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FAUNAL RELATIONSHIPS AND GEOGRAPHIC DISTRIBUTION OF MAMMALS IN SONORA, MEXICO

BY

WILLIAM HENRY BURT

ANN ARBOR
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FREDERICK M. GAIGE
Director of the Museum of Zoology

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FAUNAL RELATIONSHIPS AND GEOGRAPHIC DISTRIBUTION OF MAMMALS IN SONORA, MEXICO

INTRODUCTION

THE mammalian fauna of the state of Sonora, Mexico, has remained little known up to the present day. Although small collections of mammals have been secured at intervals for the past eighty-five years, no concentrated effort has been made to determine the species which inhabit this interesting geographic area, nor has there been any discussion of the distributional problems involved. Most of the expeditions have been brief, and only a few specimens were obtained. Nineteen of the twenty-five or so persons who have collected mammals in the state have brought back at least one species or subspecies new to science. Many of the collectors, it should be noted, did not enter the state with the express purpose of collecting mammals but picked up a few specimens incidental to other work.

The first man to collect specimens of mammals in Sonora seems to have been J. H. Clark who, in 1851, secured the type of *Peromyscus maniculatus sonoriensis* at Santa Cruz. In 1855 C. B. R. Kennerly collected the type of *Ursus kennerleyi* in the mountains of northeastern Sonora, near Los Nogales. Both of these men were connected with the Pacific Railroad surveys. In 1887 Zenón Córdova collected the type of *Spermophilus sonoriensis,* at Hermosillo, for the Museum of the Comisión Geográfica–Exploradora de México.

It was not, however, until 1889 that a systematic collector entered the state to study its mammalian fauna. This was Vernon Bailey of the United States Biological Survey. He found two forms new to science, *Perognathus baileyi* from Magdalena and *Neotoma albigula melanura* from Ortiz. Bailey's explorations were soon followed by those of Carl Lumholtz in 1890 and of the boundary surveys of 1892–94, in which E. A. Mearns and F. X. Holzner figured prominently. The decade from 1889 to 1899 was one of much activity. In addition to those mentioned, small collections were made by B. C. Condit in 1894 and by W. J. McGee and J. W. Mitchell in 1895. Up to this time, however, collecting had been confined generally to the northern portion of the state. In 1898 and 1899 E. A. Goldman of the United States Biological Survey made the first extensive collections in the southern part, chiefly in the Alamos district. He secured many species and subspecies new to science.

During the next thirty years few specimens of mammals were taken in Sonora. In the spring of 1903 J. Rowley made a small collection in the northern part, which was purchased by the Field Museum. H. E. Anthony of the American Museum of Natural History, on the Albatross Expedition

of 1911, collected on the islands of Tiburón and San Esteban. In 1915, 1916, and 1918 the hunter–naturalist Charles Sheldon, made small collections in the Sierra Pinacate and the Sierra del Rosario, and again in 1922 he secured mammals near La Libertad ranch and on Tiburón Island. Sheldon's specimens were deposited in the United States National Museum.

Since 1929 there has been a renewed interest in the mammalian fauna of Sonora, and not a year has passed without one or more expeditions there. From 1929 to 1934 J. T. Wright spent much of his time in various parts of the state; he has made probably the most extensive mammal collections from Sonora. Wright's material is deposited chiefly in the Dickey collection and in the Museum of Zoology of the University of Michigan. L. R. Dice and W. P. Harris, Jr., of the University of Michigan collected in the northwestern part of the state in 1930. Early in 1931 I visited Tiburón, San Esteban, Turner's, and San Pedro Nolasco islands, and a number of points along the coast between Tiburón Island and Guaymas. In 1932 Vernon Bailey again entered the state with Frederick W. Winthrop and Bernard Bailey, crossing it from east to west through the upper Río Bavispe region to Costa Rica ranch. In 1933 Philip M. Blossom of the University of Michigan made a splendid collection of mammals of the Sierra Pinacate. In the same year Chester Lamb amassed a large number of specimens from the north central part of the state south to Guaymas. His collection was deposited at the California Institute of Technology. In 1933 I also worked in the state, chiefly in the mountains in the extreme southeastern portion. In 1934 Laurence M. Huey of the San Diego Society of Natural History worked along the coast from Punta Peñascosa to Bahía Kino, and in 1935 Berry Campbell made a small collection of mammals in the mountains near Pilares and El Tigre. His material is now deposited in the Museum of Zoology of the University of Michigan.

In the present report an attempt has been made to gather all published data pertaining in any way to the taxonomic and distributional problems of the mammals of the state. The collections now in the University of Michigan Museum of Zoology and at the California Institute of Technology have supplemented the published data greatly, and they add much to our understanding of the mammal fauna as a whole. The present account includes 139 endemic and 2 exotic forms. Of these 110 have been recorded previously from the state. Thirteen of the twenty-nine mammals here recorded for the first time are northern record extensions from the south, and fifteen are slight southward extensions of more northerly recorded forms. Fifty-one of the species and subspecies herein recognized were originally described from specimens taken in Sonora.

This report is admittedly far from complete, but if it stimulates future researches in this state it will have served its purpose.

ACKNOWLEDGMENTS

To those institutions and individuals who have helped to make possible this report I wish to express my sincere appreciation. I am deeply indebted to Mrs. Florence V. V. Dickey for permission to study and use materials in the collections of the late Donald R. Dickey. I wish to thank Gerrit S. Miller, Jr., for identifying certain bats and E. A. Goldman for supplying information on localities in Sonora. For loan of material I am indebted to the authorities of the United States National Museum, the Biological Survey, the San Diego Society of Natural History, the American Museum of Natural History, and the Field Museum. Mrs. Charles Sheldon and her daughter, Miss Carolyn Sheldon, have kindly permitted me to go over unpublished notes of the late Charles Sheldon and use pertinent records therefrom. I wish to express my appreciation to Mr. Robert T. Moore for an enjoyable and informative reconnaissance trip through Sonora as his guest, and to the McCarteys of the Guirocoba ranch for their genial hospitality while we were studying in that region. Mr. J. T. Wright and Mr. Chester Lamb deserve especial credit for the splendid collections of mammals they have made in the state and for notes on the habits of many forms.

The courteous manner of the officials of the Mexican Government made work in their country and with their people a pleasure.

SOME FACTORS INFLUENCING MAMMALIAN DISTRIBUTION

The state of Sonora, which in outline is roughly the shape of a right-angled triangle, is bordered on the west by the Gulf of California, on the east by the high Sierra Madre Occidental, and on the north by low mountains, intervening valleys, and flat desert plains along the international boundary, and it ranges from sea level along the Gulf to nine thousand feet or more in the Sierra Madre. An extensive desert plain extends inland from the Gulf of California and covers approximately one-half of the state. Along the international boundary there are many small mountain masses running in a north–south direction for the most part and becoming successively higher to the eastward. The eastern half of the state is chiefly mountainous in character.

There are four principal river systems in Sonora. The Río de Magdalena drains a large area in the northwestern section; most of the north central part of the state drains into the Río de Sonora and its tributary the Río de San Miguel. Although occasional heavy rains during the wet season start torrents down these river systems the water is absorbed before it reaches the sea. The most extensive drainage system is that of the Río Yaqui. This stream originates in the Sierra Madre and with its tributaries, the Río de Bavispe and the Río San Bernardino, drains practically all of the eastern and southern portions of the state, except the part in the extreme southern

section which is drained largely by the Río Mayo. The rivers all flow in a southwesterly direction down the great slope from the crest of the Sierra Madre to the Gulf.

It will be noted that Sonora is bounded on two of its three sides by natural barriers, the Gulf of California on the west and the Sierra Madre on the east, which delimit the ranges of many land mammals. Most of the species of mammals that occur in the northern section of the state range northward into Arizona, and many of the species in the southern portion of the state are found south in Sinaloa and Durango.

The average annual rainfall varies from less than five inches in the western desert plains to twenty inches or more in the mountains to the east. The rainfall increases toward the southern end of the state, but to what extent we do not know, for there are no accurate records available. Most of the rain falls during the months of July and August with the remainder of the year relatively dry except in the mountains, where there are winter rains and snows.

The distribution of any animal species is governed primarily by the presence or absence of suitable habitats for individuals comprising the species. Members of a given species may occupy all of an area which, to the best of our knowledge, possesses habitats suitable to that species. Obvious barriers may keep certain animals out of such areas. Each animal, however, has an environmental tolerance beyond which it will not and cannot exist. If the animals comprising a species have a wide tolerance for diverse environmental conditions they will occur over large areas, unless barriers intervene, and thus they may be said to be generalized in habit or to be adaptable. If their limits of tolerance are restricted, their distribution usually is confined to relatively small local areas, and they may be said to be specialized or nonadaptable.

The factors, then, that control mammalian distribution in space and time must be looked for in the various components that go to make up the environment. The factors vary in degree of importance, and it is, therefore, difficult with our present lack of knowledge always to pick out those which are critical for a given species. In a large sense this can be done. For instance, it is fairly certain that a desert-adapted kangaroo rat could survive neither a marine environment nor the humid tropics. In the kangaroo rats, however, different species of the genus occupy rather diverse habitats, but if any one species is singled out it may be found that its distribution is controlled by a rather narrowly limited complex of environmental conditions. The big desert kangaroo rat (*Dipodomys deserti*), for instance, is restricted to areas where the soil is extremely sandy and easy to excavate. Here, it can be said with some degree of certainty that soil texture is one of the more important of the components of the habitat complex which limit the distri-

bution of the species. The same holds true for a number of other fossorial or semifossorial mammals. Pocket mice (*Perognathus*), pocket gophers (*Thomomys*), white-footed mice (*Peromyscus*), and ground squirrels (*Citellus*) are influenced to some extent in their distribution by soil texture.

Moisture, in the form of precipitation, affects the distribution of mammals indirectly through its influence on the vegetation and soil. The oak and pine forests of the foothills and mountains of Sonora furnish suitable habitats for tree squirrels and chipmunks. These forms are confined to forested areas from which such open country species as round-tailed ground squirrels, jack rabbits, and pronghorn antelopes are excluded. Estuaries or permanent streams are essential for raccoons and beavers. The raccoon procures much of its food along the water's edge, and the beaver must have access to a stream for the building of safety retreats. The borders of estuaries and first bottoms along streams, with relatively dense vegetation, form suitable habitats for such species as rice rats (*Oryzomys*) and cotton rats (*Sigmodon*), although the latter are not necessarily restricted to this type of habitat.

Temperature, I suspect, is influential chiefly as it affects the vegetation of an area. I cannot see how it would affect directly the local distribution of many mammals, although it might be an important factor in general distribution over large ranges of latitude or altitude. Different slope exposures with slightly different temperatures might shelter different mammal species as a result of different vegetation cover.

In Sonora there is a diversity of soil conditions varying from the black lava of the Pinacate region and the nearly pure sands in the northwest section to the humus-filled soil along the river bottoms and to rocky canyons and slopes in the mountains.

This great diversity of physical conditions and of vegetation is correlated fairly closely with the occurrence of a highly diversified mammalian fauna. Species that range widely readily break up into races, and numerous species and even genera find the northern or southern limits of their ranges in the state.

FAUNAL RELATIONSHIPS AND BIOTIC PROVINCES IN SONORA, BASED ON RECENT MAMMALS

I shall not venture into a discussion of the probable origin or origins of the mammalian fauna in Sonora. Without fossil evidence and on the basis of the existing fauna of Sonora and the surrounding regions any treatment of origin would be at best highly theoretical. Then, too, in any discussion of the origin of a fauna one should start with the earliest known members of the group in question and carry their history through the geologic ages to the present day. This, of course, is impossible in most groups and can be done only in a very general way in the few groups of animals the fossils of which have been preserved and later retrieved by man.

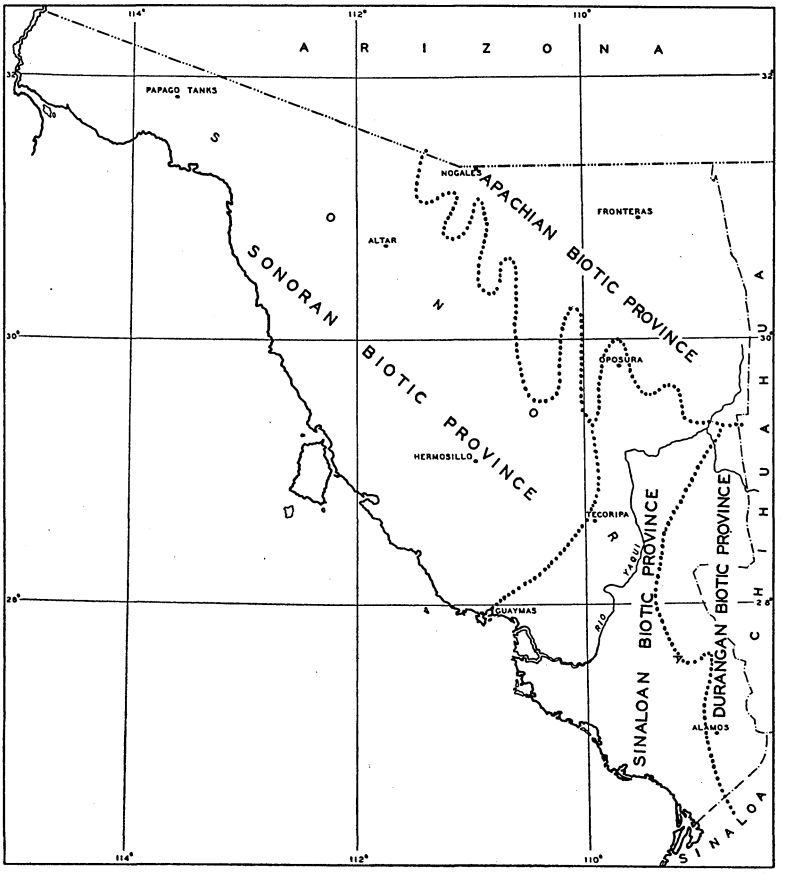
The relationships of members of the present fauna with those occupying adjoining territories can be ascertained fairly accurately when sufficient collecting has been done to determine their various components. Although future collecting will undoubtedly add to the list of mammals and will extend the ranges of those herein outlined, I believe there is now sufficient material to give a fairly accurate picture for the state. Four rather distinct mammalian faunas may be recognized within its boundaries (Map 1). These may be considered for the present at least as the terminal portions of four biotic provinces all of which extend beyond the political boundaries of Sonora, but which meet within it. I shall not be concerned here with the limits of these provinces outside the state.

SONORAN BIOTIC PROVINCE.—The most extensive of the four divisions here outlined is the northwestern desert area which extends northward and westward beyond Sonora into Arizona, California, Nevada, and Lower California (Map 1). This is part of the Sonoran Province outlined by Merriam in 1890. In Sonora it is bounded on the west by the Gulf of California. It extends south and east along the coast to Guaymas and includes Tiburón, Turner's, San Esteban, and San Pedro Nolasco islands. From Guaymas the boundary passes northeast along the north edge of the Río Yaqui Valley, curving northward at Tecoripa and extending on about two-thirds the distance to Oposura. From this point the boundary runs, in general, in a northwesterly direction to a point slightly east of Sasabe on the international line. The boundary thus has a rather devious course, following closely the limit of the desert as outlined by Shreve, Mallery, and Turnage (1936: 215). The Sonoran Province thereby interdigitates with that of the Apachian to the north and east.

The mammal fauna of this area, as now known, consists of seventy-five endemic forms, of which fifty, including five genera, are known only from this province. Thirteen of these forms occur on the islands, but are obviously close to the mainland species. In my opinion the islands do not constitute a separate division equal in rank to the mainland division, as held by van Rossem (1931). Tiburón Island has a number of distinct races of mammals, but they have close relatives on the mainland, and the fauna is no more distinct than that of the Pinacate lava field. The islands and the Pinacate lava area might be designated as districts of the Sonoran Province, but I prefer not to subdivide this area at present.

In designating the southern boundary of this area, which he called the Colorado Desert district, van Rossem excluded a coastal strip extending from just north of Sargent's Point to Guaymas. This strip was placed in with his "Alamos district" of southern Sonora. A narrow tongue of arid tropical vegetation continues up the coast to this point just north and opposite Tiburón Island, but it is too insignificant to have any influence on the mam-

malian fauna or on the bird fauna as far as I can tell from van Rossem's report. The change in the mammal fauna comes at or near Guaymas on the coast. In checking van Rossem's bird records I find that the two races of Gambel's quail, *Lophortyx g. gambelii* and *L. g. fulvipectus,* meet "just south of Guaymas." Also the two races of Douglas quail, *L. d. douglasii* and



MAP 1. Biotic provinces of Sonora, based chiefly on the mammals of the state. The dotted lines represent the approximate boundaries of the four provinces in Sonora.

L. d. bensoni, meet on the coast at Guaymas. The same is true for a number of other forms where a southern and northern race come together. Although his data on the distribution of birds do not confirm his map, they agree very nicely with the data on mammal distribution.

APACHIAN BIOTIC PROVINCE.—Mearns (1896) designated this as the "Apache or Elevated central tract" and later (1907) called it the "Elevated central tract." Van Rossem (1936), apparently not aware of Mearns's

earlier paper, designated it as the "Apache faunal area." The area includes the mountainous portion of northeastern Sonora and extends south along the Chihuahua border to the region of the Río Yaqui. The southern and western boundary is that just described as separating the Sonoran from the Apachian. From a point east of Ures, on the one hundred and tenth meridian, the boundary swings north to above Oposura then southeast to the Río Yaqui and the Chihuahua line. The province extends north and east into Arizona, New Mexico, and Chihuahua.

The mammalian fauna of this area, as now known, is made up of fifty different species and subspecies, of which twenty-four, including six genera, are known only from this province (Tables I and II). Approximately one-half of the mammal species recorded are distinctive of this area in Sonora.

SINALOAN BIOTIC PROVINCE.—The name "Sinaloan" was first proposed by Dice in a paper now in press, on "The Sonoran Biotic Province." The northward projection of this province into Sonora includes a rather extensive, coastal, lowland strip north along the gulf to Guaymas, thence north and east along the Río Yaqui Valley, at least to Oposura. It is bounded on the east by the mountainous area, along the Sonora–Chihuahua line, which seems to possess a distinct fauna and which is given a separate name here. The mammals of the Sinaloan, as here outlined in Sonora, are for the most part related to the more southern arid tropical forms. Of the thirty-six endemic species and subspecies listed for this area ten, including eight genera, are known only from this province. Four species are common only to the Sonoran and Sinaloan and thirteen to the Sinaloan and Durangan. One-fourth of the mammals known from this area are distinctive and are not known to occur elsewhere in Sonora.

DURANGAN BIOTIC PROVINCE.—Smallest and perhaps least known of the divisions outlined for Sonora is the southeastern mountain section, for which the name "Durangan" is here proposed. This area was included with the Sinaloan by van Rossem (1931) in what he called the "Alamos district." It comprises the mountainous region of southeastern Sonora, extending northward probably to the Río Yaqui. Much of the region has not been explored, and as far as mammals are concerned nothing is known about any but those of the southern portion. This probably accounts for the relatively small fauna recorded here, which is representative of only a small portion at the edge of the province, whatever its limits may be to the east and south into Chihuahua, Durango, and Sinaloa. Of the twenty-seven endemic forms of mammals known to occur, and seven or more additional ones which probably occur, seven, including one genus, are not known from any of the other areas. Eight of the forms are common to this and the Apachian province to the north, but they are not found in either of the other two areas, and thirteen are common only to the Durangan and Sinaloan.

TABLE I

SHOWING DISTRIBUTION OF SPECIES BY PROVINCES

X = Species is known from the province. **X** = Species is confined to the province in Sonora. X? = Species probably occurs in the province.

