streams. In some situations, such as fast-flowing rivers, beavers live in bank dens with the feed-bed located in deep, still water close by. The first requirement of an occupied locality is a good supply of sources of food and building materials, such as aspen poplar, paper birch, alder, and various willows. Most home sites are in the Canadian Zone, but some are located at elevations up to about 4,800 feet, as indicated by the former occurrence of the animals at Beaver Lake.

**Reproduction** — Mature females bring forth one litter a year. The average size of a litter is four or five, but it may vary from two to eight; the latter number is rare. The time of birth is normally in April and May, climaxing a gestation period of about three months (Hall and Kelson, II, 1959). Development of the young progresses at a very moderate rate; they remain with the parents until the following year, when they can fend for themselves and make way for the next batch of newly born.

**General Remarks** — Some comments have already been presented from the findings of Loring and Hollister over a half century ago. Anderson (1918) quotes Spreadborough as saying: “They are becoming very abundant in Jasper Park. One small stream that flows into the Athabasca about a mile south of Jasper has four large dams on it and a number of smaller ones. There are several in Horseshoe Lake that are so tame that they will come out of the lake and cut down trees while one is watching them.”

During June and July 1930 and June 1944, Cowan found the animals in some numbers in back-channels and beaver ponds along the Athabasca below Henry House, where he collected four specimens at Snaring River, Talbot Lake, and near Jasper. Anderson (1938) remarked:

Common and increasing inside channels of Athabasca River below Jasper and other suitable localities. The beaver is spreading steadily along streams where proper food is available. Several beaver dams, houses, food piles and loose cuttings were seen on side channels below Miette Station in the eastern part of the park.

Banfield also secured a specimen for the National Museum at Talbot Lake on May 17, 1952. In the summer of 1955 Flook (1956) noted the presence of beavers at Isaac Creek and saw old, beaver-cut stumps on the banks of Brazeau River near Job Creek.

While the species has done well in some areas, many tracts remain deserted. I have noted signs of former occupation in the form of very old dams, lodges, and “beaver stumps” at Fiddle, Cottonwood, and Ranger Creeks and at Princess and Celestine Lakes. In the latter locality (4,200 feet), time-worn cuttings of aspen poplar were especially notable a short distance from the shore line. In some places these poplar stumps are as much as 30 to 40 feet above the lake and 50 to 100 yards from the shore. Such unusual trekking for food was necessary because of the scarcity or absence of aspens near the lake, where most of the ground is dominated by spruce and pine.

I observed active beaver settlements in backwaters of the Athabasca River southwest of Brulé Lake, in similar situations south of Jasper Lake, and at various points along the Miette River between Wynd and Derr Creeks. According to local account, beavers maintain themselves efficiently in many acceptable lowland creeks and small lakes that I have not personally examined. Wardens’ observations in 1961–62 show the animals inhabiting the districts of Sunwapta and Pocahontas (Table 3).
Family Cricetidae

Deer Mouse *Peromyscus maniculatus*

Subspecies: *Peromyscus maniculatus borealis* Mearns. External measurements (average of 79 adults, both sexes): 180, 86, 20.9 mm (range 162–207, 69–101, 19.5–22.5). Weight: 21.6 grams (15.8–33.9). The very heaviest examples were gravid females.

*Status* — The deer mouse is one of the most adaptable vertebrates in the park, where it is practically ubiquitous and sometimes perhaps the most abundant mammal. At times its numbers are astonishing, but the population fluctuates markedly from year to year, and not infrequently even from one locality to another during the same season.

Extreme “lows” are rather uncommon, generous numbers being more usual. From 1960 to 1963 my four summers’ average take was 7.74 per 100 trap-nights (Tables 4, 5). The highest record was obtained in August 1962 at Fiddle Creek, where 90 *Peromyscus* were captured in 420 trap-nights (21.4 per cent). At the other extreme, only one was caught on Signal Mountain (6,400 feet) in July 1961, in 480 trap-nights. The densest population figure in the park known to me was obtained by Anderson (1938) in a very dry habitat near Miette Cabin, where 12 deer mice were taken in 24 trap-nights.

*Habitat* — Deer mice occupy nearly all kinds of ecological niches from the lowlands of the Canadi an Zone to about the upper limits of the Hudsonian Zone. While almost any kind of situation is apparently acceptable, the greater percentage of the catch was from lowland, shrub-forest environment relatively close to water, with diminishing returns farther back and up. The species is scarcest in damp swamplands, black spruce muskegs, and at higher altitudes: at Maligne Lake (5,490 feet) not a single deer mouse was taken in 320 trap-nights during July 1963. Nevertheless, some are known to go as high as timber line. Their vertical range is therefore a good 3,750 feet — that is, from 3,250 to 7,000 feet; occasional individuals may go even higher.

*Reproduction* — Mating occurs at various times during the spring and summer. Evidence points to two or three broods of young in one season, litter sizes varying from three to seven or eight. Gestation lasts for 21 to 27 days. The young are capable of breeding when only six to seven weeks old (Hall and Kelson, II, 1959). Pregnant females may be taken at least as early as mid-May. A gravid female trapped at Ranger Creek on June 27, 1960, contained six foetuses averaging 22 mm in length. Another taken at Sunwapta Pass on June 17, 1961, carried four very small embryos. Dusky immatures from one-half to two-thirds grown may be trapped almost any time from late May until August or early September.

*General Remarks* — Richardson recorded the species as *Mus leucopus* and noted its occurrence as far north as Great Bear Lake. The present scientific name was established by Mearns in 1911. During the summers of 1895 and 1896 Loring recorded these mice as “rather common” and collected a series of about 50 at Jasper House, near the Astoria River, 15 miles west of Henry House, and at the Snake Indian River.

In the early autumn of 1911 Hollister (1912) collected a series of 34 specimens at the Swift ranch, near Henry House. He said:

So abundant were the deer mice at this place that it was difficult to trap other desirable animals because the deer mice sprung so many of the traps early in the evening. We caught these mice in any and all places where traps were set, from the level of the Athabasca River to high up in the hills near Pyramid Peak and in all sorts of situations.

In the summer of 1917 to 1919 Spreadborough took many specimens near Jasper, at the mouth of Cavell Creek, at Henry House, at the Miette River, and at Shovel Pass. Cowan collected 18 deer mice from June to August 1930 at Jasper, the Snaring River, Prairie Creek, and Tonquin Valley, and a dozen others in 1943 and 1944 at Willow Creek, and at Twintree and Jacques Lakes; he also recorded their presence at the upper Smoky River (lat. 53°22’N) and Adolphus Lake, Robson Pass. On September 11, 1945, Rand secured four specimens at Maligne Canyon. In May 1952, Banfield took three at Whistler Creek, and in mid-June of the same year Lister and Moore took seven at Jasper, Athabasca Falls, and Cabin Lake.

I first became acquainted with *Peromyscus maniculatus borealis* at the headwaters of the Wildhay River in 1913 and at Rocky Pass in 1922 (Soper, 1915, 1923). I encountered them very frequently in Jasper Park from 1960 to 1963, taking a total of 120 specimens for the University of Alberta research collection.

Practically all specimens from the eastern parts of the park are essentially typical *P.m. borealis*, although a few depart somewhat from average colouration. One individual from Shale Banks is more brownish, and another from Roche Miette Creek is much paler, dorsally; the sides of the latter are a warmer buff than in typical examples.
It is to be particularly noted that deer mice from the more western localities (such as Derr Creek and the Astoria and Whirlpool Rivers) are generally larger and heavier with longer tails. An extensive series of specimens from eastern parts of the park have average measurements of 179, 84, 20.7 mm and an average weight of 20.9 grams, whereas corresponding data for a parallel series from western parts are 186, 90, 21.5 mm and 24.8 grams.

I have this comment in my field-notes:

Specimens north and east of Jasper townsite may be regarded as typical, or near-typical _P.m. borealis_; to the westward a subtle change occurs with an apparent tendency toward _P.m. artemisiae_ with longer tails and less yellowish above. At the same time, some individuals (except for longer tails) are indistinguishable from specimens taken at Snaring, Rocky River, and Fiddle Creek.

Hollister (1912) also became aware of this difference since he remarks of his Henry House specimens that they

... do not represent true _borealis_, but have slightly longer tails and have less yellow in the color of the upper parts than the typical form from Fort Simpson, Mackenzie.

_Bushy-tailed Wood Rat_ *Neotoma cinerea*

**Status** — Wood rats ("pack-rats") are quite characteristic of the Rocky Mountains and adjacent foothills. Most travellers in the region have made some reference to them, employing such terms as common or plentiful. While it is true that they are well represented locally, I have found it equally true that in many scattered tracts of country they are apparently lacking. Being of nocturnal bent, wood rats are rarely seen by the casual observer.

**Habitat** — The species haunts a wide variety of habitats ranging from the lowest valleys in the Canadian Zone up through the Hudsonian to timber line and parts of the alplands. It commonly dwells in rock-slides, in fissures in cliffs, amid craggy escarpments, under roots and boulders on the forested banks of streams, and in old abandoned cabins. Its vertical range is about 4,000 feet, i.e. between the altitudes of about 3,250 and 7,200 feet.

**Reproduction** — Evidently the species breeds only once a year in this latitude, producing a litter varying in number from two or three to six. Probably many breed in mid-spring with delivery of progeny some time in May, June, or July. The period of gestation is probably 30 to 33 days as in related forms (Rand, 1948). The times of copulation of different couples may vary by a month or six weeks.

On July 25, 1951, Robert Lister obtained, directly from the nest, three juveniles with a mean weight of 42 grams, probably born early in the month. At the same time and place but from a different litter he collected another juvenile weighing 129 grams, which is about 40 per cent of average adult weight. Three immatures secured by me on July 26, 1944, had a mean weight of 165 grams.

**General Remarks** — In 1829 Richardson described this rodent from a specimen taken by Drummond in the vicinity of Jasper House. In the early autumn of 1895, Loring found the animals common in favourable mountain habitations in this same (type) locality, and collected over 20 specimens. Based on Loring's findings there, Preble (1908) says:

Their nests built of sticks, leaves, bones, small stones and other rubbish — the usual materials — were found in the crevices of ledges, some of which seemed to have been occupied for many years. The animals were called by the Indians 'medicine rats', in allusion to the musk glands.

Hollister (1912) reported wood rats locally common throughout the region, including the country about both Jasper and Henry Houses. He gives an account of some experiences with the species, part of which is here quoted:

In one of Mr. Swift's log houses, which we had used as a cache, the animals industriously moved a large share of a sack of beans into one of our boxes of hides and horns. Mountain rats take readily to buildings and their nocturnal activity has made them famous among mountain people. The stories of their freakish antics, as told around the evening camp fires by guides, prospectors and packers, rival the most exciting bear stories in interest.

Anderson (1918) reported the taking of three specimens by Spreadborough near Jasper Station in July and August 1917, together with the latter's comment that the species was "very abundant in rock slides near Jasper". During July and August 1918 and 1919, he also took four more at Shovel Pass and near Jasper. In the summer of 1930 Cowan collected five specimens at the Snaring and Rocky Rivers, and in 1944 and 1945 four more at Devon and Tonquin Valley. In August 1939 Anderson trapped specimens at Blue Creek and
westward up the Snake Indian River; the animals were also reported as common at Willow Creek. Rand took one at Maligne Canyon on September 6, 1945, and Banfield took one at Willow Creek on December 2, 1951. In the summer of 1955 Flook sighted a wood rat in a rocky ravine northeast of Brazeau Cabin.

In the autumn of 1922 I secured specimens at Rocky Pass; the animals were apparently scarce (Soper, 1923, 1947). During four seasons in Jasper Park I obtained records of occurrence for Geraldine Lookout, Whirlpool River near Moab Lake, Derr Creek, Snaring River, and The Palisades; nowhere did the species appear to be common. Park wardens reported the presence of "pack rats" in a number of localities where I could find little or no sign of them, and where numerous trap-sets failed to produce results.

It is known that during the summer, at least, some of the animals leave lowland resorts in favour of higher terrain, returning in the autumn or early winter. Recent data on relative abundance suggest that wood rats may have been much more numerous 40 to 60 years ago than now.

Subfamily Microtinae

Gapper's Red-backed Vole

*Clethrionomys gapperi*


Status — This species periodically figures among the commoner small mammals of the park. Some earlier naturalists referred to it as plentiful, but this term does not always apply. Hollister (1912), for example, found them abundant, but the population was at a notably low level during the summers of 1960 to 1963.

During these years, 13 of my 20 well-worked study areas in the park yielded no "red-backs" whatever; great scarcity must have prevailed. In the seven localities where they were caught the average rate of capture was very low, amounting to only 2.92 per 100 trap-nights; the lowest figure was .43 and the highest 8.33 (Tables 4, 5). They were more common at the Whirlpool River and Geraldine Lookout than elsewhere. The animals were at least locally plentiful in 1938, as during that summer Anderson caught them at Maccarib Creek, Tonquin Valley (6,500 feet), at the rate of about 30 per 100 trap-nights.

Habitat — These voles have a wide variety of home sites ranging from lowland willow and silvery-berry thickets and aspen poplar woods, upwards through cool mixedwood forest or pure dense stands of evergreens, to the upper limits of the subalpine cover. Most live in well-drained uplands, but some live in damp, wooded areas beside streams and lakes and in semi-dry swamplands and sphagnum — Labrador tea muskges. A smaller percentage inhabit shrubby meadows in the alp-lands. Their vertical range embraces niches all the way from valley bottomlands up to about 7,500 feet (Canadian to Arctic-Alpine Zones).

Reproduction — Active mating appears to take place at irregular times from late April or early May until August or even early September. Some evidence indicates that even in this fairly "boreal" latitude-altitude combination the animals may have a couple of broods in a single summer. The number of young per litter may vary from two to eight. The gestation period is from 17 to 19 days (Rand, 1948).

During the latter half of August 1960 I collected five gravid females at Geraldine Lookout and the Whirlpool River with foetuses numbering from five to seven and measuring from 10 to 18 mm in length. Some juveniles no more than a third grown are out and about by early June. Then those from one-half to, progressively, three-quarters adult weight may be taken at almost any time from late June until late October; but the great majority of those trapped after late September or early October have apparently reached maturity.

General Remarks — This race has an extensive geographic distribution. With type locality near Fort Smith, N.W.T., it ranges with scarcely perceptible change of characters from Great Slave Lake south to central Alberta and west to include Jasper Park. Most zoologists have had fair success in securing study skins for their collections. Sometimes when numerous the animals can clutter up traps to the exclusion of rarer species.

Preble (1908) notes that Loring took specimens in what is now Jasper Park during the season of 1895, some 15 miles south of Henry House and others an equal distance west of that point. Hollister (1912) found the animals abundant throughout the region in 1911, and preserved a series of 65 specimens; 48 of these were collected at Henry House and the Jasper Park portion of Moose Pass.

Spreadborough took specimens at Cavell Lake in early September 1917, and several more near
Jasper and Shovel Pass in July and August 1918 and 1919. In June and July 1930 Cowan trapped a series at Jacques and Merlin Passes and Tonquin Valley, and in 1944–45 11 more at Hoochloo and Maligne Lake. On his north boundary journey in August 1939 Anderson found “red-backs” exceedingly scarce, and trapped only a few at Adolphus Lake. Rand collected single specimens at Medicine Lake and Maligne Canyon on September 11, 1945, and Banfield took two at Cavell Lake on May 28, 1952. Lister and Moore also obtained specimens at Medicine Lake on June 15, 1952.

During the autumn of 1922 I took several adults at Rocky Pass in the vicinity of timber line; at that time the “red-back” population was very low, the rate of capture averaging only 3.0 per 100 trap-nights. Some apparently excellent habitats appeared to be deserted. In the wilderness these voles, like deer mice, sometimes invade camps and cabins to nibble on stores of food.

During my park operations a total of 36 specimens was collected at Geraldine Lookout, the Whirlpool River, Cottonwood and Fiddle Creeks, the mouth of the Astoria River, and Medicine and Maligne Lakes.

**Heather Vole Phenacomys intermedius**


Average of five specimens by Cowan and Hatter: 133, 31, 18 mm.

**Status** — Few species of small mammals in the park have been sought more keenly than this *Phenacomys*. All too often they have escaped detection because of capricious dispersal and scarcity, and therefore have often been regarded as rare. They are not really rare in Jasper Park. Sometimes a small series can be taken quickly in a restricted “pocket”, while in some other areas they appear to be lacking. I captured six in 370 trap-nights at Sunwaptap Pass (6,700 feet).

**Habitat** — Heather voles occupy a wide variety of ecological niches from the Canadian Zone valleys up to the lower expanses of the Arctic-Alpine. Some of their more characteristic dwelling-places include heavy mixedwood forest; semi-open benchlands; dry grass–shrub margins of lakes, streams, and muskegs; and alpine meadows having a generous cover of heath and flowering vascular plants. Their vertical distribution is fully 4,300 feet embracing all levels from the lowest valleys up to about 7,500 feet.

**Reproduction** — In this latitude heather voles apparently breed irregularly from May until July or early August, with some possibility of two litters in a single season. The length of gestation is doubtless similar to that of the meadow vole at about 20 or 21 days. The size of the litter is usually from four to six, but may reach eight. Crowe (1943) states: “Five cases of pregnancy examined between June 23 and August 1 averaged 4.8 per litter with extremes of four and six.”

A female that I caught at Maligne Lake on July 24, 1963, carried six foetuses averaging 15 mm in length; normally birth would have taken place near the end of July. Juveniles less than half grown (10–15 grams) were trapped as early as mid-June. Nearly mature subadults (22–29 grams) were also secured at various times from late July until early September.

**General Remarks** — For the most part, zoologists have had fairly good luck in securing study skins of this vole. Loring failed in what is now Jasper Park, but he did secure a female on September 17, 1896, about 90 miles north of Jasper House. Hollister (1912) met with better results on his expedition of 1911, when he collected 11 specimens. In commenting on some of these he said:

Near our camp at the head of the Moose Pass branch of the Smoky River, Alberta, seven were collected between July 30th and August 7th. These were all caught near timberline, at about 7,000 feet, in a large grove of firs bordering the creek. Most of the specimens were trapped under logs and bushes, but one was captured in a trap placed on top of a large log. A half grown young was taken July 30th.

Spreadborough collected three specimens at Jasper House and Fiddle Creek in July 1898; a juvenile at Shovel Pass on August 19, 1918; and an adult female near Jasper on July 30, 1919. On June 22, 1930, Cowan took a single specimen at Jacques Pass, and he records five others collected from 1944 to 1946 near Jasper and at Willow Creek. Rand obtained three at Maligne Canyon in early September 1945, and Banfield one at Whistler Creek on May 26, 1952. A month later Lister and Moore collected one at the summit of Sunwaptap Pass.

The 18 specimens taken by me in the park derived from Ranger Creek (4,200 feet); Whirlpool River at Sixth Meridian (4,200 feet); Sunwaptap Pass (6,700–7,200 feet); mouth of Astoria River (3,800 feet); The Palisades (3,700 feet); Medicine Lake (4,900 feet); and Maligne Lake (5,300 feet).
Meadow Vole Microtus pennsylvanicus
Subspecies: Microtus pennsylvanicus drummondii (Aud. and Bach.). External measurements (average of 34 specimens — Cowan and Soper): 153, 43, 18.9 mm (range 134–170, 34–54, 18.5–21). Weight: 37.8 grams (23.1–48). The heaviest of the series was a gravid female with a length of 164 mm.

Status — Among the regional small mammals meadow voles are second in abundance, usually being exceeded in numbers only by deer mice. Occasionally red-backed voles are more numerous locally, but in the long run meadow voles have the ascendancy with a long-term average of 3.52 per 100 trap-nights (Tables 4, 5).

It is this rodent that periodically reaches plague numbers in the aspen woods, fields, and grasslands of central Alberta and causes extensive damage to cereal crops. So far as I know, such “population explosions” are rare in the Rocky Mountains. Nevertheless, even with the moderate aggregate within the cordillera, it is sometimes quite possible for the animals to occur in the better habitats at a local rate of several thousand to the square mile.

