

Sylvilagus nuttallii. By Joseph A. Chapman

Published 21 November 1975 by The American Society of Mammalogists

***Sylvilagus nuttallii* (Bachman, 1837)**
Nuttall's or Mountain Cottontail

Lepus nuttallii Bachman, 1837:345. Type locality west of the Rocky Mountains in the Columbia and Shoshonee River drainages (later fixed as the mouth of the Malheur River, eastern Oregon, by Nelson, 1909).

Lepus artemesia Bachman, 1839:94. Type locality Fort Walla-Walla, Washington.

Sylvilagus (*Sylvilagus*) *nuttallii* Lyon, 1904:336. First use of name combination.

CONTEXT AND CONTENT. Order Lagomorpha, Family Leporidae, Genus *Sylvilagus*, Subgenus *Sylvilagus*. There are about 14 recognized living species of *Sylvilagus* and three recognized subspecies of *S. nuttallii* (Hall, 1951:161-162; Hall and Kelson, 1959:264-265) as follows:

S. n. nuttallii (Bachman, 1837:345). See above (*artemesia* Bachman, and *grangeri* Lyon are synonyms).

S. n. pinetis (J. A. Allen, 1894:348). Type locality White Mountains south of Mount Ord, Apache Co., Arizona (Warren, 1942:270).

S. n. grangeri (J. A. Allen, 1895:264). Type locality Hill City, Black Hills, Custer Co., South Dakota (*perplicatus* Elliot, 1903, a synonym).

DIAGNOSIS. Size is relatively large for the genus. Hind legs are long; the feet are densely covered with long hair. Ears are rounded at tips and relatively short; inner surfaces are noticeably haired; tympanic bulla are medium in size. Vibrissae are never all black, some are white or partly white. Tail is large, grizzled and dark above, white beneath. Rostrum is quite long. Supraorbital processes are small and have abruptly pointed anterior projections. Postorbital processes are long and slender. Brain case is quite rounded. Palatal bridge is of medium length and usually without a posterior median spine. Molariform teeth are quite large; the first upper molariform tooth possesses three re-entrant angles, and the posterior halves of the second through fourth lower molariform-teeth possess lateral diameters rarely equal to more than half the lateral diameters of the anterior halves. The enamel ridge separating the molariform teeth into anterior and posterior sections is strongly crenulated along the median two-thirds (modified from Orr, 1940; Hall, 1951). The skull is illustrated in Figure 1.

GENERAL CHARACTERISTICS. Descriptions are in Nelson (1909:199-211), Orr (1940:98-103), Hall (1951:161), and Hall and Kelson (1959:264). Females are slightly less than 4% larger than males (Orr, 1940). The dental formula is $i\ 2/1, p\ 3/2, m\ 3/3$, a total of 28.

Some external measurements (in mm) for *S. n. nuttallii* males are: total length, 352.4, 338 to 371; length of tail, 43.7, 30 to 54; length of hind foot, 94.6, 87 to 110. Corresponding measurements for females are: 372.0, 345 to 390; 49.6, 36 to 54; 94.3, 90 to 101 (Orr, 1940). Weight of adult males averaged 719.9g, 628.5 to 830, and adult females averaged 790.3g, 690 to 871 (Orr, 1940).

Cranial measurements (in mm) of adult *S. n. nuttallii* males are: basilar length, 49.6, 48.2 to 50.7; zygomatic breadth, 32.8, 30.7 to 33.5; postorbital constriction, 11.1, 10.3 to 11.8; length of nasals, 28.9, 24.7 to 29.7; width of nasals, 13.6, 12.1 to 15.0; length of molariform series, 12.4, 12.0 to 12.9; diameter of external auditory meatus, 4.9, 4.7 to 5.4; breadth of braincase, 22.0, 20.9 to 22.6; length of palatal bridge, 5.6, 5.1 to 5.9. Corresponding measurements for females are: 49.5, 48.1 to 51.7; 33.0, 32.1 to 33.6; 11.4, 10.8 to 11.8; 28.7, 27.7 to 30.9; 13.6, 12.8 to 14.5; 12.5, 12.2 to 12.6; 4.8, 4.1 to 5.4; 22.3, 21.8 to 22.9; 5.6, 5.3 to 6.0 (Orr, 1940). Additional data on measurements may be found in Nelson

(1909), Orr (1940), Hall (1951), Hall and Kelson (1959), and Long (1965).

