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# Comments on the Taxonomy and Geographic Distribution of Some North American Rabbits

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E. RAYMOND HALL and KEITH R. KELSON

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# Comments on the Taxonomy and Geographic Distribution of Some North American Rabbits

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#### E. RAYMOND HALL AND KEITH R. KELSON

I N preparing maps showing the geographic distribution of North American lagomorphs, some conflicting statements in the literature have led us to examine the pertinent specimens of the Florida cottontail and the Audubon cottontail with results as given below. The study here reported upon was aided by a contract between the Office of Naval Research, Department of the Navy, and the University of Kansas (NR 161-791). Unless otherwise indicated, catalogue numbers are of the United States National Museum and most of the specimens are in the Biological Surveys collection of the Fish and Wildlife Service. Grateful acknowledgment is made to persons in charge of the collections for permission to use the collections under their charge.

#### Sylvilagus floridanus similis Nelson

#### 1907. Sylvilagus floridanus similis Nelson, Proc. Biol. Soc. Washington, 20:82, July 22.

Some confusion has existed concerning the subspecific identity of the Florida cottontail in Nebraska because of the way in which Nelson recorded specimens in his "The Rabbits of North America" (N. Amer. Fauna, 29:fig. 11, and pp. 169-174, August 31, 1909). He (op. cit.:174) listed the following specimens under the western subspecies, S. f. similis: Two topotypes (Nos. 87784 and 18738/25532) and of course the type; the specimen (No. 116288) from the Snake River [= Snake Creek of maps], 11 mi. NW Kennedy; two from Neligh (126074 and 151438); and one (probably 18680/25410) from Kennedy. But, he listed (op. cit.:172) under S. f. mearnsi, the eastern subspecies, a specimen (10721) from Brownlee, and two from Kennedy. One of the two from Kennedy probably was the one that is recorded in the files of the U.S. Fish and Wildlife Service as "identified by Cary. spec. in Univ. Nebraska". The other, or third, specimen from Kennedy, we judge, did not exist at all but was recorded by Nelson because a card in the reference file, under Kennedy, Nebraska, in addition to No. 18680/25410, carried a second entry, a number 3471X. The latter is the X-catalogue number of specimen No. 116288 from the Snake River! The X-catalogue is used in place of a field catalogue for specimens sent to the mammal collection of the United States Fish and Wildlife Service, by persons who do not keep regular field numbers of their own. It seems that Nelson prepared (or had prepared) his lists of specimens, at least in part, from cards rather than from the labels on the specimens themselves. Some further confusion as to names that Nelson intended to apply to cottontails in Nebraska resulted from the fact that his map (op. cit.:fig. 11) indicated that the localities mentioned above for S. f. mearnsi were within the geographic range of S. f. similis.

Our comparison of each of the Nebraskan specimens with specimens of *S. f. mearnsi* in comparable pelage from Iowa and with the type and topotypes of *S. f. similis* reveals that each of the specimens of which catalogue numbers are given above is clearly referable to *Sylvilagus floridanus similis*.

Because some mammalogists have suspected that intergradation between *Sylvilagus floridanus similis* and *Sylvilagus nuttallii grangeri* occurs along the eastern base of the Rocky Mountains, we have examined specimens which may throw light on this matter.

From *S. f. similis* (holotype and three topotypes), *S. n. grangeri* (eight practical topotypes from Redfern, South Dakota) differ as follows: Throat patch darker; hind foot shorter; ear (dry) from notch longer; rostrum narrower; posterior extension of supraorbital process enclosing a longer and wider space between it and the braincase; superior border of premaxilla straight in profile instead of convex dorsally; tympanic bullae more inflated; external auditory meatus larger (diameter of the meatus more, instead of less, than crown length of upper molars); posterior border of palate without, instead of with, spine.

Specimens of the two species from places as near each other as extreme southeastern Montana (*S. f. similis* from Boxelder Creek, Capitol and the Little Missouri River) and Devils Tower, Wyoming (*S. n. grangeri*), seem not to differ in the length of the hind foot and the ear and in the color of the spot on the chest. Also, the presence or absence of the spine on the posterior margin of the palate is subject to individual variation in these specimens but the other cranial differences, mentioned above, still are apparent. These same cranial differences are readily

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apparent between specimens of the two species taken only five miles apart in eastern Wyoming (for the precise localities, see the following paragraph). It is concluded, therefore, that *S. f. similis* and *S. n. grangeri* do not inter-grade along the eastern base of the Rocky Mountains.