Habitat — Typical habitations are largely located in lush meadows and moist swamplands with an abundance of succulent grasses and sedges. Such terrain is usually further endowed with scattered clumps of willows, alders, snowberry, shrubby cinquefoil, and other shrubs. Other acceptable homelands are the damp, grass–shrub margins of lakes, ponds, streams, and muskegs, with moderate extensions of range into adjacent mixedwood forest. Actually meadow voles enjoy a wide choice of local habitats, both laterally and vertically, for they occur from the valley floors all the way up to alpland meadows.

Reproduction — At some times and places these voles are extravagantly prolific, often copulating from late April until late summer and bringing forth several batches of young in a single season. It is highly probable that the season's first-born bear young of their own before the summer is out. Litter size varies from four to eleven, with a mean of five or six. The period of gestation is about 20 days (Rand, 1948).

I have taken females as early as mid-May with from six to eight embryos so developed that birth would have occurred within a week or ten days. I took a large gravid female carrying six foetuses approximately half formed (12 mm long) at Ranger Creek, on June 25, 1960. Many juveniles were taken in June, July, and August varying from one-half to three-quarters grown. Others of comparable size also occur well into September. At Celestine Lake on September 1 and 2, 1962, I trapped two pregnant meadow voles containing foetuses 7 and 25 mm long, respectively; evidently delivery would have taken place in about two weeks in one case, and within a couple of days in the other.

General Remarks — The type locality of this vole is stated by Bailey (1900) to be in the vicinity of Jasper House. The first specimens were taken in 1826 by Drummond, who referred to the place originally as “Valleys of the Rocky Mountains”. The regional race was named in his honour by Audubon and Bachman in 1854. Researchers in the region have usually had no trouble securing specimens. After Drummond, the next naturalist to collect meadow voles here was Loring, who found them common in most localities in 1895 and 1896; he took specimens 15 miles south of Henry House and at Smoky Valley 50 miles north of Jasper House.

In 1911 Hollister (1912) apparently found these voles at a very low ebb in Jasper Park, where he obtained only one specimen; it was taken on the Alberta side of Moose Pass. Anderson (1918) wrote: “Mr. Spreadborough states that these meadow voles were very abundant in Jasper Park in wet meadows”; in 1917 Spreadborough took 19 specimens at Jasper Station and the mouth of Cavell Creek (4,600 feet), and in August 1918 he took seven more at Shovel Pass. In 1930 Cowan got a good June–July series at Pocahontas and Tonquin Valley, and in 1944–45 he secured 11 more specimens at Maligne Lake, Devona, and Willow Creek.

During August 1939 Anderson took specimens at Willow Creek and Twintree Lake; elsewhere the species appeared to be very scarce or absent. On September 11, 1945, Rand collected a few specimens at Maligne Canyon. In 1946 Cowan reported a microtine plague of this species and the northern bog lemming along the upper reaches of Minaga Creek and as far as Monarch Meadows and Barrett Pass. During 10 days or so in mid-June 1952, Lister and Moore collected a number of specimens at Pyramid, Cabin, Medicine, and Honeymoon Lakes and Sunwapta Pass.

My own collections at Rocky Pass in the latter part of September 1922 and in Jasper Park during the summers of 1960 to 1963 embraced 21 widely spaced study areas and yielded 46 specimens; the latter were taken at Derr, Ranger, and Cotton...
wood Creeks; Shale Banks, Snake Indian River; the Rocky and Whirlpool Rivers; and Celestine and Maligne Lakes.

**Long-tailed Vole Microtus longicaudus**


**Status** — Several faunal investigators have failed to collect this species, which would ordinarily suggest some degree of scarcity. It is true that the animals appear to be absent in some parts of the region and fairly numerous or even common in others. In relative abundance they rank fifth among the park's small mammals. At times there appear to be cyclic fluctuations. My long-term average works out to only 1.28 per 100 trap-nights, based exclusively on those localities where the species was found; the highest return was 3.21 (Table 5).

**Habitat** — The habitat of long-tailed voles is largely identical with that of meadow voles, with which they are frequently associated. Long-tailed voles may be found in various types of meadows, damp sphagnum swamps, and brushy tangles along waterways from the Canadian to the Arctic-Alpine Zone. Most of them appear to favour the upper Canadian and all of the Hudsonian Zone. Some resort to tundra above timber line, to a maximum elevation of about 7,500 feet.

**Reproduction** — The species has a long breeding season, similar to that of meadow voles, running from mid-spring until August and perhaps even later. The gestation period is probably 20 or 21 days as in related forms (Rand, 1948). Litter size varies from four to six or seven. On May 28, 1963, I took a female at Medicine Lake bearing five very small embryos, evidently due for birth between June 15 and 18. Another one captured at Sunwapta Pass on June 18, 1961, carried six foetuses 8 mm in length, which would possibly have been born about August 4.

One-third-grown juveniles (15-18 grams) were taken during the first week of July, and others only about half that size (6.3-9.6 grams) during the second and third weeks of August. Hollister (1912) remarks:

Like most microtine animals, this species has a long breeding season, even at this high altitude, and specimens about one-half and others two-thirds grown were taken the same day, July 27th, together with an adult female which contained four foetuses, each 20 millimeters long.

**General Remarks** — This northern Rocky Mountain race was recognized as such in 1889; it was listed by Miller in 1924 as *Microtus mordax mordax* and re-named with the current terminology by Anderson and Rand in 1944.

The long-tailed vole is a true cordilleran organism. Loring naturally came in contact with it during his mountain investigations in 1895 and 1896. He collected specimens at Henry House, 15 miles south of that site, and at the Smoky River, northwest of Jasper House (Preble, 1908). Hollister (1912) was next on the scene when he obtained a series of specimens in late July 1911 at Moose Pass, Jasper Park; at that time this race was still listed as *M.m. mordax*. He says

... it was not until we reached higher country around Moose Pass that we found the animal common. In a sphagnum-willow swamp near our Moose Pass camp, at about 5,300 feet, eleven were trapped between July 26th and July 28th ... this species was the most common mouse, and was the only vole found in the open country above timberline.

In August 1918, Spreadborough collected eight specimens at Shovel Pass and near the town of Jasper. During the next several decades at least five or six well-qualified naturalists who visited the Jasper territory apparently failed to find long-tailed voles and collect study skins. I collected three specimens in late September 1922, at Rocky Pass, where the animals were scarce; they were trapped in moist subalpine meadows between 6,200 and 6,600 feet. In August 1938 I saw plentiful vole feeding signs (presumably made by this species) in lush, tangled grass, diminutive willows, and heather near Sunwapta Pass at about 7,200 feet (Soper, 1947). In May, June, and July, 1943-45, Cowan and Hatter collected 11 specimens at Brazee River, Maligne Lake, and Hoochlo.

During the summers of 1960 to 1963 I collected a total of 26 specimens in the following localities: Derr, Ranger, and Fiddle Creeks; Whirlpool River (Sixth Meridian); mouth of Astoria River; Sunwapta Pass; and Medicine Lake. Coarse feeding signs of microtine rodents (evidently this species) were noted on July 26, 1963, in alpine grasslands bordering a belated snowbank on Bald Hills at about 7,300 feet. The animals are partially diurnal in habit; occasionally one may be glimpsed running about in full daylight. The great majority scamper here and there at random, without leaving any distinct trails as meadow voles do.
**Water Vole Arvicola richardsoni**

Subspecies: *Arvicola richardsoni richardsoni* (De Kay). External measurements (average of five males and females): 185, 55, 25.9 mm (range 175–230, 47–69, 25–27). Weight: 66.8 grams (52.1–113.9). The heaviest individual was a very large female with five foetuses averaging 8 mm in length.

**Status** — This vole ranks among the scarcer of the park mammals, having been taken by naturalists only at long intervals. Distribution is spotty and appears inconsistent, since the animals are not found in numerous attractive, apparently typical habitats. Locally, however, they may be reasonably numerous; in such situations they are grouped in isolated colonies, being plainly gregarious and very active by night.

**Habitat** — Acceptable environment is located mostly in the Hudsonian Zone and lower lands of the Arctic-Alpine Zone. The latter appears to be preferred. The dwelling-places are normally located on the wet borders of clear, cold brooks and tarns both immediately below and above timber line. Characteristic cover consists of mixed grasses and willows, sedges, and various heath plants of the alplands. The usual vertical range lies between about 6,000 and 7,800 feet.

**Reproduction** — Relatively little information has been gathered on the breeding habits of this vole in the park. Enough evidence exists, however, to show that the average size of a litter is five, with extremes of four and eight. Young are delivered at various times from June until late September. On July 26, Crowe (1943) secured a subadult (188, 54, 27.5 mm) that contained four embryos with a mean length of 5 mm. As he remarks, it “was still in juvenile pelage, indicating early sexual maturity in this species”. Half-grown young in the National Museum of Canada, taken in June and July, show that breeding starts fairly early in the season.

**General Remarks** — In 1826 Drummond discovered this species “near the foot of the Rocky Mountains”. Bailey (1900), after close study of Drummond’s movements, fixed the actual type locality at Jasper House, Alberta. Richardson (1829) mentions that this vole “frequents moist meadows amongst the mountains, and swims and dives well, taking at once to the water when pursued”.

Preble (1908) states that in October 1896 Loring procured eight specimens in areas lying about 10 and 25 miles west of Henry House, respectively. The next collector was Hollister, who on August 5 and 7, 1911, obtained five specimens near the summit of Moose Pass, Jasper Park. He says of richardsoni: “A small colony of the animals was found inhabiting the banks of a glacial stream which helps to form the Moose Pass branch of the Smoky, just below timberline, and close to 7,000 feet altitude.”

Apparently no others were found and collected in the park until Cowan took a series of five individuals in Tonquin Valley during the early part of July 1930; there the altitude varies from about 6,450 to 6,800 feet. In the summer of 1945 he took water voles high up on Emigrants Mountain northwest of Geikie. Many biologists have failed to find this rodent in Jasper Park. Once stumbled upon, however, there is no mistaking the conspicuous burrows and the network of broad, soggy runways. The mouths of the dens are noticeably large, and many of the well-travelled trails lead directly to water.

**Muskrat Ondatra zibethicus**

Subspecies: *Ondatra zibethicus spatulatus* (Osgood). External measurements (averages of a large series by Fuller (1951) outside Jasper Park): 567.7, 253, 75.2 mm (range 496–616, 195–282, 68–81); mean weight: 1,112.2 grams (750–1,575), or about 2.5 pounds. Females average between 7 and 10 per cent smaller than males.

**Status** — In the Canadian Rockies muskrats occur in very limited numbers and in rather restricted settings. It is not likely that they were ever really common, or ever will be within the higher ranges. Mountain waters are mostly too swift, frigid, and barren of plant food to meet their basic requirements. Moderate numbers inhabit ponds, lakes, and backwaters in the Athabasca Valley lowlands, but over most of the region the animals are extremely scarce, or nonexistent.

**Habitat** — The muskrat is a truly aquatic mammal, and consequently suitable waters are a prime necessity for its existence. It inhabits sloughs, ponds, lakes, sluggish back-channels of rivers, and the main streams themselves where aquatic vegetation exists in adequate quantities. In lowland ponds and lakes living conditions reach the ideal when food plants are abundant both in the water and on shore and when bulrush and cattail provide ample materials for building lodges. Along fast-moving streams muskrats usually have their dens in the banks, with the mouths of the wide burrows under water.
Figure 10 The muskrat is a lover of sluggish streams and lowland ponds and lakes well supplied with aquatic vegetation. Photo by Ed Cesar.

Reproduction — There appear to be no breeding data for park muskrats. East of the mountains, however, the animals are known to breed from late April until August, with a gestation period of about 30 days. Litter sizes run from four to nine, and two litters per season are not uncommon (Fuller, 1956). The young are born blind, naked, and helpless, except for suckling, but grow quite rapidly, as is characteristic of rodents. Individuals ranging from juveniles to subadults are numerous from July until early November and perhaps later.

General Remarks — Preble (1908) states that Loring collected a male at Henry House on September 6, 1895, and that he noted muskrats in the valleys and foothills between Jasper House and the Smoky River in the early autumn. Hollister (1912) says:

Muskrats live in most of the rivers and ponds throughout the lower country from Prairie Creek to Moose Lake, B.C. None were seen in the higher mountains and it is probable the species never ascends the rushing torrents far from the valleys of the Athabasca and Fraser Rivers . . . . At Henry House the animals were common in a pond near the Athabasca River.

Spreadborough collected a female near Jasper Station in the season of 1917 and stated that muskrats were "to be found in most of the ponds near Jasper" (Anderson, 1918). Cowan obtained five specimens at Talbot Lake in June and July 1930, and one each at Cabin Lake in June 1944 and at Decoigne in May 1946. Clarke noted the presence of muskrats on April 11, 1941, in a back-channel of the Athabasca at Miette. In the latter part of August 1955, Flook saw one at the mouth of a small stream entering Brazeau River two miles south of Isaac Creek.

With reference to occurrence in and near the Alberta Rockies, I (1947) remarked as follows:

Personal observations indicate that well within the mountains the animal is comparatively scarce. However, it does resort in small numbers to some of the ponds, lakes and streams at the lower altitudes, more or less throughout the region under review . . . . In the fall of 1913 it was rather common in lakes northwards from Entrance and adjacent to Wildhay River.

At Rocky Pass muskrats were extremely scarce in the autumn of 1922, but a few did exist in some deep sloughs of the mountain lowlands and in some placid ponds behind beaver dams.

From 1960 to 1963 I noted muskrats on several occasions in quiet backwaters of the Athabasca River between Fiddle Creek and Devonia and from Edna Lake and Snaring to about the mouth of Snaring River. Others were recorded at Talbot and Jasper Lakes and in some reedy ponds elsewhere in the Athabasca River lowlands.

Northern Bog Lemming Synaptomys borealis

Status — Usually one of the very rarest of park mammals. While the species has been taken in a few widely separated localities, for the most part one may search for it in vain. It appears that northern bog lemmings occur widely in limited "pockets" of colonization, while scores of other apparently typical habitats remain untenanted. Supporting this conclusion is the fact that in working 20 well-spaced areas in the park (over 6,000 trap-nights) I failed to capture a single individual. At times, however, they become common in some areas, as shown below.

Habitat — The species displays a distinct penchant for damp places. Characteristic habitats include black spruce – sphagnum muskegs; shrub and grass bogs; and soggy borders of lakes and
streams grown to grass, sedges, willows, and other vegetation. To a limited extent the animals also inhabit moorish alpine meadows with a cover of grasses, sedges, and dwarf shrubs. The range embraces the Canadian to the Arctic-Alpine Zones from valley lowlands up to about 7,500 feet.

Reproduction — Relatively little is known about the breeding habits of the mountain bog lemmings. What little has been ascertained indicates that the animals may breed irregularly from spring until well on in the summer. Litter size varies from two to seven, as is borne out by Alberta gravid females (Rand, 1948). The length of gestation is probably about 20 to 21 days, similar to that of some other microtines. Except on very rare occasions the species seems to have a low breeding capacity or rate of survival. Outside the park I have captured three-quarter-grown immatures at the end of July and similar ones as late as mid-September.

General Remarks — Most collectors have either failed to take this vole, or have experienced the slimmest of success. Evidently Loring failed to find it in 1895—96, and in 1911 Hollister obtained a few only on the high terrain of Moose Pass between 5,250 and 7,000 feet. Most were trapped in sphagnum—willow swamps bordering alpine meadows on both sides of the Continental Divide. Hollister says “Two half-grown young were caught on August 4th.”

On July 3, 1898, Spreadborough secured a specimen at Henry House, and in August 1918 he collected 10 more at Shovel Pass (6,600 feet). Cowan trapped one at Tonquin Valley (6,500 feet) on July 8, 1930, and in June 1945 he and his colleague J. Hatter collected four at Willow Creek. In June 1946 Cowan reported large numbers (in the nature of a plague, together with meadow voles) on the bottomlands and hillsides of Minaga Creek, at Elysium Pass, and northwest to Monarch Meadows and Barrett Pass — an astonishing development. During that period he took single specimens at Snaring River and Emigrants Mountain, four at Willow Creek, and a notable series of 20 specimens at Elysium Pass (6,600 feet). Banfield took two specimens in the latter locality on June 26, 1946, the year of the remarkable population eruption.

On October 1, 1922, I secured two specimens at Rocky Pass; both were frequenting a moist subalpine grassy meadow at about 6,500 feet, where the conifers were dwarfed and wind-distorted. Results were negative in bogs at lower elevations.

Family Zapodidae
Western Jumping Mouse Zapus princeps
Subspecies: Zapus princeps saltator J. A. Allen.
External measurements (average of 40 park adults, both sexes): 234, 143, 31.3 mm (range 222—257, 138—155, 31—33). Mean weight: 23.7 grams (19.5—29.7).

Status — At times these jumping mice are among the commoner small mammals of the park, but over the years there is a distinct fluctuation in numbers. In some years they were found to be common or fairly common in most study areas. My long-term average rate of capture was 1.79 per 100 trap-nights (.33—4.52). Out of a total of 20 work areas, 12 yielded no Zapus whatever. The most heavily populated area discovered was at Ranger Creek, where 20 specimens were taken in 420 trap-nights in late June, 1960. They were common in many localities that year and in 1961, but dwindled acutely in 1962, while only one was captured in 1963 — a dramatic population slump.

Habitat — This embraces several kinds of life-association precincts, varying from the heavy coniferous—deciduous forest of the lowest mountain valleys up to the grass and heather moors of the alplands. The normal range is therefore from the Canadian through the Hudsonian to the lower expanses of the Arctic-Alpine Zone; the vertical distribution is fully 4,000 feet. The choicer habitats consist of fairly well-drained ground supporting grasses, vascular plants, trees, and shrubbery in the immediate vicinity of lakes, streams, and watery muskegs. A few jumping mice inhabit rather wet boggy tracts. The drier the general environment becomes and the farther it is from water, the smaller is the jumping mouse population.

Reproduction — In this latitude a female probably undergoes but one pregnancy a year. Mating of separate couples seems to be spread over many weeks from some time in May until July and perhaps early August. The usual number of young to a litter is five (Hall and Kelson, II, 1959) and may vary from four to eight (Rand, 1948). As yet few data are available from Jasper Park. On June 22 and 24, 1961, I trapped two pregnant females at Shale Banks; one carried five embryos 11 mm long, and the other six with a mean length of 4 mm. Evidently most young are born in late June and the early half of July. I found at least two distinct age groups existing simultaneously. Juveniles about one-half to two-thirds grown (10—15 grams) were caught in late July and early
August, while others about one-third grown were trapped at Fiddle Creek on August 15. Along the Whirlpool at the end of August immatures ranged in weight from 15 to 18 grams and thus approached three-quarters of adult size.

**General Remarks** — Loring appears to have been the first to collect specimens of this western race. Preble (1908) says:

J. Alden Loring took two individuals of this species a few miles west of Henry House, Alberta, September 6, 1895. In 1896 he took several near his camp in the mountains 15 miles south of Henry House. They were trapped in shrubby willows beside a small stream near timberline.

Three years later, on March 4, Allen (Anderson, 1947) described them under the name *Zapus saltator*; and on August 8 of the same year Preble (1899) published his revision of the jumping mice, listing the species as *Zapus princeps* and mentioning the specimens taken by Loring.

On the expedition of 1911 Hollister (1912) had good success, taking 20 specimens in the region. With reference to these he wrote:

At Henry House a single animal was trapped in the lower hills near a small stream . . . six in a wet meadow at Moose Pass; and six in the high alps near the head of Smoky River, Alberta. Aside from *Microtus mordax* (=*M. longicaudus*) we found the jumping mouse the most common mouse of the open meadow country above timberline.

It would appear that jumping mice were remarkably scarce in 1917 (as in 1963), since the veteran collector Spreadborough failed to get a single specimen.

On the contrary, it is obvious that 1930 was a good year, at least locally, as in June and July Cowan obtained 16 specimens in the three localities of Jasper, Snaring River, and Tonquin Valley. On August 12, 1939, Anderson collected one at Willow Creek. It seems significant that neither Rand in 1945, nor Banfield in the next couple of seasons, captured any jumping mice. On June 12, 1952, Lister and Moore took a single specimen at Cabin Lake.

