
THE ZOOLOGY OF
**ROCKY MOUNTAIN
NATIONAL PARK**

By
BAXTER L. SMITH



U. S. Department of the Interior
NATIONAL PARK SERVICE
FIELD DIVISION OF EDUCATION

Berkeley, California
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FOREWORD

This paper on the Zoology of Rocky Mountain National Park is one of several prepared by a group of research workers employed by the Field Division of Education of the National Park Service during the CWA period of 1933-34. Its purpose was to provide a background for the preparation of museum exhibits at Rocky Mountain National Park.

With its limited purpose, the paper naturally does not cover all fields of zoology in the region, nor does it give equal weight to various subjects. It does not represent the result of original field work but is rather a compilation based on an extensive examination of the published data concerning the region of the Park. Particular efforts were made to produce as complete a bibliography as possible and this feature should be of special value.

Although intended for a specific and restricted use, it is believed this paper should be of value as a preliminary introduction and as a summary of the zoology of the Rocky Mountain National Park area. With this in view as well as in response to numerous requests for copies, it was felt that the paper should be given wider distribution in this mimeographed form.

In order to save time and expense in mimeographing, references are included in the text in parentheses rather than by the use of footnotes.

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THE ZOOLOGY OF ROCKY MOUNTAIN NATIONAL PARK

A description of the zoology of Rocky Mountain Park is almost a description of the zoology of an entire country, so varied is the variation of animal (and plant) groups up a mountain side. This variation is shown even better in Mount Rainier National Park because there is a greater difference between base and summit. Long's Peak, the highest mountain in the park--14,255 feet, has a number of climatic zones, thus supporting a varied array of plant and animal life. If a traveller were to leave the base of Long's Peak and climb to the summit (see chart of trail), he would find almost as many types of plant and animal life as though he had gone thousands of miles northward into the Arctic Circle.

The place to get a comprehensive view of the life zones and their associated plants and animals is in the mountains. Life here, especially plant life, seems to take its place with almost mathematical precision in the altitudinal zones.

One of the interesting characteristics of Rocky Mountain National Park is the great altitude of its life zones. Plants and animals are scattered all over the Rockies from the lowest foothills to the highest peaks. In the Alps timberline is at about 6,500 feet, and the perpetual snow-and-ice line at about 9,000 feet; while above this the Alps rise into a zone of death; the upper slopes are lifeless. Timberline in the Rocky Mountain National Park is between 11,000 and 12,000 feet above sea level; a vertical mile higher than it is in the Alps.

What is a life zone? A mountain may be divided into a number of altitudinal or vertical zones, each of which has its characteristic plants and animals. The plants and animals that live at 14,000 feet are different in kind from those that live at 8,000 or 9,000 feet lower down the slope. Each kind occupies but a small area, is restricted in range, and has but a small local habitation in the big mountain world. Each has a zone, or climatic address, and is found in a zone which supplies its peculiar requirements, or in which it can best hold the ground against competitors. Combinations of temperature,

Moisture, soil, and slope largely determine the kinds of life that will occupy each zone.

For every thousand miles into the north the temperature is about three degrees cooler, and likewise for every thousand feet up a mountainside. The latitudinal or horizontal zones are of wide extent. The vertical or mountain zones are narrow, ragged-edged, and small. The number of these zones is commonly reckoned at seven, but each has one or more subdivisions.

The distribution of plants and animals is systematic and surprisingly orderly. This distribution is one of the most interesting facts of woodcraft, and a knowledge of the regularity of life distribution through the zones adds infinitely to one's enjoyment of the outdoors.

The rugged peaks in the Rocky Mountain National Park are not barren and lifeless, though at a distance they appear so. Above timberline the mountain sheep, fox, cony, ptarmigan, and rosy finch live the year round. The summer population embraces many kinds of birds, including the golden eagle; there are also bear, woodchuck, deer, and a wealth of flowers.

Trees are most excellent indices to zone determination. They are found always occupying the same relative positions to one another as controlled by soil, climate, and comparative vigor of each species. Even though many species have a long vertical range, yet even these are useful in this connection, inasmuch as they take on new forms corresponding to the variations in altitude.