	SONORAN	APACHIAN	SINALOAN	DURANGAN
1. *Didelphis mesamericana mesamericana*	X	.....	X	.....
2. *Balantiopteryx plicata*	.....	.....	**X**	.....
3. *Chilonycteris rubiginosa mexicana*	.....	.....	**X**	.....
4. *Mormoops megalophylla megalophylla*	.....	.....	**X**	.....
5. *Macrotus californicus*	X	X	X	X
6. *Glossophaga soricina leachii*	.....	.....	**X**	.....
7. *Choeronycteris mexicana*	.....	X	.....	X
8. *Leptonycteris nivalis*	.....	X	.....	X
9. *Myotis yumanensis yumanensis*	X	.....	X?	.....
10. *Myotis yumanensis sociabilis*	.....	X	.....	X
11. *Myotis velifer velifer*	.....	X	.....	X?
12. *Myotis californicus californicus*	.....	**X**	.....	.....
13. *Myotis californicus pallidus*	**X**	.....	.....	.....
14. *Myotis thysanodes thysanodes*	.....	X	.....	X?
15. *Pizonyx vivesi*	**X**	.....	.....	.....
16. *Pipistrellus hesperus hesperus*	**X**	.....	.....	.....
17. *Pipistrellus hesperus merriami*	.....	**X**	.....	.....
18. *Eptesicus fuscus pallidus*	X?	X	X	.....
19. *Lasiurus borealis teliotis*	.....	X	.....	X
20. *Rhogeëssa tumida*	.....	.....	.....	**X**
21. *Corynorhinus rafinesquii pallescens*	.....	**X**	.....	.....
22. *Antrozous pallidus*	.....	**X**	.....	.....
23. *Tadarida mexicana*	X	X	X	.....
24. *Eumops perotis californicus*	.....	**X**	.....	.....
25. *Ursus kennerleyi*	.....	**X**	.....	.....
26. *Procyon lotor mexicanus*	.....	X	X	X?
27. *Procyon lotor pallidus*	**X**	.....	.....	.....
28. *Nasua narica pallida*	X	X?	X	X
29. *Spilogale gracilis arizonae*	.....	**X**	.....	.....
30. *Mephitis mephitis estor*	.....	**X**	.....	.....
31. *Mephitis macroura milleri*	X	X	X	X
32. *Conepatus sonoriensis*	.....	.....	**X**	.....
33. *Taxidea taxus berlandieri*	**X**	.....	.....	.....
34. *Vulpes macrotis arizonensis*	**X**	.....	.....	.....
35. *Canis latrans mearnsi*	X	X?	.....	.....
36. *Canis latrans jamesi*	**X**	.....	.....	.....
37. *Canis latrans vigilis*	.....	.....	X	X?
38. *Canis lupus baileyi*	.....	X	.....	X?
39. *Felis onca hernandesii*	.....	.....	.....	**X**
40. *Felis onca arizonensis*	.....	**X**	.....	.....
41. *Felis pardalis sonoriensis*	.....	X?	X	X
42. *Lynx rufus escuinapae*	.....	.....	X	X?
43. *Lynx rufus baileyi*	X	X?	.....	.....
44. *Citellus grammurus grammurus*	X	X	.....	.....
45. *Citellus grammurus rupestris*	.....	.....	X	X?
46. *Citellus tereticaudus neglectus*	X	.....	X	.....
47. *Citellus spilosoma macrospilotus*	.....	**X**	.....	.....
48. *Ammospermophilus harrisii saxicola*	**X**	.....	.....	.....
49. *Ammospermophilus harrisii kinoensis*	**X**	.....	.....	.....
50. *Cynomys ludovicianus arizonensis*	.....	**X**	.....	.....
51. *Eutamias dorsalis dorsalis*	.....	**X**	.....	.....
52. *Sciurus truei*	.....	.....	X	X
53. *Sciurus aberti barberi*	.....	**X**	.....	.....
54. *Sciurus apache*	.....	X	.....	X
55. *Thomomys umbrinus sonoriensis*	.....	**X**	.....	.....

TABLE I (*Continued*)

SHOWING DISTRIBUTION OF SPECIES BY PROVINCES

X = Species is known from the province. **X** = Species is confined to the province in Sonora. X? = Species probably occurs in the province.

	SONORAN	APACHIAN	SINALOAN	DURANGAN
56. *Thomomys simulus simulus*	.....	.....	.....	**X**
57. *Thomomys bottae modicus*	X	X	.....	.....
58. *Thomomys bottae vanrossemi*	**X**	.....	.....	.....
59. *Thomomys bottae phasma*	**X**	.....	.....	.....
60. *Thomomys bottae winthropi*	X	X?	.....	.....
61. *Thomomys bottae divergens*	.....	**X**	.....	.....
62. *Thomomys bottae convergens*	**X**	.....	.....	.....
63. *Thomomys bottae camoae*	.....	.....	**X**	.....
64. *Liomys pictus sonoranus*	.....	.....	X	X
65. *Perognathus flavus sonoriensis*	**X**	.....	.....	.....
66. *Perognathus longimembris kinoensis*	**X**	.....	.....	.....
67. *Perognathus amplus rotundus*	**X**	.....	.....	.....
68. *Perognathus baileyi baileyi*	X	.....	X	.....
69. *Perognathus baileyi insularis*	**X**	.....	.....	.....
70. *Perognathus penicillatus pricei*	X	X	X	.....
71. *Perognathus penicillatus seri*	**X**	.....	.....	.....
72. *Perognathus penicillatus minimus*	**X**	.....	.....	.....
73. *Perognathus pernix rostratus*	.....	.....	X	X
74. *Perognathus goldmani*	.....	.....	X	X
75. *Perognathus intermedius lithophilus*	**X**	.....	.....	.....
76. *Perognathus intermedius pinacate*	**X**	.....	.....	.....
77. *Perognathus artus*	.....	.....	.....	**X**
78. *Dipodomys spectabilis perblandus*	**X**	.....	.....	.....
79. *Dipodomys merriami merriami*	**X**	.....	.....	.....
80. *Dipodomys merriami simiolus*	**X**	.....	.....	.....
81. *Dipodomys merriami mayensis*	.....	.....	X	X
82. *Dipodomys merriami mitchelli*	**X**	.....	.....	.....
83. *Dipodomys ordii ordii*	X	X	.....	.....
84. *Dipodomys deserti deserti*	**X**	.....	.....	.....
85. *Dipodomys deserti sonoriensis*	**X**	.....	.....	.....
86. *Castor canadensis frondator*	.....	**X**	.....	.....
87. *Castor canadensis repentinus*	**X**	.....	.....	.....
88. *Onychomys leucogaster ruidosae*	.....	**X**	.....	.....
89. *Onychomys torridus torridus*	**X**	.....	.....	.....
90. *Onychomys torridus perpallidus*	**X**	.....	.....	.....
91. *Onychomys torridus yakiensis*	.....	.....	X	X
92. *Reithrodontomys megalotis megalotis*	**X**	.....	.....	.....
93. *Reithrodontomys fulvescens fulvescens*	X	X	X	.....
94. *Reithrodontomys fulvescens tenuis*	.....	.....	.....	**X**
95. *Baiomys taylori paulus*	.....	.....	**X**	.....
96. *Peromyscus eremicus eremicus*	X	X	.....	.....
97. *Peromyscus eremicus papagensis*	**X**	.....	.....	.....
98. *Peromyscus eremicus anthonyi*	.....	X?	X	X
99. *Peromyscus eremicus tiburonensis*	**X**	.....	.....	.....
100. *Peromyscus stephani*	**X**	.....	.....	.....
101. *Peromyscus collatus*	**X**	.....	.....	.....
102. *Peromyscus pembertoni*	**X**	.....	.....	.....
103. *Peromyscus maniculatus sonoriensis*	X	X	.....	.....
104. *Peromyscus leucopus arizonae*	.....	**X**	.....	.....
105. *Peromyscus boylii rowleyi*	.....	**X**	.....	.....
106. *Peromyscus boylii specilegus*	.....	.....	.....	**X**
107. *Peromyscus boylii glasselli*	**X**	.....	.....	.....
108. *Oryzomys couesi lambi*	.....	.....	**X**	.....
109. *Sigmodon hispidus cienegae*	X	X?	.....	.....
110. *Sigmodon hispidus eremicus*	**X**	.....	.....	.....
111. *Sigmodon hispidus major*	.....	.....	X	X
112. *Sigmodon minimus minimus*	.....	**X**	.....	.....
113. *Teanopus phenax*	.....	.....	**X**	.....

TABLE I (*Continued*)

	SONORAN	APACHIAN	SINALOAN	DURANGAN
114. *Neotoma albigula albigula*	X	X	.....	.....
115. *Neotoma albigula sheldoni*	X	.....	.....	.....
116. *Neotoma albigula venusta*	X	.....	.....	.....
117. *Neotoma albigula melanura*	.....	.....	X	X
118. *Neotoma albigula seri*	X	.....	.....	.....
119. *Neotoma varia*	X	.....	.....	.....
120. *Neotoma lepida bensoni*	X	.....	.....	.....
121. *Neotoma lepida aureotunicata*	X	.....	.....	.....
122. *Neotoma mexicana mexicana*	.....	X	.....	.....
123. *Neotoma mexicana sinaloae*	.....	.....	X	X
124. *Rattus rattus alexandrinus*	X	X	X	X
125. *Mus musculus musculus*	X	X	X	X
126. *Lepus alleni alleni*	X	.....	.....	.....
127. *Lepus alleni palitans*	.....	.....	X	X
128. *Lepus alleni tiburonensis*	X	.....	.....	.....
129. *Lepus californicus deserticola*	X	.....	.....	.....
130. *Lepus californicus eremicus*	X	X	.....	.....
131. *Sylvilagus floridanus holzneri*	.....	X	.....	.....
132. *Sylvilagus audubonii arizonae*	X	X	.....	.....
133. *Sylvilagus audubonii goldmani*	.....	.....	X	.....
134. *Pecari angulatus sonoriensis*	X	X	.....	.....
135. *Odocoileus hemionus eremicus*	X	.....	.....	.....
136. *Odocoileus hemionus canus*	.....	X	.....	.....
137. *Odocoileus couesi*	X	X	.....	.....
138. *Odocoileus sinaloae*	.....	.....	.....	X
139. *Antilocapra americana mexicana*	X	.....	.....	.....
140. *Ovis canadensis gaillardi*	X	.....	.....	.....
141. *Ovis canadensis sheldoni*	X	.....	.....	.....

TABLE II

THE NUMBER OF GENERA, SPECIES, AND SUBSPECIES OF ENDEMIC MAMMALS RECORDED FROM THE DIFFERENT PROVINCES IN SONORA

	GENERA	ADDITIONAL SPECIES	ADDITIONAL SUBSPECIES	TOTAL
Confined to Sonoran	5	14	31	50
Confined to Apachian	6	8	10	24
Confined to Sinaloan	8	0	2	10
Confined to Durangan	1	3	3	7
Common to Sonoran and Apachian, but not in others	1	3	10	14
Common to Sonoran and Sinaloan, but not in others	1	1	2	4
Common to Sonoran and Durangan, but not in others	0	0	0	0
Common to Apachian and Sinaloan, but not in others	0	0	0	0
Common to Apachian and Durangan, but not in others	3	4	1	8
Common to Sinaloan and Durangan, but not in others	1	3	9	13
Common to all four provinces in Sonora	2	1	0	3

ANNOTATED LIST OF MAMMALS

In the following annotated list specimens in the Museum of Zoology, University of Michigan, are indicated by the abbreviation "MZUM.," and those in the Donald R. Dickey collection at the California Institute of Technology by "DRD." On the distribution maps the locality records for specimens examined and from reliable reports have been spotted in; type localities are circled (see also Map 26).

Didelphis mesamericana mesamericana Oken

Opossum

Did[*elphys*]. *mes-americana* Oken, *Lehrbuch d. Zoologie,* 2, Pt. 3 (1816): 1152. Northern Mexico (*fide* Miller, 1924: 3).

DISTRIBUTION.—Probably occurs throughout most of Sonora; found along streams and in the low valleys at least as far north as Ures and Oputo. Specimens from Tésia and Ures (DRD.); Hermosillo (J. A. Allen, 1901: 167); and Oputo (Bailey, 1933: 243). Also reported by Bailey as occurring near Llano.

There is a possibility that this species now ranges, or has ranged in the past, as far north as California (see J. A. Allen, 1902: 256, footnote, for discussion of Bennett's *D. californica* and *D. breviceps,* supposed synonym of *D. mesamericana*).

REMARKS.—The opossum probably is more common in Sonora than the few records indicate. It may occur in either the black or gray color phase, both phases being represented in the collections studied.

Balantiopteryx plicata Peters

Sac-winged Bat

Balantiopteryx plicata Peters, *Monatsber. k. preuss. Akad. Wissensch. Berlin,* 1867: 476. Punta Arenas, Costa Rica.

DISTRIBUTION.—Southern Sonora, as far north as Chinobampo (DRD.).

REMARKS.—One adult male of this species was taken at Chinobampo, February 19, 1930. This extends the known range of the species northward from Escuinapa in southern Sinaloa (J. A. Allen, 1906: 235).

Chilonycteris rubiginosa mexicana Miller

Small Dark Brown Bat

Chilonycteris mexicana Miller, *Proc. Acad. Nat. Sci. Phila.,* 1902: 401–2. Type collected June 9, 1897, by E. W. Nelson and E. A. Goldman at San Blas, Nayarit, Mexico.

DISTRIBUTION.—Lowlands of Southern Sonora, north to Guaymas on the coast. Specimens from Tésia, December 30, 1929; Chinobampo, February and March, 1930; and fifteen miles northwest of Guaymas, January 11, 1933 (DRD.).

REMARKS.—The presence of this species in Sonora extends its known range considerably northward and westward; the previously published northern record being Chacala, Durango (Rehn, 1904*a*: 204). One specimen take at Tésia was found at night in an abandoned adobe house, the others from southern Sonora were taken in the daytime from the dark recesses of a large cave. Specimens from near Guaymas also were taken from a cave.

Mormoops megalophylla megalophylla Peters

Bat

Mormops megalophylla Peters, *Monatsber. k. preuss. Akad. Wissensch. Berlin,* 1864: 381. Southern Mexico.

DISTRIBUTION.—Southern Sonora, as far north as Guaymas along the coast. Specimens from fifteen miles northwest of Guaymas (DRD.).

REMARKS.—Thirteen of these bats were taken from a cave by Lamb, January 11, 1933. These specimens are, to my knowledge, the first taken in Sonora and constitute a considerable northward extension of the known range of the species.

The Sonoran specimens closely resemble a series of *megalophylla* from El Salvador. Specimens of *Mormoops megalophylla senicula* Rehn have not been available for comparison, but in the original description of that race Rehn (1902: 169–70) states that the second upper premolar is broader than the length of the labial border and that a rounded shallow shoulder is formed on the internal portion of the tooth, a development which is comparatively slight in *megalophylla.* As far as this character is concerned Sonoran specimens are indistinguishable from those from El Salvador.

Macrotus californicus Baird

California Leaf-nosed Bat

Macrotus californicus Baird, *Proc. Acad. Nat. Sci. Phila.,* 1858: 116. Type, now lost, collected by G. H. Thomas, at Old Fort Yuma, Imperial County, California, on the right bank of the Colorado River (*fide* Lyon and Osgood, 1909: 290).

DISTRIBUTION.—Throughout the lower arid portions of Sonora and in the mountains at least to the oak belt. Specimens in the Dickey collections are from Saric, three miles east of Willard, Carrizo ranch, fifteen miles northwest of San José de Guaymas, San Javier, Tésia, Chinobampo, and Guirocoba. In the Museum of Zoology there are specimens from below Santa Maria mine, near El Tigre. Also reported from Ortiz and Camoa by Rehn (1904*b*: 444). These bats apparently remain in Sonora throughout the year, as specimens have been taken in nearly every month from January to December.

REMARKS.—Except for a slightly darker coloration, in mass effect, the

Sonoran specimens are not distinguishable from series of *californicus* from California.

At San Javier females were found to be carrying young on April 21, 1929. At Saric the species was observed by Wright about the middle of June, 1929, and on July 17 adult females were found to be nursing young. Four females collected at Guirocoba, May 6 and 7, 1930, each contained one embryo. In this area the young are born probably in June. Young individuals were taken by Campbell near El Tigre August 5 and 6, 1935.

In the stomachs of these bats Wright found fruit as well as insect remains. One specimen taken at Saric, October 13, 1929, contained fruit and insects in its stomach, and another specimen taken on the same date contained fruit only. Each of two bats collected at Guirocoba, May 6, 1930, contained fruit in its stomach, and specimens taken at Tésia contained both fruit and insects. To my knowledge this species has not been reported previously as being a fruit-eating bat. According to H. W. Grinnell (1918: 257) *Macrotus waterhousii* from Jamaica has been reported by Dobson as eating both fruit and insects. It is not strange, therefore, to find *californicus* subsisting in part on fruits. Residents of Alamos said that bats, probably of this species, occasionally destroyed much fruit.

Glossophaga soricina leachii (Gray)

Long-tongued Bat

Monophyllus leachii Gray, "Zoology," *Voyage of the Sulphur*, 1843: 18. Realejo, Nicaragua.

DISTRIBUTION.—Southern Sonora, north as far as Chinobampo.

REMARKS.—A slight northward extension of the known range of this species results from the taking of specimens in southern Sonora. The previously published northern records for the species are southern Sinaloa, Durango, and Tamaulipas (Miller, 1913: 420). These bats were plentiful at Chinobampo, where they were found in an adobe house and in shallow caves.

Choeronycteris mexicana Tschudi

Hog-nosed Bat

Ch[*oeronycteris*]. *mexicana* Tschudi, "Therologie," *Fauna Peruana*, 1844: 72. Mexico.

DISTRIBUTION.—Throughout most of Sonora except possibly the northwest portion and the higher mountains along the Sonora–Chihuahua border. Specimens from Guirocoba and Saric (DRD.); and Pilares and below Santa Maria mine, near El Tigre (MZUM.).

REMARKS.—Four adult females and one young male were taken at Saric, July 10, 1929, in the extreme back of a tunnel where the light intensity was a deep dusk. At Guirocoba one young was taken with its mother April 14,

1931, and other young individuals were taken during the latter part of April and early May. At Pilares, Campbell took ten adult females, one adult male, and twelve young during the period from July 1 to 12, 1935, and on August 5, 1935, he took two old females and four young adult animals. Here they were found in pockets in a cliff in a small canyon.

Leptonycteris nivalis (Saussure)

Slender Bat

M. (= *Ischnoglossa*) *nivalis* Saussure, *Rev. et magasin de zool.*, sèr. 2, 12 (1860): 492, Pl. 20, Fig. 2. Near the snow line on Pico de Orizaba, Mexico.

DISTRIBUTION.—Mountainous region of eastern Sonora. Specimens from Pilares and below Santa Maria mine, near El Tigre, (MZUM.); and Guirocoba and Chinobampo (DRD.).

REMARKS.—These bats were found in small crevices in caves; when disturbed they readily took wing and flew out.

Myotis yumanensis yumanensis (H. Allen)

Yuma Bat

Vespertilio yumanensis H. Allen, *Smithson. Misc. Coll.*, No. 165 (1864): 58. Type collected at Old Fort Yuma, Imperial County, California.

DISTRIBUTION.—Low arid desert regions of northern and western Sonora (Map 2). Colonia Lerdo only definite locality record (Miller and Allen, 1928: 68).

Myotis yumanensis sociabilis H. W. Grinnell

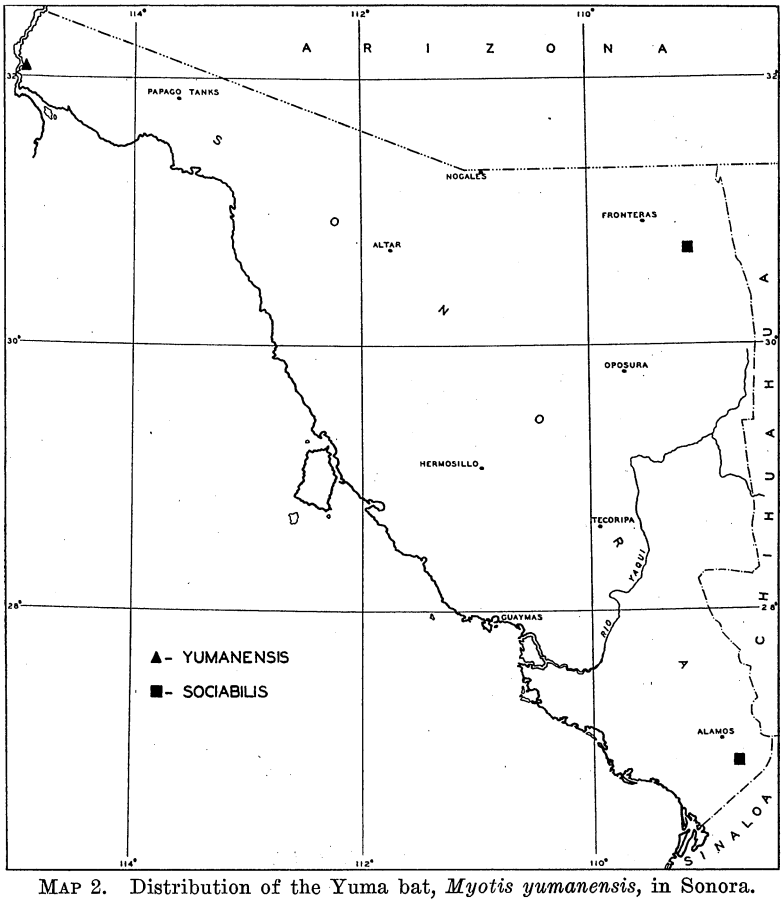
Yuma Bat

Myotis yumanensis sociabilis H. W. Grinnell, *Univ. Calif. Publ. Zool.*, 12 (1914): 318–19. Type collected July 23, 1904, by J. Grinnell at Old Fort Tejon; altitude, 3200 feet; Kern County, California.

DISTRIBUTION.—Probably throughout mountainous areas in eastern Sonora (Map 2). Specimens from Guirocoba (DRD. and MZUM.); and Pilares (MZUM.).

REMARKS.—These bats were found clinging beneath the roof of an outbuilding at Guirocoba in April and May, 1930, 1931, and 1933. Stomach contents revealed insect remains. Campbell took two young specimens at Pilares, July 31, 1935.

A series of fifteen specimens from Guirocoba and three from Pilares are similar to topotypes of *sociabilis*. This gives for the race an interrupted range with the pale desert *yumanensis* occupying the intervening Colorado Desert area. *M. y. sociabilis* probably occupies the more mountainous regions of Sonora with *yumanensis* on the low desert. With the present lack of sufficient locality records for the two races this is little more than supposition.



MAP 2. Distribution of the Yuma bat, *Myotis yumanensis*, in Sonora.

Myotis velifer velifer (J. A. Allen)

Cave Bat

Vespertilio velifer Allen, *Bull. Amer. Mus. Nat. Hist.*, 3 (1890): 177. Type collected September 7, 1889, by A. C. Buller at Santa Cruz del Valle, Guadalajara, Jalisco.

DISTRIBUTION.—Probably throughout most of the mountainous regions of Sonora. Specimens from Saric (DRD.); below Santa Maria mine, near El Tigre (MZUM.); and San Bernardino ranch (Miller and Allen, 1928: 91).

