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NOTES ON PACIFIC COAST RABBITS AND PIKAS

BY L. R. DICE

The following notes on rabbits and pikas pertain to the three Pacific Coast states: Washington, Oregon, and California. Most of them were secured by the Walker-University of Michigan Expedition to the Pacific Coast in 1922, but there are included notes on a few specimens of rabbits obtained in California by the expedition of 1924, which was supported jointly by the Carnegie Institution of Washington and the University of Michigan. I have added several records of other specimens from these states in the Museum of Zoology and other museums.

For permission to compare specimens in the California Museum of Vertebrate Zoology and in the collection of the U. S. Biological Survey I am indebted to Dr. J. Grinnell and to Dr. E. W. Nelson. I am also indebted to Stanley G. Jewett and to Alexander Walker for several records.

Ochotona princeps brunnescens Howell

Cascade Mountains Pika

A colony of these pikas was found on a large talus slope just west of Mirror Lake, Kittitas County, Washington. This lake is situated five miles southwest of Keechelus Lake, and has an elevation of about 1,200 meters (4,000 feet). Here five specimens were secured July 15–17, 1922, and several others were seen.

In the mountains about 15 miles southwest of Fort Klamath, Klamath County, Oregon, several small colonies were found on isolated rock slides on the sides of the ridges along the upper part of Three-mile Creek. Four specimens were secured August 14–16. These rock slides are completely surrounded by Douglas fir and yellow pine forest and are not far apart: perhaps none with pika colonies are more than a quarter mile from the nearest other rock slide. One pika was seen on a patch of slide rock only about 25 by 50 meters in extent. The elevation of these colonies is about 1,500–1,600 meters (5,000–5,500 feet).

The pikas at Mirror Lake seemed most active just as the evening shadows were falling across their habitat, but they were out at all times of the day.

The cry of *"yenk"* or *"yenk, yenk"* is occasionally heard, and at Mirror Lake I once heard a longer, polysyllabic, and more musical call.

One female, taken July 15 at Mirror Lake, contained five large embryos. Half-grown young were present at the same time, so that apparently two litters per year are reared in that region. The mammae on the above mentioned female were: pectoral, two pairs; inguinal, one pair.

Two males from the Fort Klamath locality weighed 143 and 152 grams, respectively, while two females from the same place weighed 153 and 170 grams.

As in other North American pikas there is a pair of glands on the sides of the neck, each of which is surrounded by long, whitish hairs. The hair about this region is usually some-

what dirty, owing to the stickiness of the greasy, glandular secretion. The gland lies just under the skin in a flat mass. The outlet of the gland through the skin is probably by a number of ducts, as no main duct nor opening could be detected with a hand lens. In an adult female from the Klamath region, skinned the day after death, the gland was black in color and about 12 by 6 millimeters in size on the skin, the outline being oval. I could detect no odor from the gland.

A forest ranger in the Keechelus Lake district called this animal the "rock-rabbit," an excellent common name for the members of this subgenus, but one which is apparently not in very common use.

Ochotona schisticeps jewetti Howell

Blue Mountains Pika

Four adult pikas were taken in the Wallowa Mountains, June 29 to July 3, 1922, on a talus slope beside Pine Creek, three miles above Cornucopia, Baker County, Oregon, at about 5,000 feet elevation. Signs were found on all the rock slides at this locality, but the animals did not seem common anywhere.

Most of those secured were taken in rat traps set near fresh heaps of feces. Several sorts of baits were tried, and fresh green leaves seemed to be most successful. Heaps of the spherical feces were noted under many of the larger rocks, where the animals apparently rest at times, and also on the tops of some small flat rocks, which seem to be used primarily for the deposition of the feces rather than as resting places. Many small rocks showed a whitish discoloration due to dried urine; these rocks were all under the shelter of large boulders, and were evidently favorite resting places for the pikas. The animals also frequent the tops of exposed boulders, but the urine evidently is washed off such places by the rain, and the whitish deposit does not form.

A number of heaps of old "hay" remaining from the previous winter were seen under large boulders. The heaps con-

sisted of little but the larger inedible sticks and much pika feces. No fresh "hay" piles were evident at this season.

No young pikas were seen at this time, and neither of the two adult females, taken June 29 and 30, contained embryos. Probably the young of the year were still too young to leave the nest. The mammae of the one adult female examined were: pectoral, two pairs; inguinal, one pair.

These animals run rapidly and noiselessly over the granite boulders. One traveling slowly moved with a little rabbit-like hop, but opportunity to watch them carefully was lacking. The call is a sort of "*enk, enk*"; but another sort of call is given when much alarmed, and one which settled itself for a rest on top of a large boulder gave a quite long, many-syllabled call.

The weights of two adult males were 178 and 180 grams, respectively; and of two adult females, 182 and 150 grams.

Some of the residents call this animal the "rock rabbit," but one man, who had known the pika in Colorado, called it the "cooney"; this evidently is a corruption of "cony," the common Colorado name.

Lepus townsendii townsendii Bachman

Western White-tailed Jackrabbit

An adult female of this species was taken June 5, 1922, near the top of the hills covered with bunchgrass southeast of Wallula, Walla Walla County, Washington. A few are reported by residents to occur on these hills, but they seldom, even in winter, come down into the sagebrush-covered valley of the Walla Walla River. According to Abe Goodwin, an old-timer in the valley, there were no black-tailed jackrabbits in the region when he arrived in 1866, only white-tails. A long time later a few black-tails appeared, and eventually became abundant, while the white-tails diminished, and now are practically confined to the bunchgrass areas on the higher hills. This information is corroborated by a number of other old residents. In the early days the whole valley was covered

with bunchgrass, with little sagebrush or rabbitbrush, but, due to overgrazing by stock, the bunchgrass has been nearly exterminated and replaced by sagebrush and other shrubs. The coming in of the black-tailed jackrabbit and the passing of the white-tail is said to have been correlated with this change in the vegetation.