Timberline in the Rockies is high--in most places as high as 11,300 feet. It is the forest frontier. It appears as old as the hills and as fixed and unchanging as they, but like every frontier, that of the forest is aggressive--is ever struggling to advance. At timberline, limber pines are growing on the drier and wind-swept slopes, while in the moister places are Engelmann spruce, arctic willow, and black birch. Here the more unfavorably located trees suffer. Many, though four or five inches in diameter at the base, are from two to six hundred years old, and are not more than four or five feet high--often smaller.

Below timberline the purple robe of coniferous forest spreads over the slopes, ridges, and basins. Engelmann spruce predominates in the upper forest zone along the streams. There are extensive forests of lodgepole pine and scattered growths of fir, aspen, and Douglas spruce. In this forest belt, the Rocky Mountain grey jay, Clark's crow, grouse, snow-shoe rabbit, porcupine, Douglas squirrel, and chipmunk are at home the year round, and in summer many nesting birds, among them the hermit thrush, kinglet, and Audubon warbler, gladden the woods and trails.

The western yellow pine and the blue or silver spruce are mostly below 8,500 feet. The aspen forms attractive groves and stream fringes. Willow, alder, cherry, birch and mountain maple appear in scattered growths. This territory was once thickly populated with larger animals. Elk are increasing and also deer. It is one of the greatest mountain sheep ranges in the world. There are straggling numbers of lynx, coyote, and mountain lion. Through all the valleys with sizable streams the beaver maintains ponds and picturesque lodges. A beaver colony is one of the most interest-stimulating sights of the outdoors and the beaver deserves a far larger place in our literature than he has.

The carnivorous animals constitute an important element in the park fauna, on account of their variety, size, and many interesting characteristics.

Within the park the families of carnivorous animals represented are the Felidae (cats), Canidae (wolves and coyotes - very few, however), Mustelidae (skunks, badgers, wolverenes-- extinct in the park now--martens, mink, weasels, and others), Ursidae (bears), and Procyonidae (coons).

Merriam calls the Colorado mountain lion Felis oregonensis hippolestes; there are only very few of them left in the park region, and they are seldom seen. The other cats are three species of lynx: the Canada lynx, Bailey's bobcat, and the mountain bobcat. The Canidae are represented by three genera: the gray foxes, the true foxes, and the wolves and coyotes. The Ursidae are represented by the two major species, the black and grizzly varieties. The Mustelidae are well represented by numerous forms, and there are a few

specimens of the Procyonidae present.

The hoofed mammals are represented by three families and four genera, or five genera if the bison is included. An interesting story accompanies the antelope. Its name, Antilocapra, means antelope-goat, but it is neither, being a distinct form of itself. The antelope is now extinct in the park proper. Coronado was supposed to have been the first European to have seen the animal in 1535. It did not receive a scientific name until 1815.

In considering the deer, it is of interest to know the origin of the scientific name of our American deer, Odocoileus. Rafinesque, that zealous, eccentric, and reckless naturalist, is the author of the name. He based it on an upper premolar tooth of a deer that was found in a cave at Carlisle, Penn. The name means hollowed tooth, and it was supposed that the animal was extinct. Actually it was the tooth of the common Virginia deer; and as no generic name had then been provided for the American deer, this was available.

The grizzly bear, though gone from the park now, was one of the most interesting animals that roamed the mountains. He was wide awake, courageous, and he was a desperate fighter if need be. He ranged all over the mountains in summer and in winter, and hibernated, usually, far up the slopes.

While most plants and animals have a restricted or home zone, a number range over a wider territory. Beaver, woodchuck, and weasel may be found in a number of zones below timberline, and even above. Sheep that live most of the year in the heights, explore a wide territory, and often come down the slopes in early spring for the first green grass. The oriole, is acquainted only with the foothills, but some of the birds that spend the winter on the lower or middle slopes, go above timberline to nest. The water ouzel is found along the alpine streams in summer, and the solitaire, one of the most eloquent singers on earth, nests upon the ground near timberline.