I had good success with jumping mice during the summer of 1960 and 1961, when I preserved about 40 specimens; these were collected at Snaring, at Derr, Ranger, and Fiddle Creeks, at the Whirlpool River, at Shale Banks, and at Celestine Lake. There is a marked difference in weight between the animals taken in spring and those taken in late summer and autumn; in spring they are lean, whereas by the first week of August many become very fat in preparation for winter hibernation. The increase above average weight in August and early September may run from 20 to 30 per cent.

The time of winter hibernation is not known exactly, but it probably begins some time between September 10 and 20. For the most part jumping mice are nocturnal in habit. Some bolder individuals, however, venture out during the day; most of these sally forth from their dens in the early evening before sundown. They travel apparently aimlessly through the woods and thickets without making any trails, although sometimes they are caught in the runways of meadow and water voles.

**Family Erethizontidae**

**Porcupine* Erethizon dorsatum**

Subspecies: *Erethizon dorsatum nigrescens* J. A. Allen. External measurements (as given by Rand, 1948): 802, 240, 116 mm; (as given by Cowan for a Jasper male) 780, 230, 112 mm; weight 18 pounds. Very large old adults may go to 830, 285, 110 mm, and weigh at least 20 to 25 pounds (Soper, 1964).

**Status** — According to earlier accounts from this region, porcupines were markedly more numerous 50 or 60 years ago than at the present time. Several investigators referred to them as common or rather common, terms that have not applied to the animal in recent years. I saw none in the park during the summers of 1960, 1961, and 1962, and only one in 1963. The wardens report occasional porcupines in various parts of the park.

**Habitat** — Porcupines are widely distributed and may resort to practically all types of environment from the low timbered valleys to the Arctic-Alpine. In some districts, at least, greater preference seems to be shown for high-altitude woods in the Hudsonian Zone and subalpine tracts than for more densely forested country at lower levels. Sometimes the animals slowly roam about in the alplands, where they evidently feed on dwarf willows and various heath plants. On occasion an individual may wander to a surprising height above tree line; Crowe (1943) reported one seen at an altitude of 9,000 feet. Girdled trees are rarely observed.

**Reproduction** — The species appears to mate in late autumn or early winter, and to drop its progeny the following May or June after a gestation period of approximately seven months (205–217 days) (Shadle, 1951). There is one litter a year, usually consisting of only one young, twins
being rather rare. The youngsters are roughly half-grown by mid or late autumn and require many more weeks to reach maturity.

**General Remarks** — Early in the century the porcupines of the Canadian Rockies were regarded as distinct under the specific name *E. epixanthus*. In 1943, however, Anderson and Rand established subspecific relationship with the *E. dorsatum* group, thus leading to the current terminology. These animals are distinctly duskier in pelage than races to the east and north, while the light tips of the guard hairs are orange yellow rather than the rusty yellow tint of typical *E. epixanthum*. The dusky mountain race occupies the whole length of the Alberta Rockies south to Waterton Lakes National Park.

With reference to porcupines in the Jasper National Park territory, Preble (1908) remarks:

> While collecting in the Jasper House region in 1895 and 1896, J. Alden Loring found this species rather common. In 1895 he took one at Jasper House on September 14, and later in the autumn saw many tracks and several of the animals in 'Rodent Valley' about 25 miles west of Henry House. In 1896 he saw one in the mountains 15 miles south of Henry House in July, found the species common in high mountains in early autumn and saw one in slide rock in 'Rodent Valley' in October.

During the summer of 1911 Hollister (1912) found porcupines "common inhabitants of the mountains" and took a number of specimens, including some from Moose Pass. He says "The porcupines are, apparently, favorite food animals of the Indians, for we found the long bones and broken skulls around all the deserted camps . . . . the porcupine is much persecuted, and usually killed at sight by the packers in these mountains."

Anderson (1918) quotes Spreadborough as saying in 1917: "Fairly common near Jasper, living in rock slides and caves. One evening one walked right into camp and I killed it with a club." Cowan collected a specimen at Jacques Pass on June 23, 1930, and another at Jasper on May 3, 1945. Three years later Donald Carter obtained three study skins just outside the park near Entrance, which were referred by Crowe (1943) to *E.d. nigrescens*. The summary of wardens' observations, in 1961–62, indicates that porcupines occur in only two districts — those of Willow Creek and Sunwapta (Table 3). Of late years, at least, the animals appear to have become very scarce. I saw none during the summers of 1960 to 1962 and only one in 1963.

**Order Carnivora**

**Family Canidae**

**Coyote Canis latrans**


*Status* — Coyotes appear to be generally distributed over the region at large and in some localities are fairly common. They are infrequently sighted, however, but spoors in dusty trails or in muddy places afford some reliable concept of their numbers. Several zoologists have considered them fairly numerous, and others, who saw little of them or of their tracks, have regarded them as scarce. From all accounts coyotes are rather erratically dispersed. I found more evidence of them in Athabasca Valley north of Henry House than elsewhere in the park. A number of tracks were also seen up the Rocky River.
Habitat — For the most part they live in the bottomlands of the major cordilleran trenches and tributary valleys in the Canadian Zone. Environmental features are mixedwood forest, lowland meadows, grassy benches, and woodland glades. In some tracts poplars predominate, with shrub thickets, while other extensive areas carry unmixed stands of conifers. Part of the coyote population roams upward into the Hudsonian Zone, and some individuals even hunt for voles and ground squirrels in the alps above timber line.

Reproduction — Coyotes mate in late February and early March, and after a gestation period of around 62 days (Rand, 1948) the whelps are born in late April and early May. Litter size is usually five to seven, but occasionally somewhat larger. The pups are blind for about 10 days. When about six weeks old they leave the den at intervals to frolic above ground. By the latter part of July, or perhaps early August, they are about half grown. Then well into the autumn, or by early winter, they finally reach adult stature and are able to hunt with well-learned skill.

General Remarks — Specimens from at least the northern and central parts of the park are referable to C. l. incolatus as treated by Jackson (Young and Jackson, 1951). This conclusion is founded on skins taken at Jasper House and at Buffalo Prairie (Prairie de la Vache), 15 miles south of Henry House. Examples from the extreme southern part of Jasper Park may well show signs of intergradation with the mountain coyote, C. l. lestes.

In 1895 Loring found coyotes abundant in the Rocky Mountain foothills of the Entrance district, and on August 30 he shot one near Jasper House; Preble (1908) then goes on to say:

In July, 1896, he occasionally heard coyotes in the mountains 15 miles south of Henry House, but the animal was less abundant there than in the foothills to the eastward. ... In October of the same year he saw coyote tracks in Caribou Basin and Rodent Valley west of Henry House.

It is clear from these statements that coyotes occurred only in moderate numbers within the mountains, but were common to the east of them.

Hollister (1912) has little to say about these animals and leaves the impression that they had been much more plentiful in earlier years than in 1911. He says:

Mr. Swift told me that he killed thirty-eight coyotes between Henry House and 'The Cache' during one winter, some eight or ten years ago. The single immature specimen collected by our party was shot by Blagden at Buffalo Prairie about 15 miles south of Henry House, September 2nd.

During long trips in the park by car, horse, and foot, Anderson (1938a) saw very little evidence of coyotes. He mentions that the wardens said that they were more common in the eastern section around Miette and Pocahontas than elsewhere. During his long trip in northern Jasper Park in August 1939, Anderson recorded the animals as scarce from the lower Snake Indian River to Willow Creek and westward to Twintree Lake and Adolphus Lake.

In March and April 1941, Clarke (1942) rated coyotes as fairly common locally in both northern and southern sectors; some were mangy, and one far advanced with this disease was shot by Warden Frank Wells on March 4 at Maligne Canyon. In the years 1942 to 1946 Cowan and Hatter secured six complete specimens at Jasper, Devon, Willow Creek, Miette Station, Brazeau Lake, and Cairn Pass. During the 1955 season, Flook (1956) found coyotes much scarcer in the southern parts of Jasper Park than had been reported by Cowan in 1943 or Fisher in 1948.

My own observations of coyotes were very limited in 1960 and 1961, partly because of the type of working locations, but probably also because their numbers were relatively low. In any event their numbers seemed to have risen by 1962. That summer there was a fair sprinkling of the animals throughout the Athabasca Valley from Fiddle Creek to the west and south, where nightly yodelling was a familiar event. Spoors were frequently noted along the Athabasca River, north and south of the Astoria River, and in the general neighbourhood of Princess and Celestine Lakes.

The season of 1963 was also fruitful, coyotes being sighted on several occasions. I saw their tracks frequently in the Roche Miette area, up the Maligne River to Medicine and Maligne Lakes, and along the trail to Beaver Lake. Around camp at the easterly end of Medicine Lake coyotes were heard repeatedly at their weird vocal exercises during late evening and into the night. Warden George Wells stated that occasional individuals travelled up to the alplands west and northwest of Maligne Lake to altitudes above 7,000 feet.

Table 3 shows a fair population of coyotes in several districts during 1961–62, notably those of Pocahontas and Snaring, with a moderate showing in the Miette, Willow Creek, Sunwapta, and Brazeau patrol areas.
Gray Wolf *Canis lupus*
Subspecies: *Canis lupus columbianus* Goldman. External measurements: Fuller (1955) gives the mean of 44 males and females from Wood Buffalo Park as 1,606, 431, 297 mm; average weight 91.8 pounds (70-116). Two males and a female taken by Cowan (pers. comm.) in Jasper Park averaged 1,739, 475, 294 mm; the larger male weighed 120 pounds. Some park specimens bear a close resemblance to *C.l. occidentalis*.

**Status** — A fair number of these predators inhabit the park. They periodically visit various districts throughout the territory. From time to time they are to be seen in their travels hunting alone or in pairs or small bands. The latter normally comprise members of a family. Sometimes members of two or three family groups gang up to form sociable packs of from 10 to 15 or more individuals. Wolves may be moderately familiar residents in some favourite tracts of country, of casual occurrence in others, and seldom if ever seen in some very extensive areas. From all accounts it is probable that no more than four or five dozen inhabit the entire sweep of Jasper Park. With a total area of 4,200 square miles, this would mean an average of no more than one wolf to 80 square miles of wilderness.

**Habitat** — Wolves resort to all types of environment in the Rockies, from the dense primeval forests of the lower valleys up to the wind-swept moorlands above timber line. These highlands, however, are visited far less often than the more hospitable woods and grasslands of the Canadian Zone. Habitual hunting territory extends only a couple of thousand feet above the lowest valleys, but the vertical range extends casually up to about 8,000 feet.

**Reproduction** — Wolves begin to breed when approximately two years old. Mating takes place at various times from late February through March, and perhaps into April. Since the period of gestation lasts from 60 to 63 days (Young and Goldman, 1944) young may be born at almost any time in April and May. Litter size varies from four to eight or more, six being about average. Wolves are well grown in about 18 months, and the males are fully matured in three years. Cowan (1947) mentions that during wolf studies in the early 1940's pups were located at Decoigne, Buffalo Prairie, Honeymoon Lake, and Blue Creek. He says “A female pup dug out of its den by Warden C. Page and examined by me on July 10, 1946, weighed 19 lbs. In September 1944, Warden White of Decoigne took a male pup weighing 70 lbs., including a full stomach of elk meat.”

**General Remarks** — According to Anderson (1947) and Hall and Kelson (1959), the Jasper Park wolves (*C.l. columbianus*) gradually grade into *occidentalis* in the northern part of the park. The records of earlier explorers indicate that even 100 or more years ago wolves were by no means overly plentiful, but there can be no doubt that variable numbers have haunted the region far back into antiquity. Their scarcity within historical times has doubtless been partly the result of waxing and waning of numbers in some sort of cyclic fluctuation.

Banfield (1958) mentions that in January 1859 Dr. Hector saw four carcasses of poisoned wolves at Jasper House, and Palliser (1860) stated that fur traders in the Athabasca Valley, within present-day Jasper Park, were killing timber wolves with strychnine. When Loring worked through the region in the autumn of 1896 wolves were uncommon, but occasionally he saw their tracks in the wilderness between Jasper House and Smoky River. The natives told him that they were large, and often black. The regional dearth of wolves at that time may well have been the result of the earlier poisoning campaign by trappers and fur traders.

Hollister (1911) reported: “The big wolves have been rather rare in this region as far back as the residents can remember. Mr. Swift told me that during his seventeen years residence in the vicinity of Henry House he had only killed two.” One of these was white with a grayish streak down the back and the other was very dark-coloured.

During my sojourn near the headwaters of the Wildhay River in the autumn and early winter of 1913, wolves were notably scarce; spoors were rarely observed. (They were also scarce at Rocky Pass in September and October, 1922.) After a long period of scarcity they became somewhat more numerous in the park by 1917, with a further moderate increase the following year. The population then remained more or less static for a considerable time.

By 1941 wolves were well represented in the park and were regularly reported by the wardens. In March and April of that year Clarke (1942) made extensive snowshoe trips in both southern and northern districts and frequently saw wolf tracks, especially between March 13 and April 4 at the Southesk River, Isaac Creek, the Poboktan
River, and Blue Creek. Park wardens were then of the opinion that wolves were again on the increase.

Referring to the middle 1940's, Cowan (1947) says:

In Jasper Park, at the present time, wolves are present during all seasons of the year along the Miette River from Yellowhead Pass eastward along the Athabasca from the junction of the Sunwapta to the confluence of the Moosehorn and the Athabasca near the northern edge of the eastern boundary. From Honeymoon Lake to Snaring the wolves range on both sides of the river, but below Snaring they are almost confined to the country north and west of the Athabasca.

Wolves occur up Whirlpool River during all seasons as they do also along the Brazeau and the lower reaches of the Snaring River and the Snake Indian River below Willow Creek. Summer range from which the wolves migrate during periods of deep, loose snow in the winter months, includes the upper Snake Indian, Topaz Creek, Moose River and the valley of Smoky River. There are extensive areas yet without a wolf population.

It appears that wolves became scarcer again in the late forties, but recovered in some degree in the next few years. Flook (1956) stated that his survey of 1955 "indicated that wolves in the southeast part of the park had increased since 1953."

Wolves are great travellers, and one would imagine that in time they would penetrate to every part of a region. When hunting they often make a run of 15 to 20 miles, and undoubtedly much farther when game is scarce. Some hunting circuits are known to have been 60 to 70 miles in length. Banfield (1953c) tells of a tagged wolf that is known to have trekked along the eastern flank of the Rockies for at least 162 miles.

These Rocky Mountain wolves are among the largest North American forms of the species, and are subject to extreme variation in colour from nearly white to virtually black; the majority have the normal blackish to gray and creamy-white pelage that one associates with timber wolves. Cowan (1947) states that a male shot at Miette on May 10, 1944, weighed 140 pounds with a full paunch. Another large male shot by Warden Frank Wells at Buffalo Prairie, and weighed by him in the presence of several witnesses, tipped the scales at 172 pounds; this extraordinary weight was partly the result of recent gorging on elk meat.

**Red Fox Vulpes vulpes**

Subspecies: *Vulpes vulpes abietorum* Merriam. External measurements: the combined mean of the species as derived from Rand (1948), Hall and Kelson (1959), and Soper (1964) comes to 1,046, 410, 178 mm. A male taken by Cowan at Moberly Flats, Jasper Park, measured 1,070, 425, 170 mm. The usual weight is 8 to 10 pounds but some old males reach as much as 12 to 15 pounds (Seton I, 1925).

**Status** — Red foxes are moderately common and widely distributed, being perhaps rather less numerous than coyotes. In summer their abundance can be only roughly determined by random sightings and by their tracks on dusty trails and on river and lake margins and sandbars; in winter and early spring it can be more easily judged from their conspicuous spoors in the snow. Owing to natural shyness, cunning, and stealth, they are rather seldom observed.

**Habitat** — In this mountain setting the normal environment of the species is essentially the same as that of coyotes. By and large, however, foxes are more inclined to roam the country at the lower elevations, within the Canadian Zone, but they are not confined to it. In summer they like the seclusion of good forests and thickets, but in colder months, and particularly when the mating instinct is rampant in March, they travel widely over frozen streams, lakes, muskegs, and wind-swept grasslands. Their tracks are more in evidence then than at any other season.

**Reproduction** — The mating season unfolds in the crisp, blustery days of early spring, when the animals are very active. The gestation period is approximately 52 days (Rand, 1948), and the litter of from four to nine pups is born in the latter part of April or in May. The youngsters are blind for about 10 days and remain in the underground nest for at least a month, after which they indulge in play periods above ground. They are weaned at about three months.

**General Remarks** — Evidently Loring learned little about red foxes in 1895-96, so it may be deduced that they were then scarce. Hollister (1912) also appears to have run into a period of low numbers during 1911, for he learned little about the animals and that chiefly through the statements of resident pioneers. He says: "Trappers reported foxes rather scarce throughout the mountains, though regularly present in most localities. Mr. Swift told me that the species was formerly much more abundant, and that the 'cross' and 'silver-grey' phases of pelage were more commonly observed than the red." That was certainly not true of the fox population I observed at the upper Wildhay River, only 35...
miles north of the Swift ranch, in the autumn and early winter of 1913.

I (1947) found red foxes numerous throughout the Wildhay country in 1913. Several were shot and trapped. Before the onset of winter their fresh tracks were seen daily on horse and game trails; after that they were scattered widely through forest and grassland of valley lowlands and ridges and in the snow of frozen rivers and lakes. It was a fairly regular experience to hear their high-pitched yippy barking after sunset. I heard one once in a vocal outburst during mid-afternoon.

In the autumn of 1922 foxes were extremely scarce at Rocky Pass; in fact, in several weeks' residence there I (1923) found no signs of their presence. That was just six years after they were abundant in Banff Park (Banfield, 1958). The National Museum of Canada has a skin and skull of a red fox taken by the Warden Service in 1927 at Whirlpool River. During the summer of 1941 Clarke (1942) saw tracks in two places near Jasper and rated the animals as generally uncommon. Cowan took a male at Moberly Flats on May 9, 1946. Evidently foxes were very scarce in 1955, as Flook (1956) does not mention them.

So far as I could ascertain, foxes continued to be uncommon in the park from 1960 to 1963; I saw only two during those summers and rarely observed their tracks. Only five were seen by the wardens in 1961-62, all in the Jasper townsite district (Table 3).

Family Ursidae

Black Bear *Ursus americanus*

Subspecies: *Ursus americanus cinnamomum* (Aud. and Bach.). External measurements (as given by Seton (II, 1926) for a fair-sized fat female): 1,613, 127, 184 mm; weight of adult males 300 to 512 pounds.

Status — These bears are fairly well represented and are, indeed, common in some parts of the park; the total population in the park may well amount to several hundreds. While their over-all distribution is wide it is also irregular and uncertain. Black bears are unquestionably scarce in some remote parts of the mountains, while in some sections of Athabasca Valley, such as around Jasper townsite and at a number of camp grounds, bears may be anything from casual wanderers to regular residents.

Habitat — Black bears find ideal quarters in the splendid mixedwood forests of the Canadian Zone from about 3,250 up to about 5,000 feet in altitude. Most of them seem to favour the valleys of the Athabasca River and such major tributaries as the Rocky, Snake Indian, Miette, and Whirlpool Rivers. These valleys provide excellent cover in the form of conifers, poplars, and undergrowth, and usually an abundance of seasonal foods such as berries and rodents. On the whole black bears habitually dwell at lower altitudes than do grizzlies, although some of the former occasionally go above the timber line.

Reproduction — As a rule, mating takes place during late June or early July (Seton, II, 1926). The period of gestation approximates 7.5 months. A litter usually comprises one or two progeny, but older, well-developed females may on rare occasions have as many as four or five (Rowan, 1945). The cubs are born in the winter den during late January or February. They are astonishingly tiny, weighing no more than about 8 or 10 ounces at birth. By springtime, when the youngsters first leave the den, they weigh about five or six pounds, and when a year old they weigh from 60 to 100 pounds. A fair percentage of cubs and adults are cinnamon coloured; both black and brown cubs may occur in the same litter, the latter sometimes being in the majority.