A few white-tailed jackrabbits are reported to occur on the tops of the hills north and northeast of Baker, Baker County, Oregon. On the upper parts of these hills there is some bunchgrass in the sagebrush, while at the lower levels there is little grass among the shrubs.

On the evening of July 12, five hares of this species were secured out of 8 or more seen on the sagebrush-covered ridge northeast of Kiona, Benton County, Washington. This species occurred in typical sagebrush, with sparse grass, and was associated with the black-tailed jackrabbit; but it was much more numerous in the habitat than that species.

The female taken June 5 near Wallula had the mammae filled with milk, but contained no embryos. One female taken July 12 at Kiona still retained some milk in the mammae. Young of weights of 1,130 and 1,420 grams, respectively, were taken the same day at Kiona. The mammae may be indicated as: pectoral, 1 pair; abdominal, 3 pairs.

The weight of the adult female taken at Wallula was 3,070 grams; an adult male taken at Kiona weighed 2,090 grams; and two adult females from the same place weighed, respectively, 2,020 and 2,690 grams.

Lepus bairdii bairdii Hayden

Rocky Mountains Snowshoe Hare

A few of these hares are reported by residents to occur near Cornucopia and near Pine in the Wallowa Mountains, Baker County, Oregon. We found their feces in thick alder brush and in alpine fir clumps in the canyon of Pine Creek, just above Cornucopia, but no hares were observed.

Lepus bairdii cascadensis Nelson
Cascade Mountains Snowshoe Hare

A few snowshoe hares were secured July 18 to 23, 1922, in hemlock forest, in cedar forest, and in the brush of an extensive burn, between Keechelus Lake and Easton, Kittitas County, Washington. It was more common in the brush of the burns than in the forest; and in the forest it was confined largely to the thicker patches of underbrush. Five specimens were taken, and several others were seen.

Remains of several, probably eaten by owls, were seen in the forests. It is most active in the early morning and late evening, but is quite shy.

A female taken July 22, four miles northwest of Easton, had much milk in the mammae and contained seven embryos, averaging a length of 15 mm. Another female taken the following day at the same place had eight embryos, averaging 25 mm. in length, but a female taken July 21 had no embryos.

One female had four pairs of mammae, which may be indicated as: pectoral, one pair; abdominal, three pairs. The other two females had each five pairs of mammae arranged: pectoral, two pairs; abdominal, two pairs; and inguinal, one pair.

An adult male weighed 1,065 grams, while three adult females weighed, respectively, 1,640, 1,580, and 1,855 grams. Both the two latter individuals were carrying embryos.

Lepus washingtonii washingtonii Baird
Washington Snowshoe Hare

This hare is apparently rare over most of the Puget Sound region. We secured one, July 26, 1922, in Thurston County, Washington, about seven miles east of Olympia. This one was in brush and briars on top of a low ridge in a dry, burned area. However, we found it to be numerous a few miles east of Alpha, Lewis County. Here we secured six specimens, July 28 and 29, and saw a number of others. A milk-wagon driver reported it to be seen commonly in the mornings along the

road between Alpha and Unalaska, but said none were found west of Unalaska. We found it to be about equally numerous in the Douglas fir forest, in braken fern on cleared or burned land, and in brush and briars in burns. It seemed seldom to go far from thick brush. All those we saw in this region were along the road, as the brush and bracken is too thick for them to be seen easily elsewhere. In the early morning the hares would be found sitting at the side of the road, and when frightened by the approach of an automobile would often run out into the road, or across it. Sometimes they would then stop under a bush to look at the cause of the disturbance; or they might run away without stopping.

At Blaine, Tillamook County, Oregon, the species is reported not common by Alexander Walker, who states that it is found mostly in vine maple thickets near heavy conifer woods. We secured a young one in such a thicket on August 6, 1922. It is not found in the thick brush, where the brush rabbit is common. Stanley G. Jewett has specimens from Netarts Bay, in the same county.

A female taken July 26 near Olympia contained four very small embryos, and her mammae were filled with milk. At Alpha, one female taken July 28 contained no embryos, but the mammae were filled with milk; another taken the same day contained three small embryos; while a third taken July 29 contained five embryos. Of this last set of embryos three were large and covered with hair, being nearly ready for birth; one was medium in size; and the other was very small and undeveloped. A juvenile hare, weighing 553 grams, was taken July 28, so that at least two litters must be reared per year in this region.

April 15, 1916, Alexander Walker found an immature specimen, with total length of 153 millimeters, in a small isolated grove of second-growth spruces with little underbrush, at Tillamook. It was completely haired, the eyes were open, and it was very lively. Probably it was several weeks old.

The mammae vary in number from 4 to 5 pairs. The female taken at Olympia had one pair of pectorals, and 3 pairs

of abdominals; two females from Alpha had the same number; while another female from Alpha had two pairs of pectorals and 3 pairs of abdominals.

The adult female from Olympia weighed 1,415 grams, including the embryos. Two adult males from Alpha weighed, respectively, 1,111 and 1,120 grams. Three adult females from Alpha weighed, respectively, 1,500, 1,395, and 1,720 grams. The first and last of these females were carrying embryos.

In the Puget Sound region, where neither cottontails nor brush-rabbits occur, this hare is often erroneously called "cottontail." In Tillamook County, Oregon, it is locally called "timber rabbit," "snowshoe rabbit," or "red rabbit."