The entire park is a wild flower garden. Differences of altitude, topography, and the unequal distribution of moisture induce more than a thousand varieties to bloom in, and color, the glad, wild valleys.

(The preceding picture is a birds-eye view of the entire range of life in the park. While I have used the drawing of Mills as a foundation, it by no means shows the needed information).

The rodents are the most successful animals, if success is measured by the number of genera, species, and individuals. To go into detail in a discussion of the rodents would be fascinating, but would be out of place here.

The beaver, as mentioned before, is one of our best natural carpenters and engineers. As a woodsman he is hardly surpassed. This is the broad-tailed beaver, Castor canadensis frondator. The body of the beaver is covered with soft dense fur, and is dark brown in color. The average weight is about 35 pounds. Beavers are aquatic and nocturnal, though under protection they will work in daytime. The nest is usually a conical lodge built of sticks and mud, in a pond formed by throwing up a dam of sticks and earth across a stream. Along streams with high banks, the nest is often in the bank above water level, and connected with the stream by a tunnel whose entrance is under the water.

There are thirteen races of beaver recognized by zoologists. The beaver once ranged over all of temperate America, wherever there was wood and water. Nevertheless, it abounded chiefly in those areas where the aspen, its favorite food, was found in abundance. Sluggish streams and small lakes with clay banks that are well wooded with aspen and willow are the favorite haunts of the beaver. The individual range is very small for an animal so large. When the pairs have found and settled in a place that suits them, they do not travel a half mile from home. On the other hand, an unmated beaver seeking a partner or good location may wander a dozen miles or so. In the Annual Report of the Forester (U.S. Dept. Agri., p. 37) for the year ending June 30, 1926, the state of Colorado was censused as having 47,314 beaver, or nearly three times more than any other state in the Union! This count includes only those in protected areas, such as the National Forests. There are others on privately protected lands, which are not in this census.

A beaver can cut down a tree about as fast as a man could

do it with a dull hatchet. Two beavers could fell a three-inch sapling in three minutes, and a six-inch tree in an hour or two.

The dam is the most famous, if not the most remarkable, of the beaver's undertakings. It is a structure of sticks, stones, roots, mud, and sod. The dam is worked on, principally at night. Another thing perhaps even more remarkable than the dam is the construction of artificial canals. These are used for transporting their wood, by water, to their lodges. Sometimes the canals are hundreds of feet long. The beaver lodge in the pond is the next step up from the burrow in the bank, which is an older institution in beaverdom than the lodge.

The diving power of the beaver is remarkable. They can stay under water for fully five minutes, which means that they could swim nearly a quarter of a mile without coming up for air.

It is generally conceded that the beaver is a monogamist, although there are exceptions. The mating season is January or early February. Gestation lasts about three months. The male is ostracized temporarily in the period before, during, and just after, birth. The young number from two to five annually. They are born with their eyes open, and are weaned at about six weeks, but continue with the mother for a year or longer.

Just as in the family of the buffalo and moose, there are outcasts or bachelors, either from choice or necessity. This is due usually to age, and these outcasts are always males.

As for signals, the most common and important is that of the tail-slap when diving. It is considered by some to be the sign of a mortal wound if a beaver dives without slapping the water with his tail. However, it seems plausible that if the beavers were in an undisturbed or protected locality, excessive tail-slapping would seem to nullify its value as a danger signal. In fact, contrary to the statement made, others say that the water is slapped with the tail only about fifty percent of the time when diving.

Very closely connected with the building instinct is the food instinct. The favorite diet of the northern beavers is the bark of the aspen, but, their diet includes, the young bark

and twigs of most of the hard woods, and in summer, roots, lily bulbs, tubers, etc. They store up food to tide themselves over periods of confinement.

Like all creatures that live in colonies and have elaborate homes, the beaver has progressed well along the lines of sanitation.

The muskrat is usually considered an enemy of the beaver, because of his damage to the dams by tunneling. Beavers usually kill out-right any intruding muskrat, though cases have been known where they lived together--even in the same lodge. Beaver often help to introduce trout, or other fish into a region. The beaver dam turns a rill into a succession of cool deep pools. In these the fish find safety, especially when the stream runs low.