General Remarks — Bears of all kinds furnish perennially interesting topics of conversation, especially among hunters, trappers, and naturalists. Mention of them is often found in the narratives of the early explorers and zoologists. Loring appears to have been the first professional to deal seriously with bears in what is now Jasper Park. Preble (1908) writes as follows:

While in the Jasper House region in the summers of 1895 and 1896 J. Alden Loring found these animals rather common and secured several specimens. On one occasion in 1895, near Henry House, a female 'cinnamon' bear and her two cubs were observed in a tall dead tree. One of the cubs was black, while the other resembled the mother in color . . . . The stomachs of all were filled with blueberries (Vaccinium). Another adult, in the black phase, was killed at Jasper House during the same summer. In 1896, while in that region, Loring saw many tracks of black bears at various points in the mountains and foothills.

In the summer of 1911 Ned Hollister (1912) found that these bears were "generally distributed throughout the wooded parts of the region", and remarked further:

Its regular range is somewhat lower than that of the grizzly, and it is most abundant along the valleys of the Athabasca, Miette and Frazer. Though here really common, it is, owing to its wary habits and exceedingly sly nature, but seldom seen. We saw plenty of tracks
of the black bears in all the lower river bottoms. . . .

Mr. Swift reported the species as regularly present in the vicinity [of Henry House].

In September and October 1913 I saw many signs and several individuals near the headwaters of the Wildhay River. They were also moderately common near Rocky Pass during the autumn of 1922 (Soper, 1947). In late July 1930 Cowan found black bears well represented along Snaring River, and collected two specimens. During the summer of 1938 Anderson reported the animals as common to abundant in the main valley of the Athabasca, especially around Jasper and the chief garbage dump, but saw little evidence of them in the northern reaches of the park.

Clarke (1942) says "In much of Jasper Park, particularly in the southeast, they are observed less often than grizzlies", while Cowan (1943) says that he saw signs in all parts of the park visited by him but that "black bears were not numerous outside the Athabasca Valley". During the summer of 1955 Flook (1956) appraised the black bear population as widely, but very thinly, dispersed throughout the southeastern part of the park. The animals appear to be scarcer in rugged, high country than in the bottomlands of the major valleys and near garbage dumps and camp-sites.

In the summer of 1960 I encountered several black bears in the Athabasca Valley and along the Snaring, Rocky, Whirlpool, and Sunwapta Rivers. Two were brown and all the rest black. A few scattered tracks and relatively fresh excrement were also noted at the Miette River, at Derr Creek, and at Honeymoon Lake.

During 1961 I saw scarcely anything of the species. Results were negative in the main study areas at Shale Banks, Snake Indian River, Signal Mountain, and Sunwapta Pass. The following summer was little better, but a cub and several spoors were seen at Fiddle Creek and also a few signs at the Astoria River. Warden Burt Rowe said that a few inhabited the forest around Celestine and Princess Lakes. In 1961–62 the wardens sighted at least a few individuals in most districts, with the largest numbers in the Jasper town area and at Athabasca Falls (Table 3).

Of the several widely scattered localities investigated in 1963, none yielded any positive evidence of black bears except for a few well-defined tracks and droppings in the Roche Miette country and at the east end of Medicine Lake. Warden George Wells mentioned occasional sightings at and around Maligne Lake, but I saw none there.

**Grizzly Bear Ursus arctos**

Forms: Several are recorded by Anderson (1947) for the Jasper Park region (as mentioned hereafter) based on Merriam’s revision of 1918. External measurements: Rand (1948) gives the following figures for a female taken in British Columbia — 2,234, 72, 201 mm. Seton (II, 1926) lists total length of grizzlies as ranging from about 1,910 to 2,245 mm and records ordinary weights of 353 to 730 pounds; also those of very large grizzlies as reaching 916 to 1,100 pounds.

Status — Grizzlies are among the most characteristic members of the Rocky Mountain fauna. The casual visitor may rarely sight one in the more familiar surroundings of the valleys, but they are really not uncommon, especially in some localities at the higher altitudes.

Habitat — Grizzlies are regular inhabitants of the alpine tundras, although some are given to sporadic wanderings at lower levels. During the height of summer, in particular, scores haunt the rolling alplands from one end of the park to the other, hunting for food in the form of roots, berries, voles, ground squirrels, marmots, and sometimes larger game. Some descend into the valleys during post-hibernation weeks and seek food in garbage dumps near mountain towns and resorts. The total vertical range approximates 5,000 feet.

Reproduction — Apparently grizzlies mate every two or three years, in late June and early July. Gestation lasts between six and seven months (Asdell, 1946), with an average of perhaps 190 days. The offspring arrive in December to January in the deep gloom of the winter den and suckle for the remainder of the winter. The number of young to a birth is one or two, very rarely three (Rowan, 1945).

Like black bear cubs, grizzly cubs at birth are amazingly small in relation to the mother’s bulk, weighing only 20 to 25 ounces. They come furnished with fine short gray hair and remain blind for about 10 days. After leaving the den in the spring they romp and generally clown around during many hours of the day. They grow rapidly and soon learn to catch some food for themselves, such as insects, mice, and voles.

General Remarks — The classification of park grizzlies is rather confusing and needs more detailed study and revision. As Rausch (1953) remarks: "The difficulty stems directly from the work of Merriam (1918) who concluded that there are 86 forms of grizzlies (and brown bears)
in North America.” Anderson’s (1947) listings, based on the Merriam classification, suggest that four distinct (?) forms of grizzlies regularly inhabit or casually visit the Rocky Mountains of Jasper Park; the indicated geographic ranges of several of these actually overlap. On the face of it this seems most unlikely.

The type locality of one of these forms, *U. latifrons* Merriam, is Jasper House; the other listed forms are *U. horribilis dusorgus* Merriam, *U. canadensis rungiusi* Merriam, and *U. hylostromus* (Elliot). The type locality of *U.c. rungiusi* is given as the headwaters of the Athabasca River near the Columbia Ice-field (Anderson, 1947). It seems probable that the described physical differences of these animals are merely individual variations of skulls and pelage not warranting differentiation into species and subspecies.

Hollister (1912) remark: “. . . the relationships of many of the named kinds probably never will be understood fully, at least for those kinds which formerly occurred in those parts of the United States [and Canada] where the grizzly now is extinct.”

Preble (1908) writes: “In the summer of 1895 J. Alden Loring found grizzly bears to be rather common in the mountains of the Jasper House region, where three were killed by the party. These had been feeding on berries (*Vaccinium*). In many instances the animals had been digging for roots and spermophiles or overturning rotten logs in search of insects. In 1896 he found traces of the animals in Rodent Valley, and ascertained the fact of their occurrence in the higher parts of the mountains between Jasper House and Smoky River.” In 1898 McEvoy (1900) reported the species plentiful along the route to Yellowstone Pass.

Like Loring and McEvoy, Hollister (1912) found grizzlies still common throughout the region and remarked:

In general it ranges higher than the black bear, and during the summer months frequents the rocky tops and open snowy alpavds rather than the wooded valleys and slopes. Members of our party noted tracks of large grizzlies in many places. The animals appeared from the abundant ‘sign’ to be not uncommon in the higher mountains above our Moose River camps, and also about Moose Pass and the head of Smoky River. The bears are shy creatures, rarely seen, and are probably the most difficult of all the big game animals of the region to secure.

Spreadborough (1919) stated that during the previous two summers of collecting in Jasper Park he failed to detect a single grizzly, suggesting a decrease in numbers since 1911.

Anderson (1938a) reported grizzlies more common here than in the two National Parks to the south, and further remarked:

Occasional grizzlies visit some of the garbage dumps near Jasper, but traces of grizzly are seldom seen except on the higher ridges and trails in the more remote sections of the park. The writer did not hear of grizzly bears causing serious annoyance to persons on the regular trails or camps, but the case of the late Warden Goodair, who was killed in Tonquin Valley in 1929, presumably because he inadvertently stepped between a resting grizzly and her cubs.

In August 1939, Anderson noted the presence of grizzlies at or near Willow Creek, upper Blue Creek, Indigo Lake, Byng Pass, Twintree Lake, and the upper Smoky River.

Clarke (1942) stated that these bears were well distributed in Jasper Park, and that the territory could be regarded as fully stocked. At Shale Banks he saw a relatively fresh track, the first spoor of the season, on April 6, 1941. In 1943 Cowan saw abundant grizzly sign from Jonas Pass to Brazeau Basin, and again from Cairn Cabin down the Medicine-tent and Rocky Rivers. He also saw tracks between Jacques and Medicine Lakes, at Shale Banks, up the Blue River, and near Adolphus Lake.

Apparently grizzly status was much the same when Cowan visited the northern and southeastern sections of the park in 1944, for he remarked that grizzly tracks were noted on almost all the trails we travelled, but the bears themselves were seen with such infrequency as to make each such occasion a memorable one. In the two years during which some 1500 miles of trail was travelled just 6 grizzlies were seen by myself and two others by other members of the party.

On June 6, 1946, Cowan secured a skin and skull at Medicine Lake. In the spring of 1951 Banfield collected a specimen near Devona for the National Museum of Canada.

Flook (1956) states that tracks and other signs of grizzlies were well distributed in southeastern Jasper Park in 1955, but that the animals were not actually common. Most of his records were obtained at or near the Southesk, Cairn, Rocky, and Medicine-tent Rivers and Summit Lake.

During the autumn of 1922 I learned that a number of grizzlies frequented the Rocky Pass locality at the eastern boundary of Jasper Park. None was actually sighted, but various signs above timber line were unmistakable. In the summers of 1960 to 1963 the wardens reported grizzlies as
common to fairly common more or less throughout the park. On May 28, 1960, I saw a female and a cub on the southern shoulder of Esplanade Mountain, and others were reported on the De Smet and Victoria Cross Ranges. Warden Norman Young stated that during part of the early summer of 1959 16 grizzlies were resorting to a garbage dump east of Jasper Park Lodge.

In 1961 two grizzlies were noted southeast of Signal Mountain between Amber Mountain and Shovel Pass. On September 23, 1961, J. H. Atkinson collected one for the University of Alberta at the Snake Indian River. Table 3 shows that wardens sighted grizzlies in most patrol areas in 1961–62, most frequently in the districts of Jasper townsite, Pocahontas, and Sunwapta.

In 1963 I learned that grizzlies had descended from the more elevated habitats into various parts of Athabasca Valley, including The Palisades, Snaring, and the Roche Miette country, as well as the Snake Indian River, Willow Creek and other areas. Warden Max Elder was treed by a grizzly while clearing trail near Willow Creek in early May 1963. The same action has been forced upon Chief Warden McGuire and other officers while on wilderness patrols and other routine work. In nearly all such episodes cubs were apparently involved.

Family Mustelidae

Marten Martes americana

Subspecies: Martes americana abietinoides Gray.

External measurements: the combined averages of males as presented by Rand (1948) and Hall and Kelson (1959) are 616, 197, 88 mm. The mean of two males taken by Cowan and Hatter at Brazeau Lake and Willow Creek, Jasper Park, was 603, 180, 95 mm. According to Hall and Kelson male weights range up to 2.75 pounds. Females are appreciably smaller.

Status — These fur-bearers are well represented in the park. Distribution, however, is spotty: in some areas few, if any, exist, whereas in others the animals verge on abundance, usually in remote tracts far from any human activity. In earlier times trappers almost exterminated martens in the area, but since Jasper Park was established in 1907 the population has been largely restored.

Habitat — For the most part martens inhabit the cordilleran Canadian Zone with its rich forest of spruce, fir, pine, poplar, and undergrowth. Some also live in the better "pockets" of coniferous growth in the Hudsonian Zone well up toward timber line. In Jasper Park the over-all vertical range covers 3,400 to 4,000 feet. A high percentage of good coniferous cover is a basic requirement at all elevations.

Reproduction — The home den is often a hollow tree or log, or sometimes an excavation at the roots of a tree or on a brushy wooded slope. Much has still to be learned about breeding habits. According to Asdell (1946), it appears that copulation occurs in late July and August and that the progeny are delivered about 220 to 230 days later — that is, in March or April. Litters usually number three or four. The youngsters suckle for five or six weeks, after which they can partially sustain themselves on more solid food such as mice and voles.

General Remarks — In the early fur trade no fur bearer was sought after more persistently than the North American marten. Its rich and lustrous fur offered lucrative rewards to professional trappers, both white and Indian. As a result martens were extirpated in many parts of the continent.

By the end of the nineteenth century the species was in serious decline in most places except remote tracts difficult of access. Thus Loring could report in 1895 and 1896 that they were still rather common among the mountains of western Alberta, as he frequently saw their tracks in freshly fallen snow; that may have been at a peak period in their cycle of abundance. He trapped a male that measured 589, 155, 82 mm near Henry House on September 26, 1895.

Hollister (1912) reached the region too late to find martens in anything like maximum numbers. As he says,

This valuable fur-bearing animal was formerly very common in all the forested parts of these mountains, and it is still present in sufficient numbers to merit the attention of trappers. Many are taken each winter, but, from all I could learn, the catch has lately fallen far below that of olden times... Martens were reported as fairly common at Yellowhead Lake and at Henry House.

During the autumn and early winter of 1913 I saw scattered marten signs in heavy spruce forest along the upper reaches of the Wildhay River. An Indian hunter I met near Moberly Creek in late November had a dozen marten pelts taken "near the river's source" — presumably around and above Rock Lake. They may have represented a population overflow from neighbouring Jasper Park. The National Museum in Ottawa has four males and three females collected at Swiftwater Creek in March 1930 and a male taken by Warden E. McDonald on December 2, 1931.
On June 19, 1930, Cowan obtained a specimen at Merlin Pass (6,000 feet) near the Jacques Range, where they were then apparently quite scarce. In May and July of 1944 he collected two specimens at Willow Creek and Brazeau Lake, respectively. In 1938 Anderson believed the marten situation to be gratifying, as the animals appeared to be at least fairly common in many districts. He added:

...Since the problem [of trapping by Indians] does not enter into this park, the marten should have a good chance to perpetuate themselves, and as they range widely should ultimately supply a reservoir for western Alberta trappers. The opinion of most persons conversant with the facts is that if the marten did not have a sanctuary in the parks, there would be few, if any, Alberta martens.

During March and April 1941 Clarke (1942) saw many signs of marten in Jasper Park and concluded that they were moderately common in favourable habitats. Two years later Cowan (1943) remarked that the animals were not abundant in the southeastern part of the territory, but "on the streams tributary to the Snake Indian from the north this fur-bearer was apparently present in larger numbers". On September 6 and 8, 1945, Rand collected three specimens at Maligne Canyon for the National Museum, in Ottawa.

In the autumn of 1922 I ascertained that marten occurred sparingly at the headwaters of the McLeod and Cardinal Rivers and at Rocky Pass, but were much more numerous in adjacent Jasper Park, where they were not molested. In the summers of 1960 to 1963 information from all sources pointed to a good population. Evidently the animals are regularly more numerous in the remote northern district than to the south and east of the Athabasca River. Particularly good marten country was said to lie north and east of Moose Pass.

While working at Sunwapta Pass in the latter part of June 1961 I noted a few signs of marten in dense evergreen woods southeast of Nigel Pass at 6,800 to 7,000 feet altitude, where I also glimpsed marten very briefly in the gathering twilight of late evening. No sign of them could be found on Signal Mountain later in the season. Table 3 shows only a few sightings in 1961–62, in the districts of Blue Creek, Whirlpool River, Sunwapta, and Maligne Lake.

In 1963 wardens reported the presence of marten in heavy spruce forest around the easterly end of Medicine Lake, up the valley containing Beaver and Jacques Lakes, and along the upper Maligne River to Maligne Lake. The animals were former-

Figure 12 The marten is a very retiring member of the weasel family, favouring the solitude of deep, coniferous forests. Photo by Ed Cesar.

ly abundant in the latter locality, where Warden Larry McGuire was once stationed for several years. During that time many martens frequented the woods near the cabin. Eventually about a dozen of them became quite tame because of frequent offerings of food: some were so trusting and fearless that they would even venture a few feet inside the open door of the kitchen — surely a unique performance.

**Fisher Martes pennanti**
Subspecies: *Martes pennanti columbiana* Goldman. External measurements: males of the species average approximately 988, 391, 114 mm (range 915–1033, 356–422, 113–118). Weights up to 15 and possibly 18 pounds (Hall and Kelson, 1959). Females are considerably smaller than males, with only about one-half the weight.
Status — This valuable fur-bearer, also known as pekan, has become one of the rarest of Alberta species. It has been ruthlessly exterminated in one district after another owing to the demand for a high-priced fur rivalling that of the marten in quality.

The ravished area included most of what is now Jasper Park. The damage was done before the park was created in 1907; since then, despite full protection, the species has failed to make much, if any, recovery. It is very doubtful, indeed, whether more than a few pairs survive in the remotest northern wilds of the park.

Habitat — The species is chiefly an inhabitant of the Canadian Zone and moves about both on the ground and in trees. More or less remote evergreen forest and non-molestation are absolutely necessary for survival. Environmental requirements are essentially the same as those for marten. Some fisher habitats include swampy, black spruce terrain on the borders of lakes, streams, and muskegs. The vertical range above the valleys of the Rockies is perhaps rarely more than a few thousand feet.

Reproduction — The home lairs of this species are usually located in tree cavities well above ground, but they have also been found in hollow logs and rock crevices. Few dens have ever been discovered. Mating appears to take place from March until early May. Hall and Kelson (1959) remark: “The fisher... has a litter of 2-4 young after a gestation period of 352 (338-358) days.” The young are born about a year after the successful spring breeding — an unusually long period of spring dormancy and gestation (Rand, 1948).

General Remarks — Unless the fisher succeeds in maintaining a foothold in the Rocky Mountain National Parks or in provincial parks, it seems doomed to ultimate extinction in Alberta. It is doubtful if the animals ever were actually plentiful there in the best of times. They were clearly approaching the vanishing point in the Rockies in the 1890’s, as is indicated by Loring’s investigations in 1895-96; these apparently yielded no fisher information of any kind beyond the fact of rarity, or local non-existence.

Hollister (1912) lists the species, but clearly neither he nor any member of his party had any first-hand knowledge of the fisher. All he said was “Not common, but reported as present in all the higher forests. Mr. Swift has taken several in the immediate vicinity of Henry House.” Few of the naturalists who have visited the park since the time of Hollister have mentioned the fisher.

Anderson’s 1934 range map for the species shows distribution including the northern Alberta Rockies south over Jasper Park. At the upper waters of the Wildhay River in 1913 and at Rocky Pass in 1922 my own observations and questioning of game guardians and Indians drew a blank regarding the fisher. It seemed that already the animals had been locally exterminated. During extensive faunal studies in Jasper Park in the summer of 1939 R. M. Anderson discovered no indication that fishers existed in the territory covered. Clarke (1942) stated that there was then “no certain evidence that the fisher exists within the boundaries of Jasper Park.”

Ermine or Weasel Mustela erminea
Subspecies: Mustela erminea invicta Hall. External measurements (average of three males caught by Spreadborough-Anderson, 1918): 299, 84.6, 38.6 mm (range 289-310, 82-88, 37-41). A male taken by Cowan at Tonquin Valley measured 300, 98, 42 mm. Mean weight about 150 to 160 grams.

Status — With the possible exception of martens, these little hunters are more abundant in Jasper Park than any other member of the Mustelids. Ermine may be rated as fairly common, especially in the best years. Their distribution is very extensive, but local status undergoes marked variation from one district to another and from year to year.

Habitat — Typical environment favoured by these animals includes the usual Canadian Zone elements of mixedwood forest, poplar-willow flats, rocky slopes, and ravines, and at least the lower-altitude rock-slides. Some individuals penetrate upwards in the Hudsonian to near timber line. Their vertical range is therefore not less than about 4,200 feet. Their dens are located in places such as hollow logs, piles of boulders, and the abandoned or pillaged burrows of rodents.