DISTRIBUTION. The species is confined to the intermountain area of North America. It ranges from just above the Canadian border south to Arizona and New Mexico, and from the foothills of the eastern slopes of the Rocky Mountains west to the eastern slopes of the Cascade-Sierra Nevada Range (figure 2). According to Hall (1951:161): "In the northern part of its range *S. nuttallii* occurs principally in the sagebrush areas but it occurs also in the timbered areas in the southern part of its range." Cowan and Hatter (1940) noted a northward extension of the species into southern British Columbia. In California, the species is found from 4500 feet (1372 m) to at least 10,500 feet (3200 m) (Orr, 1940). Genoways and Jones (1972) noted that *S. nuttallii* evidently has been replaced by *S. floridanus* "over much, if not all," of southwestern North Dakota in recent years.

FOSSIL RECORD. There are no fossil records of *S. nuttallii*. Dr. W. W. Dalquest (personal communication) reported that the earliest appearance of the genus known to him was the Broadwater local fauna, early Pleistocene, of Nebraska. He further pointed out that identification of Pleistocene *Sylvilagus* to species is difficult unless unusually good material is available.

FORM AND FUNCTION. There are four or five pairs of mammae: one pair pectoral, two or three pairs abdominal, and one pair inguinal (Dice, 1926). "An adult female taken May 24, 1929, is in very worn pelage, and the new coat is well started beneath the old worn hair. Two adults collected October 23 and 24, 1929, are in full winter pelage" (Borell and Ellis, 1934). Thus, a single annual molt is apparent in this species.

ONTOGENY AND REPRODUCTION. The nest of *S. nuttallii* is reported to be a cuplike cavity lined with fur and dried grass. The top of the nest is covered with fur, grass, and small sticks, probably placed there by the female (Orr, 1940). Cowan and Guiquet (1956) believed the nest is constructed in a burrow. Orr (1940) reported young that were able to move about at a weight of as little as 40.1 grams, but further pointed out that these young may have been scared from the nest prematurely. Young weighing about 75 grams apparently do move at least short distances from the nest because Orr (1940) reported small trails from a nest that probably were made by the young rabbits.

In Oregon, a fetal sex ratio of 1 male to 1.05 females was found; the adult sex ratio was 1 male to 1.18 females (Powers and Verts, 1971).

In northeastern California, Orr (1940) believed that the breeding season began about April and ended in July. A female rabbit collected in Nevada on 24 May 1924 was suckling young (Borell and Ellis, 1934). The breeding season in Oregon lasted from 22 February to 30 July (Powers and Verts, 1971); most females there produce four litters per year but some produce five. However, Orr (1940) believed that in California the number of litters produced per year did not exceed two. The gestation period is 28 to 30 days (Cowan and Guiquet, 1956).

In California and Nevada, Orr (1940) reported the mean litter size to be 6.1 (range 4 to 8). Hall (1946) and Borell and Ellis (1934) reported a mean litter size of 5.0 (range 4 to 6) for Nevada. Davis (1939) reported a rabbit that contained six embryos. Dice (1926) reported a mean litter size of 4.7 (range 4 to 5) for three rabbits collected in Washington and Oregon. Cowan and Guiquet (1956) reported a mean litter size of 2.0 for British Columbia. An average of 4.3 (range 1 to 6) viable embryos per pregnant female examined in Oregon was reported by Powers and Verts (1971). Turner (1974) recorded