Lepus washingtonii klamathensis Merriam

Oregon Snowshoe Hare

August 15 to 17, 1922, I trapped five young and one adult male of this slightly marked subspecies, 10 miles southwest of Fort Klamath, Klamath County, Oregon. All of these were secured in a thick patch of sticky buckbrush (*Ceanothus velutinus*). This was in a burned area at an elevation of about 4,200 feet, on the mountain slopes just above the west side of the Klamath marshes. Numerous sapling conifers of fir, Douglas fir, and cedar occur scattered among the buckbrush. Although we secured a few reports from residents that the tracks of these hares had been seen in winter it is apparently rather rare and very local in the Klamath mountains. I saw a few old signs in buckbrush thickets along the road about five miles southeast of the Klamath entrance to Crater Lake, National Park, but although I searched many other places, did not find any evidences of its presence elsewhere. In the patch of buckbrush, where I secured the specimens, its signs and trails were abundant. Here it was very shy, and only one was seen outside the patch of buckbrush, to which it retreated immediately on my approach.

These hares, when caught in traps, both at Blaine and in the Klamath region, squealed when approached.

Five partly grown young taken ten miles southwest of Fort Klamath, August 15 to 17, weighed from 374 to 600 grams. The adult male weighed 1,068 grams.

Lepus californicus californicus Gray
California Jackrabbit

This subspecies is the darkest in coat color of the California jackrabbits. I consider it to be restricted to the immediate vicinity of the ocean, and would separate the form of the Sacramento Valley as distinct.

A young female was taken September 10, 1922, on the sand dunes one mile north of Morro, San Luis Obispo County, California, and several others were seen on these drifting dunes, and in the thickets of willows and of a leguminous shrub at their borders.

The Museum of Zoology also has specimens taken in 1920 at Corralitos, Santa Cruz County, where it is said by residents to occur rather rarely in the chaparral and in open live oaks and grass.

The individual taken at Morro had the posterior part of the calcaneum much enlarged and ossified, the ossification involving the tendon of Achilles. But this condition did not seem to interfere seriously with running.

Lepus californicus bennettii Gray
San Diego Jackrabbit

In early October, 1922, I saw only one jackrabbit in the vicinity of La Jolla, San Diego County, California, although I hunted carefully for them. This one was in thick brush on the upland, and was not secured. The species was rare this season, but old signs were plentiful in some openings of the brush. The Museum of Zoology has one specimen taken in 1908 at Morena, San Diego County.

Lepus californicus wallawalla Merriam
Washington Jackrabbit

This jackrabbit was abundant in the Walla Walla Valley near Wallula in late May and early June, 1922. It is found

throughout the sagebrush of the valley and invades cultivated fields, but apparently avoids the willow habitat along the stream. It occurs commonly in patches of sagebrush on the northern slopes of the high bunchgrass hills southeast of Wallula, but was not observed in open bunchgrass, perhaps because of the lack of cover. In late June it was found to be numerous in the sagebrush ten miles north of Baker, Baker County, Oregon. July 12 several were seen and one collected in sagebrush between Richland and Kiona, Benton County, Washington. One was secured in Klamath County, Oregon, in young yellow pine forest, twelve miles north of Klamath Springs, California.

This species was much more abundant near Wallula in 1922 than at the time of my previous study in the same situation, eight years earlier.[1] This was true in spite of a great number killed the previous winter, 1921–22, in several jackrabbit drives. Many dead bodies still lay in the sagebrush, but the living were to be found in excessive numbers. The residents attributed this abundance of the jackrabbit to a decrease throughout the region in the numbers of the coyote, many of which had been killed by a government trapper. Probably this explanation has much basis in fact, for the ground-squirrel (*Citellus townsendii*) was also excessively abundant this year. Under normal conditions the numbers of both the ground-squirrel and jackrabbit are undoubtedly controlled in considerable degree by the coyote.

At Wallula the Washington jackrabbit seems considerably more shy than in the Baker region, and usually darts wildly away when alarmed. When running away through short sagebrush the black ear tips and the black tail are very prominent. I have a number of times mistaken the black ear-tips of a running jackrabbit for the moving shadow of a flying bird; conversely, I have sometimes been deceived by the shadow of a flying bird, thinking it the ears of a jackrabbit stealing away through the sagebrush. When put up this jack-

[1] Dice, L. R., J. Mammalogy 1: 19–20. 1919.

rabbit often runs about a hundred yards and then stops to look back at the pursuer. Probably this is to determine the exact position and extent of the danger; when much frightened it will run a long distance without stopping.

On top of a low sagebrush hill near Wallula, on June 7, I found the hind legs of a jackrabbit which had been eaten by some carnivore, almost certainly a coyote. The jackrabbit had apparently been sitting in a form under a sagebrush, and had been seized either while in the form, or before it could move more than a foot or two.

In the Wallula region many young were present from May 26 to June 8; one juvenile weighing 499 grams was taken May 28. Females taken May 27 and May 30, respectively, had much milk in the mammae, and one taken June 3 contained four embryos of a length of 45 mm. No embryos were found in six other adult females taken in this period. Near Baker young of all ages were common from June 19 to 26, one of a weight of 279 grams being taken June 26. Milk was found in the mammae of two females taken June 22 and 24, respectively, and one taken June 23 contained three embryos of a length of 25 mm. No embryos were found in four other adult females taken in this period. The mammae of five females examined were uniformly: pectoral, one pair; abdominal, two pairs.

The weights of two males from Wallula were 1,640 and 1,850 grams, respectively; and five females averaged 2,074 (1,880–2,430) grams. The three largest males secured at Baker weighed 1,510, 1,550, and 1,880 grams, respectively; and four females averaged 2,492 (2,190–2,840) grams.