Reproduction — Relatively few data about the breeding habits of this mountain race have been gathered. It is known, however, that the species breeds in the summer, with delivery of young the following spring. This long pregnancy of 9 to 10 months results from delay in the final blastocyst implantation. The number of young to a litter varies from four to nine (Rand, 1948); the average appears to be five. It is said that their eyes open when they are a little over a month old.

General Remarks — Early information on park ermine is very limited. Loring collected an immature specimen on July 21, 1896, 15 miles south
of Henry House, and saw another in October of the same year 25 miles to the west. Exceptional among the records is a fine series of five males and females collected by Spreadborough at Jasper and Henry Houses in August and September 1898.

Hollister (1912) and his party secured very little information on weasels; Riley saw one at Prairie Creek, and one was shot just south of Mt. Robson in late August. Of this Hollister says: “These were the only weasels seen by our party, though the trappers report them fairly common, and numbers are secured each winter.” He referred the specimens to M.c. cigognanni; but in his compendium American weasels Hall (1951) places all Jasper Park specimens in the present subspecies (M.e. invicta Hall).

I (1919) found ermine plentiful along the upper reaches of the Wildhay River during the early winter of 1913. In about seven weeks I trapped 80 well up the river valley and along lower Jarvis, Winter, and Moberly Creeks. A careful estimate based on trap-line coverage of narrow strips of valley forest indicated at least 10 ermine to the square mile. Probably that the population was then at a similar level in adjacent parts of Jasper Park.

Spreadborough took a male and a female at Shovel Pass on August 21, 1918, and four more near Jasper in early July 1919; one was a juvenile collected on July 5. In July 1930, Cowan collected one at Tonquin Valley (6,900 feet) and another at Snaring River (3,290 feet), and on September 5, 1945, he collected another at Tonquin Valley. In 1939 Warden George Foley told Anderson that weasels were fairly common at Willow Creek. It is quite possible that the animals were plentiful in Jasper Park during 1954, when they were reported “very common” in Banff Park (Banfield, 1958).

In the four summers from 1960 to 1963 I gained very little additional knowledge about weasels. The population seemed to be in a depressed stage; signs were very scarce, and trapping efforts of no avail. During the winters of those years, however, park wardens reported a fair showing of snow trails. In the second week of June 1960 (a very late spring), while a bulldozer crew was opening the high road to the Signal Mountain Lookout through snow three to ten feet deep, the men saw two ermine (both still in full winter pelage) loping along near the 6,400-foot level.

Least Weasel Mustela nivalis

Subspecies: Mustela nivalis rixosa (Bangs). External measurements: the average for males is about 200, 32.5, 21.9 mm, while females are approximately one-tenth smaller. Weights usually run between 45 and 55 or 60 grams, or only little more than that of a large meadow vole; this weasel is the smallest beast of prey on the continent.

Status — The least weasel is truly one of the rarest of park mammals. There is but a single record for the entire area — a male trapped by Spreadborough at Miette River, southwest of Jasper, on July 11, 1898 (Anderson, 1919). For a male it was somewhat smaller than average, with measurements of 175, 29, 20 mm.

Habitat — Apparently the same as that of the ermine, Mustela erminea.

Reproduction — Seton (II, 1926) remarks that “Gestation in the Weasels is about 42 days. The young are usually 5 in a litter, but vary from 4 to 6.” Data given by Hall (1951) show that, at least in the United States, “young least weasels may be born in every month of the year”.

General Remarks — During seven weeks in the early winter of 1913 I saw several trails of least weasels in the snow along the headwaters of the Wildhay River, a short distance from Jasper Park. One was captured in November a few miles east of Rock Lake. Compared with the preceding species the least weasel was very scarce; the ratio of its occurrence to that of M. erminea appeared to be no better than one to a hundred. Local Indians said that they might accidentally catch one or two almost any winter while trapping for the larger weasels. So rare is the least weasel in the Alberta Rockies that Banfield (1958) had no record of its occurrence in neighbouring Banff Park.

Long-tailed Weasel Mustela frenata

Subspecies: Mustela frenata longicauda Bonaparte. External measurements: this is by far the largest of the weasels, the males averaging about 438, 158, 50 mm and having a weight of 370 to 390 grams. Females average about one-eighth smaller.

Status — In the light of present information this weasel appears to be very scarce within the park. There may be more intrusions over eastern and western boundaries than we are aware of. At present the species seems to be of only “accidental” status.

Habitat — Over most of its range the long-tailed weasel normally frequents open prairies, parklands, and shortgrass plains. In the foothills and mountains, however, it lives mostly in the Canadian Life Zone environment of mixedwood forest, brushy valley flats, and grasslands. A little
farther south, at least, it wanders into the Hudsonian Zone and occasionally goes as high as timber line and tundra meadows.

**Reproduction** —

There is only one litter per year and mating occurs in July and August. Young are born in April and May. Embryos are implanted only 21 to 28 days before the young are born, and the preceding part of the long gestation period (205–337 days) the embryos lie dormant in the uterus as unimplanted blastocysts (Hall and Kelson, 1959).

Rand (1948) says that there are four to six young in a litter. Lactation lasts for about five weeks.

**General Remarks** — There appears to be only one positive record of occurrence in the park, a specimen mentioned by Hall (1951) having been taken at Moose Pass, Alberta; the Alberta end of the pass lies in Jasper Park. The species is unquestionably very thinly dispersed in the northern Rockies of Alberta.

A possible reference to this weasel occurs in one of R. M. Anderson’s field note-books of 1939:

Mr. H. M. Laing who spent some time in Jasper and Banff National Parks in 1930, as park naturalist, informed me that this weasel (M. frenata) as well as the smaller Bonaparte Weasel (=M. erminea) are the principal enemies of the Pika, or ‘Rock Rabbit’ (Ochotona princeps), following the little animals into their holes in the crevices of the rock slides.

Whether or not this implied the actual occurrence of M. frenata in Jasper Park is uncertain, but its occasional presence in neighbouring Banff Park is well proved (Banfield, 1958).

After his studies in Jasper Park in 1941, Clarke (1942) said of M. frenata: “Occasional reports indicate that this species may be found in Jasper Park.” Positive records should eventually be obtained in the Athabasca Valley west and south of Brulé Lake. In early October 1922, I saw a large weasel spoor, almost certainly that of a long-tailed weasel, on a high bench near Rocky Pass. Examples that may occur in the extreme western sections of the park may be intergrades with M. f. oribasus.

**Mink Mustela vison**

Subspecies: Mustela vison energumenos (Bangs). External measurements: averages as given by Rand (1948) are 560, 190, 67 mm and by Seton (II, 1926) 610, 178, 63 mm, with usual weights of from about 1.5 to 2 pounds. Occasional big males weigh as much as 4 pounds. Females are considerably smaller.

**Status** — In some parts of the park the species is not uncommon. It haunts widely scattered tracts of favourable, but limited, environment, optimum living conditions for mink being rather scanty in the cordillera. Consequently the animals are usually either quite scarce or completely absent in most areas.

**Habitat** — Required ecological conditions are best supplied by the Canadian Zone. Typical haunts of the mink are in and along rivers, marshy ponds and lakes, muskeg waterways, and sluggish creeks of the lowlands. In Jasper Park the most suitable habitats are found in parts of the valleys of the Athabasca and Miette Rivers. The dens are located chiefly in bank burrows, log jams, beaver dams, and such places.

**Reproduction** — Breeding activities reach their peak with the onset of spring, mating normally occurring in March or April. To some extent the time may depend upon latitude, altitude, and general climatic conditions. Gestation lasts from about six to ten weeks. Litter size is normally five or six, but may vary from three to ten (Rand, 1948). In late June or July the juveniles are weaned and engage in such activities as catching insects, frogs, mice, small birds, and ultimately fish.

**General Remarks** — Like marten, fisher, and beaver, the mink was a prize fur-bearer zealously tracked down by trappers and fur dealers. Merciless hunting and trapping in the nineteenth century
had greatly reduced their numbers by the 1890’s and the early 1900’s, and by the time the park was set aside in 1907 the population was at a very low ebb. After that there was some degree of recovery.

Evidently the population had not yet reached its lowest point when Loring was on the upper Athabasca in 1895. Preble (1908) comments: “While in the Jasper House region in 1895 and 1896 J. Alden Loring found the mink to be common throughout most of that section, and obtained skulls from 40 miles northeast of Jasper House, Whitemud and Moose Creeks.” Just 15 years later Hollister (1912) tells an entirely different story to the effect that the animals were scarce near Henry House and that the party did not see a single mink or obtain any information about the species on the entire journey into the Rockies.

In the autumn and early winter of 1913 I found that mink were very scarce around the headwaters of the Wildhay River; only three were secured in nearly two months of trapping. In 1922 they were almost non-existent along the upper McLeod and Cardinal Rivers, including tributary streams. All that Clarke (1942) saw of the species during his widespread investigations in 1941 was a solitary spoor on the shore of the Athabasca River near Miette. Most visiting naturalists had nothing to report on the subject of mink.

My own field work revealed nothing about park mink — not even a single set of tracks in muddy or sandy margins of streams. In 1961 Warden Frank Burstrom informed me that a few mink existed here and there in the Athabasca and Miette Valleys and at Beaver Lake. In the Jasper Tourist News, Summer 1961, the following appeared:

Traps at the hatchery corralled 50 mink last season. To this determined animal the fences protecting the fish pools are no stronger than a single strand of rusted wire. He’ll find the weakness and crawl through. Then he’ll feast happily on luscious rainbow trout, splake, eastern brook and all or any of the variety of species raised at this prolific hatchery. Once trapped, the mink is usually given a dab of paint to identify him as a one-time hatchery visitor and escorted to some lake or stream miles away. It’s a standing story that they sometimes beat the truck back to the hatchery!

During the season of 1963 I learned that a few mink resort to Maligne River and Beaver Creek. Warden George Wells remarked that mink were rare at Maligne Lake, but that an occasional individual made an appearance. Early in July of that year one was sighted near the bridge at the lake outlet. About a year earlier Wells had seen a large individual on the Maligne River a couple of miles below Maligne Lake.

Wolverine *Gulo luscus*

Subspecies: *Gulo luscus luscus* (Linnaeus). External measurements: the combined male averages from Hall and Kelson (1959), Seton (II, 1926), and Rand (1948) work out to 1,044, 218, 191 mm, with weights ranging from about 30 to 36 pounds. Females average about 10 per cent less in linear measurements and 30 per cent less in weight.

**Status** — The history of the “Indian devil” has been one of a losing battle against extermination, beginning during the past century and continuing to this day. In many parts of its North American range it has been wiped out completely, and there is little or no likelihood of its ever being seen there again. No doubt in the long run the species will survive in a wild state only in some wilderness parks and game sanctuaries, such as Jasper Park. While the species is far from common, it does at least survive with scattered representatives in several remote tracts of the mountain wilds.

**Habitat** — The wolverine roams primitive sections of terrain all the way from the lowland forests of the Canadian to the alplands of the Arctic-Alpine Zone. The vertical range is therefore well in excess of 4,000 feet. Especially during the heat of summer, the animals range freely at various altitudes between timber line and 8,000 feet. The den is located in such places as natural rifts and holes, under windfalls and boulders, or simply in a surface depression thickly overhung with the boughs of conifers. Such hideaways are customarily near streams and lakes.

**Reproduction** — Breeding appears to take place at widely different times from December to February. Hall and Kelson (1959) remark: “As in many other mustelids there seems to be a long period between fertilization of the ovum and its implantation; length of the gestation period is not known.” Krott (1959) says that the species usually has two or three young to a litter, and that the young are blind for about four weeks.

**General Remarks** — Over most of the Rocky Mountain region it is possible that wolverines were never particularly common. Some observers in the old days may well have gained a contrary impression, but it must be remembered that even a few in any one district could create havoc with fur trap-lines and thereby suggest an abundance that did not actually exist. On the other hand, the animals are naturally withdrawn, suspicious, devilishly cunning, and rarely observed. In consequence, many travellers had no knowledge of them.
at first hand and had little or nothing to say in their journals on the subject. For their size wolverines are notably powerful, tenacious, and destructive.

Preble (1908) remarks: "In 1896 J. Alden Loring obtained a skull in the mountains 15 miles south of Henry House and reported it rather common among the mountains between Jasper House and Smoky River, in the early autumn." It seems clear that up to then the trappers had not radically reduced wolverine numbers.

One may conclude that in the next 15 years wolverine numbers dwindled dramatically, for by 1911 Hollister discovered that the animals were "rather rare"; none was detected by his party. He was informed by Mr. Swift, however, that a few existed in various parts of the mountains and were observed more frequently in winter, as a result of the species' habit of trekking down into the valleys from high altitudes with the beginning of snow and cold weather. For the next 28 years the animals are not mentioned by any of the few zoologists then making park investigations, although the National Museum of Canada has a *Gulo* skull found by Cowan at Jacques Pass in October 1929.

In Anderson's regional report of 1939 he was able to state that the animals were "present in small numbers in some sections of the park"; he further remarks:

The wolverine is not (usually) an aggressive predator and lives to some extent on the left-over remnants of 'kills' by wolves, coyotes and cougars, animals that die from natural causes, etc. A slow-moving animal, it probably lives largely on mice and other small rodents.

During August of that year he learned on his trip to the northern boundary that wolverines occurred sparingly at Willow Creek, Byng Pass, and Twintree Lake and were much more numerous to the westward in a broad band of territory along the Continental Divide.

Contrary to earlier reports, Clarke (1942) reported wolverines rather numerous, especially in the upper Smoky River area. Tracks were seen at Maligne Canyon, the Rocky, Brazeau, and Snake Indian Rivers, and Poboktan Creek. With minor exceptions the individual spoors seen in the snow continued for many miles along the trails, indicating wide coverage by solitary animals.

Cowan (1943) wrote:

This animal was apparently much less abundant in Jasper than in Banff. Tracks on the trail along Twintree Lake were the only sign seen, but it is undoubtedly present in small numbers elsewhere in the northern part of the park. The only notes on food habits were supplied by wardens. Thus, Micky McGuire reported the killing of a young buck deer by a wolverine and Frank Wells came upon a bull moose killed by one of these animals in deep snow.

Cowan collected a male at Topaz Lake on May 30, 1944.

Donald Flook's investigations in southeastern Jasper Park in July-September 1955 brought little to light on the species:

The recent tracks of two wolverines were seen by Warden Dawson and the writer on September 25 in the snow at the head of the creek which drains into the Rocky River from the north, two miles above Grizzly Cabin.

My park work in the four summers of 1960-63 uncovered little information about wolverines, none of it at first hand. Wardens M. McGuire and Norman Young stated that a few of the animals dwelt in the wildest and most remote parts of the park. Table 3 shows that in 1961-62 wolverines were sighted in the districts of Smoky and Whirlpool Rivers, Sunwapta, Brazeau, and Maligne Lake. In 1963 Warden George Wells told me that a few inhabited the mountain valleys and ranges of the Maligne Lake district, from the lowest levels to points well above timber line.

Summer is the time when they most frequent the alplands. It appears that the wolverine is nowhere very common, is rather capriciously distributed, and is seldom encountered at any season. The best estimates of its numbers and whereabouts, of course, are made from study of its trails in snow — information from that source being obtained chiefly by the wardens.

**Striped Skunk Mephitis mephitis**

Subspecies: *Mephitis mephitis hudsonica* Richardson. External measurements: a male taken by me in Wood Buffalo Park measured 660, 250, 88 mm and another male secured at Turtle Mountain, Manitoba, was 666, 205, 57 mm and weighed 6.25 pounds. Seton (II, 1926) gives adult measurements averaging 711, 267, 82 mm, with usual weights varying from about 3 to 6 pounds. Fat autumn adults may be several pounds heavier. Young at birth weigh about one-half ounce (14.15 grams) and at eight weeks 1.5 pounds.

**Status** — The striped skunk is one of the least known of Jasper Park mammals. The species is relatively numerous in a vast territory east of the foothills, but becomes increasingly scarcer as the mountains are approached and entered. Very few have ever been met with in the park, and most of these were frequenting the bottomlands of the
lower Athabasca Valley. It is obvious that the mountain environment lacks the critical qualifications most acceptable to these animals.

**Habitat** — Because of their particular methods of living, skunks in northern latitudes are confined to the Transition and Canadian Life-Zones. They find congenial surroundings in brushy prairies, coulees, meadows, parklands, and poplar woods, and apparently to a somewhat lesser degree in the truly boreal mixedwood forest. With increase in altitude the sparse population diminishes and finally disappears. From what little is known of them in Jasper Park it is assumed that few skunks go above the 3,500- to 4000-foot level. Dens are normally in the form of deep burrows and sleeping chambers, similar to those of woodchucks, on dry, rolling bottomlands, benches, valley slopes, and ridges.

**Reproduction** — It seems that most mating is done in March and possibly early April. Pregnancy lasts fully nine weeks, and in the northern latitudes the four to eight young are born in May and early June (Seton, II, 1926). Infant skunks are blind at birth and continue so for about 18 days. They nurse for five or six weeks and then venture forth for short excursions above ground.

**General Remarks** — Apparently nothing about skunks can be found in the early literature. Loring provides the first reliable information for the region. Preble (1908) states that Loring took a specimen at Jasper House on August 25, 1895, and reported the species as uncommon. He observed another individual at Henry House on October 9, 1896 — evidently the full extent of his findings on skunks. Hollister (1912) commented that “The skunk is very rare in these mountains and was not met with by our party.”

The relative dearth of the animals in this region is amply demonstrated by lack of reference to them in the field accounts and memoranda of several zoologists. The “period of silence” extended from the time of Hollister until a Jasper Park superintendent sent the National Museum of Canada a skin obtained at Yellowhead Pass (3,711 feet) on March 3, 1933. Next was Clarke (1942), who gave five words in his wildlife summary to the skunk: “Reported in the Pocahontas area”.

In the autumn of 1913 I saw nothing of the species along the upper Wildhay River, and resident Indians stated that although present it was very scarce in foothills and mountains alike. I did not see a single skunk or any undoubted sign any-

where in the park from 1960 to 1962, but in late May 1963 one was observed near the government buildings at The Palisades. Wardens had told me earlier that skunks inhabited Athabasca Valley in small numbers upstream to beyond Henry House, and perhaps nearly as far as Jasper; and that at long intervals lone skunks had been killed by motorcars along the highway between Fiddle Creek and Rocky River.

**River Otter Lutra canadensis**

Subspecies: *Lutra canadensis preblei* Goldman. External measurements: figures for a male taken by me at upper Wildhay River (near Jasper Park, November 1913) are 1,122, 408, 115 mm. Maximum measurements from Hall and Kelson (1959) are 1,300, 507, 146 mm. Seton (II, 1926) considered the average weight to be about 20 pounds (18-25 pounds). Females are a little less stockily built than males and run about one-fifth smaller.

**Status** — An extremely scarce and thinly dispersed member of the park’s wildlife. It has seldom been encountered by anyone, and over the territory as a whole is either very rare or absent. This appraisal applies especially to the higher altitudes, where living conditions are generally unfavourable.

**Habitat** — The otter is chiefly a Canadian Zone denizen with home environment similar to that frequented by mink, beaver, and other aquatic mammals. It chooses a variety of forest- and shrub-fringed waterways from creeks to rivers, as well as back channels, beaver ponds, and lakes. While mostly inhabiting lowland watercourses, at times otters also ascend turbulent streams in the foothills and mountains. Their dens are normally of roomy burrows in the banks of streams and lakes, with the entrances concealed below water.

**Reproduction** — Mating is said to occur in late February or early March. After a gestation period of seven to eight weeks, the young are born in the snug underground nest — a once-yearly event; litter size varies from two to four (Rand, 1948). By mid-summer the youngsters become strong and very active, and by winter they appear to be nearly, if not fully, grown.

**General Remarks** — There appears to be nothing in the records to suggest that otters were ever more than sparsely represented in the Alberta Rockies. Evidently they were nearly wiped out by the 1890’s, as Loring appears to have learned nothing about them at that time. The situation was little changed in 1911 when Hollister (1912) investigated the Jasper territory; in general, otters 61
were then quite uncommon, although Mr. Swift stated that "some were seen and trapped each year along the Athabasca River near Henry House".