REMARKS.—At Saric twenty-eight males and twelve females of this species were taken in adobe houses from May to September, 1929.

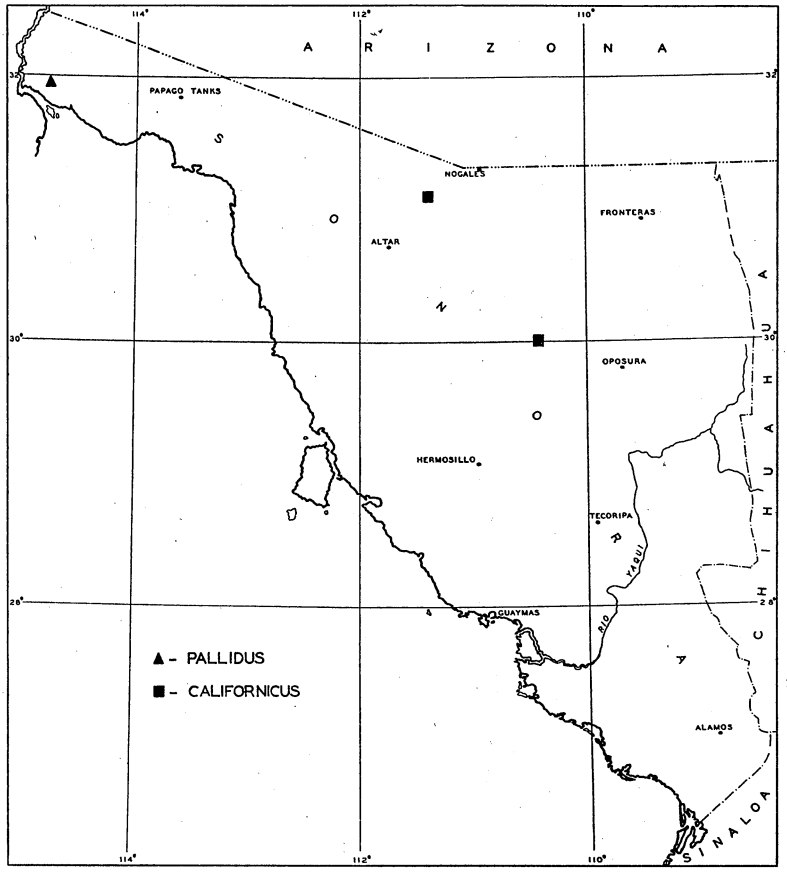
Myotis californicus californicus (Audubon and Bachman)

California Bat

Vespertilio californicus Audubon and Bachman, *Journ. Acad. Nat. Sci. Phila.*, 8 (1842): 285–87. "California." By subsequent restriction, Monterey, Monterey County, California (see Miller and Allen, 1928: 153).

DISTRIBUTION.—Northeastern Sonora as far west as Saric (Map 3). Specimens from Saric (DRD.); and Providencia mines (Miller and Allen, 1928: 155).

REMARKS.—Two specimens of this race taken at Saric in July and September, 1929, resemble closely specimens from California, except that one of them is more reddish in coloration.



MAP 3. Distribution of the California bat, *Myotis californicus*, in Sonora.

Myotis californicus pallidus Stephens

California Bat

Myotis californicus pallidus Stephens, *Proc. Biol. Soc. Wash.*, 13 (1900): 153. Type collected April 1, 1895, by Frank Stephens at Vallecito, eastern San Diego County, California.

DISTRIBUTION.—Low arid desert region of northwestern Sonora (Map 3). El Doctor (DRD.).

REMARKS.—One male was taken at El Doctor, February 1, 1929. It is typical *pallidus*.

Myotis thysanodes thysanodes Miller

Fringed Bat

Myotis thysanodes Miller, *N. Amer. Fauna*, No. 13 (1897): 80. Type collected July 5, 1891, by T. S. Palmer at Old Fort Tejon, California.

DISTRIBUTION.—Probably most of Sonora. The taking of this species was to be expected, as it occurs north, east, and south of Sonora. One specimen from below Santa Maria mine, near El Tigre (MZUM.).

Pizonyx vivesi (Menegaux)

Fish-eating Bat

Myotis vivesi Menegaux, *Bull. mus. d'hist. nat. Paris*, 7 (1901): 323. Type collected December, 1900, by Léon Diguet at "Cardonal Island," Sal si Puedes Archipelago, at the north of the Gulf of California, Mexico.

DISTRIBUTION.—One specimen, a mummy, is recorded from Guaymas (Miller and Allen, 1928: 213).

REMARKS.—As these bats subsist entirely on fish, as far as is now known (Burt, 1932), I suspect that the one mummified specimen found on the mainland is accidental. Some of the islands in the Gulf of California that lie near the Sonora shore possibly shelter colonies of these bats, but so far they have not been discovered. The nearest known colony is on Isla Partida some one hundred and forty miles distant.

Pipistrellus hesperus hesperus (H. Allen)

Canyon Bat

Scotophilus hesperus H. Allen, *Smithson. Misc. Coll.*, No. 165 (1864): 43. The type was collected in 1855 by Major G. H. Thomas at Old Fort Yuma, Imperial County, California, on the right bank of the Colorado River, opposite the present town of Yuma, Arizona.

DISTRIBUTION.—Probably in most of the low desert area of northwestern Sonora (Map 4). One specimen from Verrugo Pass, fifty miles northeast of Puerto Libertad (Dice and Blossom, 1937: 17).

Pipistrellus hesperus merriami (Dobson)

Canyon Bat

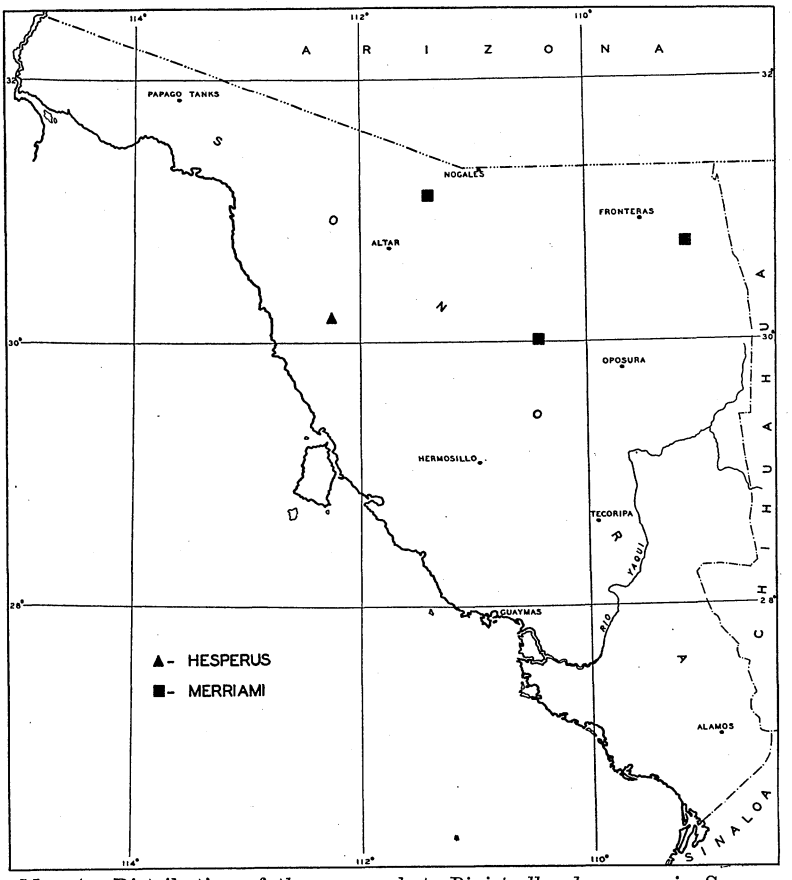
Vesperugo merriami Dobson, *Ann. and Mag. Nat. Hist.*, Ser. 5, 18 (1886): 124. Red Bluff, Tehama County, California (*fide* Miller, 1897: 31).

Pipistrellus hesperus apus Elliot, *Field Columb. Mus., Publ. Zool.*, Ser. 3, 90 (1904): 269. Providencia mines, Sonora.

DISTRIBUTION.—Mountainous parts of northeastern Sonora, west as far as Saric and south to Providencia mines (Map 4). Recorded from Providencia mines as *apus* (Elliot, 1904); Saric (DRD.); and Pilares (MZUM.).

REMARKS.—At Saric these bats usually made their appearance before sundown. A young individual was taken here July 27, 1929.

In his recent revision of the *Pipistrellus hesperus* group of bats, Hatfield (1936) placed *P. apus* Elliot in the synonymy of *P. hesperus australis* Miller and included practically all of Sonora in the range of *australis*. I cannot



MAP 4. Distribution of the canyon bat, *Pipistrellus hesperus,* in Sonora.

follow Hatfield in his treatment of the Sonora *Pipistrellus* for two reasons. First, I believe his conclusions to be based on inadequate data (he admits on pages 260 and 261 that he saw no specimens of *apus!* Nor did he list any other specimens from Sonora), and second, specimens from Sonora in the Dickey collections and at the Museum of Zoology, in my opinion, do not corroborate his statements. (For a discussion of the status of Elliot's proposed race *apus* see Burt, 1933 : 115.)

Eptesicus fuscus pallidus Young

Pallid Brown Bat

Eptesicus pallidus Young, *Proc. Acad. Nat. Sci. Phila.*, 1908: 408. Type collected July 22, 1903, by R. J. Young at Boulder, Boulder County, Colorado.

DISTRIBUTION.—Probably most of western and northern Sonora, as far south as Guaymas. Specimens from Saric and Guaymas (DRD.); and Providencia mines (Elliot, 1907: 510).

REMARKS.—Two adult males were taken at Saric in June, 1929, and two more at Guaymas in May, 1930. The Guaymas specimens were taken from an old woodpecker nest in a salguaro association. These specimens are slightly darker in coloration than Great Basin specimens.

Lasiurus borealis teliotis (H. Allen)

Western Red Bat

Atalapha teliotis H. Allen, *Proc. Amer. Phil. Soc.*, 29 (1891): 5–7. Type locality unknown, probably southern California.

DISTRIBUTION.—Sparingly distributed throughout most of Sonora. Specimens from Saric, May to August, 1929, and Guirocoba, January 14, 1932 (DRD.).

REMARKS.—These solitary bats were found clinging to the leaves of persimmon trees at Saric.

Rhogeëssa tumida H. Allen

Bat

R[hogeëssa]. tumida H. Allen, *Proc. Acad. Nat. Sci. Phila.*, 1866: 286. Type collected by A. J. Grayson at Mirador, Vera Cruz (*fide* Lyon and Osgood, 1909: 276).

DISTRIBUTION.—Extreme southern Sonora. One specimen from San Rafael, February 29, 1931 (DRD.).

REMARKS.—This is a considerable northward extension of the known range of the species; the northernmost previously recorded locality of occurrence being Colima (Miller, 1897: 124).

Corynorhinus rafinesquii pallescens Miller

Pale Lump-nosed Bat

Corynorhinus macrotis pallescens Miller, *N. Amer. Fauna*, No. 13 (1897): 52. Type collected August 3, 1894, by A. K. Fisher at Keam Canon, Navajo County, Arizona.

DISTRIBUTION.—Northeastern Sonora. Specimens from Saric (DRD.); and Pilares and below Santa Maria mine, near El Tigre (MZUM.).

REMARKS.—From August 15 to September 20, 1929, nine specimens were collected in houses at Saric. These specimens apparently are intergrades between *pallescens* and *C. r. mexicanus* G. M. Allen. In the original description of *mexicanus*, G. M. Allen (1916: 347) says: "It is odd that the accessory

cusp of the inner upper incisor, usually wanting in other races of *megalotis* [=*rafinesquii*], should be normally present in *mexicanus.*" Allen found this cusp wanting in but one of eighteen specimens examined. In the present series of nine from Saric one (DRD. No. 16857) has a distinct cusp, and three (DRD. Nos. 16833, 16861, and 16868) have indications of the cusp. The remaining five have the cusp absent. In coloration the Saric specimens average slightly darker than California specimens of *pallescens.* One specimen (DRD. No. 16857) agrees both in skull and skin characters with Allen's description of *mexicanus.* Although the Saric specimens show intergradation they are closer, on the average, to *pallescens* than to *mexicanus* and are treated here as such. Five specimens taken by Campbell from July 4 to August 5 were adult males.

Antrozous pallidus (Le Conte)

Pallid Bat

V[*espertilio*]. *pallidus* Le Conte, *Proc. Acad. Nat. Sci. Phila.,* 7 (1855): 437. Type collected by J. H. Clark at El Paso, El Paso County, Texas; first entered in U.S.N.M. Catalogue May 19, 1853 (*fide* Lyon and Osgood, 1909: 279).

DISTRIBUTION.—Northern Sonora. Specimens from Saric (DRD.); "Sonora" (Baird, 1859: 5); and Pilares (MZUM.).

REMARKS.—Twelve adults and thirteen young, some still nursing, were taken in houses at Saric, July 17, 19, and 28, 1928. These specimens average slightly larger and darker than a series of ten specimens from Nevada and California. Campbell found the bats inhabiting a shed at Pilares, where they roosted between some boards and the tin roof. At the same locality he shot some from crevices in a high cliff. Four females taken July 2, at Pilares, all contained well-developed embryos, two contained two embryos each, and two one embryo each. Seven young specimens were taken from July 15 to 17. The young are born probably in early July at this latitude.

Tadarida mexicana (Saussure)

Free-tailed Bat

M[*ollossus*]. *mexicanus* Saussure, *Rev. et mag. de zool.,* sèr. 2, 12 (1860): 283–85, Pl. 15, Figs. 2, 2*a*. Type collected at Ameca, Jalisco (*fide* Shamel, 1931: 5).

DISTRIBUTION.—Probably throughout Sonora. Specimens from Chinobampo and Ures (DRD.); and Pilares, (MZUM.). Shamel (1931: 6) records one specimen from Sonora, but gives no definite locality.

Eumops perotis californicus (Merriam)

Mastiff Bat

Molossus californicus Merriam, *N. Amer. Fauna,* No. 4 (1890): 31. Type collected December 14, 1889, by E. C. Thurber at Alhambra, Los Angeles County, California.

DISTRIBUTION.—Mountains of northeastern Sonora. Pilares (MZUM.).

REMARKS.—This species has been recorded from Arizona (Sanborn, 1932), but this is the first time it has been taken within the confines of Sonora. From July 13 to 16, 1935, Campbell took seventeen specimens near Pilares. The bats were shot from crevices in a high cliff. To my knowledge all previous specimens have been taken either from buildings or while the bats were flying in the evening. Eight young were taken July 16, 1935. Nine adult females also were taken during this time. This indicates a segregation of old males and old females during the time that young are still being cared for by the mother.

Ursus kennerleyi Merriam

Sonora Grizzly

Ursus kennerleyi Merriam, *Proc. Biol. Soc. Wash.*, 27 (1914): 194. Type collected June, 1855, by C. B. R. Kennerly in the mountains of northeastern Sonora, near Los Nogales.

DISTRIBUTION.—Nothing is known concerning the range of the species, the type being the only specimen known from Sonora (Merriam, 1918: 61). It is probable that the species formerly ranged throughout the mountains of northeastern Sonora and may be found there still.

Procyon lotor mexicanus Baird

Raccoon

Procyon hernandezii, var. *mexicana* Baird, "Mammals," *Pacific R. R. Rept.*, 8 (1857): 215. Type collected April, 1855, by C. B. R. Kennerly at Espia, Chihuahua (given in original description and by subsequent authors as Sonora).

DISTRIBUTION.—Probably most of eastern and southern Sonora (Map 5). Recorded from La Noira [*sic*] = La Noria (J. A. Allen, 1895: 250); and Tecoripa (DRD.).

REMARKS.—The type locality of this race has been erroneously given as Sonora by authors. Espia, from which locality Dr. Kennerly obtained the specimens used by Baird in the original description, is located in northwestern Chihuahua near 108° west longitude.

Procyon lotor pallidus Merriam

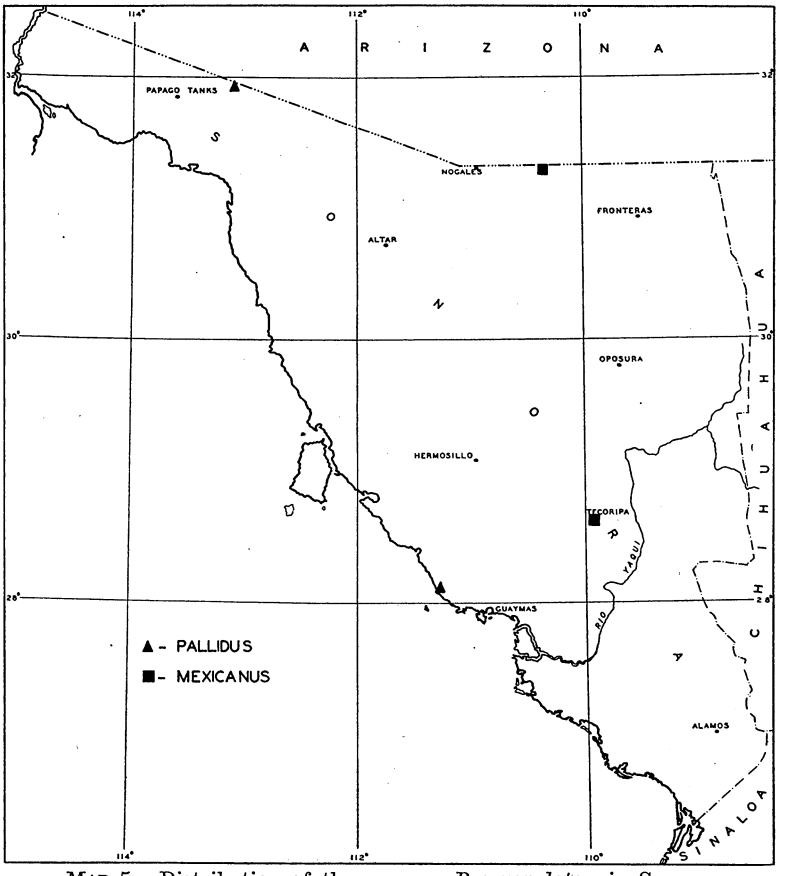
Raccoon

Procyon pallidus Merriam, *Proc. Biol. Soc. Wash.*, 13 (1900): 151. Type collected October 16, 1899, by F. Stephens at New River, Colorado Desert, Imperial County, California.

Procyon lotor ochraceus Mearns, *Proc. Biol. Soc. Wash.*, 27 (1914): 64. Río Sonoyta, near Quitobaquita, monument No. 172, Sonora.

DISTRIBUTION.—Streams and lagoons of northwestern Sonora (Map 5). Recorded from Río Sonoyta, near Quitobaquita (Mearns, 1914: 64); and Bahía San Pedro (DRD.).

REMARKS.—At Sargent's Point raccoon tracks were numerous in the mud flats around a lagoon. A skeleton, with portions of the dry skin attached, was picked up at Bahía San Pedro.



MAP 5. Distribution of the raccoon, *Procyon lotor,* in Sonora.

Nasua narica pallida Allen

Coati

Nasua narica pallida Allen, *Bull. Amer. Mus. Nat. Hist.,* 20 (1904): 53–54. Type collected by Carl Lumholtz in the vicinity of Guadalupe y Calva, Chihuahua.

DISTRIBUTION.—Probably throughout most of Sonora except the northwest desert area. Specimens from Guirocoba, Chinobampo, and San Javier (DRD.); and two miles east of Ures (Luther Little collection).

REMARKS.—The coati is often gregarious in its habits. Thirty or forty may be seen feeding together during the day, or an old male may be seen foraging alone. The habit of the old males of leaving the herds and shifting

alone has given rise to a popular belief, among the inhabitants of areas where coatis are common, that there are two forms. Old individuals seen alone are called "solitarios" by the natives; the others are "cholugoes." The food of the coati consists chiefly of fruits, berries, nuts, and tender vegetation. It also eats carrion, grubs, and insects.

Spilogale gracilis arizonae Mearns

Spotted Skunk

Spilogale phenax arizonae Mearns, *Bull. Amer. Mus. Nat. Hist.*, 3 (1891): 256–57. Type collected March 13, 1886, by E. A. Mearns near Fort Verde, Yavapai County, Arizona.

DISTRIBUTION.—Northern Sonora. Recorded only from Sierra de San José (Howell, 1906: 29).

Mephitis mephitis estor Merriam

Striped Skunk

Mephitis estor Merriam, *N. Amer. Fauna*, No. 3 (1890): 81–82. Type collected August 17, 1889, by Vernon Bailey, near Little Spring, San Francisco Mountain, Coconino County, Arizona. Altitude, 8200 feet.

DISTRIBUTION.—Northern Sonora, southern limit of range unknown. Recorded by Howell (1901: 34) from the following localities near the international boundary line; Río Santa Cruz, Río San Pedro, Sierra de los Patagones, San Bernardino ranch (monument No. 77), and La Noria (monument No. 111).

Mephitis macroura milleri Mearns

Hooded Skunk

Mephitis milleri Mearns, *Proc. U. S. N. M.*, 20 (1897; advance sheets, February 11, 1897): 467. Type collected November 13, 1893, by F. X. Holzner at Fort Lowell (near Tucson), Pima County, Arizona.

DISTRIBUTION.—Throughout most of Sonora except perhaps the extreme northwestern desert region. Specimens from Alamo Wash and Guirocoba (DRD.); Sierra de los Patagones, Río Santa Cruz, Santa Cruz, Hermosillo, Magdalena, Camoa, and Alamos (Howell, 1901: 43); and recorded from Sierra Cubabi (Hornaday, 1908: 103).