Data on specimens from Laramie County in eastern Wyoming show that *S. f. similis* is a heavier animal than *S. n. grangeri* and also that *similis* molts earlier. For example, an adult female (K.U. No. 15936) taken on July 13, 1945, three miles east of Horse Creek P.O., 6400 ft., weighed 1374 grams and is in fresh pelage, whereas an adult female of *S. n. grangeri* (K.U. No. 15935), taken on July 17, 1945, two miles west of Horse Creek P.O., 6600 ft., weighed only 1149 grams, and still has some of the worn winter pelage on the upper parts.

#### Sylvilagus floridanus holzneri (Mearns)

1896. Lepus sylvaticus holzneri Mearns, Proc. U.S. Nat. Mus., 18:554, June 24.

1904. Sylvilagus floridanus holzneri, Lyon, Smithsonian Miscl. Coll., 45:336, June 15.

Examination of cottontail rabbits from Arizona in the Biological Surveys Collection and the United States National Museum indicates that Sylvilagus audubonii can be distinguished from Sylvilagus nuttallii and Sylvilagus floridanus by the larger (more inflated) tympanic bullae. Topotypes of Sylvilagus nuttallii pinetis and other specimens from Alpine, Mt. Thomas, Springerville, the Prieto Plateau at 9000 feet on the south end of the Blue Range, and the Tunitcha Mountains are characterized by a posteriorly pointed supraoccipital shield and a long, wide space between the braincase and the posterior extension of the supraorbital process. The cottontails with equally small tympanic bullae from more western and more southern localities are referable to Sylvilagus floridanus holzneri on the basis of a posteriorly truncate or emarginate supraoccipital shield and a narrower and shorter space (usually a "foramen") between the braincase and the posterior extension of the supraorbital process. In S. f. holzneri the posterior end of the posterior process fuses with the braincase whereas the posterior end of this process in Arizonan specimens of S. n. pinetis merely lies against the braincase or projects free of it. In specimens from Arizona the difference in shape of the posterior border of the supraoccipital shield and the difference in size of the space between the braincase and the posterior extension of the supraorbital process are the only differences of taxonomic worth found by us. Many other features of the skull, of color of pelage, and of size of external parts all fell within the range of individual variation of a series of specimens from one locality.

Specimens from the following localities in Arizona are referable to *Sylvilagus floridanus holzneri* (Mearns).

Hualpai Mts., Nos. 117461, 117462, 117488, 117490, 117495, 227735, and 227832; Ft. Whipple, No. 214157; Prescott, No. 34667/46752; Mayer, No. 247495; Reynolds Creek Ranger Station, Sierra Ancha Mts., Gila Co., No. 247734; Fish Creek, Tonto National Forest, 2000 ft., No. 212833; north base Mt. Turnbull, 4500 ft., No. 214339; Ash Creek, 6100 ft., Graham Mts., No. 204363; Pinery Canyon, 7500 ft., Chiricahua Mts., No. 247953; Thomas Cañon, 2 mi. E Baboquivari Mts., No. 244420; Pine Springs, 15 mi. south of Colorado Cañon, No. 2425 Amer. Mus. Nat. Hist. On December 4, 1950, we removed the skull of No. 2425 to more certainly ascertain the identity of the individual.

The specimens listed above include those that Nelson (N. Amer. Fauna, 29:211, August 31, 1909) listed from the Hualpai Mountains, Pine Springs, and Prescott under the name *Sylvilagus nuttallii pinetis*. Nelson (*op. cit.*:Pl. X, fig. 2) figured one of these skulls from the Hualpai Mountains as *S. n. pinetis* and the cranial measurements (*op. cit.*:201) that he records for *S. nuttallii pinetis* likewise are of these same specimens of *Sylvilagus floridanus holzneri*. Nelson's description (*op. cit.*:207-210) seems to have been affected by the erroneous (as we see the matter) inclusion of these specimens of *S. f. holzneri* in the materials identified by him as *Sylvilagus nuttallii pinetis*.