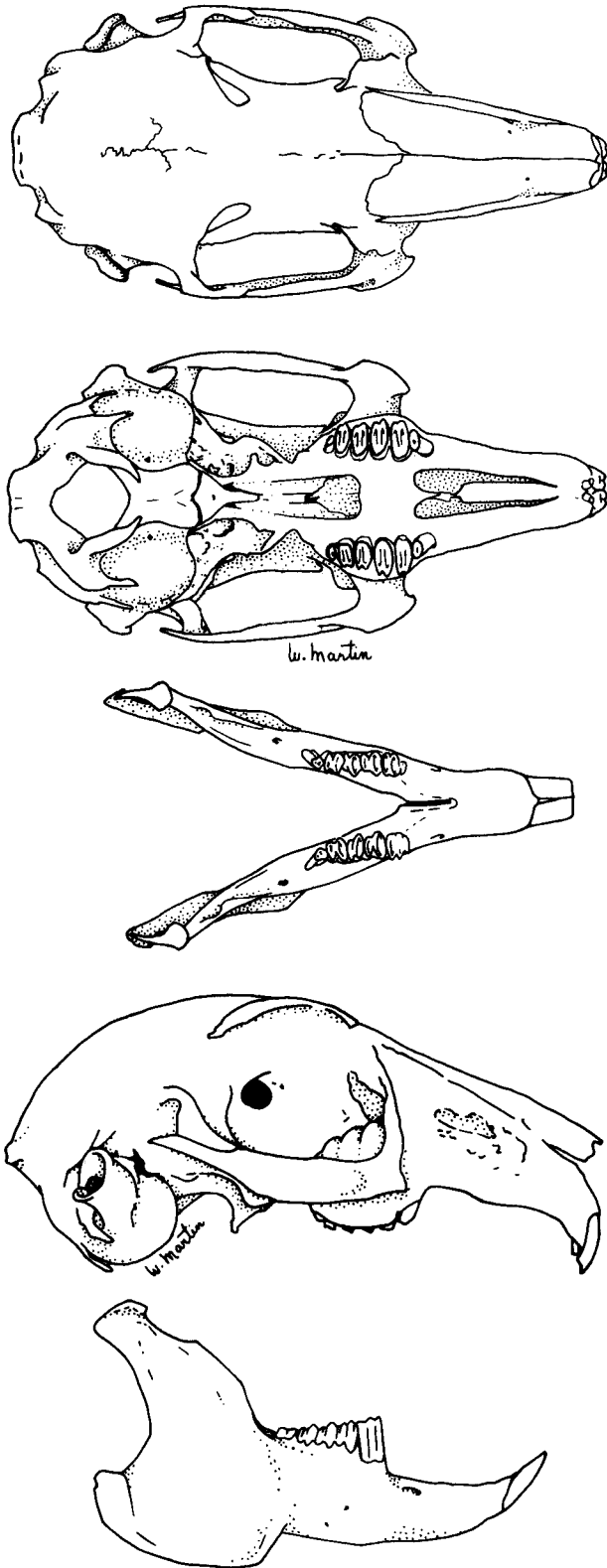


FIGURE 1. Skull and mandible of *Sylvilagus nuttallii nuttallii*. From top down: dorsal view, ventral views of cranium and mandible, and lateral views of cranium and mandible. Drawn by Wilma Martin from a female (USNM 212428) taken at Herrett Ranch, Vale, Oregon, on 1 June 1916.

females pregnant with three, four, and five embryos from the Black Hills of South Dakota.

Powers and Verts (1971) found a mean ovulation rate of 5.0, a mean implantation rate of 4.6, and a mean of 0.3 embryos resorbed. They reported one instance of a juvenile