REMARKS.—At Guirocoba, in May, 1933, a skunk was seen foraging on several different nights in a stack of peanut hay. He was so intent on eating peanuts that even though I approached to within four feet of him with a searchlight he showed no signs of uneasiness. His eye shine was a yellowish green in color.

Conepatus sonoriensis Merriam

Sonora Skunk

Conepatus sonoriensis Merriam, *Proc. Biol. Soc. Wash.*, 15 (1902): 162–63. Type collected October 29, 1898, by E. A. Goldman at Camoa, Río Mayo, Sonora.

DISTRIBUTION.—Southern Sonora. Recorded only from Camoa (Merriam, 1902: 162).

Taxidea taxus berlandieri Baird

Badger

Taxidea berlandieri Baird, *Mamm. N. Amer.*, 1857: 205. Type collected by J. Pope at Llano Estacado, Texas, near the border of New Mexico.

DISTRIBUTION.—Probably most of northern Sonora, south at least to Guaymas along the coast. Reported from Costa Rica ranch (Lamb, notes) and twenty miles north of Guaymas (Wright, notes). Wright saw a dead badger along the road at the latter locality October 23, 1934. No specimens have been recorded from Sonora, nor have I seen any there.

Vulpes macrotis arizonensis Goldman

Desert Fox

Vulpes macrotis arizonensis Goldman, *Journ. Wash. Acad. Sci.*, 21 (1931): 249. Type collected December 9, 1913, by E. A. Goldman two miles south of Tule Tanks, near the Mexican boundary, Yuma County, Arizona.

DISTRIBUTION.—No specimens are recorded from Sonora, but the species probably occurs over much of the desert region in the northwestern portion of the state.

Canis latrans mearnsi Merriam

Coyote

Canis mearnsi Merriam, *Proc. Biol. Soc. Wash.*, 11 (1897): 30–31. Type collected February 5, 1894, by Edgar Mearns at Quitobaquita (monument No. 172, International Boundary), Pima County, Arizona.

DISTRIBUTION.—Probably most of northern and western Sonora (Map 6). No specimens have been actually recorded from Sonora, but the type locality is just north of the boundary and might as well have been in Sonora as in Arizona. Lamb (notes) heard coyotes, probably of this race, at Alamo Wash, and Hornaday (1908: 122, 135) reports them from Quitobaquita and Agua Dulce.

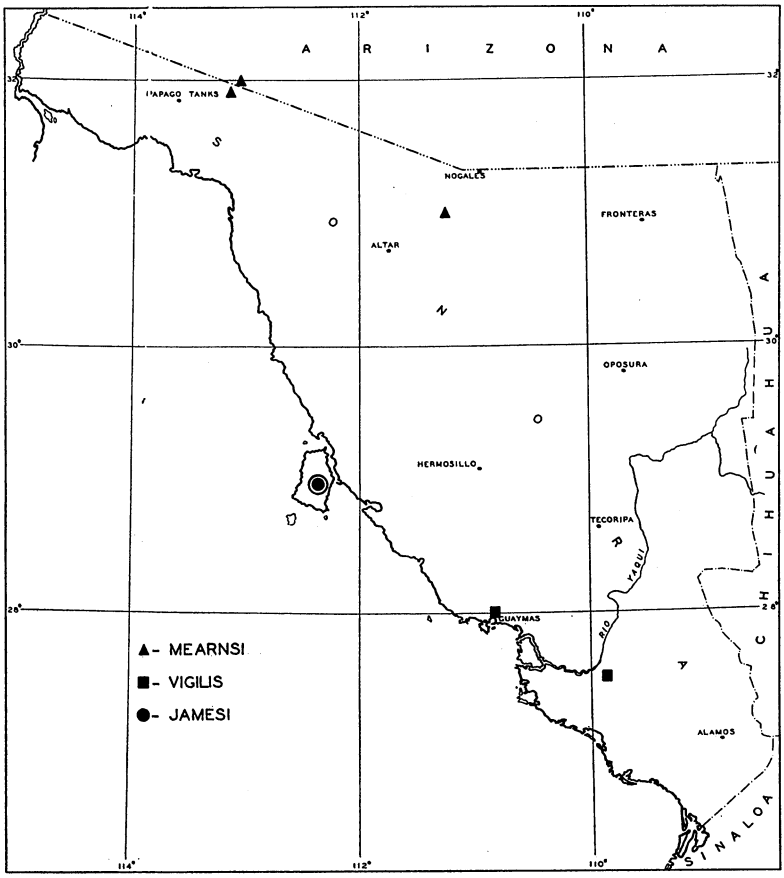
Canis latrans jamesi Townsend

Coyote

Canis jamesi Townsend, *Bull. Amer. Mus. Nat. Hist.*, 31 (1912): 130. Type collected April 13, 1911, by H. E. Anthony of the "Albatross Expedition," on Tiburón Island, Sonora.

DISTRIBUTION.—Confined to Tiburón Island (Map 6).

REMARKS.—These small coyotes apparently are rather numerous on the island. Their tracks were common along the beaches, where they evidently fed to some extent at low tide. The narrow channel separating Tiburón



MAP 6. Distribution of the coyote, *Canis latrans,* in Sonora.

Island from the mainland apparently has been an effective barrier to the coyotes, and this small race has evolved on the island.

Canis latrans vigilis Merriam

Coyote

Canis vigilis Merriam, *Proc. Biol. Soc. Wash.,* 11 (1897): 33. Type collected February 6, 1892, by E. W. Nelson at Manzanillo, Colima.

DISTRIBUTION.—Southern Sonora, north as far as Empalme (Map 6). Specimens from Obregon and Empalme (DRD.).

REMARKS.—As compared with *Canis latrans mearnsi* Merriam from southern Arizona the two specimens from Obregon and Empalme are much darker in coloration; the limbs and ears are of a much deeper fulvous. Cranially the Obregon skull differs from *mearnsi* in having smaller teeth and narrower nasals. I have had no specimens of *vigilis* for comparison, but because

the two specimens from southern Sonora agree with the description of that race I do not hesitate to assign them to it. Empalme probably is near the northern limit of the range of *vigilis*.

Canis lupus baileyi Nelson and Goldman

Wolf

Canis nubilus baileyi Nelson and Goldman, *Journ. Mammalogy*, 10 (1929): 165–66. Type collected July 10, 1899, by E. W. Nelson and E. A. Goldman at Colonia Garcia (about sixty miles southwest of Casas Grandes), Chihuahua. Altitude, about 6700 feet.

DISTRIBUTION.—Probably throughout the Sierra Madre along the Sonora–Chihuahua boundary. Recorded from Santa Cruz (Nelson and Goldman, 1929: 166).

REMARKS.—While at Guirocoba I had a report of a large wolf that had been killed by a cow hand, but the specimen had been disposed of before I could get in touch with the man who was supposed to have killed it. It is barely possible that the report was based on a wolf of this species.

Felis onca hernandesii (Gray)

Jaguar

Leopardus hernandesii Gray, *Proc. Zool. Soc. London*, 1857: 278. Pl. 58. Collected at Mazatlán, Sinaloa. Described from an individual in the gardens of the Zoological Society of London.

DISTRIBUTION.—North probably as far as southern Sonora.

REMARKS.—Mr. Obermüller of Alamos, Sonora, has a rug made from a fine large skin of *Felis onca*. The specimen was taken in the mountains near Alamos and probably belongs to the race *hernandesii*, as it is unlikely that *arizonensis* goes that far south. Jaguars were reported to be fairly common in the mountains of southern Sonora.

Felis onca arizonensis Goldman

Jaguar

Felis onca arizonensis Goldman, *Proc. Biol. Soc. Wash.*, 45 (1932): 144–45. Type collected April 12, 1924, by Jack Funk near Cibecue, Navajo County, Arizona.

DISTRIBUTION.—Mountainous parts of northern Sonora. Recorded from the western foothills of the Sierra Madre, due west of Casas Grandes, Chihuahua; one skull (Nelson and Goldman, 1933: 238). There is a sight record from Cañon de Guadalupe (Baird, 1859: 7); and a skin, probably of this race, in the possession of Mr. Kibbe at Alamo ranch, was taken in the mountains fifteen miles west of the ranch (Lamb, notes).

Felis pardalis sonoriensis Goldman

Ocelot

Felis pardalis sonoriensis Goldman, *Journ. Mammalogy*, 6 (1925): 123–24. Type collected December 3, 1898, by E. A. Goldman at Camoa, Río Mayo, Sonora.

DISTRIBUTION.—Lowlands and foothills of southern Sonora, north to Arizona. Specimens from Camoa (type locality) and Guirocoba (DRD.).

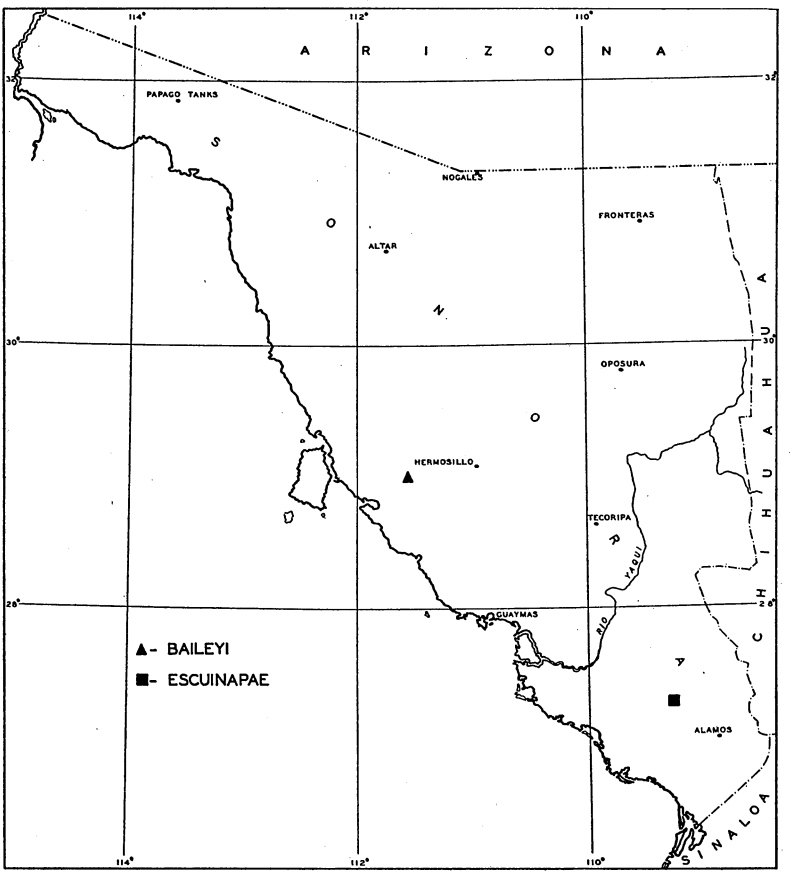
REMARKS.—This small cat apparently is rather common in southern Sonora. The only specimen collected was at Guirocoba, where a skin was brought in by the natives.

Lynx rufus escuinapae Allen

Wildcat

Lynx ruffus escuinapae Allen, *Bull. Amer. Mus. Nat. Hist.*, 19 (1903): 614–15. Type collected December 24, 1895, by J. H. Batty at Escuinapa, Sinaloa.

DISTRIBUTION.—Southern Sonora, at least as far north as the Río Mayo (Map 7). Camoa, one specimen (DRD.).



MAP 7. Distribution of the wildcat, *Lynx rufus*, in Sonora.

REMARKS.—Wildcats were reported to be common in southern Sonora. The one specimen available fits the description of *escuinapae* almost exactly,

and, though comparative material of *escuinapae* has not been available, I do not hesitate to allocate it to that race. It certainly is not *baileyi*.

Lynx rufus baileyi Merriam

Wildcat

Lynx baileyi Merriam, *N. Amer. Fauna*, No. 3 (1890): 79. Type collected December 28, 1888, by Vernon Bailey at Moccasin Spring, Coconino County, Arizona.

DISTRIBUTION.—Northern Sonora south as far as Costa Rica ranch (Map 7). Recorded from Costa Rica ranch (Lamb, notes).

REMARKS.—I have seen no specimens from Sonora; however, it seems likely that *baileyi* and *escuinapae* will be found to intergrade in the Río Yaqui region if their distribution coincides with that of other known forms.

Citellus grammurus grammurus (Say)

Rock Squirrel

S[ciurus]. grammurus Say, in Long's *Account of an Expedition from Pittsburgh to the Rocky Mountains. . . .*, 2 (1823): 72. Type collected on the Purgatory River, near mouth of Chacuaco Creek, Las Animas County, Colorado (*fide* Cary, 1911: 87).

DISTRIBUTION.—Foothills and mountains of northern Sonora south as far as Tecoripa (Map 8). Specimens from Saric and Tecoripa (DRD.). Reported from Los Nogales (Baird, 1857: 311); Sierra de San José, Santa Cruz, and other points along the boundary as far west as La Osa (Mearns, 1907: 322–23); Providencia mines, and Cerro Blanco (Elliot, 1907: 176); Verrugo Pass (Dice and Blossom, 1937: 20); and Sierra Seri (Charles Sheldon, sight records, notes).

REMARKS.—This species was found to be common along fields and rocky hillsides and near old deserted houses at Saric and Tecoripa. The latter locality is probably near the southern limit of the range of this race in Sonora. I saw rock squirrels on Tiburón Island, but was unable to obtain any. The Tiburón Island squirrels are tentatively placed in this race.

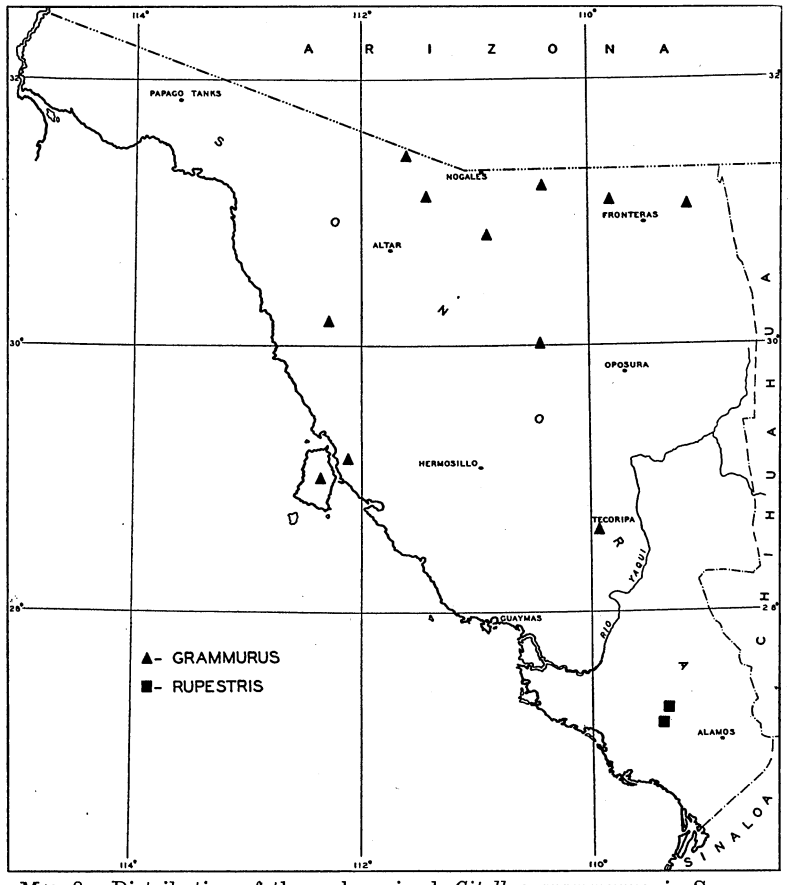
Citellus grammurus rupestris Allen

Rock Squirrel

Citellus (Otospermophilus) grammurus rupestris Allen, *Bull. Amer. Mus. Nat. Hist.*, 19 (1903): 595–96. Type collected April 13, 1903, by J. H. Batty on the Río Sestin, northwestern Durango.

DISTRIBUTION.—Southern Sonora, north at least as far as Tésia (Map 8). Specimens from Tésia (DRD.); and Camoa (MZUM.).

REMARKS.—These squirrels were common along the edges of fields and streams in the cultivated country of southern Sonora. They are more or less colonial in their habits.



MAP 8. Distribution of the rock squirrel, *Citellus grammurus*, in Sonora.

Citellus tereticaudus neglectus (Merriam)

Ground Squirrel

Spermophilus neglectus Merriam, *N. Amer. Fauna*, No. 2 (1889): 17. Type collected February 9, 1889, by Vernon Bailey at Dolan's Spring, Mohave County, Arizona.
Spermophilus sonoriensis Ward, *Amer. Nat.*, 25 (1891): 158, Hermosillo, Sonora.

DISTRIBUTION.—Low desert areas of Sonora south to the Río Mayo. Recorded from Hermosillo (Ward, 1891: 158); and El Doctor, one mile south of Hermosillo, ten miles south of Querobabi, Obregon, and Carrizo ranch (DRD.).

REMARKS.—These little ground squirrels were observed, from the highway, to be common from Hermosillo to the Río Mayo. They were most numerous along the Río Yaqui Valley from Empalme to Obregon (= Cajeme). A. H. Howell (in a letter) considers *sonoriensis* as a synonym of *neglectus*. I have followed him in the designation of the Sonoran material.

Citellus spilosoma macrospilotus (Merriam)

Ground Squirrel

Spermophilus spilosoma macrospilotus Merriam, *N. Amer. Fauna*, No. 4 (1890): 38. Type collected June 11, 1889, by Vernon Bailey at Oracle, Pinal County, Arizona.

DISTRIBUTION.—A narrow strip along the northern boundary of Sonora, west as far as La Noria (Río Santa Cruz). Recorded from La Noria (Mearns, 1907: 335).

Ammospermophilus harrisii saxicola (Mearns)

Antelope Squirrel

Spermophilus harrisii saxicolus Mearns, *Proc. U. S. N. M.*, 18 (1896): 2; reprint, p. 444. Type collected February 17, 1894, by E. A. Mearns and F. X. Holzner at Tinajas Altas, Gila Mountains, Yuma County, Arizona.

DISTRIBUTION.—Lower Sonoran zone of northwestern Sonora. Recorded from the Sierra Pozo Verde, Pozo de Luis, Santo Domingo, and Quitobaquita (Mearns, 1907: 305–6, 308); twenty-five miles west of Sonoyta (Dice and Blossom, 1937: 23; one immature, April 24, 1933); and Agua Dulce (Hornaday, 1908: 311, sight record).

Ammospermophilus harrisii kinoensis Huey

Antelope Squirrel

Ammospermophilus harrisii kinoensis Huey, *Trans. San Diego Soc. Nat. Hist.*, 8 (1937): 352. Type collected February 22, 1935, by Laurence M. Huey at Bahía Kino, Sonora.

DISTRIBUTION.—Known only from a narrow coastal strip of Sonora from Bahía Kino north to Puerto Libertad. Recorded from Bahía Kino and Puerto Libertad (Huey, 1937: 353); Picu Pass, twenty miles east of Puerto Libertad, ten miles northeast of Verrugo Pass, and Cerna, forty-five miles northeast of Puerto Libertad (Dice and Blossom, 1937: 23); and Sierra Seri (Charles Sheldon, sight record, notes).

Cynomys ludovicianus arizonensis Mearns

Prairie Dog

Cynomys arizonensis Mearns, *Bull. Amer. Mus. Nat. Hist.*, 2 (1890): 305. Type collected May 3, 1885, by E. A. Mearns at Point of Mountain, near Willcox, Cochise County, Arizona.

DISTRIBUTION.—Northeastern Sonora—at least formerly. Recorded from Río San Pedro, Mexican boundary line (Mearns, 1907: 341).

Eutamias dorsalis dorsalis (Baird)

Chipmunk

Tamias dorsalis Baird, *Proc. Acad. Nat. Sci. Phila.*, 7 (1855): 332. Type collected in 1851, by J. H. Clark at "Fort Webster, Coppermines of the Mimbres," near present site of Santa Rita, Grant County, New Mexico (*fide* A. H. Howell, 1929: 131).

DISTRIBUTION.—Mountains of northeastern Sonora. One specimen from above Santa Maria mine near El Tigre (MZUM.). Mearns (1907: 293) stated that "the Gila chipmunk [*E. d. dorsalis*] crosses the Mexican boundary line in a narrow belt, including the San Luis and Guadalupe mountains (monuments Nos. 64 to 75)."

REMARKS.—Only one specimen was secured by Campbell; this was an adult female, suckling, taken July 31, 1935.

Sciurus truei Nelson

Tree Squirrel

Sciurus truei Nelson, *Proc. Wash. Acad. Sci.*, 1 (1899): 61. Type collected January 20, 1899, by E. A. Goldman at Camoa, Río Mayo, Sonora.

DISTRIBUTION.—Oak belts of southern Sonora as far north as San Javier. Specimens from Camoa (type locality), Guirocoba, Baromico, Chinobampo, and San Javier (DRD.).

REMARKS.—Young squirrels of this species were seen playing at San Javier, April 9, 1929. At this locality they were not found below an altitude of thirty-five hundred feet. A few squirrels were seen in the low mountains near Chinobampo, and at Guirocoba they were common above twenty-four hundred feet altitude. In the mountains twenty-five miles northeast of Guirocoba, at Baromico, near the Chihuahua line, these squirrels were abundant in the oaks, but none were seen in the pines. Their nests were made of leaves and twigs and usually were out on the bushy parts of the limbs.