Lepus californicus vigilax, new subspecies

Sacramento Valley Jackrabbit

Type: Adult female, skin and skeleton, No. 54454, Museum of Zoology, University of Michigan; from Ball's Ferry, Shasta County, California; collected August 23, 1922, by L. R. Dice; original number, 1185.

Body size and length of ears as in *L. c. californicus* from the neighborhood of the Pacific Ocean at Point Reyes, Morro,

and San Luis Obispo, but general color more reddish buff at all seasons, and especially in winter; much less black on the back, especially in summer. The sides of the body and the outer edges of the underparts in particular are less yellowish buff and more reddish buff than in *californicus*.

As compared with *richardsonii* from the Salinas Valley and Mission San Antonio, *vigilax* is reddish buff rather than pale yellowish buff or grayish. These two subspecies are closely related, but seem to be clearly distinct. The difference between them is most striking in winter, when *vigilax* is rich reddish buff on the sides while *richardsonii* from Jolon is dark gray on the sides with a tint of pale yellowish buff.

Color of type. The individual was molting when collected and over the middle portion of the back and on the crown of the head new pelage had replaced the old, but the remainder of the animal is apparently covered by the old coat. The general color of the new coat on the back is nearest deep brownish drab of Ridgway, lightly ticked with pale straw-color. The old coat of the back is nearest light drab. The middle of the nape is drab gray; and the post-auricular patch and the lower part of the back of the ear are very pale smoke gray. The outer edge of the belly (old coat) is between vinaceous fawn and avellaneous, brightest on shoulder; the sides of the body are somewhat darker, and the middle of the belly is slightly paler.

Measurements of type. Total length, 584 mm.; tail, 82; hind foot, 138; ear from crown, 162. Skull: Condylo-basal length, 82.0 mm.; zygomatic breadth, 39.0; interorbital constriction, 10.9; brain case breadth, 30.0; diastema, 27.0; length molar series, 16.1.

Three adult females from Ball's Ferry weighed 2,625, 3,180 (type), and 2,610 grams, respectively; a male from San Andreas weighed 2,440 grams; two males from Angel's Camp weighed 2,730 and 2,660 grams, and two females from the same place 2,870 and 3,180 grams.

One female from Ball's Ferry, and two from Angel's Camp, each had three pairs of mammae: pectoral, one pair; abdominal, two pairs.

This subspecies reaches its most typical development in the Sacramento Valley. Specimens examined from Marysville Buttes, Red Bluff, Tehama, and the banks of the Sacramento River at Ball's Ferry appear typical. Specimens from San Andreas and Angel's Camp in the Sierra foothills, and from Carbondale, Modesto, Oakdale, and other places in the upper San Joaquin Valley are less reddish and more yellowish buff than typical specimens from the northern Sacramento Valley, and are presumed to indicate intergradation in color toward *tularensis*. These northern San Joaquin Valley specimens, however, have in general the large size and long ears of *vigilax*. Some of these intergrades, if such they are, show a close approach in characters to *richardsonii* of the Salinas Valley, and perhaps a part of the northern San Joaquin Valley should be included in the range of *richardsonii*.

Specimens from Rogue River and from other localities west of the Cascade Mountains in Oregon belong to the Sacramento Valley race, *vigilax*.

One of these jackrabbits was taken August 10, 1922, in a partially cleared yellow pine forest four miles south of Myrtle Creek, Douglas County, Oregon. Stanley G. Jewett reports that it has invaded the Willamette Valley, Oregon, within recent years, reaching now as far north as the Columbia River.

At Ball's Ferry, Shasta County, California, it was common during late August in grain fields, in open live oaks and grass, and in the thick brush along the Sacramento River; it was found to be numerous in early September in Calaveras County near Angel's Camp and San Andreas, in open oaks and grass, in cultivated fields and pasture, and in chapparal brush.

This jackrabbit, probably due to frequent hunting, is quite shy and a careful advance is necessary to get within shot-gun range on foot. Those at Ball's Ferry, in late August, after being put up, often stopped after going about 100 yards and looked back at their pursuer. This was usually a brief stop, and they soon ran on again. Also they had the habit of jumping high in the air as they ran away; this might have been to see better the source of the disturbance.

A young one (weight 849 grams) was taken August 10 at Myrtle Creek, Oregon; but all taken in August and September in the Sacramento Valley and in Calaveras County, California, were of practically adult size. No embryos were found in any of these, though one female taken August 22 at Ball's Ferry had some milk in the mammae, as did also two females taken September 17 at Angel's Camp.

Lepus californicus richardsonii Bachman

Richardson Jackrabbit

Late in August, 1922, this jackrabbit was numerous near Soledad, Monterey County, on open sand areas and among willow thickets on the flood-plain of the Salinas River. However, the farmers report that it visits alfalfa fields on the uplands at night. At San Antonio Mission, six miles northwest of Jolon, it was abundant in early September along the San Antonio River (then dry), especially in the dry brush of the bench land.

The Santa Lucia Mountains between Mission San Antonio and the Pacific Coast are not high and are covered mostly with open oak encinal, with chaparral on the higher parts; and there are many open places. So far as one can see there is no reason why jackrabbits could not thrive all over the area, and certainly there is no barrier to their spreading from the Salinas Valley to the Coast, or the reverse. However, jackrabbits seem to be very rare all through these mountains. We drove into the mountains to a hunting camp eighteen miles west of Mission San Antonio, and saw no signs of any; the man in charge of this camp reported that he had seen only two in the mountains in several years' residence. Evidently the scarcity of jackrabbits in these mountains reduces interbreeding of the Coast race and the Salinas Valley race to a minimum.

The ears of those taken at Mission San Antonio showed numerous healed cuts and slits, evidently caused by catching on barbed wire or on thorns.