In the early winter of 1913 the animals were rare along the upper waters of the Wildhay River. During a two-month period of observations I saw only one: it was shot on the edge of shore-ice at an open rapid while eating a wild duck. By 1922 only a very few remained in the Rocky Pass country embracing the headwaters of McLeod and Cardinal Rivers and Toma Creek. On October 2 the deep trail of one was seen in the snow bordering a creek about three miles southwest of Mountain Park. Forest rangers commented that otters had virtually been trapped out of the foothills and adjoining mountains by that date (Soper, 1923). Perhaps conditions were then about the same in neighbouring Jasper Park, since little recovery could have taken place since the unrestrained trapping operations before 1907.

The National Museum of Canada has an adult female specimen collected by Cowan at Snaring River on June 12, 1930. For the next three decades wildlife investigators omitted any mention of otters in their many park reports, which certainly seems to imply great scarcity or absence. I found no trace of the species anywhere in the park in the summers from 1960 to 1963. In 1961–62 otters were sighted by wardens only in the district of Pocahontas (Table 3).

**Family Felidae**

**Mountain Lion or Cougar Felis concolor**

Subspecies: *Felis concolor missouensis* Goldman. External measurements: average of males is approximately 2,600, 925, 265 mm. In 1944 Cowan (pers. comm.) collected a female at Devona, Jasper Park, that measured 1,873, 765, 286 mm and weighed 100 pounds. Rand (1948) gives the length of a large Alberta male as "112 inches (2,844 mm) ... weight up to about 200 pounds". Mean weight appears to be around 160 pounds. Females are substantially smaller than males.

**Status** — A moderate number of these large and graceful felines haunt the park; they cannot properly be referred to as either common or rare. They are notoriously secretive, and are seldom sighted by man except with the aid of hunting dogs. At wide intervals a spoor may be spotted in dusty and sandy trails or on river bars. Their tracks are better and more frequently revealed in the snows of winter. Their regional distribution is extensive, but for the most part individuals and pairs are thinly dispersed. It is probable that the entire park population does not exceed a dozen or two at any given time.

**Habitat** — This big, wide-ranging cat lives chiefly in the lusher woods of the Canadian Zone, where the deep seclusion of mixedwood or pure evergreen forest provides a prime essential of its environment. Its principal denning, resting, and hunting areas are located in the larger mountain trenches and major tributary valleys. Individual lairs are well hidden in thick cover, sometimes in caves, but mainly in well-fashioned surface nests in the shelter of windfalls, ledge-rocks, or dense overhanging conifers.

**Reproduction** — Mating apparently takes place at various times from early winter until spring. The gestation period lasts about 96 days and the two to four young may be born at almost any time from February to July; at birth their weight is about one pound. Eyes become fully open during the second week after birth. The cubs can eat some fresh meat when six weeks old, but are not fully weaned until some time later. At eight weeks of age the young weigh about 10 pounds, and at six months from 30 to 45 pounds. When one-third to one-half grown they are able to kill on their own, preying upon ground squirrels, rabbits, and sometimes larger game (Young and Goldman, 1946).

**General Remarks** — It is conceivable that in early times cougars were very scarce in these northern latitudes, but extended their range from the south in recent years. Such apparent former scarcity, or absence, is suggested by the silence of both Loring and Hollister on the subject. Equal lack of reference to cougars is to be noted in the papers of Anderson (1918), Spreadborough (1919), and others. A male collected in the park by Warden F. A. Bryant on February 17, 1927, and sent to the National Museum in Ottawa was one of the first cougars to be detected in the valley of Athabasca River.

Thereafter northward extension of range is indicated by increased sightings and general evidence of steadily growing numbers of resident animals. The invasion was on a scale to arouse comment. In his 1938 faunal report Anderson says: "A good deal is heard about the cougar in the region of Jasper Park." He adds that by the winter of 1935–36 it was thought desirable to curb the upswing of the big cats: 19 of them were then killed with the aid of trained cougar dogs. In the autumn of 1938 several more were hunted down by the warden service.
Clarke's investigations in 1941 revealed a number of spoors along the Rocky, Medicine-tent, and Snake Indian Rivers; he remarked: "A very small population is indicated and reports from the wardens confirm this. Cougars have been more numerous, but more than fifty have been killed in recent years."

Cowan's observations of cougar spoors in 1943-44 ran practically parallel to Clarke's findings in 1941. At the same time it was known that a modest number of the animals still roamed the Jasper wilds. Cowan (1943) stated: "Warden F. Burstrom reported that during the winter of 1942-43 he believed that there were four cougars working in the Snake Indian Valley between Devona and Rock Creek. There were doubtless others in the park."

In 1953 P. Brodie obtained two specimens for the Department of Zoology of the University of Alberta. Flook's 1955 big-game survey in southeastern sections of the park evidently revealed no signs of the animals. Cowan secured a female near Devona in 1944 that measured 1,873, 762, 286 mm and weighed 100 pounds.

My investigations during the early 1960's had little more success than Donald Flook's: I noted one old track at Whirlpool River, near Moab Lake, in late August 1960, and another at Snake Indian Falls on June 25, 1961. Wardens continued to report scattered individuals. Very few sightings were recorded for 1961-62 — only single cases in each of 6 districts out of 14 (Table 3).

It is normally impossible to ascertain the true status of cougars without the use of trained dogs, or unless tracks in snow impart some knowledge of their numbers, over-all distribution, and general activities.
**Lynx Lynx canadensis**

Subspecies: *Lynx canadensis canadensis* Kerr. External measurements: a very lean female that I collected near Jasper Park in June 1964 measured 840, 98, 240 mm and weighed only 8.2 pounds. Corresponding average measurements from Seton (I, 1925) are 915, 102, 242 mm. Maximum measurements from Hall and Kelson (1959) are 954, 125, 250 mm. Fully adult weights usually range from about 13 to 28 pounds, but exceptionally sturdy old males are several pounds heavier.

**Status** — Lynx numbers are subject to extreme cyclic fluctuations, the cycle being completed in approximately 10 years. To a very large extent the existence of the lynx depends on the varying hare; when the latter is abundant the lynx feeds particularly well, prospers, has large litters, and rapidly mushrooms to a high population level. Such a development is recurrent in Jasper Park, as elsewhere, but there is some evidence that well back in the mountains the ebb-and-flow dependence on hares is much less pronounced.

**Habitat** — The habitat of the lynx is substantially the same as that of the cougar, described earlier. Horizontal and vertical distribution is also much the same, although when at peak numbers the lynx may wander more often into the Hudsonian Zone. During the summer and autumn, at least, occasional individuals visit the open alps above timber line.

**Reproduction** — Mating occurs in the latter part of the winter (chiefly in March), and after a gestation period of 62 days the usual two to five kittens are delivered some time in late April or in May (Seton, I, 1925). The youngsters are suckled for eight or ten weeks and are cared for by both parents. There is much companionship with the mother for about a year, by which time they are practically full-grown.

**General Remarks** — In Canadian trap-line country it would be a very inattentive traveller indeed who did not have lynx forced on his attention by white and Indian trappers, by the existence of old trap and snare cubby sets, and by the discarded skulls and other bones around trapping cabins. In the National Parks, of course, such features do not exist, but in good years tracks and the animals themselves are not infrequently seen — the former more often on dusty trails, sand hills, and shore-line sediments of streams. On winter patrols wardens gain good knowledge of status and dispersal by noting the typically large tracks in the snow.

Preble (1908) provides some early information for this region: “In the early autumn of 1895, J. Alden Loring saw many tracks of lynxes about the base of the Rocky Mountains in western Alberta. In 1896 he reported the species common in the valleys . . . 15 miles south of Henry House in July, and in similar situations between Jasper House and Smoky River in the early autumn”; a specimen that he secured 25 miles west of Henry House measured 872, 93, 222 mm; its stomach contained remains of *Microtus* and *Synaptomys*.

The species continued to be periodically plentiful into the early 1900’s. Hollister (1912) says:

*The lynx is normally common in the region covered by our expedition, but its abundance is more dependent on the numbers of the rabbits than is that of other carnivores . . . in seasons of rabbit plenty the trappers take great numbers of lynx skins. Mr. Swift states that in the Henry House region he once trapped forty lynxes during a single winter . . . The time of our visit was a poor one for securing specimens of the carnivores, which are usually very difficult to trap in summer.*

In the autumn and early winter of 1913 I found lynxes common around the sources of the Wildhay River. Criss-crossing tracks were plentiful, and several individuals were trapped. The nearer I approached to the boundary of Jasper National Park, the more numerous the animals seemed to be. Varying hares were then exceedingly abundant (Soper, 1921; 1947). In the autumn of 1922, at which time hares were scarce, I found only a moderate number of lynxes in the Rocky Pass country. In an early October snowfall I saw a lynx trail near tree line at Rocky Pass. A forestry officer told me that in summer some lynxes roam well into the treeless alplands, where they live on ground squirrels, voles, white-tailed ptarmigan, and other bird species (Soper, 1923).

For the next decade or two there are few significant park data. In 1941 Clarke (1942) found the species slowly increasing in the park, but retarded in the cycle by a very slow build-up of varying hares. Tracks were noted in Athabasca Valley and along Rocky River. Lynx numbers continued to increase slowly for at least the next couple of years. Banfield (1958) noticed an upswing in Banff Park in 1953, when “their tracks were quite common and the animals themselves frequently seen”. It is not certain, but highly probable, that the animals simultaneously became common in adjacent Jasper Park.

In the early 1960’s I could find very little sign of lynx anywhere in the park. Wardens’ sightings in 1961–62 indicate a low numerical level (Table
3). Nevertheless, from sign noticed in the winter of 1962-63 the wardens forecast some sort of cyclic peak in the next year or so, especially if hares became more abundant.

**Order Artiodactyla**

**Family Cervidae**

**Wapiti or Elk Cervus canadensis**

Subspecies: *Cervus canadensis nelsoni* V. Bailey.

External measurements: Seton’s (III, 1927) averages for an adult bull and cow, 2,412, 127, 635 mm; weights range from about 600 to 1,100 lbs. Apparently most weights fall between the figures of 650 to 700 pounds. Maximum measurements of stags given by Hall and Kelson (1959) are 2,972, 212, 660 mm. Cows are markedly smaller than bulls. A new-born calf weighs about 30 pounds. Height of bulls at the withers is approximately 5 feet (1,530 mm).

**Status** — Wapiti provide one of the finest wildlife spectacles that the park has to offer. They are not always in evidence (often hidden by the forest), but considerable numbers are present. They are most likely to be observed in the valleys of the Athabasca River and its tributaries such as the Miette, Rocky, and Snake Indian Rivers; to the southeast other groups, or larger herds, inhabit the valleys of the Brazeau, Southesk, and Cairn Rivers. Some of the finest concentrations occur in Athabasca Valley north of Jasper.

**Habitat** — The species is equally at home in the forests of the Canadian or Hudsonian Zones and on the open grasslands of valley floors, slopes, and benches, such as exist on the Henry House flats and at Dominion and Buffalo Prairies. Of special attraction is the “parkland” type of vegetation; there growths of aspen poplars alternate with patches of range grass and low shrubbery. In foul weather the animals resort to the shelter provided by coniferous forest. In summer wapiti commonly visit the open tundra above timber line, but always retreat to the major valleys during deep snow and the coldest part of the winter. Consequently the vertical range through the year is all of 4,000 to 4,500 feet.

**Reproduction** — September and October bring the frenzy of the rut, when the bugling bulls search for mates and often engage in furious and sometimes fatal combat with each other. A bull will gather as large a harem as circumstances permit. After breeding, the sexes settle down quietly in segregated groups. After a gestation period of about 260 days the dappled calves (usually single, rarely twins) are born during the warm days of May and June (Seton, III, 1927). Mothers and their progeny are inseparable for many months.

**General Remarks** — Early British explorers gave the name “red deer” to this ungulate because of its similarity to the European red deer (*Cervus elaphus*). The name “elk” is a misnomer; the preferred name “wapiti” is said to have originated with the Shawnee Indians.

In early times wapiti were abundant over most of Alberta north to Peace River. They were still plentiful in many areas up to 1810, when Alexander Henry saw large herds from Edmonton to the foothills and in the mountains westwards from Rocky Mountain House. Some time later wapiti began dwindling in numbers, and by the end of the century they had been almost exterminated in western Canada by a series of severe winters and by heavy killing by white and Indian hunters. Webb (1959) states that by 1907 there were only about 1,000 head remaining in three Alberta areas; one of these areas was the upper Brazeau River watershed, which is still one of the best wapiti ranges in southern Jasper Park.

Preble (1908) commented:

In 1896, while exploring between Jasper House and Smoky River, J. Alden Loring reported that a few were said still to exist near the head of Pembina River, where, however, during recent years the Indians had nearly exterminated the species by ‘crusting’ *

This evidently referred to a territory not only in the Pembina drainage, but also at and around Cardinal River and other tributaries not far from present-day Jasper Park. It is clear from the account that Loring saw nothing of wapiti in what is now park territory. There is every reason to believe that by the 1890’s or earlier the animals there had completely disappeared.

McEvoy (1900) says that in 1898 no wapiti were left in that area and that only a few remained alive in the foothills. Hollister’s (1912) party saw nothing of the species except some very old weathered antlers found near the upper end of Buffalo Prairie. Lewis Swift stated that during his 17 years of hunting in the region he had never seen a single wapiti. That suggests that wapiti had been wiped out of present Jasper Park territory by 1894, if not much sooner.

*After a thaw and then freezing weather, the surface of the deep snow would become crusted. Under these conditions the snow would bear the weight of a man, but not that of a wapiti or moose, giving distinct advantage to the hunter.*
Webb (1959) wrote:

Around 1920 the tide began to turn once more and elk began to become more numerous. Native herds increased and re-introductions were made to the National Parks and Cypress Hills. By 1924 the total had increased to about 2,000 head.

In 1920, 89 "elk" were released at Jasper. From then on they slowly multiplied, and individuals and small bands of wapiti began to appear again in areas of Jasper Park from which they had vanished decades before. By the 1930's they were becoming fairly common in some of the park's better grazing and browsing areas.

After his Jasper Park field inspections in 1938, Anderson reported:

The elk appear to be abundant in most of the eastern and central portions of the park, particularly along the Athabasca River, but are not as common in the western part of the park. Summer feed seems to be abundant nearly everywhere on suitable range, as well as large areas suitable for winter range, except during winter when snow is unusually deep.

Clarke (1942) wrote of conditions prevailing two years later:

There still remain large areas of Jasper Park without elk, and they have not reached excessive numbers anywhere. The valleys of the Rocky and Snake Indian are becoming well stocked while the Brazeau and Athabasca Valleys support a large population ... . The largest group was in Buffalo Prairie.

In 1943-44 Cowan found that wapiti were wintering along the Brazeau River to Brazeau Lake and in the valleys of the Southesk, Cairn, Rocky, and Athabasca Rivers. In the Athabasca Valley concentrations occurred between Devona and Jasper and on Dominion and Buffalo Prairies. Lesser numbers occurred on the upper Athabasca to the Sunwapta River, along the lower Chaba and Whirlpool Rivers, up the Maligne River to and around Medicine Lake, and northward along the Snake Indian to Willow Creek. Cowan commented:

The summer distribution extends to the alplands above all the wintering grounds. Elk reach Wilcox and Nigel Passes, and occurred at all points visited in the southern part of the park ... Supt. J. S. Wood reported elk to outnumber all other game in the Elysium Pass area ... . There is ample indication that elk of the Athabasca watershed are increasing and spreading.

The animals had not yet reached large tracts of wilderness in northwestern Jasper Park.

During 1943-44 Cowan and Hatter collected a series of 10 wapiti skulls at Jasper, Henry House Flats, Devona, and Brazeau Lake. In the spring of 1952 Banfield collected a wapiti on the flats near Henry House for the National Museum.

Flook (1956) mentions that the park wardens had reported heavy wapiti mortality during the winter of 1947-48. A satisfactory build-up apparently followed, for during his 1955 survey Flook estimated the population in the southeastern part of the park at not fewer than 250. The best sightings occurred along the upper Brazeau River, Isaac Creek, and the Southesk River. The sightings by wardens in 1961-62 (Table 3) certainly reflect thriving populations in all major areas except the upper Smoky River district. The numbers were especially noteworthy in the districts of Jasper townsite, Snaring, Miette, Pocahontas, Yellowhead, and Athabasca Falls; apparently wapiti are the most abundant big game mammals in the park.

During the summers of the early 1960's I noted good numbers of wapiti in the Athabasca drainage area as far as the Sunwapta River; at Ranger Creek; on the Miette River westward to Dominion Prairie; at Celestine Lake, and on up the Snake Indian River to the falls. Occasional sightings were made at the Maligne River, near the easterly end of Medicine Lake, and for a short distance to the south in the valley of the upper Maligne River.

The largest numbers invariably occurred through Athabasca Valley in such localities as The Pali­sades, Henry House, Snaring, and Devona. These various valley herds of from one to several dozen individuals were not particularly wild, but would often permit an approach to 100 yards or so before dashing off into the woods.

Mule Deer Odocoileus hemionus
Subspecies: Odocoileus hemionus hemionus (Rafinesque). External measurements: Average for the species is about 1,735, 152, 555 mm (Rand, 1948). Hall and Kelson (1959) give maximum measurements for bucks as 1,800, 230, 585 mm with weights up to 456 pounds. Average for the species, however, appears to lie between 250 and 300 pounds. Does are somewhat smaller and lighter than bucks. The latter have a shoulder height of about 42 inches (1,071 mm).

Status — This is one of the park's commonest big game animals. Mule deer are seen by visitors more often than any other hoofed animal, with the exception of wapiti. Occasionally some especially blâse individual may be encountered wandering about town or camp grounds, exhibiting no fear of man whatever. Although they are abundant in some areas and have extensive geographical distribution, tracts of country exist where mule deer are absent or rarely observed.
Habitat — The preferred home environment is essentially similar to that of wapiti, with favourite cover and food supplies located in the Canadian Zone. During the summer, however, a good percentage of the animals move upward to the Hudsonian Zone, and some even well into the alplands. In winter the return trek brings them back to the abundant feed and cover of the lowest valleys. The seasonal movement of many individuals may encompass an altitude differential of 4,000 feet or more.

Reproduction — Breeding reaches a crescendo during the autumn, especially in October. During the rut the bucks become restless and combative, their necks swell, and their many fights cause grievous wounds, exhaustion, loss of weight, and sometimes death from interlocking of antlers and consequent starvation. One or two fawns per doe are born the following spring after a gestation period of about seven months. Their coats are sprinkled over with white spots, which are retained for most of the summer. The mother and immatures stay together until the following year, at least until new-born fawns arrive during May and early June (Seton, III, 1927).

General Remarks — The familiar story attaches to the mule deer — a big game species abundant in the early history of the West and then going into marked decline. By the end of the nineteenth century very few were left in the Jasper country, according to McEvoy’s (1900) appraisal relating to 1898.

Preble (1908) says that when Loring visited the region in 1895 he saw little of mule deer in Athabasca Valley anywhere above or below Jasper and Henry Houses, and in 1896 he reported the species as “rare between Jasper House and Smoky River”. Fifteen years later Hollister (1912) evidently saw little or no improvement, for he says: “Mule deer were formerly common in this region, and in
the early days many were killed. They are still present but in greatly reduced numbers. The range of the species, Mr. Swift informs me, includes all the valleys and lower levels and, during the summer, parts of the higher mountains.” Individuals were sighted by the party near Jasper and Henry Houses, along the Miette River, and near Maligne Lake.

After Jasper Park was established in 1907 all game had a new lease on life. Most species augmented their numbers in a relatively short time. Already by 1918 Spreadborough said of mule deer that “... they are common in Jasper Park”. On June 29, 1930, Cowan collected a buck at Snaring River. Anderson reported in 1939 that mule deer appeared to be fairly common in all parts of the park and seemed to have a wider range than any other big game mammal, also that “they are much more in evidence in winter when the deep snows drive them out of some of their mountain retreats.”