Sciurus aberti barberi Allen

Abert Squirrel

Sciurus aberti barberi Allen, *Bull. Amer. Mus. Nat. Hist.*, 20 (1904): 207. Type collected October 14, 1901, by C. M. Barber at Colonia Garcia, Chihuahua.

DISTRIBUTION.—Mountains of northeastern Sonora. Recorded as being seen in "oak-covered mountains about Santa Cruz" (J. H. Clark in Baird, 1859: 37).

REMARKS.—No specimens have been taken in Sonora, but the sight records recorded above probably were of this race.

Sciurus apache Allen

Apache Squirrel

Sciurus apache Allen, *Bull. Amer. Mus. Nat. Hist.*, 5 (1893): 29. Type collected December, 1890, by F. Robinette, Lumholtz Expedition, about twenty-nine trail miles northeast of Nacori, Sonora. Altitude, 6300 feet.

DISTRIBUTION.—Higher reaches (pine belt) of the Sierra Madre along the eastern border of Sonora. In addition to the type locality, the form has been recorded from Río Bavispe (Bailey, 1933: 242); and high mountains at Baromico (DRD.).

REMARKS.—The type specimen of *Sciurus apache* was sent to the American Museum without a label, and those in charge at the time apparently did not obtain the exact locality data from Lumholtz, leader of the expedition that collected it. In the original description Allen gave the type locality as "northern Chihuahua." Bailey (1933: 242), in speaking of *S. apache*, states that the type locality is on the Río Bavispe in northern Sonora.

In the first volume of his *Unknown Mexico* (1902) Lumholtz tells of his ascent of the Sierra Madre by way of Nacori. His party left Nacori, December 2, 1890, and after crossing two small mountain ranges entered the valley of the Río Huehuerachi, separated from the upper Bavispe by the highest part of the Sierra Madre at this latitude (the Sierra Nacori of the natives). After camping at an elevation of four thousand feet, about twenty-three miles from Nacori, they continued on their way toward the crest. On page 36, Lumholtz states:

> Thus we advanced for about six miles and made camp, at an elevation of 6,300 feet, on some old trencheras, with a fine view over the vast country we had left below. Large flocks of gray pigeons of remarkable size squatted on the pine trees near by, and two specimens of the gigantic woodpecker were here observed for the first time. Here, too, Mr. Robinette shot a new species of squirrel, *Sciurus Apache*. It was large, of a pale grayish-yellow color varied with black, and having a long, full and bushy tail.

From this camp, Lumholtz and his party continued on up the west side of the mountain, reaching the crest about the middle of December. The type locality is thus definitely in Sonora as stated above.[1]

Thomomys umbrinus sonoriensis Nelson and Goldman

Mountain Gopher

Thomomys umbrinus sonoriensis Nelson and Goldman, *Journ. Mammalogy*, 15 (1934): 118. Type collected November 21, 1932, by Vernon Bailey and Frederic Winthrop ten miles east of Chinapa, Río Sonora Valley, northern Sonora. Altitude, 3000 feet.

DISTRIBUTION.—Irregularly broken or mountainous region west of the Sierra Madre in northeastern Sonora (Map 9). Recorded from ten miles east of Chinapa and from Guasabas (Nelson and Goldman, 1934: 118); Providencia mines (three specimens in Field Museum); and Sierra Huasava [Guasabas] (*T. fulvus*, J. A. Allen, 1895: 205).

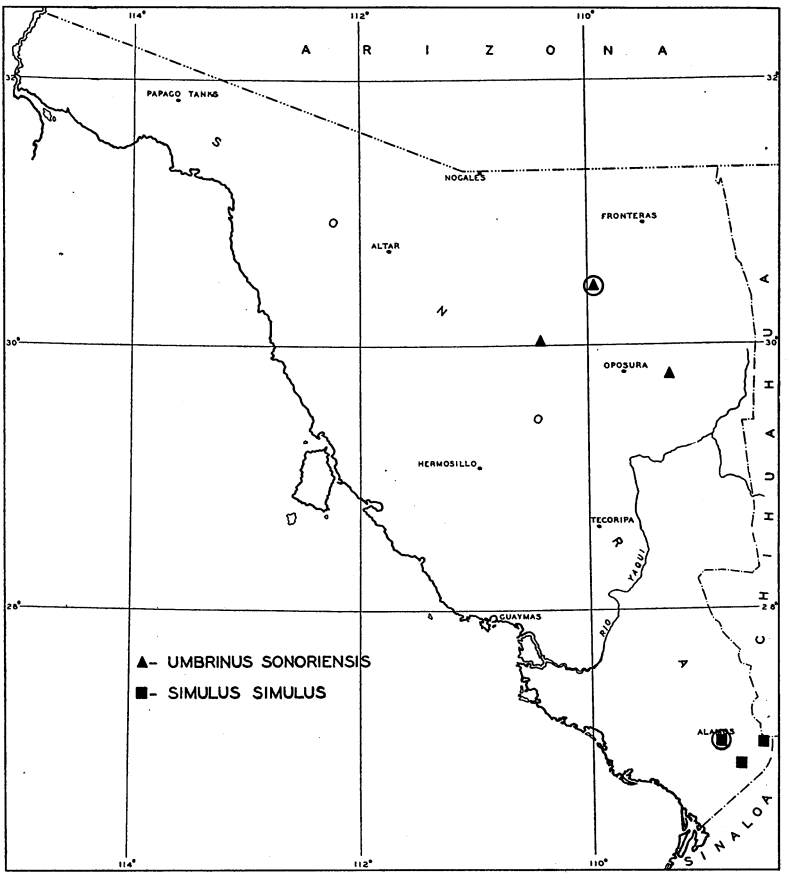
Thomomys simulus simulus Nelson and Goldman

Mountain Gopher

Thomomys simulus simulus Nelson and Goldman, *Journ. Mammalogy*, 15 (1934): 120. Type collected December 29, 1898, by E. A. Goldman at Alamos, southern Sonora. Altitude, 1200 feet.

[1] Since the above was written van Rossem (1936*b*) has published a note on the type locality of *Sciurus apache*.

DISTRIBUTION.—River valleys and foothills up through the oak belt of southeastern Sonora (Map 9). Recorded from Alamos (type locality); and seven miles southwest of Guirocoba and Baromico (DRD.).



MAP 9. Distribution of the mountain gophers, *Thomomys umbrinus* and *Thomomys simulus*, in Sonora.

Thomomys bottae modicus Goldman

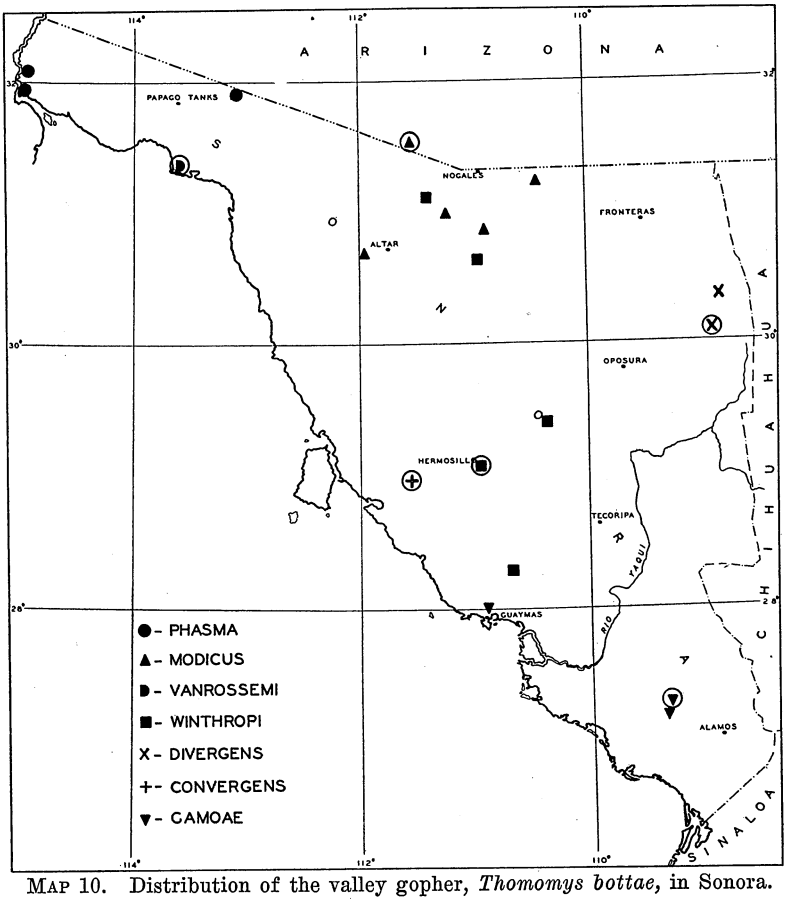
Valley Gopher

Thomomys fulvus modicus Goldman, *Journ. Wash. Acad. Sci.*, 21 (1931): 418. Type collected December 14, 1893, by E. A. Mearns and F. X. Holzner at La Osa, near the Mexican boundary, southern end of Altar Valley, Pima County, Arizona.

DISTRIBUTION.—Valleys of north central Sonora near the Sonora–Arizona line (Map 10). Specimens from Cerro Blanco (Field Museum); thirty-five miles northwest of Magdalena (DRD.); and Río Santa Cruz (Bailey, 1915: 86, under *toltecus*). One specimen, MZUM., No. 61771, taken five miles

east of Pitiquito is referred to this race, although it is not typical *modicus* (Dice and Blossom, 1937: 25).

REMARKS.—This race occupies a narrow strip along the north central portion of Sonora. Passing south it soon changes into *winthropi*.



MAP 10. Distribution of the valley gopher, *Thomomys bottae*, in Sonora.

Thomomys bottae vanrossemi Huey

Valley Gopher

Thomomys bottae vanrossemi Huey, *Trans. San Diego Soc. Nat. Hist.*, 8 (1934): 1. Type collected February 15, 1934, by Laurence M. Huey at Punta Peñascosa, Sonora.

DISTRIBUTION.—Known only from the type locality (Map 10).

Thomomys bottae phasma Goldman

Valley Gopher

Thomomys fulvus phasma Goldman, *Proc. Biol. Soc. Wash.*, 46 (1933): 72. Type collected December 8, 1913, by E. A. Goldman, two miles south of Tule Tanks, Tule Desert, near the Mexican boundary, Yuma County, Arizona.

DISTRIBUTION.—Desert region of northwestern Sonora (Map 10) east as far as Quitobaquita, and south to Cienega Well (thirty miles south of monument No. 204) and the Colorado River, twenty miles south of the Mexican boundary (Goldman, 1933: 74).

Thomomys bottae winthropi Nelson and Goldman

Valley Gopher

Thomomys bottae winthropi Nelson and Goldman, *Journ. Mammalogy,* 15 (1934): 122. Type collected December 21, 1932, by Frederic Winthrop and Bernard Bailey at Hermosillo, Sonora.

DISTRIBUTION.—River valleys and plains of central Sonora, north as far as Saric and south to Ortiz (Map 10). Specimens from Saric, Magdalena, Hermosillo (type locality), and Ures (DRD.); and from Ortiz (Nelson and Goldman, 1934: 122).

REMARKS.—Specimens from Saric are intermediate between *winthropi* and *modicus,* but seem to be closer to *winthropi.* At Saric pocket gophers were found to be plentiful in the cultivated fields, especially those of alfalfa. The soil was a sandy loam.

Thomomys bottae divergens Nelson and Goldman

Valley Gopher

Thomomys bottae divergens Nelson and Goldman, *Journ. Mammalogy,* 15 (1934): 122. Type collected November 8, 1932, by Vernon Bailey and Frederic Winthrop, four miles west of Huachinera, Río Bavispe, northeastern Sonora. Altitude, about four thousand feet.

DISTRIBUTION.—Upper part of Río Bavispe Valley (Map 10). Recorded from Bacerac and Huachinera (Nelson and Goldman, 1934: 123).

Thomomys bottae convergens Nelson and Goldman

Valley Gopher

Thomomys bottae convergens Nelson and Goldman, *Journ. Mammalogy,* 15 (1934): 123. Type collected December 13, 1932, by Vernon Bailey and Frederic Winthrop at Costa Rica ranch, the delta of the Río Sonora, southwest of Hermosillo, Sonora.

DISTRIBUTION.—Low desert plains of central western Sonora (Map 10). Recorded from Costa Rica ranch (type locality).

Thomomys bottae camoae Burt

Valley Gopher

Thomomys bottae camoae Burt, *Occ. Papers Mus. Zool. Univ. Mich.,* 344 (1937): 1–2. Type collected October 19, 1934, by J. T. Wright at Camoa, Río Mayo, Sonora.

DISTRIBUTION.—Coastal plains of southern Sonora from the Río Yaqui Valley south probably to Sinaloa (Map 10). Recorded from Camoa, Tésia, and San José de Guaymas (Burt, 1937).

Liomys pictus sonoranus Merriam

Spiny Pocket Mouse

Liomys sonorana Merriam, *Proc. Biol. Soc. Wash.*, 15 (1902): 47. Type collected December 19, 1898, by E. A. Goldman at Alamos, Sonora.

DISTRIBUTION.—Southern Sonora, north at least as far as Ures. Specimens from Guirocoba, Chinobampo, Tésia, Tecoripa, and Ures (DRD.); and Alamos and Camoa (Goldman, 1911: 37).

REMARKS.—Spiny pocket mice were rather scarce at Tecoripa and at Ures, where they were trapped in cultivated fields. At Tecoripa, Wright found gourd seeds in their cheek pouches. At Tésia they were common along the second bottom of the river and in cultivated fields, where they were trapped in colonies of cotton rats (*Sigmodon*). The food of the spiny pocket mice at this locality consisted chiefly of seeds of cultivated beans and wheat. At Guirocoba the animals were fairly common along the edges of cultivated fields.

The previously known northern record for the genus *Liomys* was Camoa, Sonora (Goldman, 1911: 37). The taking of a specimen at Ures extends the range not only of the species but also of the genus north to this point, which is very probably near the northern limit of its range. *Liomys* might be expected to occur on northward for a short distance along the Río Sonora. There is relatively little variation throughout the range of the species in the state.

Perognathus flavus sonoriensis Nelson and Goldman

Silky Pocket Mouse

Perognathus flavus sonoriensis Nelson and Goldman, *Journ. Wash. Acad. Sci.*, 24 (1934): 267. Type collected December 13, 1932, by Vernon Bailey and Frederic Winthrop at Costa Rica ranch, Lower Río Sonora, Sonora.

DISTRIBUTION.—Lower desert plains of middle western Sonora. Recorded only from Costa Rica ranch.

Perognathus longimembris kinoensis Huey

Silky Pocket Mouse

Perognathus longimembris kinoensis Huey, *Trans. San Diego Soc. Nat. Hist.*, 8 (1935): 73. Type collected February 26, 1935, by Laurence M. Huey at Bahía Kino, Sonora.

DISTRIBUTION.—Probably throughout most of the arid desert of northwestern Sonora. Recorded only from the type locality.

Perognathus amplus rotundus Goldman

Gila Pocket Mouse

Perognathus amplus rotundus Goldman, *Journ. Wash. Acad. Sci.*, 22 (1932): 387. Type collected November 9, 1931, by Bernard Bailey at Wellton, Yuma County, Arizona.

DISTRIBUTION.—Probably most of the northwestern desert area of Sonora. Recorded only from Papago Tanks (Dice and Blossom, 1937: 26).

Perognathus baileyi baileyi Merriam

Bailey Pocket Mouse

Perognathus baileyi Merriam, *Proc. Acad. Nat. Sci. Phila.*, 1894: 262–63. Type collected November 3, 1889, by Vernon Bailey at Magdalena, Sonora.

DISTRIBUTION.—Most of Sonora, except the higher mountains along the eastern border, south to Obregon. Specimens from Magdalena (type locality); Alamo Wash (thirty-five miles northwest of Magdalena), Ures, Hermosillo, Bahía San Carlos, San José de Guaymas, and Obregon (DRD.).

REMARKS.—An adult female collected at Obregon is relatively smaller and darker in coloration than typical *baileyi* and may represent a distinct race. This is the southernmost locality at which *baileyi* has been taken on the mainland of Mexico.

Perognathus baileyi insularis Townsend

Bailey Pocket Mouse

Perognathus baileyi insularis Townsend, *Bull. Amer. Mus. Nat. Hist.*, 31 (1912): 122. Type collected April 13, 1911, by H. E. Anthony of the "Albatross Expedition," on Tiburón Island, Sonora.

DISTRIBUTION.—Tiburón Island.

REMARKS.—These pocket mice were found to be common on the gentle slopes and more or less flat areas where the soil was part sand and part gravel. The vegetation in these areas was shrubbery, interspersed with smaller herbaceous vegetation.

Perognathus penicillatus pricei Allen

Sand Pocket Mouse

Perognathus pricei Allen, *Bull. Amer. Mus. Nat. Hist.*, 6 (1894): 318. Type collected May 31, 1894, by B. C. Condit at Oposura, Sonora.

DISTRIBUTION.—In general most of northern Sonora, except the higher mountains on the east, south to San José de Guaymas. Recorded from Oposura (type locality), Batamotal, Hermosillo, Magdalena, Ortiz, Quitobaquita, Sonora, and Sonoyta (Osgood, 1900: 48); Costa Rica ranch, Ures, and San José de Guaymas (DRD.); Cerro Blanco (Elliot, 1907: 339); two miles south of Sasabe, Papago Tanks, and Sierra Pinacate, forty-one miles west of Sonoyta (Dice and Blossom, 1937: 28); and Pilares (MZUM.).

Perognathus penicillatus seri Nelson

Sand Pocket Mouse

Perognathus penicillatus goldmani Townsend, *Bull. Amer. Mus. Nat. Hist.*, 31 (1912): 122 (not of Osgood, 1900).

Perognathus penicillatus seri Nelson, *Proc. Biol. Soc. Wash.*, 25 (1912): 116 (substitute for *goldmani* Townsend). Type collected April 13, 1911, by H. E. Anthony of the "Albatross Expedition," on Tiburón Island, Gulf of California, Sonora.

DISTRIBUTION.—Probably occupies most of Tiburón Island. Nineteen specimens were trapped on the east side at Petrel Bay on the gentle slopes and flat areas where the soil was part sand and part gravel.

Perognathus penicillatus minimus Burt

Sand Pocket Mouse

Perognathus penicillatus minimus Burt, *Trans. San Diego Soc. Nat. Hist.*, 7 (1932): 164–65. Type collected December 31, 1931, by W. H. Burt on Turner's Island, Gulf of California, Sonora.

DISTRIBUTION.—Known only from the type specimen, which was taken in the bottom of a narrow canyon, on sandy soil.

Perognathus pernix rostratus Osgood

Broad-nosed Pocket Mouse

Perognathus pernix rostratus Osgood, *N. Amer. Fauna*, No. 18 (1900): 51. Type collected October 28, 1898, by E. A. Goldman at Camoa, Río Mayo, Sonora.

DISTRIBUTION.—Southern Sonora, north to Tecoripa. Specimens from Guirocoba, Chinobampo, Camoa (type locality), Obregon, Tésia, and Tecoripa (DRD.).

REMARKS.—This species was found to be common below the oak belt in southern Sonora. Young were being born at Obregon in October and November, 1929. Here the mice preferred thick cactus associations, and the cheek-pouch contents revealed mostly seeds of cactus (*Opuntia*). At Tésia the mice were found to be abundant among the low bushes along the first bottom of the river. Here the food consisted chiefly of grass seed. At Chinobampo they were found only along the edges of cultivated fields, where they were abundant.

Specimens from Obregon and Tecoripa average considerably larger than those from Tésia, Chinobampo, Camoa, and Guirocoba. The skulls show the more pronounced widening of the nasals and the entire rostral region. It is probable that there are three races of *pernix,* one (*pernix*) in Sinaloa, one (*rostratus*) in southern Sonora and northern Sinaloa, and one (unnamed) occurring from north of the Río Mayo at least to Tecoripa.

Perognathus goldmani Osgood

Goldman Pocket Mouse

Perognathus goldmani Osgood, *N. Amer. Fauna*, No. 18 (1900): 54–55. Type collected February 15, 1899, by E. A. Goldman at Sinaloa, Sinaloa.

DISTRIBUTION.—Lowlands of southern Sonora north and west to the Río

Mayo. Recorded from Alamos and Camoa (Osgood, 1900: 55); also Tésia and Chinobampo (DRD.).

REMARKS.—This species was found to be abundant at Tésia, but rare at Chinobampo. At Tésia these pocket mice inhabited chiefly the brushy arroyos along the second bottom of the river. At Chinobampo they were found along the edges of cultivated fields. The food consisted chiefly of grass seeds.

Perognathus intermedius lithophilus Huey

Rock Pocket Mouse

Perognathus intermedius lithophilus Huey, *Trans. San Diego Soc. Nat. Hist.*, 8 (1937): 355. Type collected February 5, 1935, by Laurence M. Huey at Puerto Libertad, Sonora.

DISTRIBUTION.—Known only from Puerto Libertad (Huey, 1937: 355), but it probably ranges over a considerable area along the northwest coast of Sonora.

Perognathus intermedius pinacate Blossom

Rock Pocket Mouse

Perognathus intermedius pinacate Blossom, *Occ. Papers Mus. Zool. Univ. Mich.*, 273 (1933): 4–5. Type collected April 26, 1933, by P. M. Blossom at Papago Tanks, Sierra Pinacate, Sonora.

DISTRIBUTION.—Dark-colored lavas of the Pinacate region in northwestern Sonora, extending northward into southern Arizona. Specimens from Papago Tanks and forty miles west of Sonoyta, Sierra Pinacate (MZUM.).