A female taken at Soledad, September 1, contained four embryos of a length of 50 mm. Most of the jackrabbits taken

at Mission San Antonio were practically fully grown, but two taken September 3 were young, weighing 1,586 and 1,680 grams, respectively.

The mammae of a female from Mission San Antonio were: pectoral, one pair; abdominal, two pairs.

Two females from Soledad weighed 2,620 and 3,550 grams, respectively. Three males from Mission San Antonio weighed 2,950, 2,000, and 2,565 grams; and two adult females weighed 2,120 and 3,100 grams.

Lepus californicus tularensis Merriam

San Joaquin Valley Jackrabbit

After going over most of the specimens available I am of the opinion that *tularensis* is a well marked subspecies of jackrabbit inhabiting the southern part of the San Joaquin Valley, and I would therefore reinstate it as a tenable subspecies. It differs from *richardsonii* of the Salinas Valley in being smaller in body size, having smaller ears, and averaging paler in color. There is considerable variation in color in these jackrabbits, and some of the darker specimens from the San Joaquin Valley match specimens from Mission San Antonio and the Salinas Valley, but they average paler, especially in summer, and no Salinas Valley specimen is nearly as pale as are some specimens from the San Joaquin Valley.

This jackrabbit is numerous throughout Fresno and Kings counties, California, and in 1922 and 1924 I secured specimens at Fowler, Laton, and Lanare, Fresno County, and at Lemoore, Kings County. It occurs in the vineyards, in stubblefields, and in fields grown up to weeds; it is common in the open uncultivated country beginning about eight miles south of Lemoore and also in the low sagebrush on the west side of the Fresno Slough, west of Lanare.

On the morning of September 25, 1922, near Lemoore, I found a fresh trail where a jackrabbit had been dragged. By back-tracking I found the place where the rabbit had met his death. There were a few bits of rabbit fur scattered about

and numerous tracks indicating a struggle. This was at the edge of thick weeds along a dusty road through a stubblefield. The rabbit had then been dragged about 25 meters along the road, and then about 25 meters along a shallow dry ditch, at right angles to the road. Here the body of the rabbit had been left, as it evidently could not be drawn by the captor through a thick growth of "yellowtop." It was a fully grown male, with wounds at the side of the neck, and the blood of the body had been sucked away, but no part of the animal had been eaten. The tracks in the dust indicated probably a musteline, but were larger than those of a weasel, and were neither dog, cat, nor fox. Both Mephitis and Spilogale were common in adjoining fields, and I am inclined to think that the deed was done by a Spilogale, for the tracks seemed too small for Mephitis, except possibly for a young one.

The grape growers complain of the damage done by these jackrabbits to the vineyards. They eat both the leaves and the young vines and also the grapes. One taken September 23 at Lemoore had many grape seeds and skins in the stomach. In winter they are said to eat the bark of young orchard trees.

A female taken September 23, 1922, near Lemoore contained two embryos, of a length of 55 mm.; and two other females taken September 26 had milk in the mammae. In early June, 1924, there were numerous partly grown young in the region about Lemoore; an adult female taken June 8 near Lanare had much milk in the mammae, but another taken June 9 at Laton had only a slight amount of milk. Of two females taken June 12 at Laton, one contained two embryos of a length of 95 mm., and the other three embryos of a length of 70 mm. A female taken June 15 at Lemoore contained three small embryos.

Six females from Lemoore and two from Laton had each three pairs of mammae: one pair, pectoral; two pairs, abdominal.

Two adult females from Lanare weighed 2,000 and 2,030 grams, respectively, six males from Lemoore averaged 2,025

(1,740–2,210) grams, and six females averaged 2,398 (2,200–2,710) grams; two females from Fowler weighed 2,760 and 2,450 grams, respectively; and one male from Fowler weighed 1,940 grams.

Sylvilagus nuttallii nuttallii (Bachman)

Nuttall Cottontail Rabbit

This rabbit was numerous in late May and early June, 1922, near Wallula, Walla Walla County, Washington, in willow brush along the Walla Walla River, in cultivated fields, and in the sagebrush of the valley. It also lives sometimes under buildings. A few were noted in ravines and among rocks on the lower slopes of the steep bunchgrass hills to the south, but it seems to avoid, in general, the wide stretches of sagebrush.

Ten miles north of Baker, Baker County, Oregon, this rabbit was common in late June in the rocky ravines of the sagebrush-covered hills, and several were secured from about old houses in the wide sagebrush-covered valley, but none were seen in the general sagebrush apart from these situations.

An immature male was taken July 13 in a small ravine in the sagebrush hills just east of Kiona, Benton County, Washington.

A female taken near Wallula, May 30, was nursing young, but contained no embryos; another female taken May 31, at the same place, contained five small embryos and also was nursing young. Each of these females was seen in the company of an adult male, which seems to indicate a pairing of the sexes for at least a number of days at mating time. On May 26 and 28 two half-grown young of weights of 495 and 399 grams, respectively, were secured. A female taken near Baker on June 19 contained four small embryos, and another taken June 20 contained five small embryos. Five young of weights from 197 to 536 grams were taken June 19 to 25. This evidence indicates at least three broods per season.

The number of mammae in this species seems to vary from four to five pairs. A female taken at Wallula, Washington,

had five pairs, while of four adult females taken at Baker, Oregon, two had four pairs and two had five pairs each. The mammae are distributed as follows: pectoral, one pair; abdominal, two or three pairs; inguinal, one pair.

Two adult males from Wallula, Washington, weighed 768 and 737 grams, respectively, while two adult females weighed 916 and 923 grams. Four adult females from Baker, Oregon, averaged 927 grams, the extremes being 868 and 985 grams.