There is one aspect of the beaver lodge that deserves the full and careful attention of some trained naturalist; that is, the moated lodge as the home of a community.

The moat entirely changes the aquatic life. New fishes, new plants, new insects are attracted. The top of the lodge furnishes a secure nesting place for wild geese, wild ducks, divers, grebes, etc.; the hollows in the walls afford refuge to water shrews, snakes, mink, and muskrats. Fish lurk in the deeper pools below, and insects of all kinds flourish in the walls, the roof, and the bedding.

Since the deer have been given so much interest in Yellowstone, it is best not to go into too much detail here. There is only one kind of deer that is common in Colorado: the mule deer (Odocoileus hemionus). There is a relationship between the deer and the beavers. This is observable both in food and range, both overlapping considerably. The white-tailed deer and its subspecies range over practically the whole of continental North America; and curiously enough, the range coincides closely with Sargent's map of the distribution of the oaks in America east of the Rockies. From this it is readily seen that acorns are a staple in the diet of the deer. The wide spread notion that deer feed chiefly on grass is ill founded. Grass they will eat at times, but the main and necessary diet is brushwood, twigs, and leaves of trees. Deer seem to be very fond of poison oak.

In water some deer seem very much at home. They have been known to swim so fast that a canoe-man must race to overtake them. The ordinary gait of the deer is a low, smooth bounding, with an occasional high jump. A deer can travel at about 25 miles per hour, but cannot keep it up for more than 3 or 4 miles.

The mountain sheep almost reaches the acme of agility among the larger hooped mammals. As with the beaver, the State of Colorado boasts more sheep than any other state--about 8,000 or twice as many as are in the state of Wyoming, including Yellowstone park, and a little less than twice as many as are in Montana, including Glacier Park.

Rocky Mountain National Park is a natural sheep range. However, at the present writing, the sheep in and around the park are affected with some sort of disease. Accordingly, so far as presentability and health are concerned, the bighorn sheep of Glacier Park are by far the best.

This animal is sometimes called the American Ibex. The horns of the male are curved and massive. The horns of the bighorn, contrary to the statements of some observers, are not used in uprooting food of any kind, but are solely weapons and secondary sex characters, which come into their most dominant play during the breeding season.

An obscure but interesting feature is the gland that is found under each eye. It secretes an unctuous, waxy stuff with the peculiar sheep-smell of the race, quite strong. It probably has to do with a system of smell signals. This gland is much more developed in the Asiatic bighorns.

Another detail of the bighorn equipment for the battle of life are the pads of the breast and knee, where the skin is developed to an almost cartilaginous shield over a quarter of an inch thick. The whole sternum and front of the knees are thus protected and for evident reasons. Hitherto, the camel has been supposedly the inventor and exclusive wearer of knee-pads. (These references on the padding apply more specifically to the Texas sheep as observed by Bailey).

Formerly the range and feeding grounds of the bighorn were the grassy foothills and bluffs not far from the crags.

It was not gifted with speed, or weapons, or fighting strength, but this it had: the power to bound up a sheer and rugged cliff that was impossible for any other big creature in its range, except perhaps a mountain lion or mountain goat. There is a wide difference in the mountaineering of the white goat and the bighorn. The goat is a climber like the monkey; the sheep is a sure-footed boulder like the chamois. The cliff-mastery of the bighorn is marvelous. Today all is changed, and the bighorn has been forced to the high mountains.

The sheep are very clannish, and they will roam a certain upland. At some seasons the rams are apart, yet in touch with the flock, which is composed of ewes, lambs, and spike-rams; that is, rams not yet of mature age. Like most big game in snowlands the bighorn have two ranges, one for summer and one for winter. The moose, though not in the park, is an exception to this generalization.

The bighorn is a delicate feeder. When one sets in parallel columns the foodstuffs of elk, deer, and bighorn, he is surprised to see what a variety of crude, rough, woody, or rank-smelling and rank-tasting things the deer will eat. The bighorn, on the other hand, eats mostly nothing but the sweetest and most delicate of the hillside grasses and flowers. Other plants forming an important part of the sheep's diet are: leaves of the chinquapin (Castanopsis sempervirens), wild parsnip (Palpinacea sativa), manzanita berries (Arctostaphylos), twigs and leaves of Rhus trilobata, and Rhamnus crocens californicus.