Perognathus artus Osgood

Batopilas Pocket Mouse

Perognathus artus Osgood, *N. Amer. Fauna*, No. 18 (1900): 55. Type collected October 6, 1898, by E. A. Goldman at Batopilas, Chihuahua.

DISTRIBUTION.—Mountains of extreme southeastern Sonora. Specimens from Guirocoba (DRD.).

REMARKS.—A fairly common species along creek bottoms and the edges of cultivated fields.

Dipodomys spectabilis perblandus Goldman

Banner-tailed Kangaroo Rat

Dipodomys spectabilis perblandus Goldman, *Journ. Wash. Acad. Sci.*, 23 (1933): 466. Type collected October 27, 1889, by Vernon Bailey at Calabasas, Santa Cruz County, Arizona. Altitude, about thirty-five hundred feet.

DISTRIBUTION.—North central Sonora. Recorded from Cerro Blanco (Elliot, 1907: 327, under *spectabilis*); Noria (DRD.); and two miles south of Sasabe (Dice and Blossom, 1937: 30).

REMARKS.—Dens of these kangaroo rats are conspicuous from the highway in the vicinity of Noria. The country here was of a plains type, with scattered mesquites and a cover of short grass.

Dipodomys merriami merriami Mearns

Merriam Kangaroo Rat

Dipodomys merriami Mearns, *Bull. Amer. Mus. Nat. Hist.*, 2 (1890): 290. Type collected May 16, 1885, by E. A. Mearns at New River, between Phoenix and Prescott, Maricopa County, Arizona.

DISTRIBUTION.—Most of the desert area of northern Sonora, except the northwestern arm, south to San José de Guaymas (Map 11). Specimens from Hermosillo, one to three miles south of Hermosillo, Costa Rica ranch (forty-five miles southwest of Hermosillo), Ures, and San José de Guaymas (DRD.); Cerro Blanco (Elliot, 1907: 322–23); and Ortiz and Guaymas (Merriam, 1893: 345).

REMARKS.—Specimens from Ures and San José de Guaymas show intergradation, in their darker coloration, toward *mayensis*.

Dipodomys merriami simiolus Rhoads

Merriam Kangaroo Rat

Dipodomys simiolus Rhoads, *Proc. Acad. Nat. Sci. Phila.*, 1893 (1894): 410. Type collected October 19, 1893, by R. B. Herron at Agua Caliente, now Palm Springs, Riverside County, California.

DISTRIBUTION.—Sandy areas of extreme northwestern Sonora (Map 11). Specimens from El Doctor (DRD.); and Sierra Pinacate (forty miles west of Sonoyta), and two miles east of Pitiquito (Dice and Blossom, 1937: 31).

REMARKS.—Future collecting undoubtedly will show that this race occurs south to Bahía Kino or farther along the gulf. A few of the specimens from Costa Rica ranch approach *simiolus* in pallid coloration.

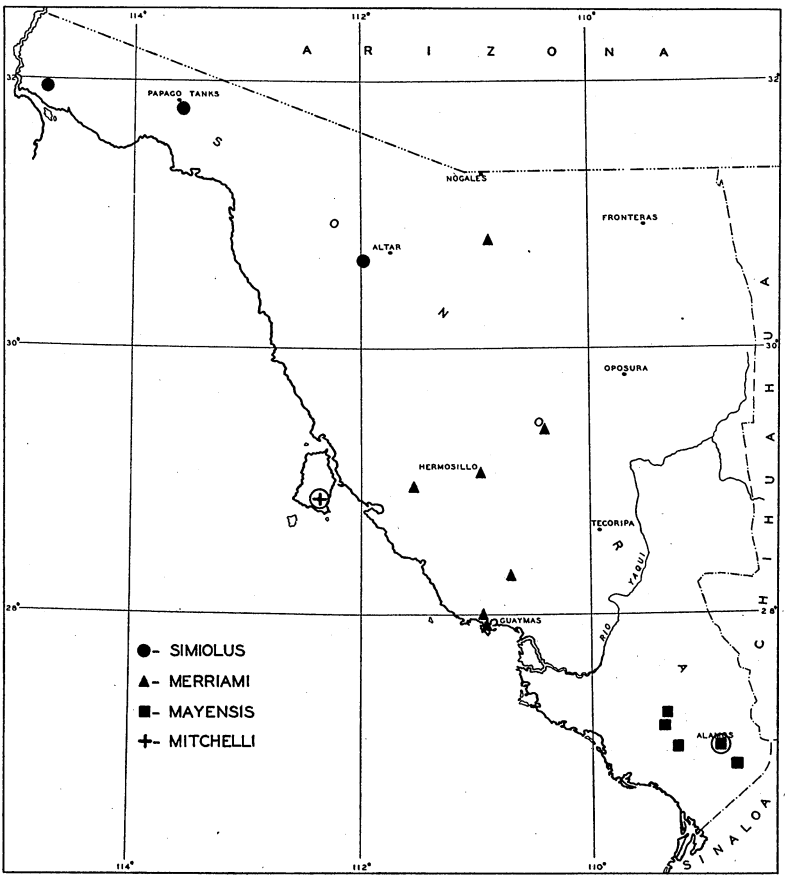
Dipodomys merriami mayensis Goldman

Merriam Kangaroo Rat

Dipodomys merriami mayensis Goldman, *Proc. Biol. Soc. Wash.*, 41 (1928): 141–42. Type collected December 19, 1898, by E. A. Goldman at Alamos, Sonora.

DISTRIBUTION.—Southern Sonora, north to the Río Yaqui (Map 11). Recorded from Alamos (type locality); and Guirocoba, Chinobampo, Tésia, and Camoa (DRD.).

REMARKS.—At Tésia and Chinobampo this species was found to inhabit the slightly brushy areas along the lowlands. The food, as shown by cheek-pouch contents, consisted of seeds of grasses, weeds, beans, and corn.



MAP 11. Distribution of the Merriam kangaroo rat, *Dipodomys merriami*, in Sonora.

Dipodomys merriami mitchelli Mearns

Merriam Kangaroo Rat

Dipodomys mitchelli Mearns, *Proc. U. S. N. M.*, 19 (1897): 719. Type collected December 23, 1895, by J. W. Mitchell on Tiburón Island, Gulf of California, Sonora.

DISTRIBUTION.—Low flat sandy areas on Tiburón Island (Map 11).

REMARKS.—This kangaroo rat was found to be abundant locally on the island. In certain places where the soil was sandy the ground was so honeycombed with kangaroo-rat burrows that one frequently broke through while walking over the area.

I see no good reason for considering *mitchelli* a full species. It is very close in characters to the mainland form *merriami* and is, in my estimation, only subspecifically distinct.

Dipodomys ordii ordii Woodhouse

Ord Kangaroo Rat

D[ipodomys]. ordii Woodhouse, *Proc. Acad. Nat. Sci. Phila.*, 6 (1853): 224. Type collected by Dr. Woodhouse at El Paso, El Paso County, Texas.

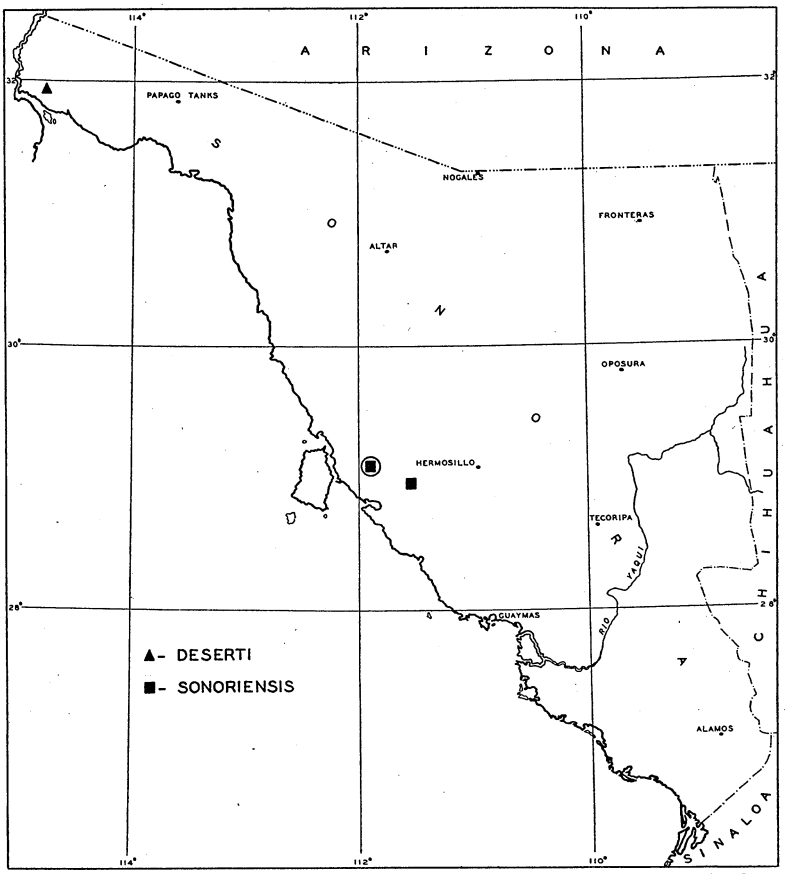
DISTRIBUTION.—Northeastern Sonora. Specimens from Alamo Wash, thirty-five miles northwest of Magdalena (DRD.); Santa Cruz (Baird, 1857: 412); and Fronteras (J. A. Allen, 1895: 215, under *chapmani*).

Dipodomys deserti deserti Stephens

Desert Kangaroo Rat

Dipodomys deserti Stephens, *Amer. Nat.*, 21 (1887): 42. Type collected June 29, 1866, by F. Stephens on the Mohave River, San Bernardino County, California.

DISTRIBUTION.—Extreme northwest arm of Sonora (Map 12). Specimens from El Doctor (DRD.).



MAP 12. Distribution of the desert kangaroo rat, *Dipodomys deserti*, in Sonora.

REMARKS.—These large kangaroo rats were common around El Doctor, where they were found in colonies. They were seen occasionally by day on the desert.

Four specimens from El Doctor agree in all essentials with specimens of *deserti* from Nevada and California.

Dipodomys deserti sonoriensis Goldman

Desert Kangaroo Rat

Dipodomys deserti sonoriensis Goldman, *Proc. Biol. Soc. Wash.*, 36 (1923): 139. Type collected January 3, 1922, by Charles Sheldon at La Libertad ranch, thirty miles east of Sierra Seri, Sonora.

DISTRIBUTION.—Low desert coastal area of western Sonora in the vicinity of La Libertad and Costa Rica ranch north to Arizona (Map 12). Recorded from La Libertad (type locality); and Costa Rica ranch (DRD.).

Castor canadensis frondator Mearns

Beaver

Castor canadensis frondator Mearns, *Proc. U. S. N. M.*, 20 (1897): 2; reprint, 1898: 502. Type collected October 24, 1892, by E. A. Mearns and F. X. Holzner on the Río San Pedro, Sonora, near monument No. 98 of the Mexican boundary line.

DISTRIBUTION.—Known from the Río San Pedro and Río Sonora in northeastern Sonora (Mearns, 1907). Workings recorded from Cañon de Guadalupe (Baird, 1859: 41).

Castor canadensis repentinus Goldman

Beaver

Castor canadensis repentinus Goldman, *Journ. Mammalogy*, 13 (1932): 266–67. Type collected September 14, 1909, by Clarence Birdseye at Bright Angel Creek, Grand Canyon of the Colorado River, Arizona. Altitude, four thousand feet.

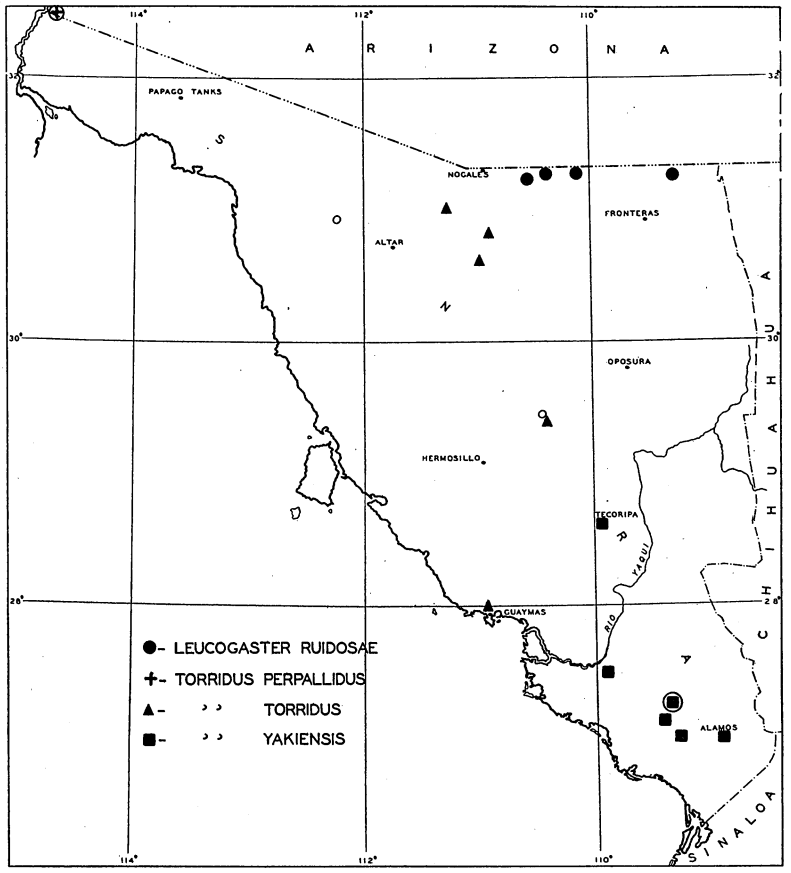
DISTRIBUTION.—Vicinity of Colorado River. No specimens are known from Sonora, but beaver workings are recorded from the Colorado River, thirty miles north of its mouth (Baird, 1859: 41). In the description of this race Goldman records two skulls from fifteen miles south of Yuma, Arizona.

Onychomys leucogaster ruidosae Stone and Rehn

Grasshopper Mouse

Onychomys ruidosae Stone and Rehn, *Proc. Acad. Nat. Sci. Phila.*, 1903: 22. Type collected September 19, 1898, by C. M. Barber at Hale's ranch, Ruidoso, Lincoln County, New Mexico.

DISTRIBUTION.—Northeastern Sonora (Map 13). Recorded from Río Santa Cruz (Hollister, 1914: 449); San Bernardino Valley (near monument



MAP 13. Distribution of the grasshopper mouse, *Onychomys leucogaster*, and the scorpion mouse, *O. torridus*, in Sonora.

No. 77), Río San Pedro (boundary line), and La Noria (Mearns, 1907: 374, under *melanophrys*).

Onychomys torridus torridus (Coues)

Scorpion Mouse

Hesperomys (*Onychomys*) *torridus* Coues, *Proc. Acad. Nat. Sci. Phila.*, 1874: 183. Type collected at Camp Grant, Graham County, Arizona.

DISTRIBUTION.—Most of northern Sonora, except the extreme northwestern desert arm, south to San José de Guaymas where it meets *yakiensis* (Map 13). Recorded from Cerro Blanco and Magdalena (Hollister, 1914: 459); and Alamo Wash, Ures, and San José de Guaymas (DRD.).

REMARKS.—Specimens from Ures and San José de Guaymas are intermediate between *torridus* and *yakiensis*, but are closer to *torridus* in color and small size.

Onychomys torridus perpallidus Mearns

Scorpion Mouse

Onychomys torridus perpallidus Mearns, *Proc. U. S. N. M.*, 19 (1896): 4; reprint, p. 140. Type collected March 27, 1894, by E. A. Mearns and F. X. Holzner on the left bank of the Colorado River at monument No. 204, Mexican boundary line, Yuma County, Arizona.

DISTRIBUTION.—Probably ranges in extreme northwestern Sonora (Map 13). There are no records from the state, but the type was taken at the boundary.

REMARKS.—Although it is not definitely recorded from the state I believe this race should be included in the Sonoran fauna.

Onychomys torridus yakiensis Merriam

Scorpion Mouse

Onychomys torridus yakiensis Merriam, *Proc. Biol. Soc. Wash.*, 17 (1904): 124. Type collected October 28, 1898, by E. A. Goldman at Camoa, Río Mayo, southern Sonora.

DISTRIBUTION.—Southern Sonora as far north as Tecoripa (Map 13). Recorded from Alamos and Camoa (Hollister, 1914: 471); and Chinobampo, Tésia, Obregon, and Tecoripa (DRD.).

REMARKS.—At Obregon these mice were caught in open cactus-covered land where there was little or no grass. At Chinobampo, Tésia, and Tecoripa they were found in open grass and brush-covered land, usually away from water. Two immature specimens were taken at Tésia, December 3 and 11, 1929, and one immature was taken at Camoa, June 9, 1931.

The Tecoripa specimens approach *torridus* in size and coloration, but in general are closer to *yakiensis* of southern Sonora.

Reithrodontomys megalotis megalotis (Baird)

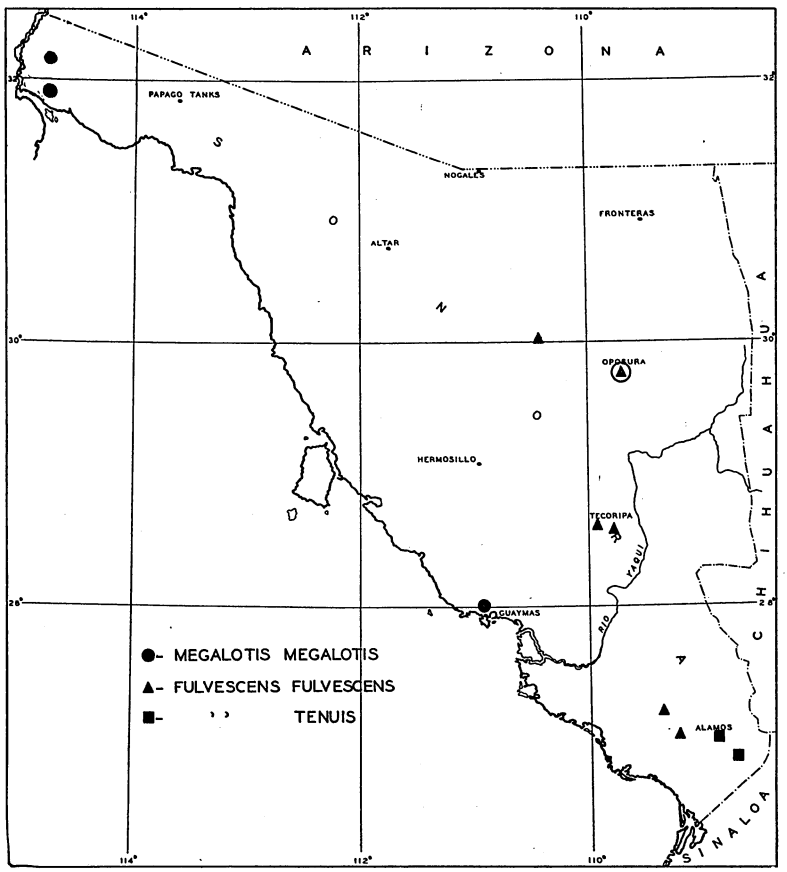
Harvest Mouse

Reithrodon megalotis Baird, *Mamm. N. Amer.*, 1857: 451. Type collected by Dr. C. B. R. Kennerly between Janos, Chihuahua, and San Luis Springs, Grant County, New Mexico.

DISTRIBUTION.—Northern and western Sonora south to San José de Guaymas (Map 14). Recorded from Cienega Well, thirty miles south of monument No. 204 (Howell, 1914: 29); and El Doctor and San José de Guaymas (DRD.).

REMARKS.—A single specimen from San José de Guaymas differs appreciably from *megalotis* in smaller size, paler coloration with a decidedly pinkish cast, smaller skull with small brain case, parallel-sided zygomata spreading abruptly anteriorly, and other details. If more specimens are ever

available this will undoubtedly be shown to represent a distinct race. Until that time I prefer to consider it as *megalotis*.



MAP 14. Distribution of the harvest mice, *Reithrodontomys megalotis* and *R. fulvescens*, in Sonora.

Reithrodontomys fulvescens fulvescens Allen

Harvest Mouse

Reithrodontomys mexicanus fulvescens Allen, *Bull. Amer. Mus. Nat. Hist.*, 6 (1894): 319. Type collected June 1, 1894, by B. C. Condit at Oposura, Sonora.

DISTRIBUTION.—Most of Sonora except the northwestern desert area and the extreme southeastern portion where it is replaced by *tenuis* (Map 14). Recorded from Oposura and Providencia mines (Howell, 1914: 44); and San Javier, Tecoripa, Chinobampo, and Tésia (DRD.).

REMARKS.—At Tecoripa harvest mice were taken in grass associations along the edge of a field; at San Javier along an arroyo where the soil was

rocky and there was scant growth of grass and low brush. At Tésia they were again found in grassy situations along the second bottom of the river, and at Chinobampo in grass and brush along the edges of cultivated fields.

Reithrodontomys fulvescens tenuis Allen

Harvest Mouse

Reithrodontomys tenuis Allen, *Bull. Amer. Mus. Nat. Hist.*, 12 (1899): 15. Type collected March 11, 1897, by P. O. Simons at Rosario, Sinaloa.

DISTRIBUTION.—Extreme southeastern Sonora (Map 14). Recorded from Alamos (Howell, 1914: 47); and Guirocoba (DRD.).

REMARKS.—Two specimens were taken at Guirocoba in a grassy habitat.