Sylvilagus audubonii audubonii (Baird)

Audubon Cottontail Rabbit

This species was common in late August, 1922, at Ball's Ferry, Shasta County, California. It occurs in the heavy brush on the flood-plain of the Sacramento River, and in the willows and other brush along the river banks. Some burrows were noted under thick brush in the soft alluvial soil of the river banks. In early morning and late evening it feeds in the adjacent fields and grassland; a field of ripe barley was a favorite place; but when disturbed the animals retreat quickly to the shelter of the brush.

September 12 one was seen at the edge of heavy brush along a small creek just above Corralitos, Santa Cruz County. It is reported rather rare in the region, and is said by residents to have appeared only within the last few years. Dora L. Dice secured a specimen here July 2, 1920.

September 17–20, 1922, three were taken near San Andreas, Calaveras County. These were all taken in low brush growing among open live oaks and white oaks. The brush is made up of poison oak, oak sprouts from cut stumps, and other species. There are numerous trails through the grass and brush, probably made largely by these animals. The species is said by residents also to occur at Angel's Camp in the same county.

The series from Ball's Ferry is considered to be typical *audubonii*. The specimen from Corralitos is slightly paler in color than those of this series, and probably is tending in this respect toward the form of the Salinas Valley; but it is much

more nearly like *audubonii* than *vallicola* in color and agrees with *audubonii* in the length of the ears. The San Andreas series also is slightly paler in color than the series from Ball's Ferry.

None of the four adult females from Ball's Ferry contained embryos on August 22, though the mammae of two contained much milk. Several partly grown young were collected on that day, the smallest weighing 640 grams. No embryos were found in the adult female taken September 19 at San Andreas. The mammae of five females from these two places are: pectoral, one pair; abdominal, two pairs; inguinal, one pair.

One adult male from Ball's Ferry weighed 965 grams, while four females averaged 1,042 (1,005–1,104) grams. The female from Corralitos weighed 1,090 grams. An adult male from San Andreas weighed 900 grams, and two adult females 970 and 1,105 grams, respectively.

Sylvilagus audubonii vallicola Nelson

San Joaquin Valley Cottontail Rabbit

This rabbit is numerous in the San Joaquin Valley, but is difficult to secure. Near Lemoore, Kings County, in September, 1922, pellets and trails were abundant in many of the fields which had grown up thickly to weeds. A prickly and sticky weed, "yellow-top," made a thick mat several feet high covering often many acres, from which the rabbits could not be dislodged. One which was caught in a trap in such a weed patch was eaten by some carnivore, probably Mephitis or Spilogale, both of which abounded in the vicinity. Another caught in a trap set under a fence between a grassy pasture and a grape vineyard was eaten entirely, perhaps by a coyote. I did secure one juvenile in a trap set in a small burrow in a stubble field grown to weeds. Several were shot along roads near Lemoore and near Hanford, and one which had been run down by an automobile was picked up dead near Armona. Several were seen and one secured at the edge of willows and other shrubs along Fresno Slough, just west of Lanare, Fresno County.

Specimens were secured in June, 1924, near Fowler and Laton, Fresno County. They were found living under old buildings, about lumber and brush piles, and in old weedy fields. Near Lanare several were seen along the brushy banks of old sloughs. Between Laton and Lanare one was seen in the dusk of evening in a wide open field of short grass, and was at least a quarter mile from the nearest brush or high weeds.

In late August of 1922, a number were found in the willows along the flood-plain of the Salinas River at Soledad, Monterey County, but they were shy and only two specimens were secured. At San Antonio Mission, in the same county, northwest of Jolon, the species was common in early September, both in the willows of the flood-plain of the San Antonio River and in the dry brush of the bench land adjoining. It is reported by a resident to occur rarely in the Coast Mountains at a hunting camp eighteen miles west of the Mission.

One small embryo was found in a young female taken June 9, 1924, at Fowler. No embryos were found in either of the two adult females taken September 29, 1922, at Lanare, nor October 1 at Hanford, though the latter individual had milk in the mammae. No embryos occurred in any of the four adult females taken September 3 and 5 at Mission San Antonio. A young one weighing 225 grams was taken September 22 at Lemoore. An immature male weighing 705 grams was taken August 31 at Soledad. September 3–5 young of a weight of 664 grams to full adult size were numerous at Mission San Antonio.

In two individuals from the San Joaquin Valley and two from Mission San Antonio, examined, the mammae were found to be: pectoral, one pair; abdominal, two pairs; inguinal, one pair.

An adult male from Lemoore weighed 860 grams, and an adult female 1,030 grams. An adult female from Lanare weighed 735 grams, but was in poor condition, and much diseased. An adult male from Fowler weighed 790 grams. An adult male from Soledad weighed 888 grams. Six adult males

from San Antonio Mission averaged 1,041 (970–1,120) grams, and three adult females weighed, respectively, 1,057, 1,105, and 1,185 grams.

These rabbits are reported by farmers in Fresno and King's counties to damage seriously new vineyards by eating the young grape vines, sometimes completely killing the small plants.

Sylvilagus audubonii sanctidiegi (Miller)

San Diego Cottontail Rabbit

This subspecies was numerous in early October, 1922, in the desert shrubs near La Jolla, San Diego County, California. It has a decided preference for the vicinity of the rocky rims of the ravines. Several were trapped in runways radiating from a burrow among the desert brush on the sides of a small ravine near the Scripps Institute. The Museum of Zoology also has specimens taken at Delusa and at San Diego, San Diego County, and at Santa Ana, Orange County.