In its normal range the bighorn prefers a drink at least once a day, but in the drier ranges, it has almost dispensed with the desire for water.

The eyesight of the creature is of the highest order, his ears are reduced in size, yet still keen, but his sense of smell is negligible. A sheep's scenting qualities are about on a par with a bear's poor vision.

Thieves and robbers were wont in olden days to inhabit rocky fastnesses and to forage and plunder from their safe retreat. And so with the mountain or pack-rat (Neotoma

cinerea orolestes)--it's name means ashy colored mountain robber.

This is the notorious packrat, and many are the tales, both tall and otherwise, concerning the pranks of the animal. The species is found in Colorado and portions of Wyoming. It is found over an extremely wide range of altitude, from 4,6000 feet at Grand Junction up to timberline, or higher, and seems to make itself at home anywhere. While warm weather lasts they do not trouble habitations very much, but when in the mountains the weather begins to get colder, the rat looks out for a warm place for his winter residence, and often selects a cabin or ranch house. His presence is soon known of by the disappearance of small articles. The rat will carry off almost anything it can carry, and quite as often when it finds something new, it will leave what it has and take the new - hence the name trade-rat.

It's nests are often made of material apparently procured by shredding gunny sacks, old clothing, and such material as it finds around dwellings. These are often worked into a globular form with an entrance to one side. At other times the nests are made of shredded bark, rootlets, etc.

This species has a more pronounced musky odor than any other of the genus. It is much more persistent even than that of the skunk. The bushy-tailed rats are apparently more prolific than the round-tailed species.

The wolverene (*Gulo luscus*), though extinct in the park now, is an animal worthy of mention, mostly because of his reputation, and because the type species was found in Colorado. It's name means throat or gullet--hence glutton, and it is one of the cruellest and most gluttonous of the wild animals. It is in a class with the minks and weasels.

It's food consists of any animal it may be able to capture. Dead animals are not despised (they are hyena-like in this respect), and they will take those caught in traps and devour them. Hunters' caches are often torn up and destroyed. The wolverene, in the north, will follow a line of traps, eating or hiding animals that may be caught, tearing up hides--in fact destroying everything in it's power. This

animal is one of the most destructive and detested of all North American animals.

The rutting season is in March or April, and the young are born about 60 days later, there being from one to three in a litter, and occasionally as many as five. The fur is of considerable value.

The grizzly bear, while more important in other parks perhaps, deserves mention. In Colorado this bear is confined to the more mountainous portions of the state, and is apparently not now found in the foothills.

The grizzly bears, in common with all bears which live where the winters are severe, spend the winter in a state of hibernation, for which they accumulate a thick layer of fat.

Bears are omnivorous, eating anything in the shape of food that they may find, vegetable or animal, fresh or otherwise. Bears often open rotten logs to get the grubs; they tear open ant hills and lick up the inhabitants with their tongues. And the bear's fondness for honey is proverbial. They will take almost any chances and endure almost anything to get honey.

The largest bear that was actually weighed of which there is any record, weighed 1,153 pounds. Normally a wild grizzly weighs around 600 pounds. There are no grizzly bears in the park at present.

The black bear at this time is the only kind of bear in the park. It's habits are the same in general as those of the grizzly. It is holding it's own very well, and is slightly increasing in numbers.

The larger animals mentioned herein have been selected because of some quality or trait, either good or bad, which makes them noticeable. But, even though Rocky Mountain National Park has a wealth of larger animal life, the bird life is of great importance and variety, also. The latest estimate on the number of birds recorded from Colorado places the total at over 400 species. All of these will not be found in the park proper, but I would venture to say that

there are more species out of the 400 or so recorded for the state, represented in the park than are of the total number of animals represented, exclusive of the invertebrates.