The specimens so far mentioned from Arizona can be identified with ease. The identification becomes difficult, however, when the holotype of S. f. holzneri, from the Huachuca Mountains, is examined. The difficulty results from the holotype having a barely detectable emargination in the posterior border of the supraoccipital shield. In this respect the holotype is intermediate between S. f. holzneri (as known by specimens from more western localities in Arizona) and S. n. pinetis from the White Mountains to the northward. As noted above, S. f. holzneri has a deep notch and S. n. pinetis has none. This intermediacy of the holotype supports the possibility, mentioned by Nelson (op. cit.:200), that intergradation occurs between S. f. holzneri and S. n. pinetis. Additional evidence, however, is against this possibility; the notch in the supraoccipital is deeper in specimens (No. 66136, from Chiricahua Mts., and No. 204364, from Ash Creek in Graham Mts.) from mountains geographically intermediate between the Huachuca Mountains and the White Mountains. Also, the holotype of S. f. holzneri differs from S. n. pinetis and agrees with other specimens of S. f. holzneri from farther southwest in Arizona in the robustness of the posterior extensions of the supraorbital processes and in the considerable degree of fusion of the tips of these processes with the squamosals. Additionally, the rostrum of the holotype is wide and deep as in other specimens of S. floridanus from more eastern localities and is unlike the narrow and shallow rostrum of S. n. pinetis.

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If intergradation occurs in Arizona between the species *Sylvilagus floridanus* and *Sylvilagus nuttallii*, as Nelson (*op. cit.*:200) intimated it might, the intergrades probably will be found along the Tonto Rim or in the territory between the Blue Range and the Graham Mountains.

#### Sylvilagus floridanus cognatus Nelson

1907. Sylvilagus cognatus Nelson, Proc. Biol. Soc. Washington, 20:82, July 22.

We have examined the specimens recorded by Nelson (N. Amer. Fauna, 29:193, August 31, 1909) and conclude that Nelson (*op. cit.*) accurately described them. We differ from Nelson on one point of interpretation; we prefer to use the trinomial, instead of the binomial, for *cognatus* because the kind and amount of difference between it and subspecies of *Sylvilagus floridanus* (*S. f. holzneri* and possibly *S. f. llanensis*) is on the order of magnitude that distinguishes subspecies, and not full species, of *Sylvilagus*.

The specimen (W.D. Hollister, original No. 208) from the Datil Mountains, lent to us by the Colorado Museum of Natural History, does have, as Nelson (*op. cit.*) pointed out, larger tympanic bullae and a slenderer rostrum than do other specimens of *S. f. cognatus*. Nevertheless, No. 208, agrees with *cognatus* and differs from *Sylvilagus nuttallii pinetis* in the greater vertical depth of the zygoma, the greater transverse width of the first pair of upper incisors, the broader posterior extensions of the supraorbital processes, the fusion (instead of freedom from, or mere touching to, the braincase) of the tips of these extensions, the less upturned supraorbital processes, and the more nearly truncate posterior margin of the supraorbital shield. Therefore, the specimen is referable to *Sylvilagus floridanus cognatus*. The slender rostrum and large tympanic bullae of No. 208 are either individual variations or features peculiar to the population of *Sylvilagus floridanus* in the Datil Mountains.

#### Sylvilagus floridanus robustus Bailey

#### 1905. Lepus pinetis robustus V. Bailey, N. Amer. Fauna, 25:159, October 24.

Nelson (N. Amer. Fauna, 29:194-195, August 31, 1909) described specimens from the Big Bend area of Texas. This was the only area from which Nelson had specimens. Our examination of these same specimens indicates that his description of them was accurate. Davis and Robertson (Jour. Mamm., 25:271, September 8, 1944) recorded a specimen, under the name Sylvilagus robustus, from "The Bowl, Guadalupe Mountains, Culberson County, Texas." Our examination of the skull of this specimen (9 adult, No. 658, Mus. Zool., Louisiana State University) indicates that it is, among named kinds of rabbits, best referred to robustus. The specimen is morphologically as well as geographically intermediate between S. f. cognatus and S. robustus. This morphological intermediacy is illustrated by certain of the following cranial measurements of three adult females: No. 108695 (robustus), Chisos Mts.; No. 658 from the Guadalupe Mts.; and No. 128651, NE slope Capitan Mts. Basilar length, 59.2, 54.2, 54.4; length of nasals, 33.9, 31.1, 32.2; breadth of rostrum above premolars, 19.3, 17.5, 17.0; depth of rostrum in front of premolars, 15.8, 14.8, 14.0; interorbital breadth, 20.4, 19.1, 19.7; parietal breadth, 27.2, 27.1, 26.5; diameter of bulla, 13.3, 12.2, 10.7. Considering the intermediate nature of specimen No. 648, and the kind and amount of difference between Sylvilagus floridanus cognatus and S. robustus, it seems appropriate to us to use the name-combination Sylvilagus floridanus robustus.