I am unable to distinguish the skulls of this form from those of *S. a. audubonii,* but the skins from La Jolla are distinctly darker in color on the back than those of any other California race of cottontail. This seems due to the presence of more black hairs on the back. The nape patch also is darker than in *audubonii.*

None of the three adult females taken at La Jolla contained embryos October 10–12, but on October 9 and 10, two young of weights of 858 and 748 grams, respectively, were secured. The mammae of the one adult examined were: pectoral, one pair; abdominal, two pairs; inguinal, one pair.

One adult male weighed 978 grams, and three adult females weighed, respectively, 914, 875, and 975 grams.

Sylvilagus bachmani bachmani (Waterhouse)

California Brush-rabbit

This brush-rabbit was common in early September, 1922, one mile north of Morro, San Luis Obispo County, California, along the ocean dunes. It occurs among the high willows just

back of the dunes; among the lower willow thickets in protected places on the ocean side of the dunes, and among the thickets of a leguminous shrub growing in protected places on the ocean side of the dunes.

In the evenings and mornings it feeds in the patches of sweet clover and other herbs and grass at the edges of the thickets. It is very shy and difficult to secure, especially as it will carry off a large charge of shot.

It is numerous at Corralitos, Santa Cruz County, and between Watsonville and Santa Cruz. I saw several here in the middle of September, and the Museum of Zoology has several specimens taken in 1920 at Corralitos. It is found chiefly in the chaparral brush on the mountain sides, but occurs also in brush in the ravines and along the roadsides.

No embryos were found in the few adult females taken at Morro, but two immature individuals were taken September 9, weighing respectively 573 and 540 grams. The mammae of the one female showing them plainly were: pectoral, one pair; abdominal, two pairs; inguinal, one pair.

One of those taken at Morro had an abscess in one of the hind feet.

The weights of two adult females taken at Morro are 693 and 690 grams, respectively.

Sylvilagus bachmani ubericolor (Miller)

Redwood Brush-rabbit

A few brush-rabbits are reported by residents to occur near Rainier, Oregon; we heard several July 31, 1922, in the thick brush of willows and other shrubs, but did not secure any. Stanley G. Jewett reports it to be common all over the northern Williamette Valley and through the coast range to the coast. At Blaine, Tillamook County, we found it common in early August in thick second-growth brush and in brake ferns both on the hillsides and in the valleys.

A specimen in the U. S. Biological Survey collection from Mt. Veeder, about 10 or 12 miles northwest of Napa, Cali-

fornia, is much paler in color than *bachmani* or *ubericolor,* but much richer in color than specimens of *virgulti* from the Salinas or San Joaquin valleys. This specimen was taken August 17, 1909, by N. Hollister, on the east slope of Mt. Veeder, at about 1,950 feet elevation. It was "shot along an old road bordering a dark, watered canyon in the redwood forest." More specimens are needed to determine the relationships of the brush rabbits in that district.

At Blaine, in the evenings and mornings, this rabbit feeds in the open patches of grass and of herbs near the brush. If approached stealthily it may often be surprised in the open, when it usually "freezes" until the source of danger is located; but after a moment it slips away into cover. If suddenly startled it dashes into the brush, but often stops just under cover to look back. It apparently makes use of any trail or opening available in the brush, but some trails seem principally made by this species. It often runs along the tops of logs, even those three feet or more in diameter. I secured three on top of logs, and saw others. Use is made of burrows; one young was trapped in a large tunnel where previously a *Citellus beecheyi douglassii* and an *Aplodontia rufa pacifica* had been secured; another juvenile was taken in another trap in the same set of runways under logs and tunnels through the ground. This was on a hillside with open brush.

When caught in a trap it squeals when taken in the hand.

No embryos were found in any of the females secured by us at Blaine, but two females captured on August 3 had a slight amount of milk in the mammae, and one taken August 7 had the mammae filled with milk. Young of weights from 210 to 416 grams were common in the period of our stay: August 3 to 7. The mammae in the three adult females taken consisted of four pairs: pectoral, one pair; abdominal, two pairs; inguinal, one pair.

In the very small young there is a prominent white spot on the forehead, which is small or obsolete in the adults.

Three adult females without embryos from Blaine weighed, respectively, 768, 848, and 899 grams. Three adult males

taken by us weighed, respectively 781, 785, and 698 grams.

Near Blaine the local name is "brush-rabbit" or sometimes, erroneously, "cottontail."

Sylvilagus bachmani cinerascens (Allen)

San Diego Brush-rabbit

This brush-rabbit was common near La Jolla, San Diego County, California, in early October, 1922. I found it in dense grass with low shrubs and cacti on exposed slopes, in dense chaparral of scrub oaks and other shrubs on top of the hills and in the ravines, and on areas from which the chaparral had been burned recently.

All those secured were practically fully grown, and some were very fat. Six females weighed, respectively, 554, 563, 564, 587, 617, and 728 grams; four males weighed 426, 571, 574, and 600 grams. The mammae of the one specimen recorded were: pectoral, one pair; abdominal, two pairs; inguinal, one pair.

Sylvilagus bachmani mariposae Grinnell

Mariposa Brush-rabbit

A few brush-rabbits occur in Calaveras County, but it is reported not numerous by the ranchers. Near Angel's Camp three were secured in mid-September, 1922, in thick forests of oak and in heavy chaparral of manzanita, poison oak, and other shrubs. Near San Andreas four were taken in small thickets of oak sprouts growing from oak stumps, and in heaps of brush.

Two adult males weighed, respectively, 620 and 630 grams; an immature male weighed 540 grams. Two females, not quite mature, weighed 565 and 515 grams, respectively.

Sylvilagus bachmani virgulti, new subspecies

Salinas Valley Brush-rabbit

Type: Skin and skeleton, adult male, No. 54562, Museum of Zoology, University of Michigan; from Soledad, Monterey

County, California; collected September 1, 1922, by L. R. Dice; original number, 1200.