Without fear of contradiction, I think Yellowstone Park has by far the greatest assemblage of living forms of any park in the entire system. With this in mind, I will try to separate from the mass of material that which will be peculiar to, and distinctive of Rocky Mountain National Park.

In museum display the reptiles undoubtedly should be given a place, but there are relatively few in the park as compared to other places, and the interest they would create might not justify a great amount of stress. The same is true of the amphibians. A most interesting exhibit case could be prepared on these two classes, stressing the ecological and evolutionary development of related forms, and their interdependence. It also might not be amiss to attempt to display the earlier forms of amphibian and reptilian life as fore-runners of the present living forms.

The fishes of the park could be used as a point of interest. A "tank display" always attracts favorable attention.

Stories of the relationships of various invertebrates to fishes can be prepared with relative ease, and the odd and interesting cases of parasitism can be most advantageously utilized. The example below connects, the vertebrates with the invertebrates.

The early life of our commonest fresh water mussels is filled with shifts for a living that illustrate in a remarkable way the interdependence of organisms. The adult mussels live in the mud in the bottoms of streams and rivers. The eggs are numerous and hatch into minute and very helpless larvae. The eggs of the river mussels are passed into the watertubes of the gills, where they are incubated. In the case of most river mussels, the eggs develop into a glochidium. This is a tiny little bivalved animal, very sensitive on the ventral surface, and which will close upon anything that touches it. The gills of fishes become infected when water containing glochidia is drawn in. Fins, and their lashing, cause a few glochidia to become attached

to their edges. Many forms of glochidia have little hooked tooth-like projections on the ventral edges of the valves. Whether hooked or not they are able to cling securely when attached in the proper place to the proper host.

The fish is not a passive agent in mussel distribution. The tissues of the fish respond in the same way as plant tissue does to a gall insect. Since this period lasts for some weeks, or even months in a few cases, the glochidia become encysted. Each attacking species of glochidium has its own particular host, and will grow only on the proper host. They will not attach themselves to any other.

It may be noted in passing that a little European fish, the bitterling, has turned tables on the mussels. It has a long ovipositor by means of which it inserts its own eggs into the gill cavity of a mussel, where they are incubated.

Insects can prove very interesting, if given a chance. Interest can be stimulated by the display of the more curious and conspicuous species, such as the camouflaged forms, the larger and more brilliantly colored beetles, and the moths and butterflies. From this could be continued the less colorful but none the less interesting study of the smaller, and many times more important species.

In presenting the zoology of Rocky Mountain National Park from the standpoint of the park visitor's interest, one meets certain difficulties. The range of the larger forms of life is relatively wide, while that of the smaller and less conspicuous forms is too little known, or else they do not attract enough attention. Beaver, deer, bear, etc., would be conspicuous in any park, but certain forms of insects, molluscs, arachnids, and the lower plant forms, while supremely important in the biologic relationships, are not conspicuous enough to warrant the "playing up" that the larger forms do.

Basing my conclusions on the statistics regarding certain animals, I would make Rocky Mountain National Park famous for its beaver and bighorn sheep (temporarily disregarding their present condition), since the State of Colorado has more by far of these two animals than any other state in the Union. The other larger animals could be brought in to intensify and correlate the interest created in the two stressed forms.

Supplementing these animals would be the birds, which I consider of almost equal importance in power of stimulating interest. There are at present more than 400 species recorded from Colorado, and a goodly percentage would be found in the park at some time of the year.

If the park is to stress glaciation with emphasis on the action of cirque glaciers and the effects of prevailing winds, then by all means, efforts should be made to draw some relationship between the geologic processes that have taken place and the flora and fauna of the region. In Yellowstone a similar relationship has been shown in connection with vulcanism. Adam's paper on base-leveling should furnish clues from which to proceed in this demonstration at Rocky Mountain National Park.

I have gone into detail on some of the larger forms, such as I thought interesting enough to warrant it. But others might be chosen instead. If a complete check-list could be prepared for the region of Rocky Mountain Park, and its immediate surroundings, showing the known occurrences of both animal and plant forms, and where possible the approximate probability of their being seen and identified by the visitor, then the park would assume a new importance.

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