The species continued to increase, or at least hold its own. As a result of his investigations in 1941 Clarke (1942) asserted that

So far mule deer in Jasper Park have not suffered at all from the competition of elk ... . Mule deer are sparingly distributed in the higher and snowier parts of the park, being found in winter at lower elevations. In the open winter range of the Athabasca Valley they are exceedingly numerous.

Cowan (1943) met with similar conditions and recorded the animals as occurring in varying numbers in nearly all investigated parts of the park. He also noted their abundance in Athabasca Valley during the winter and early spring. He wrote:

In April the heaviest deer concentrations were found on the bluffs and flats adjacent to Devona. Censuses taken here on April 16 and 18 and covering two square miles of territory yielded concentrations of from 35 deer per square mile to 60 per square mile.

In August 1948 H. D. Fisher found mule deer markedly common only between Cairn River and Rocky Forks (Flook, 1956). While carrying out an extensive game survey in the southeastern sector of the park Flook sighted only 25 mule deer from July 18 to September 27, 1955. The population, although well distributed, was much thinner than in many other park areas and Flook suggested that the southeast territory may be marginal deer habitat.

In 1956 J. R. Nursall collected a mule deer specimen in Jasper Park for the University of Alberta. Table 3 shows mule deer occurring in all 14 patrol districts in 1961-62, with the largest numbers listed for Athabasca Valley from Jasper northeast to Miette and Pocahontas, and in the districts of Willow Creek and Athabasca Falls. Among big game the mule deer evidently ranks third in abundance, being surpassed only by wapiti and mountain sheep.

My own observations in 1960 indicated that the animals were well distributed in the park, being most numerous in Athabasca Valley and along tributary streams. Many signs and sightings occurred at Ranger Creek, at Athabasca Falls, along the Miette and Sunwapta Rivers, and along the Athabasca north and east to the Rocky River, Snaring, and Devona, with a few along Fiddle Creek.

The next season they were recorded very sparingly at Sunwapta Pass and more liberally up the Snake Indian River to Shale Banks and the falls. I saw a few near timber line at Signal Mountain. During the summers of 1962 and 1963 mule deer were again sighted in many of the above localities; moderate numbers were also noted at Fiddle and Roche Miette Creeks, The Palisades, Medicine Lake, the lower and upper Maligne River, and Maligne Lake. Individuals are sometimes seen on the neighbouring Bald Hills, sometimes well above the tree line. Scharff (1966) says that the animals were particularly in evidence in the Lake Annette and Lake Edith areas.

At present the mule deer is plentiful and widely dispersed in Jasper Park. There should be further increase and territorial expansion until more serious competition with wapiti arrests the present trend — a remarkable change from pre-park days, when so many game animals had been virtually obliterated in this region.

White-tailed Deer *Odocoileus virginiana*

Subspecies: *Odocoileus virginiana ochroura* (V. Bailey). External measurements: approximate average figures for males as taken from Seton (III, 1927) are 1,895, 222, 504 mm. Females are about one-quarter smaller. Hall and Kelson (1959) give maximum measurements as 2,062, 330, 521 mm and weights up to 350 pounds. Usual weights appear to lie between 200 and 250 pounds. At birth a fawn varies in weight from about 4.5 to 7.0 pounds. Male height at the shoulder is about 40 inches (1,020 mm).

*Status* — This species is as yet the rarest and least familiar of the park’s ungulates. The “white-tail” was formerly unknown so far north in the Alberta Rockies, but it has recently begun to infiltrate the territory. The animals may be rarely, if ever, clearly sighted by travellers on the main
highways, but scattered examples do reside in Athabasca Valley at least, and their number appears to be slowly increasing.

**Habitat** — Their habitat is practically identical with that of the mule deer. Knowledge of their vertical distribution is scanty, but it probably rises well above the valley floors in the Canadian Zone and perhaps enters the lower terrain of the Hudsonian Zone. In some western localities of adjacent Banff Park white-tailed deer regularly visit high passes along the Continental Divide. In time they may do so also in Jasper Park, despite the higher latitudes.

**Reproduction** — General mating habits closely parallel those of mule deer. Some observers believe the “white-tail” to be less polygamous than other deer. Breeding takes place in the autumn, and the one or two spotted fawns are born the following spring. Duration of pregnancy averages about 210 days, and it appears that twins are more frequent than singles (Seton, III, 1927).

**General Remarks** — Nothing whatever was known of the white-tailed deer in Jasper Park until a few years ago. Nineteenth-century accounts bear no reference to the species, nor do the findings of Hollister in 1911.

The first intimation of its local occurrence is provided by Cowan (1943) as follows:

The only record of this species in Jasper Park comes from Warden B. White at Decoigne. He saw a single animal, a doe, close to his station upon several occasions during July, 1943. Though it is most difficult to suggest where this animal could have come from, there seems little doubt that the identification was correct.

The next record was established by Banfield (1953), who observed a young doe on May 23, 1952, near the confluence of the Athabasca and Miette Rivers, two miles south of Jasper. The “white-tail” can be notably shy and wary and is quite capable of adroitly avoiding observation, especially perhaps when numbers are low. For this reason it is not surprising that most observers have failed to record any sightings. Naturally more of these deer are spotted by resident wardens, who are on patrol at all seasons of the year. In their game summary of 1961-62 (Table 3) they listed a few for the districts of Jasper townsite, Snaring, Willow Creek and Yellowhead.

At the summer’s end of 1960 I wrote in my field journal:

> Until a comparatively few years ago the ‘white-tail’ was unknown in Jasper Park. It is now slowly becoming more numerous, but is still greatly outnumbered by the mule deer. Wardens situated in Athabasca Valley report at least a dozen of these deer in the area between Devona and the mouth of Miette River. During the second week of June I saw a pair and a single individual about three miles southwest of Snaring.

I saw none in 1961 and 1962. On May 17, 1963, however, I saw a doe near the main channel of the Athabasca River due west of Roche Miette Creek, and on May 23 I saw a buck between Henry House and The Palisades.

**Moose Alces alces**

Subspecies: *Alces alces andersoni* Peterson. External measurements: for the three leading measurements of a bull Seton (III, 1927) gives 2,903, 63, 792 mm, with height at the shoulders of 6 feet (1,836 mm). Usual weights range from about 800 to 1,000 pounds, but some males reach 1,200 pounds or more. Cows are normally about 10 to 15 per cent smaller than bulls.

**Status** — Moose are now much more plentiful in this region than they were in the late 1800's and the early part of the present century. The turning-point evidently coincided with the creation of Jasper Park in 1907. Moose were then becoming very rare, or had been wiped out, in many parts of the cordillera. Recovery after 1907 was slow, but now the animals are to be seen in most parts of the territory at one season or another. Current information indicates that hundreds now haunt the park’s deeper solitudes. Occasionally one appears at close range near one of the roads leading through quieter parts of the park.

**Habitat** — The type of environment that attracts wapiti and deer, most of which lies in the Canadian Zone, is also largely used by moose. Moose, however, also like swampy situations, and are therefore usually found near lakes, ponds, streams, grass-shrub bogs, muskegs, and contiguous mixed-wood forest and brulé. A typical warm-weather habit is to wade out belly-deep into pond or lake to feed on subaquatic plants. During the summer moose also often ascend to the higher elevations, including the alplands, but during the winter they generally return to the lower valleys for browsing and shelter.

**Reproduction** — The hoarse bellowing of bull moose during the September-October breeding season is one of the most arousing sounds of the wilderness. The female carries her foetus (or foetuses) for about 244 days; sometimes twins are born (Seton, III, 1927). Most of the calves are dropped in May, with some births in early June. Mother and progeny are closely associated during
the next year. By the third year the young bull is nearing sexual maturity.

**General Remarks** — Moose populations, like those of many other Canadian mammals, were seriously reduced — indeed, in many parts of the Rockies they were wiped out — during the nineteenth century. Possibly part of the decline was caused by disease; in 1847-48 moose, wapiti, and bison were reported as suffering from some disease on the east slope of the Rocky Mountains.

By the time Loring reached the region in 1895 the moose population was low. A fair number certainly survived in the less accessible wilds northward from Jasper House to Smoky River, but the species was destined to decline still further, a trend noted by McEvoy (1900), who reported moose extremely scarce in the Jasper area in 1898. The downward trend was confirmed in 1911 by Hollister's field work in the valleys of Athabasca and Miette Rivers and elsewhere, where he found that the animals were rare or absent in most of the country traversed; he remarked: "Moose Pass, Moose River and Moose Lake seem to the present-day traveller wrongly named." Mr. Swift told Hollister that no moose had appeared in the Henry House district during the 17 years he had lived there.

With the protection resulting from creation of the park in 1907 a change for the better gradually developed. Under sanctuary conditions the animals now met no serious threat apart from occasional deep snow and attacks by timber wolves. By the late thirties they were becoming well established again. In 1939 Anderson found them well represented in suitable localities where lakes and brushy valleys existed.

By 1941 Clarke (1942) reported:

Moose are generally distributed in Jasper Park, with several areas of real abundance, such as Willow Creek. They are not influenced by snow and will winter at high altitudes in the continental divide area if good forage is available. Alpine fir is utilized by them. In Jasper Park various species of willow and dwarf birch are their most important food plants.

Cowan (1943), on long inspection trips, found the animals widely distributed, although uncommon in many areas. He comments:

At the junction of the Rocky and Medicine-tent Rivers there was evidence of a heavy population although but few were seen. However, the heaviest concentration encountered anywhere, during the summer, was that of Mowitch Creek near Little Heaven Summit. Here on August 16 the moose population was found to be close to 8 per square mile.

These reports illustrate the amazing benefits of game protection to a species that was almost on the verge of extinction. In all it required about 30 years to achieve these striking results. Flook (1956), reporting on his southeastern park investigations in 1955, said that apparently "...moose were as numerous at the time of the current survey as at any time during the preceding 15 years and were possibly at the highest level for that period." He saw the greatest numbers in the Cairn Pass area, at the lakes around the source of the Cairn River, and around Rocky Forks and Summit Lakes. "Elsewhere they were well distributed but not abundant."

Table 3 shows sightings in 1961-62 in all 14 patrol areas, with most in the districts of Pocahontas, Willow Creek, Yellowhead, Athabasca Falls, Sunwapta, Rocky River, and Maligne Lake. Evidently *Alces* takes fourth place in abundance among the park's big game animals.

During the summers of 1960 to 1963 I found moose widely distributed at varying densities from scarce or absent to common. In 1960 I observed them at Snaring, on Ranger and Derr Creeks, and along the Miette and Sunwapta Rivers. The following season I saw many signs of them from well below the Sunwapta Pass summit (6,675 feet) up to at least 7,500 feet. Old moose droppings and browsing signs were abundant in the Snake Indian River valley during the latter part of June, but evidently all the animals had departed for higher country some time before.

In 1962 and 1963 moose were equally in evidence, for instance in the Fiddle Creek—Jasper Lake section, between Medicine, Beaver, and Jacques Lakes, and along the mid-upper Maligne River. Many signs were also noted at Maligne and Moose Lakes. Warden George Wells stated that fair numbers inhabited choice parts of the latter district; some individuals ascended the neighbouring slopes of Queen Elizabeth Range to above timber line, and a few sometimes ranged the tundra between Maligne Pass and Antler Mountain.

**Caribou Rangifer tarandus**

Subspecies (Woodland caribou): *Rangifer tarandus caribou* (Gmelin). External measurements: total length, males, 2,176 mm (1,905–2,472); hind foot, males, 625 mm (580–660); total length, females, 1,870 mm (1,730–2,045); hind foot, females, 582 mm (555–600) (Banfield, 1962). Weight, up to 600 pounds. Cows are about 10–15 per cent smaller than bulls.
Status — It is certain that the park caribou (earlier listed as Rangifer arcticus fortidens Hollister) was at one time much more abundant than it is today, but nothing very precise is known regarding its former status. Our knowledge of the present numbers of these caribou is somewhat vague, and cannot be improved without wider and more penetrating investigations. We do know, however, that they are far from plentiful in the region as a whole.

Habitat — Park caribou run the full environmental scale from the lowest mountain trenches to the highest parts of the vegetated alplands. At different seasons they sample living conditions from the Canadian through the Hudsonian to the Arctic-Alpine Zone. During the winter they forage at lower levels on various mosses, lichens, and shrubbery. In the summer they inhabit favourite alpine and subalpine meadows, where their food consists of lichens, sedges, grasses, heath plants, and other vegetation. Their vertical range is from the lower valleys to about 8,000 feet.

Reproduction — Little information is available concerning mating, general breeding facts, and rearing of young of the Jasper Park caribou. It appears, however, that most of the breeding activities take place during September and October, followed by a gestation period of about seven months. Usually there is only one fawn, but sometimes twins occur. Births normally take place in May and early June (Hall and Kelson, 1959).

General Remarks — These caribou are more difficult to study than most native big game animals. They show a marked preference for solitudes far from human activity, and during most of the year range subalpine woods and the high alplands — usually the least accessible of all Rocky Mountain terrain.

These caribou were known to early travellers, such as David Harmon, as far back as some 160 to 170 years ago. As Seton (III, 1927) says, John Richardson described this animal in 1854 but did not name it. From some time in the 1800's the regional caribou steadily declined in numbers and range and by the early part of this century had disappeared from many sections of the Alberta Rockies. On the other hand, some local populations survived very well in distant fastnesses such as the Mt. Robson region, northwestern Jasper Park, and the Continental Divide country to the northwest.

Caribou were only casually met with by Alden Loring when he visited this region in 1895; he saw some near timber line in the Jasper House district, and collected two of them. In July 1896 he saw tracks 15 miles south of Henry House, and two months later noted the presence of caribou between Jasper House and the Smoky River, both on high mountains and in some of the valleys. About mid-October he saw many tracks in "Rodent Valley", 25 miles west of Henry House. From information picked up in 1898 by McEvoy (1900), it appeared that by then caribou had become very scarce in some of their former haunts.

About mid-summer of 1911 Hollister's party collected a number of caribou at Moose Pass, Alberta, which he described as a form new to science (Rangifer fortidens Hollister, 1912, but now placed under R.t. caribou; see revision by Banfield, 1962). At that time they were regarded as the largest and darkest of North American caribou. Lewis Swift informed Hollister that very few of the animals existed anywhere along the Miette and Athabasca Valleys and northeastwards of Henry House to the outermost ranges, where they were formerly plentiful. In the Moose Pass country, however, the animals were still fairly common, but far short of their former abundance. All sightings were in high, open alplands with a considerable depth of snow.

Miller (1915) remarked: "The occurrence of caribou on the east slope south of 53° is limited to the west side of the Athabasca River from the Miette south to Fortress Lake". If that was actually the case, numbers of them must have gone east of the Athabasca at some later date. On August 24, 1917, Spreadborough collected an adult bull and saw several others near Mt. Edith Cavell (Anderson, 1918). Cowan secured a specimen for the National Museum of Canada on July 4, 1930, at Tonquin Valley. In the summer of 1939 Dr. Anderson heard from a member of a geological survey party that about 200 of these caribou had been seen around the headwaters of the Saring River. He also recorded them at Willow Creek (winter), upper Blue Creek, Indigo Lake, Snake Indian Pass, and Twintree Lake.

Clarke (1942) stated that they were found in small numbers locally south and east of Athabasca Valley, but never east of Maligne and Brazeau Lakes; they were also uncommon around the headwaters of the Athabasca River. He goes on to say:

To the north and west they are more common, Blue Creek, Byng Pass and the Tonquin Valley being favourite summer areas, and the region of the Snake
Indian and westward, winter areas.... Caribou are usually seen in summer in alpine meadows.... The caribou migrate on well-beaten trails from summer to winter areas. In late March and early April the movement was upwards.... Fall migrations down the valley of Snake Indian River are reported by Warden Jones to be in herds of twenty and thirty, often coming close together.

From his investigations in the late spring and the summer of 1943 Cowan reported:

Caribou were seen in Jonas Pass, tracks of several animals were noted in Poboktan Pass and from Brazeau Lake to the basin below Brazeau Ice-fields. In 1941 approximately 60 head were ranging the alplands of the Tonquin Valley.... To the north of the Athabasca, caribou, or signs of their presence, were noted at Willow, Mowitch and Blue Creeks, Topaz Lake, Hoodoo Shelter, Byng Pass and through the length of the Smoky Valley. Only in the Byng Pass region were they abundant.

In 1943 and 1944 Cowan and Hatter collected several complete specimens and separate skulls at Blue Creek, Byng and Poboktan Passes, and Tonquin Valley.

In 1953 Micky McGuire reported the wintering of caribou at Beaver Lake and of caribou that had spent the summer high up on Mt. Sirdar. Flook's 1955 game survey in southeastern Jasper Park found the caribou situation substantially the same as had been reported by Cowan (1943) and Fisher (1948), although Flook sighted a few more of the animals. Table 3 shows that in 1961-62 at least a few caribou were sighted in each of ten patrol districts out of the fourteen listed; more were recorded in the districts of Willow and Blue Creeks, Whirlpool River, Sunwapta, and Maligne Lake than elsewhere.

In the seasons of 1960 to 1963 I secured very little information on caribou, as most study areas were not in the caribou range. The following is taken from my field-notes:

Maligne Lake, July 23-31, 1963: A fair number of caribou have been reported as frequenting high mountain pasturcadies westward from this lake. Some time in early July Warden Wells observed a herd of about 34 when he was on a patrol to alplands a few miles northeast of Mt. Kerkeslin. All were well above timberline and feeding peacefully on tundra vegetation. A few are said to visit alplands to the northwest and southeast between Amber Mountain and Shovel Pass, and intervening tundra almost to Maligne Pass. On the 26th of the month a little group of four was observed near the head of Evelyn Creek, southeast of Mt. Hardisty.

**Family Bovidae**

**Bison Bison bison**

Subspecies: *Bison bison athabascae* Rhoads. External measurements: Seton (III, 1927) gives a mean for the species as 3,422, 710, 622 mm and a height at the shoulders of 5.5 to 6 feet (1,673 to 1,836 mm). Weights of bulls range from about 1,800 to 2,200 pounds. Cows are distinctly smaller, with shoulder height of about 5 feet (1,530 mm) and customary weights of around 700 to 800 pounds, though some may exceed 1,000 pounds. A large bull collected by Harry Radford southwest of Fort Smith, N.W.T., December 1, 1909, weighed 2,402 pounds.

The wood bison formerly ranged from mountains in the United States northward through the Alberta Rockies and parts of Mackenzie District, the Yukon, and Alaska. It has long been extinct in the Rocky Mountains. It is not definitely known when the last were killed there, but it would seem to have been some time about the middle of the nineteenth century. In some isolated tracts extermination may have occurred sooner.

A half century earlier the animals were still common directly north of present-day Jasper Park territory. As Preble (1908) points out: "Harmon, in 1898, found the animals abundant on the plains on either side of Peace River from Vermilion Falls nearly to the Rocky Mountains; and in 1810 some on the Peace between Forts Dunvegan and St. John." When they were finally wiped out there is uncertain. Dawson (1881) says that while exploring in the Grande Prairie district north of Smoky River, in the summer of 1879, he saw numerous old signs of bison such as rubbing-trees and wallows; local Indians said that the last of these bison had been killed off many years before.

It seems clear that in the Jasper Park region and farther south they did not survive the 1850's. Banfield (1958) says that, so far as is known, the last one was killed in the Banff Park territory in 1858. After his expedition of 1911 Hollister (1912) remarked:

A few years ago buffalo skulls, old and weathered, were not uncommonly found in the mountains bordering the upper Athabasca Valley. Numbers were found on the east side of the Athabasca River, some 15 miles south of Henry House, at a point locally known as Buffalo Prairie (originally named by French voyageurs as Prairic de la Vache). Mr. Lewis Swift told me that at the time he came into this country, some seventeen years ago, the oldest Indians could not remember the living buffaloes. People then seventy-five years old know nothing of the animals beyond the fact that the bleached skeletons were there.

That would imply local extermination in the first quarter of the nineteenth century.