Palest in color of the California brush-rabbits, the nape patch pale cinnamon buff. Ears long.

Coloration of type: The molt has been completed on the back and mostly so on the sides of the body of the type. The sides of the body (new pelage) are pale gray, combined with very light brown, giving an effect nearest drab of Ridgway. The back is the same ground color as the sides, but is overlaid with a small amount of pale yellowish brown and a considerable amount of black. The sides and back are distinctly less blackish and somewhat less brownish than in *cinerascens,* to which form it is nearest in color. The top and front of the head are slightly grayer than the back, and the sides of the head somewhat more gray than the sides of the body. The nape patch is pale cinnamon buff rather than cinnamon, as in our adult specimens of *mariposae* and *bachmani,* or sayal brown, as in *cinerascens.* The outside of the fore-leg is army brown, as is also the outside of the hind leg near the heel. Most of the underparts are white, with blackish underfur showing through.

The measurements of the type, adult male, in the flesh were: length, 325 mm.; tail, 30 mm.; hind foot, 75 mm.; and ear from crown, 86 mm. Skull: Condylo-basal length, 55.5 mm.; zygomatic breadth, 30.0; brain case breadth, 23.7; interorbital constriction, 9.7; diastema, 17.3; length molar series, 11.4.

The type weighed 615 grams; a male and a female from Mission San Antonio weighed, respectively, 615 and 730 grams.

In our collection are three specimens of this form from Mission San Antonio, collected early in September, 1922, and three specimens, including the type, from Soledad, collected late in August. At Mission San Antonio it was numerous in the dry brush on the bench lands, bordering San Antonio Creek, but it was much less numerous than the cottontail. At Soledad only a few were found, these occurring in the willow thickets on the flood-plain of the Salinas River.

I refer to this form specimens in the California Museum of Vertebrate Zoology from the following localities in California: San Lucas, Monterey County; 6.3 m. N. E. Soledad, Monterey County; Jolon, Monterey County; San Miguel, San Luis Obispo County; and Bodfish, Kern County.

Specimens in the collection of the U. S. Biological Survey from Badger, Tulare County, and Jamesburg and Paraiso Springs, Monterey County, are also referred to this subspecies. This form is thus shown to occupy the Salinas Valley and adjacent valleys, and the eastern edge of the southern San Joaquin Valley. Series from near the mouth of the Salinas River are much darker and are intergrades toward *bachmani* or perhaps *ubericolor*. Those from near Monterey Bay seem distinctly referable to *bachmani*, and it is therefore impossible to apply the name *trowbridgei*, based on a Monterey specimen, to the Salinas Valley race.

Specimens from the mountains surrounding the southern end of the San Joaquin Valley and also those from the mountains of southern California, back from the coast, appear to be somewhat intermediate between this form and *cinerascens*, which is darkest near the ocean. However, more study is necessary to settle exactly the ranges of these races.

Several immature specimens were taken in the last week of August at Soledad, and in the first week of September at Mission San Antonio, but no very small individuals were seen at either place, and no embryos were found in the females taken.

Sylvilagus bachmani exiguus Nelson

Lower California Brush-rabbit

A specimen of brush-rabbit in the United States Biological Survey collection taken at Whitewater, Riverside County, California, September 13, 1907, by Vernon Bailey, is distinctly referable to *exiguus*, having the very long ears and gray rump of that form. This subspecies has not previously been reported from California, but apparently occurs in the state on the Colorado Desert side of the southern mountains.

Brachylagus idahoensis (Merriam)
Idaho Pigmy Rabbit

This species was found only in one restricted area ten miles north of Baker, Baker County, Oregon, in late June. This was in a patch of old sagebrush, four to six feet in height, growing on the gently sloping alluvial fan of a small ravine debouching on a broad valley. This patch of high sage was about fifty yards in width on the average, about three hundred yards long, and was surrounded by the low sagebrush of the general region. A small dry wash passed through the habitat, and there was water in the ravine only a short distance above. The whole region, including the patch of high sagebrush, had been heavily overgrazed by sheep, and very little vegetation except sagebrush and rabbitbrush remained. A few of the tiny pellets of this rabbit were found in another patch of high sage a little higher up in an adjacent ravine, but we saw no evidences of its presence elsewhere.

In this patch of sagebrush we secured ten of the rabbits and saw several others. Some were trapped, but most were shot in the evenings and mornings, in the lower sage bordering the higher growth, where they were presumably feeding.

This rabbit seems extremely nervous and quick, keeping well out of sight if possible. Most of them were secured by shooting, often from the hip, into a clump of rabbitbrush or sagebrush into which a rabbit had been seen to dodge.

Several small burrows in the habitat were apparently used at times by these rabbits, but I am not sure to what extent. All the burrows seen had their openings near the bases of clumps of high sagebrush. Some were only a few inches deep, being hardly more than a "form"; others were longer, but the longest examined was only about eighteen inches in length. No nest or chamber was found in any of the burrows. Some had two entrances, the tunnel being open at both ends. The tunnel opening was usually about three inches in height and slightly less in width.

Several very small young were seen between June 20 and 26, and just at dusk on the 25th a very tiny young one was seen in company with an adult female, evidently its mother, which was secured, and which had the mammae filled with milk. The smallest one taken weighed just 100 grams, but another weighed but 105 grams. Another adult female taken on the 21st, also had the mammae filled with milk. No embryos were found. The mammae of three adult females were: pectoral, one pair; abdominal, two pairs; inguinal, two pairs.

The remains were found of several which had apparently been eaten by coyotes, the tracks of which were noted in the habitat where these rabbits were found.

Four adult females weighed, respectively, 446, 360, 384, and 512 grams. None of the males taken were fully adult.