Actual intergradation, in the sense of interbreeding between individuals of a continuously distributed population of animals, probably does not occur regularly between *S. f. cognatus* and *S. f. robustus* nor between several populations within either one of these subspecies; in south-central Arizona and western Texas the animals are said to occur only in the higher parts of the mountains. Consequently a given population is separated from another by low-lying territory inhospitable to the species *Sylvilagus floridanus*. This low-lying territory is inhabited by another species, *Sylvilagus audubonii*. More intensive collecting in the region concerned may, however, show a continuous distribution of the species *Sylvilagus floridanus* in several areas where it seems now to have an interrupted distribution.

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#### Sylvilagus audubonii neomexicanus Nelson

1907. Sylvilagus audubonii neomexicanus Nelson, Proc. Biol. Soc. Washington, 20:83, July 22.

Nelson (N. Amer. Fauna, 29:230, August 31, 1909) listed under *Sylvilagus audubonii cedrophilus* Nelson an adult female, skin with skull (U.S. Nat. Mus., Biol. Surv. Coll., No. 108698) from fifteen miles south of Alpine, Texas. Nelson (*loc. cit.*) remarked that the "bleached" color of the back and the great lateral breadth of the tympanic bullae of No. 108698 were peculiarities not possessed by any other specimen examined. Geographically, the locality of capture is far south of other known occurrences of *S. a. cedrophilus* and approximately on the boundary separating the range of *S. a. minor* from that of *S. a. neomexicanus*. The large size, which may have induced Nelson to refer the specimen to *S. a. cedrophilus*, is not surprising considering that the individual is a female and fully adult. A combination of new and old fur on the upper parts

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presents a pattern that might be duplicated in other specimens of *S. a. neomexicanus*. The lateral inflation of the tympanic bullae can be interpreted as intergradation with the geographically adjacent *S. a. minor* to the south; *S. a. minor* has large bullae. There are no features otherwise which suggest that the specimen is anything other than *Sylvilagus audubonii neomexicanus* and we refer it to that subspecies.

#### Sylvilagus audubonii minor Mearns

#### 1896. Lepus arizonae minor Mearns, Proc. U.S. Nat. Mus., 18:557, June 24.

1907. S[ylvilagus]. a[uduboni]. minor, Nelson, Proc. Biol. Soc. Washington, 20:83, July 22.

Nelson (N. Amer. Fauna, 29:230, August 31, 1909) listed, without comment, under *Sylvilagus audubonii cedrophilus* Nelson, a skin with skull inside (Amer. Mus. Nat. Hist., 5419, Q adult or sub-adult) from San Diego, Chihuahua, Mexico. We locate San Diego approximately 230 miles south and 60 miles east of El Paso, Texas. Thus, the specimen is from near the center of the geographic range of *Sylvilagus audubonii minor*. With the permission of Mr. G.G. Goodwin of the American Museum of Natural History we removed the skull. It differs in no essential features from those of other specimens of *S. a. minor*. For example, of specimens in the United States National Museum, Biological Surveys Collection, a female (No. 132002) from Guzman in Chihuahua, and a male (No. 51020) from Santa Rosalia in the same state, are almost indistinguishable from the San Diegan specimen. The specimen is without external measurements but the length of the hind foot and length of ear from the notch in the dry state (80 and 57, respectively) agree with the corresponding measurements of *S. a. minor*. Color of the skin furnishes no diagnostic character as between *S. a. minor* and *S. a. cedrophilus*. We identify the specimen from San Diego as *Sylvilagus audubonii minor*.

Transmitted January 30, 1951.

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