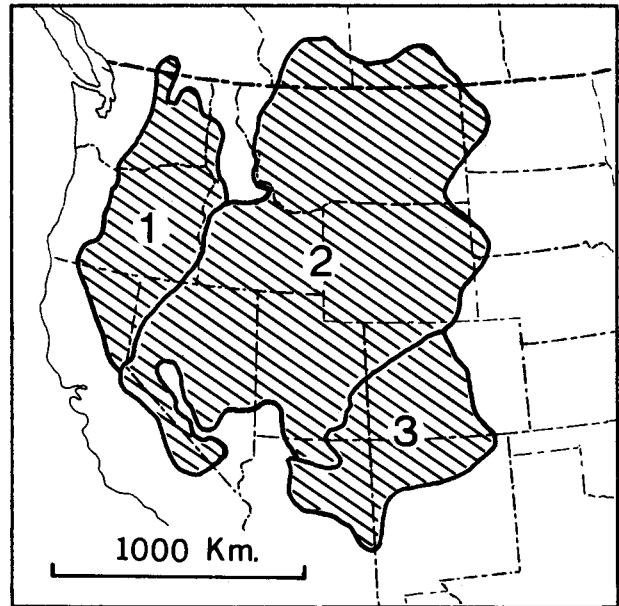


FIGURE 2. Distribution of *Sylvilagus nuttallii* and its subspecies in western North America: 1, *S. n. nuttallii*; 2, *S. n. grangeri*; 3, *S. n. pinetis* (adapted from Orr, 1940; Hall, 1951; Hall and Kelson, 1959; Hoffmeister and Lee, 1963).

female about 90 days old breeding, but felt that such occurrences were rare. They calculated that an adult female breeding throughout the reproductive season would produce about 22 young in five litters, or if she stopped breeding in late June, about 17 young in four litters. They noted that the species seems more fecund than previously believed.

ECOLOGY. The species inhabits rocky, wooded, or brushy areas (Dice, 1926; Orr, 1940; Hall, 1951; Dalquest, 1941). In Washington, *S. nuttallii* "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" (Dice, 1926:17). Dice also noted this rabbit in the willows along the Walla Walla River, in cultivated fields, and among the rocks and ravines on the lower slopes of steep, bunchgrass-covered hills. In California, the species occupies rocky, sage-covered hills and canyons (Orr, 1940). In Nevada, the species prefers higher, rocky, sage-grown regions, whereas the Audubon's cottontail (*S. audubonii*) occupies the adjacent desert valleys (Orr, 1940).

The species uses burrows and forms, the extent depending on the nature of the environment (Orr, 1940). Rabbits living in dense sagebrush or riparian growth probably spend most of their time above ground. Those inhabiting less dense vegetation frequently resort to crevices in rocks or burrows for protection. Orr (1940) excavated a burrow of *S. nuttallii* in a small ravine at the base of a large clump of sagebrush. The burrow had two entrances which extended at right angles to each other for a distance of 1 m before they joined in a small pocket containing dried grass. The greatest depth of the burrow system was 0.6 m. Feces of both young and adult cottontails indicated that young may have been reared in the burrow. Orr (1940) did not know if the species digs its own burrows or utilizes those excavated by other animals. However, Walker *et al.* (1964) reported that, so far as is known, only the pygmy rabbit (*S. idahoensis*) constructs its own burrows.

The fact that *S. nuttallii* unfailingly took refuge beneath the abundant rocks in Petes Valley, California, led Grinnell *et al.* (1930) to conclude that a shortage of food, rather than of shelter, was the main delimiting factor in that area.

Mammalian predators include bobcats, *Lynx rufus*, and coyotes, *Canis latrans* (Orr, 1940). Avian predators include: great horned owls, *Bubo virginianus*; long-eared owls, *Asio wilsonianus*; marsh hawks, *Circus hudsonius*; Swainson hawks, *Buteo swainsoni*; red-tailed hawks, *B. borealis* (Borell and Ellis, 1934); and golden eagles, *Aquila chrysaetos* (Hall, 1946). One possible reptilian predator, the rattlesnake, *Crotalus oreganus*, also has been noted (Grinnell *et al.*, 1930).

Known helminth parasites of *S. nuttallii* include: cestodes, *Cittotaenia pectinata*, *C. perplexa*, *C. variabilis*, *Railletina retractilis*, and *Taenia pisiformis*; and nematodes, *Dermatoxys veligera*, *Nematodirus neomexicanus*, *Protostrongylus pulmonalis*, and *Trichostrongylus colubriformis* (Erickson, 1947; Honess, 1935; Hall, 1908; Dikmans, 1937; Scott, 1943). Coccidia also have been reported from this species (Honess, 1939).

The most important food item of *S. nuttallii* in eastern Lassen County, California, during most of the year is believed to be sagebrush (Orr, 1940). Western juniper (*Juniperus occidentalis*) also is eaten; Orr pointed out that after the first snowfall, little else is available in the region. In spring and summer, grass is selected in preference to all other vegetation (Orr, 1940).