Clarke (1942) mentioned that several bison skulls were seen at cabins along Brazeau River;
that the Athabasca Valley had been a well-known range; and that it was highly probable that the animals once inhabited the Snake Indian River drainage area. He saw a distinct old-time wallow in the vicinity of Devona. In 1960 I also came upon over-grown, shrubby depressions in sandy ground, between Snaring and Cobblestone Creek, that had all the earmarks of ancient bison wallows; but the vast majority of old bison imprints have long since disappeared forever.

Mountain Goat *Oreamnos americanus*

Subspecies: *Oreamnos americanus missoulae* J. A. Allen. External measurements: the average male dimensions as presented by Seton (III, 1927) are 1,648, 177, 349 mm. A female taken by Cowan (pers. comm.) in August 1943, at Byng Pass, Jasper Park, measured 1,412, 160, 322 mm, and a female kid (same time and place) 920, 100, 250 mm. Seton gives male height at the shoulders as 39 inches (994 mm). Rand (1948) cites weights of 150 to 300 and even 400 pounds. Females are from 10 to 20 per cent smaller than males.

Status — No mammal of the Rockies is more typical of the alplands than the mountain goat. In summer its whitish pelage is often conspicuous against the dark rocky background. It is widely dispersed in Jasper Park and common, or fairly plentiful, on many of the high ranges. Because of their lofty retreats and relative inaccessibility, they ordinarily fare better in hunting country than do game animals at lower levels. In the National Parks the species is now perhaps as numerous as in any former times.

Habitat — Normally the Arctic-Alpine Zone at various heights above timber line. Familiar features are cirques, crags, cliffs, ridges, and rock-slides, as well as alpine meadows and slopes covered with grasses and heaths — altogether the most rugged terrain that the Rockies have to offer. Goats are relatively sedentary, with somewhat restricted home ranges, but individuals and groups frequently descend into subalpine woods for certain foods and shelter, and even go down as far as the Canadian Zone to visit so-called “goat licks”. Some of the connecting trails have been so long in use that they are deeply etched into the forest floor.

Reproduction — Mating takes place in late autumn, chiefly during November. Collectively, the rut may last for several weeks, during which time the males are jealous and bellicose. Gestation lasts for about six months, with the one or two kids being born during late April or in May (Seton, III, 1927). For the most part the she-goats, immatures, and kids stay together in well-knit groups during the summer, segregated from the “billies”. The latter wander about in solitude or in small groups.

General Remarks — The very early history of the mountain goat in this region is obscure. We can only conjecture as to its status until near the end of the 1800's, but certainly they were much less vulnerable to destructive hunting than several other big game species. In some regions it is known that goats were abundant when some other ungulates were scarce and faced with extermination.

Alden Loring found goats well represented when he visited this territory in 1895, and was also informed that much the same situation obtained throughout the mountains. In July 1896 many were living in the easternmost ranges, but they dominated the region from the upper Athabasca to the Continental Divide. McEvoy (1900) said that goats were plentiful in 1898 “especially far into the mountains. They prefer higher and more rugged mountains than the sheep.”

It is interesting to note that goats were still abundant in the mountains when Hollister was there during the summer and autumn of 1911. He remarked:

We found goats inhabiting most of the higher ranges on both sides of the main divide. Blagden started one in the mountains above Brulé Lake [Bedson Ridge?], and Mr. Swift tells me that he has killed many on Pyramid Peak, a few miles west of his homestead near the site of the old Henry House.

In the high divide country around the headwaters of the Moose and Smoky Rivers the animals were “really common” and Hollister collected several. They were equally plentiful in various neighbouring areas and existed in some numbers at Maligne Lake.

Miller (1915) says that the mountain goat “is everywhere present along the east slope in numbers that it would be difficult to estimate, but certainly well up in the thousands.” Even if he was too optimistic, it is clear that the animals were still numerous, and after 1907, they received complete protection. Thereafter there was no question as to their satisfactory status. In August 1937 C. Matheson collected a park specimen for the museum of the University of Alberta. Anderson (1938) referred to goats as holding their own on suitable ranges; in 1939 he heard that many were inhabiting the high country along the upper Snaring
River and tributaries. He personally sighted the species near Indigo Lake, at a point a few miles southeast of Snake Indian Mountain, and along the upper Smoky River a few miles east of Mt. Bess.

Clarke's inquiries of 1941 revealed that the species was rarely seen along the Rocky and Southesk Rivers, and also that it reached the peak of abundance near the line marking the westward limit of bighorn sheep. From there to the main divide, goats were the dominant big game of the Arctic-Alpine Zone.

Cowan (1943) discovered near-absence of goats on the Brazeau River watershed, but stated that elsewhere in the park they existed in fair numbers.

The big bands that at certain seasons frequent Shale Banks on the lower Snake Indian River were not there when the present examination was made. Heaviest concentrations were found on the hills west of Mowitch Creek and Derr Creek. Here 56 were seen during a 4-hour climb.

Other areas frequented by goats (sometimes only in modest numbers) include the Victoria Cross, De Smet, and Bosch Ranges and the vicinity of Willow and Blue Creeks and Daylight Peaks. In August 1943 Cowan collected two complete specimens and a separate skull at Blue Creek and Byng Pass.

During August 1948 H. D. Fisher observed 56 of the animals on the Brazeau-Rocky River watersheds. In the same general region Flook (1956) met with about half that number, but that did not necessarily signify a decline in the population, since flocks can be readily overlooked in this notably complex terrain. While goats appear to be far from common in such districts as Miette, Whirlpool River, and Yellowhead, there are excellent aggregates of them in the north of the park and along many parts of the high ranges of the Continental Divide. Various-sized bands and small groups reside in mountain areas southwest from the Whirlpool River at least to Mt. Fryatt and to Fryatt and Lick Creeks. East of the upper Athabasca and Sunwapta Rivers goats are found in many scattered locations, including Kerkaslin and Wilcox Mountains, Poboktan Creek and Pass; and northwards to Maligne and Jacques Lakes, Roche Miette and Ashlar Ridge (Cowan, 1944). In the wardens' game summary of 1961–62 (Table 3) goats were recorded in all districts except that surrounding Jasper townsite; greatest prevalence is shown in the districts of Pocahontas, Smoky River, Athabasca Falls, Brazeau River, and Maligne Lake.

During the summers of 1960 to 1963 I learned little about goats apart from facts supplied by the park staff. The picture derived from their accounts is in harmony with most of the information outlined above. I found no goats at all in the alplands at Sunwapta Pass, Signal Mountain, and the Bald Hills, near Maligne Lake. In late June 1961 I saw many goats with small kids visiting the licks at Shale Banks, Snake Indian River; sometimes they were mixed with bighorn sheep and lambs. Other small bands of goats were present farther up the river near Snake Indian Falls.

While working around Maligne Lake in late July 1963 I saw none, but Warden George Wells said that about 40 inhabited high terrain between Maligne Lake and Antler Mountain, and also parts of Queen Elizabeth Range to the east. A party of mountaineers I met at the east end of Maligne Lake on July 30, 1963, reported the presence of goats high up near Mt. St. Paul and between Coronet Glacier and Mt. Mary Vaux.

Scharff (1966) remarks: "... at Mile 23, south of Jasper on the Banff-Jasper Highway, goats come down to the Goat View Point to lick minerals in the high clay banks there."

Mountain Sheep (or Bighorn Sheep)  
*Ovis canadensis*

Subspecies: *Ovis canadensis canadensis* Shaw.  
External measurements (two males taken by Cowan at Brazeau Lake and Cairn Pass, 1943–44, respectively 1,505, 140, 408 mm and 1,683, 114, 440 mm. Hall and Kelson (1959) give weights of 150 to 300 pounds. Females are 10 to 20 per cent smaller in some dimensions.

**Status** — These well-adapted mountaineers are highly characteristic of the Alberta Rocky Mountains. They formerly suffered drastic decline in numbers at the hands of Indian and white hunters; in some areas of this region they were slaughtered off completely. The destruction was abruptly halted, none too soon, when Jasper Park was set aside as a wildlife sanctuary in 1907.

Shortly after the park was created, sheep were making spontaneous increases over a wide territory in its northern and eastern sectors, until today the park population of sheep may well be between one and two thousand head. Their distribution is erratic — they are abundant in some especially attractive places and scarce or absent in others. Some extensive areas of the park, however, apparently never were inhabited by mountain
sheep; this was owing to long-existing inimical conditions relating to interdependent summer and winter feeding ranges. At present the population appears to be slowly declining because of forest regeneration of fire-created grassland ranges.

**Habitat** — In most respects their habitat is similar to that already described as occupied by mountain goats. Mountain sheep and mountain goats are equally adjusted to a life above timber line; at times both descend into the forest at lower levels; and they are attracted to the same licks. The bighorn, however, is a more frequent visitor to the lowlands of the principal mountain valleys. Fair-sized flocks are not uncommonly met with in Athabasca Valley between Jasper and Pocahontas.

**Reproduction** — Much of the year the rams are segregated in bachelor parties, but in late autumn they seek out the ewes. The rut runs its course in November and into December. The males are polygamous, and at that time engage in many face-scarring fights, during which the ewes feed near by with quiet unconcern. Gestation lasts for about 180 days. One lamb is born to a ewe once a year, usually during the latter part of May or early June (Hall and Kelson, 1959). Within a few hours the lambs are able to run and skip about, and in two or three weeks they are amazingly sure-footed. They may stay in the company of their mothers for as many as three years. Many of the observed small groups are probably bound together by family ties.

**General Remarks** — It is reasonable to assume that bighorn sheep still existed in considerable numbers during the early 1800's. This is indicated by David Douglas who recorded these sheep as abundant in the Jasper country in 1827. Preble (1908) mentions that Richardson (1829) credited Drummond with having shot many of these sheep (then called *Ovis montanus*) in the mountains near the head of Athabasca River — more precisely, perhaps, near Athabasca Pass. The Earl of Southesk (1875) encountered many bands in what is now southern Jasper Park.

In the more remote recesses of the region sheep continued to be more or less common into the 1890's, but elsewhere marked reduction had taken place by then. In the early autumn of 1895 Loring met with the animals in the Jasper House district. The following summer, in the same general territory, he found sheep well dispersed in the higher mountains as far southwest as Henry House. The Indians then declared that that was practically their local western limit; this was later substantiated by Loring, who found them especially plentiful in the mountains 15 miles south of Henry House. Quite a few were also inhabiting the rugged ranges between Jasper House and the Smoky River. Referring to the season of 1898 in this region, McEvoy (1900) stated:

Mountain sheep are scarce in the first ranges of the mountains. They do not appear to go more than thirty or forty miles into the mountains and seem to confine themselves to the limestone ranges.

By the time Hollister (1912) came upon the scene in 1911 the sheep had been even more thinned out, though they were still solidly entrenched in some localities. He says:

Mountain sheep still exist in some numbers in certain parts of the Jasper Park country . . . Mr. Swift, whose long experience in these mountains makes his statement authoritative, told me that the sheep were confined in this region to the 'first and second Alberta ranges', and did not occur on the main divide.

Formerly exceedingly abundant, the sheep are now confined to a few limited ranges. Some of the best of these are in the immediate vicinity of Jasper Park, and the preservation of the bands should be assured. The old stories of the former abundance of sheep handed down from the active days of Jasper House and Henry House trading posts are almost like myths. Sheep are always local and are known to range in certain mountains while other sections, apparently equally favourable, are entirely wanting in the animals.

The party actually saw no sheep at all until after reaching Maligne Lake, where many were seen and four were collected for the U.S. National Museum. During their short stay in that locality the party sighted about 50 sheep, 35 of them in a single day.

Miller (1915) estimated that from 200 to 450 sheep dwelt in the mountains between the northern boundary of Banff Park and the Athabasca River. After creation of the park in 1907 the species was not long in responding to protection by a steady increase in numbers and a re-invasion of territory where they had been shot out or seriously depleted years before. For the Rockies as a whole, Webb (1959) remarked: "Sheep numbers declined gradually until around 1920 when a slight reversal started . . . . Prior to 1914 the Stoney Indians played a large role in depleting the herds."

In 1938 Anderson mentioned "a sufficient population" and said that some wardens believed a number of areas were actually overstocked. Anderson continued:

One warden told me of riding a horse along the highway below Jasper a few years ago and getting into the middle of a flock of about 140 sheep on the high-
The sheep kept walking along with him and he had difficulty getting through the flock. He thought the sheep were too numerous at that time.

Clarke (1942) found the population excellent but varying greatly in abundance over their range in the eastern and northern parts of the park. He found outstanding numbers on both sides of Athabasca Valley from Jasper to East Gate, and suggested that these might number about half of all the sheep in the park. He commented: ‘This is probably the largest continuous area of sheep range backed by suitable summer range in North America’. The approximate western limit of sheep range was found to run from Nigel Pass to Wilcox Peak and Jonas Pass, then northwest in the mountains east of the Sunwapta and Athabasca Rivers to The Palisades and on to Blue Creek and Smoky River.

During the summer of 1944 Cowan visited most of the sheep range in eastern sections of the park from Wilcox Peak in the south to Topaz Lake near the northern boundary. Scattered bands of bighorns were observed in numerous places between these two points. Usually the local populations numbered no more than a few dozen, but in some areas the count was considerably greater, in one instance running as high as 450. These larger aggregates were seen at Cairn Pass, Signal Mountain, Colin Range, Roche Miette, Devona, and Miette. Cowan’s total tally for 1944 was 2,259 sheep. That could not, of course, represent the total park population, since it is impossible to survey all inhabited slopes at one time.

From an aerial survey conducted in southeastern Jasper Park in February 1953, Banfield (1953a) concluded that a marked decline in sheep had taken place since 1946. He thought that a contributing factor might have been severe mortality as a result of the harsh winter of 1948–49, but disease was not ruled out as a possibility. On a horse patrol in the same region the following August his observations (1953b) confirmed the population decline that he had earlier noted from the air.

In the wardens’ game summary of 1961–62 (Table 3) sheep were recorded in all patrol districts except the upper Smoky River and the Whirlpool River; greatest numbers were listed for the districts of Jasper town, Snaring, Miette, Pocahontas, Sunwapta, and the Brazeau and Rocky Rivers. Evidently mountain sheep are the second commonest big game species in the park, exceeded in numbers only by wapiti.

Because of their location, my wildlife investigations in the early 1960’s revealed little concerning mountain sheep. I observed some at Fiddle, Miette, Bosche, and De Smet Ranges and at Coral Creek. While large numbers are above timber line during the summer, others are then to be found at much lower altitudes, including the lowlands of Athabasca Valley. On June 9, for instance, I saw a band of 26 rams along the highway southeast of The Palisades, and on August 31 I encountered a flock of 30 ewes and lambs crossing the road near East Gate, evidently en route from Fiddle Range to the Athabasca River.

During 1961 I saw no sheep except at Shale Banks where many visited the licks on the shale slopes along the west side of the Slave Lake. Here they mixed freely with mountain goats, the young of both species playfully intermingling. The firetower officer then at Devona Lookout, Art Anderson, said that sheep frequently visited the mountain near the tower and also wandered over the ranges to the north and west.

In 1963 I noted sheep on several occasions. On May 16 I observed about 40 on the bank of the Athabasca River near Pyramid Creek, and on June 3 a total of 36, all ewes and lambs, were feeding along the south shore of Edna Lake. Warden George Wells reported a good showing of sheep in parts of the Maligne Lake district. Mountaineers that I met on July 30 reported sighting small bands northeast of Monkhead Mountain and others to the north on the flanks of Maligne Mountain.

Hypothetical species

Pygmy Shrew Microsorex hoyi

This shrew has never been captured in Jasper Park. It is virtually certain, however, that it will eventually be detected there. This conviction is based on the facts that on September 26, 1896, Loring collected one at Muskeg Creek, a tributary of Smoky River, only some 30 miles north of the park (Preble, 1908), and that in 1935 Donald Carter caught four near Entrance, only a few miles east of the park boundary (Crowe, 1943); they are referable to the geographical race M.h. intervectus Jackson.

The extreme rarity of the pygmy shrew in the Canadian Rockies is indicated by the fact that Banfield (1958) did not list it for neighbouring Banff Park. Pygmy shrews are to be looked for in the same kinds of habitats as those of cinereous
and vagrant shrews. In some other Alberta areas pygmy and cinereous shrews have been found in close association, and occasionally taken in the same trap on alternate nights. Sometimes both have been observed in grassy lowlands travelling the runways of meadow voles.

**Big Brown Bat Eptesicus fuscus**
Careful search of the literature has failed to reveal a single record of this bat in Jasper Park. Nevertheless, there is a good possibility of its occurrence there, especially in the Miette—Devona area. That is suggested by Carter's collection of eight of these bats near Old Entrance in the early half of September 1935 (Crowe, 1943); Crowe referred them to *E. f. pallidus* Young. Old Entrance is only 10 air-line miles from the park, so that one cannot but feel convinced that some individuals fly south into the park. Banfield (1958) reports several records for Banff Park.

**Hoary Bat Lasiurus cinereus**
There is reason to suspect that this bat migrates, at least, through Jasper Park. Distribution of the species covers the entire length of Alberta and part of the Northwest Territories. Consequently it may be expected to occur during the summer almost anywhere in the province, including the Canadian Rockies. Banfield (1958) lists three specimens for Banff Park and remarks that the southward migratory movement takes place during the third week of August. A theoretical flyway from the north would lead through Jasper Park via the upper Athabasca and Sunwapta Rivers and thence southward through Sunwapta Pass into Banff Park.

**Woodchuck Marmota monax**
As yet there are no park records, and I received no hint of the presence of "groundhogs" in conversation with any of the wardens. It is possible, however, they may enter the park through the broad Athabasca River gap between Fiddle Range and Bedson Ridge. This expectation is founded on the circumstance that in 1935 Donald Carter (Crowe, 1943) collected three woodchucks near Entrance, only 10 or 11 miles northeast of the park boundary, which can easily be reached over ordinary foothills terrain skirting Athabasca River and Brulé Lake.

While I was collecting near the mouth of Fiddle Creek in August 1962, I saw on the side of an old abandoned railway grade a burrow that could have belonged to this species. In 1963 I noted similar burrows, five or six inches in diameter, on the slope of a low ridge flanking the south shore of the Athabasca River due east of Miette. Unfortunately I was unable to go back for conclusive investigations.

**Brown Lemming Lemmus trimucronatus**
It appears necessary to call this species a hypothetical resident of the park since there is no indisputable record of its occurrence there. Yet there is a definite possibility that it may be found in the alplands of northern Jasper Park, where it should be diligently searched for. The geographical race represented is *L. t. helvolus* (Richardson). In this latitude it apparently frequents only the Arctic-Alpine Zone between about 6,000 and 8,000 feet.

Regarding it, Preble (1908) wrote:

> This species is known from Richardson's description of a specimen taken by Drummond in the Rocky Mountains, ostensibly in latitude 56° — but in reality from near the headwaters of one of the tributaries of Peace River, or between there and the Jasper House region.

Anderson (1947) gives part of its range as the "Rocky Mountains region of northwestern Alberta". Hall and Kelson's (1959) distribution map shows the range of the species as barely touching northwestern Alberta in about latitude 53°40'N. For brown lemmings to be present at all in the Alberta Rockies, their habitations would have to occur south of about the source of Kakwa River or Sheep Creek.

From information on the species across the Divide in British Columbia (Stanwell-Fletcher, 1943), it appears that brown lemmings, like their relatives in the Arctic regions, undergo marked fluctuations in numbers in cycles of about four years. At the peaks they exist in teeming abundance, and then almost vanish.

Sheldon (1932) remarked that near Laurier Pass, British Columbia, brown lemmings seemed to prefer grassy slopes and passes above timber line at about 6,000 feet altitude. Breeding occurs in spring and early summer and sometimes into July. Litters vary in size from three to nine young (Rand, 1948). Sheldon (1932) took a female on July 17 with six embryos. Lemmings are active at all seasons. This species does not turn white in winter, but retains the brownish pelage throughout the year. Adults average approximately 155, 22, 21 mm in size and have an estimated mean weight of between 30 and 40 grams.
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