Baiomys taylori paulus (Allen)

Baiomys

Peromyscus paulus Allen, *Bull. Amer. Mus. Nat. Hist.*, 19 (1903): 598. Type collected April 17, 1903, by J. H. Batty at Río Sestin, northwestern Durango.

DISTRIBUTION.—Southern Sonora. Specimens from Obregon (DRD.).

REMARKS.—Four specimens of *Baiomys,* two adult females and two immature males, were taken at Obregon, November 6 to 20, 1929. They were caught on land which was being irrigated and were apparently rare at this, the only locality at which they were taken. Forty-two trap nights in a restricted area produced four specimens. Rolled oats were of no use as bait; all four were taken at traps baited with bacon or cheese. An adult female, DRD., No. 16928, collected November 20, 1929, was suckling young.

These records from Sonora extend the known range of the species from southern Sinaloa on the south and from central Chihuahua on the east.

It is with much reluctance that I place the Sonora specimens in the subspecies *paulus,* partially because there is a mountain barrier between Sonora and central Chihuahua and Durango. It is possible, however, that they occur along the coast of Sinaloa and thence northward into Sonora. In addition to the relatively remote geographic position of the Sonora locality there are certain skin and skull characters which lead me to suspect that a distinct race occurs in Sonora. Because there are only four specimens (two of these being immature) from the state, it seems best to refrain from adding another doubtful name to the list.

In a comparison of Sonoran specimens with a topotypical series of *paulus,* kindly loaned by the staff of the American Museum of Natural History, I find that in size there is little difference, the Sonoran series averaging slightly larger; the coloration of this series is more grayish brown (less reddish); however, the series of *paulus* at hand was collected in 1903, and it is possible that the color has faded slightly in thirty years. The skulls of the Sonoran specimens are flatter, less convex, anteroposteriorly; the interparietal is more

nearly oval, with the transverse diameter relatively less and the anteroposterior diameter relatively greater; the lateral portions of the interparietal do not taper out to a point as they do in specimens of *paulus* from Durango; the suture between the frontals and the parietals is shaped somewhat differently in the two groups. Were a series of specimens available the above characters might lose their significance. Further collecting in the state is necessary before definite statements can be made concerning the systematic status of *Baiomys* there.

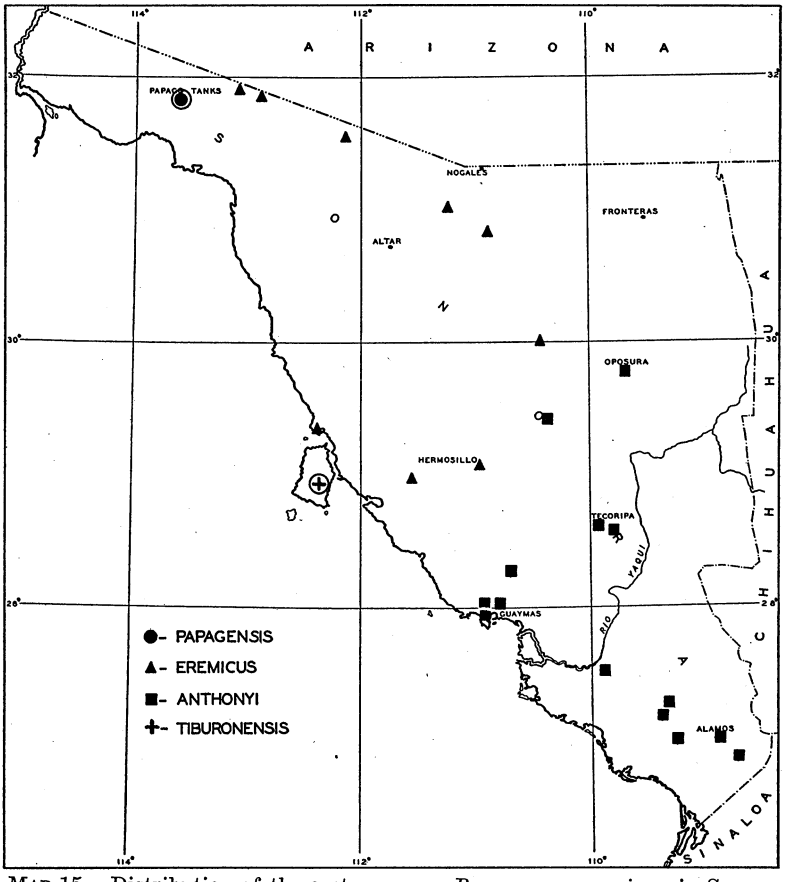
Peromyscus eremicus eremicus (Baird)

Cactus Mouse

Hesperomys eremicus Baird, *Mamm. N. Amer.*, 1857: 479. Type collected at Old Fort Yuma, Imperial County, California, on the Colorado River, opposite Yuma, Arizona.
Peromyscus merriami Mearns, *Proc. U. S. N. M.*, 19 (1896): 2, reprint, p. 138. Type from Sonoyta, Sonora.

DISTRIBUTION.—With local variations, ranges throughout most of northwestern Sonora, except the Pinacate region, from as far east as Providencia mines, south and west to Hermosillo, intergrading with *anthonyi* at Guaymas (Map 15). Recorded from Cerro Blanco, Pozo de Luis, Providencia mines, Quitobaquita, and Sonoyta (Osgood, 1909: 242); and Hermosillo, Costa Rica ranch, Sargent's Point, and Alamo Wash (DRD.).

REMARKS.—Hermosillo specimens are not typical *eremicus,* but according to available examples they are nearer that race than they are to *anthonyi* from southern Sonora. Osgood (1909: 250) considered specimens from Hermosillo and Magdalena as *anthonyi.* Curiously enough Osgood's distributional map does not agree with his text in regard to *eremicus* in Sonora. He reports this race from Cerro Blanco and Providencia mines, both well within the range of *anthonyi* as given on his distributional map. Specimens from Alamo Wash vary somewhat from the others in larger size and darker coloration, otherwise they are similar. Blossom (1933: 4) assumed specimens from Hermosillo to be typical *anthonyi,* and on this basis considered those from the vicinity of Tucson, Arizona, to be *anthonyi.* I agree with Blossom that the Hermosillo and Tucson specimens are the same, but I cannot agree with him in calling them *anthonyi.* With ample series of *anthonyi* from southern Sonora, where this race displays its characters in undiluted form, it is at once evident that Hermosillo and Tucson specimens are nearer to *eremicus* than to *anthonyi* as these races are now known. If, of this variable species, a name were to be given to each series that shows a slight difference in color tone from series from adjoining localities there would be no less than six races in the state. It is well, I believe, to point out these local variations, but to name all of them would be likely to lead only to confusion and would defeat the purpose of taxonomy.



MAP 15. Distribution of the cactus mouse, *Peromyscus eremicus*, in Sonora.

Peromyscus eremicus papagensis Goldman

Cactus Mouse

Peromyscus eremicus papagensis Goldman, *Proc. Biol. Soc. Wash.*, 30 (1917): 110. Type collected February, 1915, by Charles Sheldon at Sierra Pinacate, Sonora.

DISTRIBUTION.—Confined to the Pinacate lava beds (Map 15). Three specimens in the Museum of Zoology were collected at Papago Tanks by Blossom (Dice and Blossom, 1937: 34).

Peromyscus eremicus anthonyi (Merriam)

Cactus Mouse

Hesperomys (*Vesperimus*) *anthonyi* Merriam, *Proc. Biol. Soc. Wash.*, 4 (1887): 6. Type collected May 10, 1886, by A. W. Anthony at Camp Apache, Big Hachita Mountains, Grant County, New Mexico.

Peromyscus goldmani Osgood, *Proc. Biol. Soc. Wash.*, 17 (1904): 75. Type collected December 19, 1898, by E. A. Goldman at Alamos, Sonora.

DISTRIBUTION.—Southern and eastern Sonora, north and west to Guaymas and Ures thence northeast to southwestern New Mexico (Map 15). Recorded from Alamos, Camoa, Guaymas, and Oposura (Osgood, 1909: 250); and Batamotal and Ortiz (*ibid.,* under *tiburonensis*). In the Dickey collection there are specimens from Guirocoba, Tésia, Chinobampo, Obregon, San Javier, Tecoripa, San José de Guaymas, and Ures.

REMARKS.—There is much size variation in the specimens at hand. Those from Guirocoba average smaller than those from Tésia, Obregon, Chinobampo, San Javier, Tecoripa, and Ures. Specimens from near Guaymas, here considered as intergrades, are again slightly smaller.

It is strange that, although much collecting has been done recently in the Alamos district and large series of *Peromyscus* have been obtained, no further specimens of *goldmani* as defined by Osgood have come to light. I have examined the type, which is an extremely old female with badly worn teeth. The large hind foot measurement (24 mm.) which Osgood gave as one of the characters, I believe to be an error. This is the field measurement given on the tag. By carefully measuring the dry feet I found that the left hind foot measured 21.5 and the right foot 21.6 mm. One would not expect 2.5 mm. shrinkage. A specimen (No. 95847, U. S. Biol. Surv. coll.) which Osgood called *anthonyi* measured, hind foot dry, 22.2 mm. (this measurement was given as 23 mm. on the tag). The coloration of the type is slightly less grayish than specimens of *anthonyi,* but this might be no more than normal variation to be expected in the race.

Peromyscus eremicus tiburonensis Mearns

Cactus Mouse

Peromyscus tiburonensis Mearns, *Proc. U. S. N. M.,* 19 (1897): 720. Type collected December 25, 1895, by J. W. Mitchell on Tiburón Island, Sonora.

DISTRIBUTION.—Tiburón Island (Map 15).

REMARKS.—This species was found to inhabit chiefly the areas where there were outcroppings of rocks along the sides of small canyons. Osgood (1909: 250) considered specimens from the adjoining mainland to be *tiburonensis;* however, a series of specimens from Sargent's Point, directly opposite Tiburón Island are, to me, distinct from the island representatives.

Peromyscus stephani Townsend

San Esteban Mouse

Peromyscus stephani Townsend, *Bull. Amer. Mus. Nat. Hist.,* 31 (1912): 126. Type collected April 14, 1911, by H. E. Anthony of the "Albatross Expedition," on San Esteban Island, Gulf of California, Sonora.

DISTRIBUTION.—San Esteban Island.

REMARKS.—This is the only endemic land mammal known from San

Esteban Island. A colony of rats (*Rattus*) has become established on the island, but there seems to have been little or no competition between the two species thus far.

Peromyscus collatus Burt

Turner's Island Mouse

Peromyscus collatus Burt, *Trans. San Diego Soc. Nat. Hist.*, 7 (1932): 172. Type collected December 31, 1931, by W. H. Burt on Turner's Island (lat. 28° 43′ N., long. 112° 19′ W.), Gulf of California, Sonora.

DISTRIBUTION.—Turner's Island.

Peromyscus pembertoni Burt

Pemberton Mouse

Peromyscus pembertoni Burt, *Trans. San Diego Soc. Nat. Hist.*, 7 (1932): 176–77. Type collected December 26, 1931, by W. H. Burt on San Pedro Nolasco Island (lat. 27° 58′ N., long. 111° 24′ W.), Gulf of California, Sonora.

DISTRIBUTION.—Confined to San Pedro Nolasco Island.

REMARKS.—This species was trapped on a steep grass-covered hillside on the east side of the island. It shares the island with one other species, *Peromyscus boylii glasselli.*

Peromyscus maniculatus sonoriensis (Le Conte)

Deer Mouse

Hesp[*eromys*]. *sonoriensis* Le Conte, *Proc. Acad. Nat. Sci. Phila.*, 1853: 413. Type collected in 1851 by J. H. Clark at Santa Cruz, Sonora.

DISTRIBUTION.—A narrow strip along the northern border of Sonora, east as far as Sierra de los Patagones. Recorded from Cienega Well, Colonia Lerdo, Colorado River (twenty miles south of the United States boundary), opposite mouth of Hardy River, Santa Cruz, Río Santa Cruz, and Sierra de los Patagones (Osgood, 1909: 93).

Peromyscus leucopus arizonae (Allen)

Wood Mouse

Sitomys americanus arizonae Allen, *Bull. Amer. Mus. Nat. Hist.*, 6 (1894): 321. Type collected March 13, 1894, by W. W. Price and B. C. Condit at Fairbank, Cochise County, Arizona.

DISTRIBUTION.—Northeastern Sonora west as far as Saric. Recorded from San Bernardino ranch, Santa Cruz, and Río Santa Cruz (Osgood, 1909: 127); Río San Pedro and La Noria (Mearns, 1907: 410); and Saric (DRD.).

REMARKS.—At Saric, Wright found these mice inhabiting the cottonwood trees. One was shot from a tree in which others, probably of the same species, were seen.

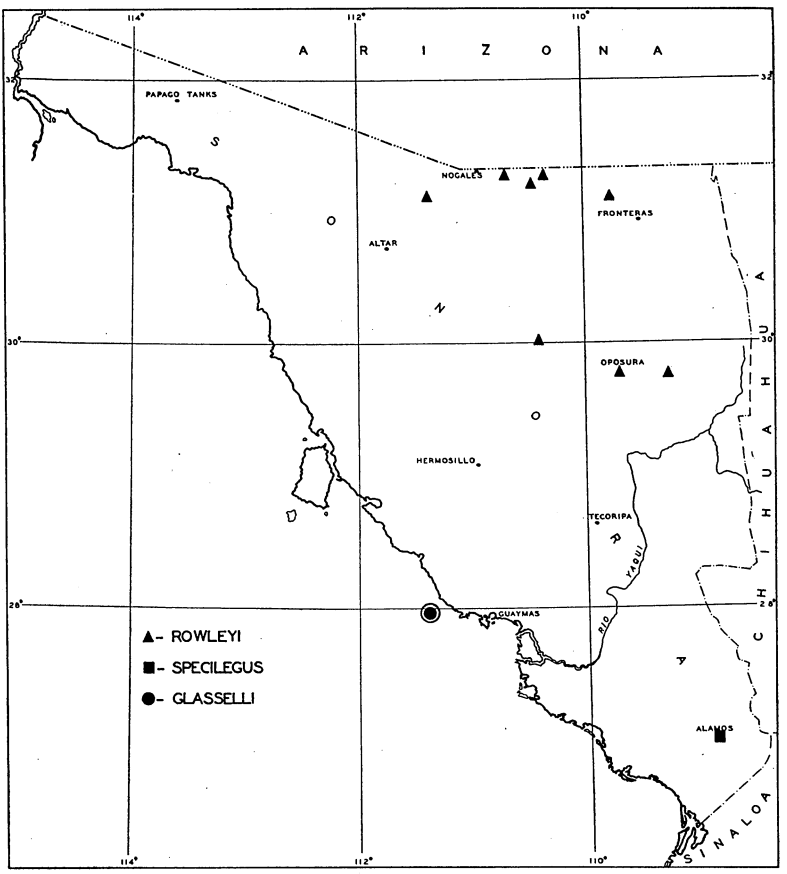
Peromyscus boylii rowleyi (Allen)

Brush Mouse

Sitomys rowleyi Allen, *Bull. Amer. Mus. Nat. Hist.*, 5 (1893): 76. Type collected April 20, 1892, by Charles P. Rowley at Noland ranch, San Juan River, Utah.

Peromyscus metallicola Elliot, *Field Columb. Mus., Chicago, Zool. Ser.*, 3 (1904): 245. Type collected at Providencia mines, Sonora.

DISTRIBUTION.—Mountains and broken country of northeastern Sonora, west as far as Saric (Map 16). Specimens from Saric (DRD.); Sierra



MAP 16. Distribution of the brush mouse, *Peromyscus boylii*, in Sonora.

Huasabas, Providencia mines, Sierra de San José, Río Santa Cruz, and Sierra de los Patagones (Osgood, 1909: 147); Oposura (Elliot, 1907: 229); and, in addition to a number of the above localities, from La Noria (Mearns, 1907: 419).

Peromyscus boylii specilegus Allen

Brush Mouse

Peromyscus specilegus Allen, *Bull. Amer. Mus. Nat. Hist.*, 9 (1897): 50. Type collected December 27, 1893, by Audley C. Buller at Mineral, San Sebastian, Mascota, Jalisco.

DISTRIBUTION.—Mountains of extreme southeastern Sonora (Map 16). Recorded from mountains near Alamos (Osgood, 1909: 151).

Peromyscus boylii glasselli Burt

Brush Mouse

Peromyscus boylii glasselli Burt, *Trans. San Diego Soc. Nat. Hist.*, 7 (1932): 171. Type collected December 26, 1931, by W. H. Burt on San Pedro Nolasco Island (lat. 27° 58′ N., long. 111° 24′ W.), Gulf of California, Sonora.

DISTRIBUTION.—Confined to San Pedro Nolasco Island (Map 16).

REMARKS.—This species was taken in the same trap line as *pembertoni*.

Oryzomys couesi lambi Burt

Rice Rat

Oryzomys couesi lambi Burt, *Proc. Biol. Soc. Wash.*, 47 (1934): 107. Type collected January 20, 1933, by Chester Lamb at San José de Guaymas, Sonora.

DISTRIBUTION.—Probably coastal area from San José de Guaymas south into Sinaloa. Recorded from the type locality.

REMARKS.—The finding of rice rats in Sonora considerably extends the known range of the genus northward along the west coast of Mexico.

Sigmodon hispidus cienegae A. B. Howell

Cotton Rat

Sigmodon hispidus cienegae A. B. Howell, *Proc. Biol. Soc. Wash.*, 32 (1919): 161. Type collected January 4, 1916, by Laurence M. Huey at Bullock's ranch, four miles east of Fort Lowell, Pima County, Arizona.

DISTRIBUTION.—North central Sonora south to Ures and Hermosillo (Map 17). Specimens from Ures and from one mile south of Hermosillo (DRD.).

REMARKS.—The specimens here recorded under *cienegae* are all young, and the present determinations must be considered tentative until such time as a series of adult specimens can be procured.

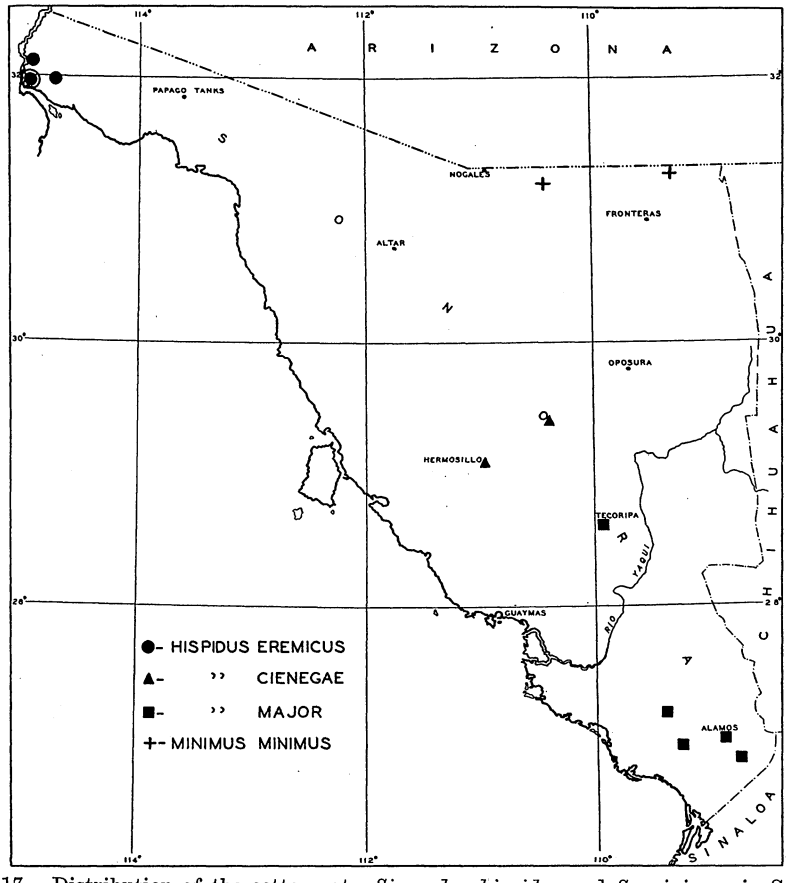
Sigmodon hispidus eremicus Mearns

Cotton Rat

Sigmodon hispidus eremicus Mearns, *Proc. U. S. N. M.*, 20 (1897): 304; reprint, 1898: 504. Type collected March 24, 1894, by E. A. Mearns and F. X. Holzner at Cienega Well, thirty miles south of monument No. 204, of the Mexican boundary line, on the left bank of the Colorado River, Sonora.

DISTRIBUTION.—A strip along the Colorado River in extreme northwestern Sonora (Map 17). Specimens from El Doctor (DRD.); and Cienega Well (type locality) and opposite Hardy River (Mearns, 1907: 452).

REMARKS.—Seven specimens were taken at El Doctor in a field planted to millet. Two young, about one-fourth grown, were taken on January 30



MAP 17. Distribution of the cotton rats, *Sigmodon hispidus* and *S. minimus*, in Sonora.

and February 3, 1929. Mearns (*ibid.*) reported them to be "most numerous about beds of wild hemp which grow luxuriantly upon the broad savannas bordering the Colorado. . . ."

Sigmodon hispidus major Bailey

Cotton Rat

Sigmodon hispidus major Bailey, *Proc. Biol. Soc. Wash.*, 15 (1902): 109. Type collected October 20, 1898, by E. W. Nelson and E. A. Goldman at Sierra de Choix, northeast

of Choix, Sinaloa. Type locality given as fifty miles northeast of Choix, but estimated at probably only ten or fifteen miles northeast, in a personal letter from Goldman, March 28, 1934.