BEHAVIOR. The mountain cottontail appears to be more solitary than some other members of the genus. Orr (1940) attributed this to the environment in which these rabbits live, which is mostly in habitats of uniform sagebrush. In areas where patches of green grass or other desirable habitats are found, *S. nuttallii* may concentrate in the same manner as does *S. bachmani* or *S. audubonii* within their respective ranges.

When disturbed, mountain cottontails usually run anywhere from 5 to 15 m away from the point of danger. Then the rabbit will pause, facing directly away from, or at an angle to, the source of danger. The rabbit, with its ears held erect, usually remains motionless and well screened from observation by intervening brush. If any further disturbance is detected by the rabbit, it will hop away in a semicircular path to "fool" the pursuer and draw attention from the actual direction of retreat (Orr, 1940).

S. nuttallii usually feeds in the shelter of brush, or in clearings a few meters from cover. Clearings near cover seem to be preferred along streams and near springs (Orr, 1940). Feeding usually occurs in the early morning and evening. In Lassen County, California, Orr (1940) reported that mountain cottontails feed from dawn until 0930 and again as early as 1430, whereas in Lincoln County, Nevada, most were seen along the margin of a creek between 1745 and dark. Orr (1940) reported that heavy rain and wind apparently reduced open ground feeding, but that cold did not appear to interfere with predawn activities.

GENETICS. The nuttall cottontail has a diploid chromosome number of 42 (Worthington and Sutton, 1966).

Johnson (1968) electrophoretically examined the blood of 23 *S. nuttallii* and reported that it was similar to that of other species of *Sylvilagus* he studied. Johnson and Wicks (1964) showed an electropherogram of both the proteins and hemoglobins of *S. nuttallii* and compared them with those of *S. floridanus*, *S. bachmani*, and *Brachylagus idahoensis*.

REMARKS. Some early mammalogists believed that intergradation occurred between *Sylvilagus floridanus similis* and *S. n. grangeri* along the eastern base of the Rocky Mountains. However, Hall and Kelson (1951) concluded that the two species do not intergrade.

The author is grateful to Dr. W. W. Dalquest for reviewing the manuscript. This is Contribution Number 541, Center for Environmental and Estuarine Studies, University of Maryland.

LITERATURE CITED

- Allen, J. A. 1894. Descriptions of five new North American Mammals. Bull. Amer. Mus. Nat. Hist. 6:347-350.
- 1895. List of mammals collected in the Black Hills region of South Dakota and in western Kansas by Mr. Walter W. Granger, with field notes by the collector. Bull. Amer. Mus. Nat. Hist. 7:259-274.
- Bachman, J. 1837. Observations on the different species of hares (genus *Lepus*) inhabiting the United States and Canada. Jour. Acad. Nat. Sci. Philadelphia 7:282-361.
- 1839. Additional remarks on the genus *Lepus*, with corrections of a former paper, and descriptions of other species of quadrupeds found in North America. Jour. Acad. Nat. Sci. Philadelphia, 8:75-105.
- Borell, A. E., and R. Ellis. 1934. Mammals of the Ruby Mountains region of north-eastern Nevada. Jour. Mammal. 15:12-44.
- Cowan, I. M., and J. Hatter. 1940. Two mammals new to the known fauna of British Columbia. Murrelet 21:9.
- Cowan, I. M., and C. J. Guiquet. 1956. The mammals of British Columbia. Handbook British Columbia Prov. Mus. 11:1-413.
- Dalquest, W. W. 1941. Distribution of cottontail rabbits in Washington state. Jour. Wildlife Mgt. 5:408-411.
- Davis, W. B. 1939. The recent mammals of Idaho. The Caxton Printers, Ltd., Caldwell, Idaho, 400 pp.
- Dice, L. R. 1926. Notes on Pacific Coast rabbits and pikas. Occas. Papers Mus. Zool., Univ. Michigan 166:1-28.
- Dikmans, G. 1937. A note on the members of the nematode genus *Trichostrongylus* occurring in rodents and lagomorphs, with descriptions of two new species. Jour. Washington Acad. Sci. 27:203-209.
- Elliot, D. G. 1903. Descriptions of twenty-seven apparently new species and sub-species of mammals. Publ. Field Columbian Mus., Zool. Ser. 3:239-261.
- Erickson, A. B. 1947. Helminth parasites of rabbits of the genus *Sylvilagus*. Jour. Wildlife Mgt. 11:255-263.
- Genoways, H. H., and J. K. Jones, Jr. 1972. Mammals from southwestern North Dakota. Occas. Papers Mus., Texas Tech Univ. 6:1-36.
- Grinnell, J., J. Dixon, and J. M. Linsdale. 1930. Vertebrate natural history of a section of northern California through the Lassen Peak region. Univ. California Publ. Zool. 35:1-594.
- Hall, E. R. 1946. Mammals of Nevada. Univ. California Press, Berkeley and Los Angeles, 710 pp.
- 1951. A synopsis of the North American Lagomorpha. Univ. Kansas Publ., Mus. Nat. Hist. 5:119-202.
- Hall, E. R., and K. R. Kelson. 1951. Comments on the taxonomy and geographic distribution of some North American rabbits. Univ. Kansas Publ., Mus. Nat. Hist. 5:49-58.
- 1959. The mammals of North America. The Ronald Press Co., New York, 1:xxx + 1-546 + 79.
- Hall, M. C. 1908. A new rabbit cestode, *Cittotaenia mosaics*. Proc. U. S. Nat. Mus. 34:691-699.
- Hoffmeister, D. F., and M. R. Lee. 1963. Taxonomic review of cottontails, *Sylvilagus floridanus* and *Sylvilagus nuttallii*, in Arizona. Amer. Midland Nat. 70:138-148.
- Honess, R. F. 1935. Studies on the tapeworms of the Black Hills cottontail rabbit, *Sylvilagus nuttallii grangeri* (Allen), with special reference to the life history of *Cittotaenia variabilis* Stiles. Univ. Wyoming Publ. Sci. 2:1-10.
- 1939. The coccidia infesting the cottontail rabbit, *Sylvilagus nuttallii grangeri* (Allen), with descriptions of two new species. Parasitology 31:281-284.
- Johnson, M. L. 1968. Application of blood protein electrophoretic studies to problems in mammalian taxonomy. Syst. Zool. 17:23-30.
- Johnson, M. L., and M. J. Wicks. 1964. Serum-protein electrophoresis in mammals: significance in the higher taxonomic categories. Pp. 681-694, in Taxonomic biochemistry and serology (C. A. Leone, ed.), The Ronald Press Co., New York, 728 pp.
- Long, C. A. 1965. The mammals of Wyoming. Univ. Kansas Publ., Mus. Nat. Hist. 14:493-758.
- Lyon, M. W., Jr. 1904. Classification of hares and their allies. Smithsonian Misc. Coll. 45:321-447.
- Nelson, E. W. 1909. The rabbits of North America. N. Amer. Fauna 29:1-314.
- Orr, R. T. 1940. The rabbits of California. Occas. Papers California Acad. Sci. 17:1-227.
- Powers, R. A., and B. J. Verts. 1971. Reproduction in the mountain cottontail rabbit in Oregon. Jour. Wildlife Mgt. 35:605-613.
- Scott, J. W. 1943. A new lungworm from the Leporidae *Protostrongylus sylvilagii*, n. sp. Univ. Wyoming Publ. 10:57-71.
- Turner, R. W. 1974. Mammals of the Black Hills of South Dakota and Wyoming. Misc. Publ. Univ. Kansas Mus. Nat. Hist. 60:1-178.
- Walker, E. P., et al. 1964. The mammals of the world. The Johns Hopkins Press, Baltimore, 2:647-1500.
- Warren, E. R. 1942. The mammals of Colorado. Univ. Oklahoma Press, 330 pp.
- Worthington, D. H., and D. A. Sutton. 1966. Chromosome numbers and karyotypes of three species of Leporidae. Mammal. Chromosome Newsl. 8:282-283.

Principal editor of this account was S. ANDERSON.

JOSEPH A. CHAPMAN, APPALACHIAN ENVIRONMENTAL LABORATORY, CENTER FOR ENVIRONMENTAL AND ESTUARINE STUDIES, UNIVERSITY OF MARYLAND, LAVALE 21502.