DISTRIBUTION.—Southern Sonora, north, along the coast, to Guaymas and inland to Tecoripa (Map 17). Recorded from Alamos (Bailey, 1902: 110); and Guirocoba, Chinobampo, Tésia, and Tecoripa (DRD.).

REMARKS.—The Tecoripa specimens, mostly young and difficult to classify, are tentatively placed in this race. Specimens from Guaymas are smaller than typical *major* and are probably intermediates between *major* and the races occurring to the northward, but the material at hand is insufficient properly to designate geographic ranges for the various races of *hispidus* in the state. The species evidently occurs over most of Sonora where suitable habitats exist.

Sigmodon minimus minimus Mearns

Cotton Rat

Sigmodon minima Mearns, *Proc. U. S. N. M.*, 17 (1894): 130. Type collected April 26, 1892, by E. A. Mearns and F. X. Holzner at the "upper corner monument, New Mexico, on the Mexican boundary line one hundred miles west of the initial monument on the west bank of the Río Grande" (monument No. 40, one hundred miles west of El Paso, Texas).

DISTRIBUTION.—Mountainous region of northeastern Sonora (Map 17). Recorded from Río Santa Cruz (Bailey, 1902: 114); and San Bernardino ranch (Mearns, 1907: 447).

Teanopus phenax Merriam

Wood Rat

Teanopus phenax Merriam, *Proc. Biol. Soc. Wash.*, 16 (1903): 81. Type collected November 4, 1898, by E. A. Goldman at Camoa, Río Mayo, Sonora.

DISTRIBUTION.—Lowlands of southern Sonora from the Río Mayo north to San José de Guaymas. Specimens from Camoa (type locality); and Tésia, Chinobampo, and San José de Guaymas (DRD.).

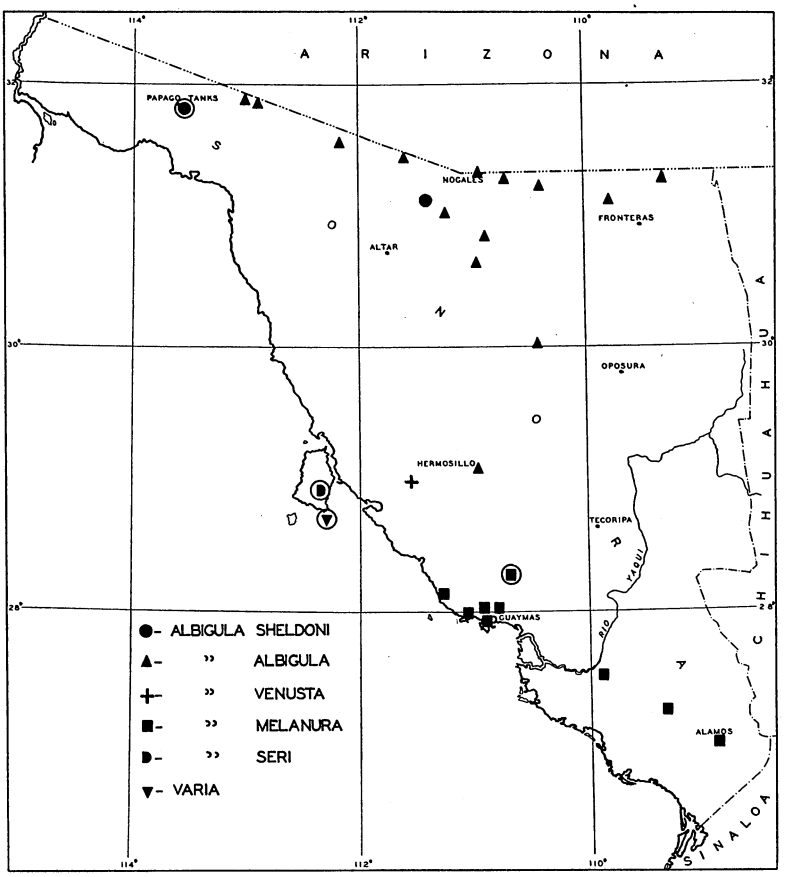
REMARKS.—Nests of these rats were found usually along streams in thick brush or low trees. Persimmons seemed to serve as an important part of their diet; rats were commonly seen in these trees at night. A female collected at Chinobampo, February 23, 1930, contained two 20-mm. embryos.

Neotoma albigula albigula Hartley

White-throated Wood Rat

Neotoma albigula Hartley, *Proc. Calif. Acad. Sci.*, Ser. 2, 4 (1894): 157. Type collected June 14, 1893, by W. W. Price and R. L. Wilbur in the vicinity of Fort Lowell, Pima County, Arizona.

DISTRIBUTION.—Desert area of north central Sonora south as far as Hermosillo (Map 18). Recorded from Sonoyta, Santa Cruz, San José Mountains, Río San Bernardino (near the Mexican boundary), Pozo de



MAP 18. Distribution of the white-throated wood rat, *Neotoma albigula,* and the Turner's Island wood rat, *N. varia,* in Sonora.

Luis, Sierra de los Patagones, Nogales, Magdalena, and Hermosillo (Goldman, 1910: 33); Cerro Blanco and Providencia mines (Elliot, 1907: 275); Alamo Wash (DRD.); and La Osa, Sonoyta, and Santo Domingo (Mearns, 1907: 481–82).

Neotoma albigula sheldoni Goldman

White-throated Wood Rat

Neotoma albigula sheldoni Goldman, *Proc. Biol. Soc. Wash.,* 28 (1915): 136. Type collected in 1915 by Charles Sheldon in the Sierra Pinacate (Papago Tanks), Sonora.

DISTRIBUTION.—Pinacate Mountain region east to Saric (Map 18). Recorded from the Sierra Pinacate (type locality); and Saric (DRD.).

REMARKS.—Saric specimens, although somewhat darker in coloration than topotypes of *sheldoni,* are probably best referred to this race.

These wood rats built relatively small houses, usually with a burrow into the ground beneath the pile of nest material.

Neotoma albigula venusta True

White-throated Wood Rat

Neotoma venusta True, *Proc. U. S. N. M.,* 17 (1894): 2; reprint, p. 354. Type collected November 30, 1891, by Frank Stephens at Carrizo Creek, San Diego County, California.

DISTRIBUTION.—A narrow strip along the gulf coast of Sonora south to Costa Rica ranch (Map 18). Specimens only from Costa Rica ranch (DRD.).

Neotoma albigula melanura Merriam

White-throated Wood Rat

Neotoma intermedia melanura Merriam, *Proc. Biol. Soc. Wash.,* 9 (1894): 126. Type collected November 13, 1889, by Vernon Bailey at Ortiz, Sonora.

DISTRIBUTION.—Lowlands of southern Sonora north as far as Ortiz (Map 18). Recorded from Alamos, Camoa, Batamotal, Guaymas, Presidio (near Guaymas), and Ortiz (Goldman, 1910: 36); and San José de Guaymas, Bahía San Carlos, Bahía San Pedro, and Obregon (DRD.).

At Obregon these rats nested commonly among cactus (*Opuntia*).

Neotoma albigula seri Townsend

White-throated Wood Rat

Neotoma albigula seri Townsend, *Bull. Amer. Mus. Nat. Hist.,* 31 (1912): 125. Type collected April 12 to 13, 1911, by H. E. Anthony of the "Albatross Expedition," on Tiburón Island, Gulf of California, Sonora.

DISTRIBUTION.—Probably occurs over most of Tiburón Island (Map 18).

REMARKS.—Nest houses of these rats were common along the small canyons and throughout the chaparral. They were usually at the bases of small trees and were from three to five feet in diameter. Sticks and bones made up the bulk of the house material, and on the top of nearly every house examined were a number of small bright-colored stones.

Neotoma varia Burt

Turner's Island Wood Rat

Neotoma varia Burt, *Trans. San Diego Soc. Nat. Hist.,* 7 (1932): 178. Type collected December 31, 1931, by W. H. Burt on Turner's Island, Gulf of California, Sonora.

DISTRIBUTION.—Turner's Island (Map 18).

REMARKS.—Wood-rat nests were common in the dense growths of cactus and brush on this small island.

Neotoma lepida bensoni Blossom

Cactus Wood Rat

Neotoma lepida bensoni Blossom, *Occ. Papers Mus. Zool. Univ. Mich.*, 315 (1935): 1. Type collected April 26, 1933, by Philip M. Blossom at Papago Tanks, Sierra Pinacate, Sonora.

DISTRIBUTION.—Sierra Pinacate. Specimens from Papago Tanks and Elegante Crater, forty-one miles southwest of Sonoyta (MZUM.).

Neotoma lepida aureotunicata Huey

Cactus Wood Rat

Neotoma lepida aureotunicata Huey, *Trans. San. Diego Soc. Nat. Hist.*, 8 (1937): 349. Type collected February 14, 1934, by Laurence M. Huey at Punta Peñascosa, Sonora.

DISTRIBUTION.—Known only from Punta Peñascosa (Huey, 1937: 350).

Neotoma mexicana mexicana Baird

Mexican Wood Rat

Neotoma mexicana Baird, *Proc. Acad. Nat. Sci. Phila.*, 7 (1855): 333. Type collected by John Potts near Chihuahua, Chihuahua.

DISTRIBUTION.—Extreme northeastern Sonora (Map 19). Recorded from Río San Pedro (Baird, 1857: 492); Cuchuta (J. A. Allen, 1893: 28); and Oposura (J. A. Allen, 1895: 221).

Neotoma mexicana sinaloae Allen

Mexican Wood Rat

Neotoma sinaloae Allen, *Bull. Amer. Mus. Nat. Hist.*, 10 (1898): 149–50. Type collected May 14, 1897, by P. O. Simons at Tatameles, Sinaloa.

DISTRIBUTION.—Southern Sonora north as far as San Javier (Map 19). Recorded from Alamos (Goldman, 1910: 61); and Guirocoba, Mira Sol, Camoa, and San Javier (DRD.).

Rattus rattus alexandrinus (Goeffroy)

Roof Rat

Mus alexandrinus Goeffroy, *Cat. mammif. mus. nat. d'hist. Paris*, 1803: 192. Type collected at Alexandria, Egypt.

DISTRIBUTION.—Probably throughout Sonora wherever there are places of habitation, also now established on San Esteban Island. Specimens from Tésia, Hermosillo, and San Esteban Island (DRD.); and Cerro Blanco (Elliot, 1907: 195).

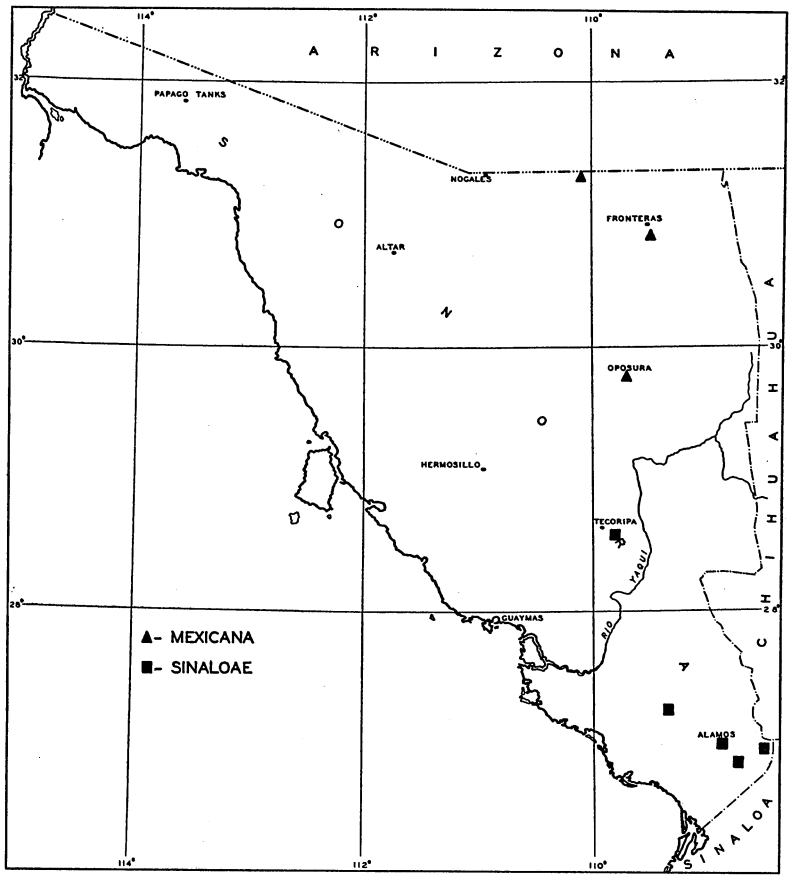
REMARKS.—At Hermosillo these rats were seen running about the streets at night; they were numerous everywhere.

Mus musculus musculus Linnaeus

House Mouse

[*Mus*] *musculus* Linnaeus, ed. 10, *Syst. nat.*, 1 (1758): 62. Type from Upsala, Sweden.

DISTRIBUTION.—Through the state of Sonora where there are places of habitation. Specimens from San José de Guaymas and Tecoripa (DRD.).



MAP 19. Distribution of the Mexican wood rat, *Neotoma mexicana*, in Sonora.

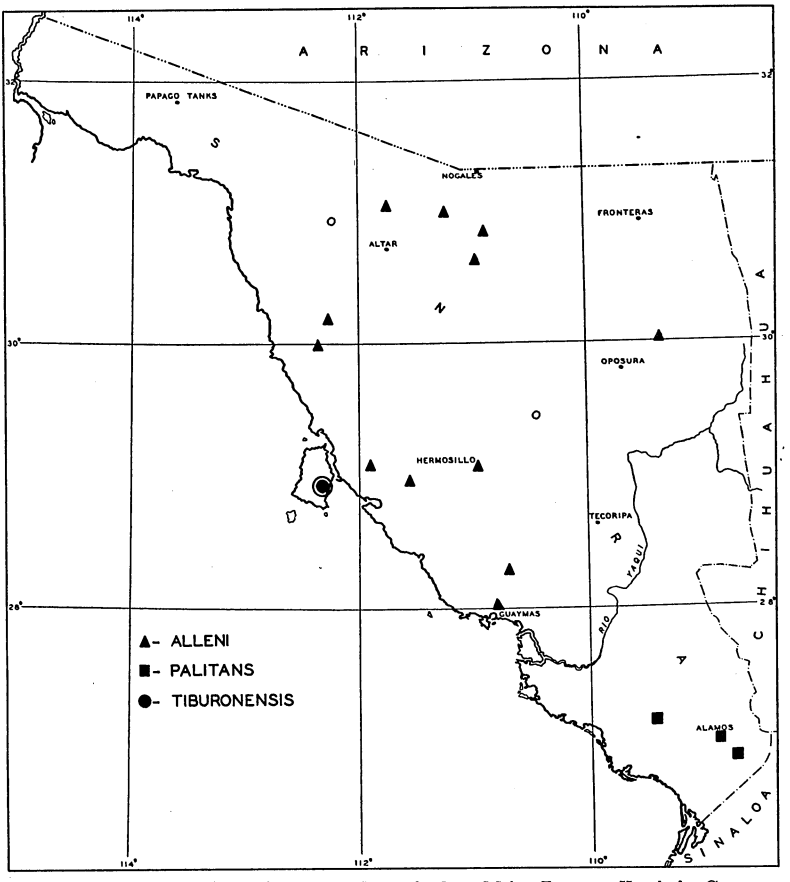
Lepus alleni alleni Mearns

Antelope Jack Rabbit

Lepus alleni Mearns, *Bull. Amer. Mus. Nat. Hist.*, 2 (1890): 294. Type collected May 8, 1885, by E. A. Mearns at Rillito, on the Southern Pacific Railroad, Pima County, Arizona.

DISTRIBUTION.—Lowlands of north central Sonora to Guaymas (Map 20). Recorded from Oputo, Hermosillo, Magdalena, Ortiz, and Batamotal (Nel-

son, 1909: 118); Cerro Blanco (Elliot, 1907: 379); Verrugo Pass, Picu Pass, and twenty-two miles north of Altar (Dice and Blossom, 1937: 40); also recorded by Lamb (notes) from Alamo Wash and Costa Rica ranch, and by Charles Sheldon (notes) from La Libertad ranch.



MAP 20. Distribution of the antelope jack rabbit, *Lepus alleni*, in Sonora.

REMARKS.—On the Nogales–Guaymas road these jack rabbits were common from Cibuta south to Guaymas. None were seen in the oak-covered hills between Cibuta and Nogales.

Lepus alleni palitans Bangs

Antelope Jack Rabbit

Lepus (*Marcotolagus*) *alleni palitans* Bangs, *Proc. New England Zool. Club*, 1 (1900): 85. Type collected August 7, 1897, by P. O. Simons at Aguacaliente, about forty miles southeast of Mazatlán, Sinaloa.

DISTRIBUTION.—Lowlands of southern Sonora north to the Río Yaqui,

where it intergrades with *alleni* (Map 20). Recorded from Alamos (Nelson, 1909: 119); and Guirocoba and near Navajoa (DRD.).

REMARKS.—These jack rabbits were seen commonly in the lowlands between Guirocoba and the Río Yaqui. Their altitudinal range was below that of the oaks.

Lepus alleni tiburonensis Townsend

Antelope Jack Rabbit

Lepus alleni tiburonensis Townsend, *Bull. Amer. Mus. Nat. Hist.*, 31 (1912): 120. Type collected April 13, 1911, by H. E. Anthony of the "Albatross Expedition," on Tiburón Island, Gulf of California, Sonora.

DISTRIBUTION.—Lower levels of Tiburón Island (Map 20).

REMARKS.—Jack rabbits were fairly numerous, but rather wild, on Tiburón Island. The winter pelage is much darker than the faded summer pelage in which the black-tipped hairs turn to brown.

Lepus californicus deserticola Mearns

Black-tailed Jack Rabbit

Lepus texianus deserticola Mearns, *Proc. U. S. N. M.*, 18 (1896): 564. Type collected May 7, 1894, by F. X. Holzner on the western edge of the Colorado Desert, and the base of the Coast Range Mountains, Imperial County (given as San Diego County), California.

DISTRIBUTION.—Extreme northwestern portion of Sonora along the Colorado River (Map 21). Specimens from El Doctor (DRD.).

Lepus californicus eremicus Allen

Black-tailed Jack Rabbit

Lepus texianus eremicus Allen, *Bull. Amer. Mus. Nat. Hist.*, 6 (1894): 347. Type collected March 5, 1894, by W. W. Price and B. C. Condit at Fairbanks, Cochise County, Arizona.

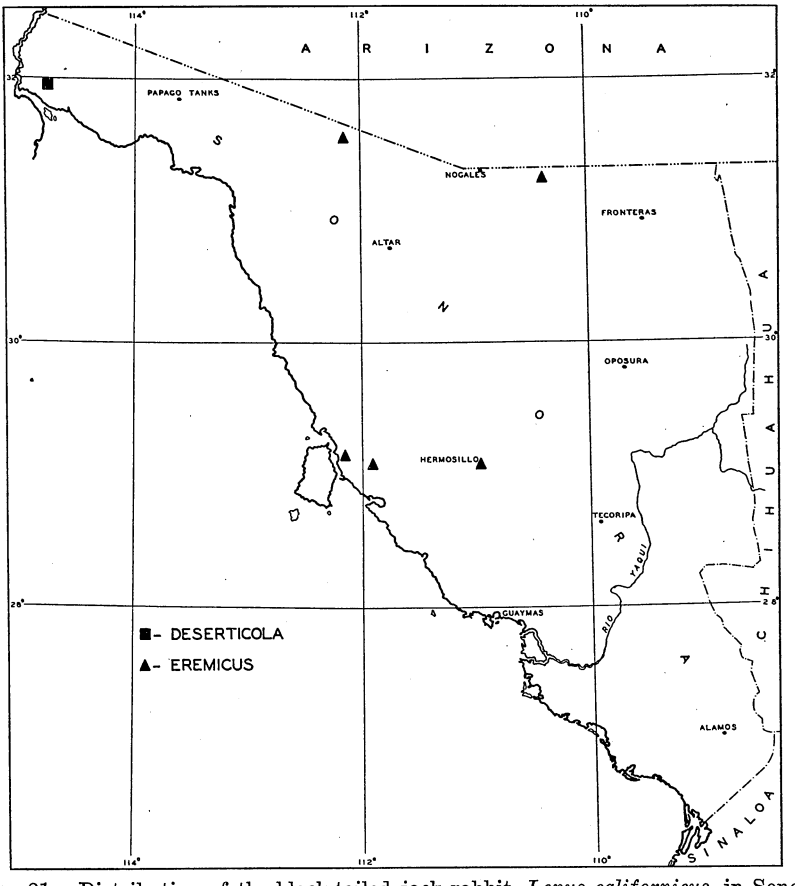
DISTRIBUTION.—Northern Sonora, except for extreme western portion, south to Hermosillo (Map 21). Recorded from Santa Cruz, Pozo de Luis, and Hermosillo (Nelson, 1909: 141). Also recorded from La Libertad ranch and Sierra Seri (Seriland) by Charles Sheldon (notes).

Sylvilagus floridanus holzneri (Mearns)

Cottontail

Lepus sylvaticus holzneri Mearns, *Proc. U. S. N. M.*, 18 (1896): 554. Type collected August 29, 1893, by F. X. Holzner in Douglas spruce zone, near the summit of the Huachuca Mountains, southern Arizona.

DISTRIBUTION.—High mountains of eastern Sonora. Recorded from Hall's ranch (Cañon de Guadalupe), and Sierra de San José (Nelson, 1909: 180).



MAP 21. Distribution of the black-tailed jack rabbit, *Lepus californicus*, in Sonora.

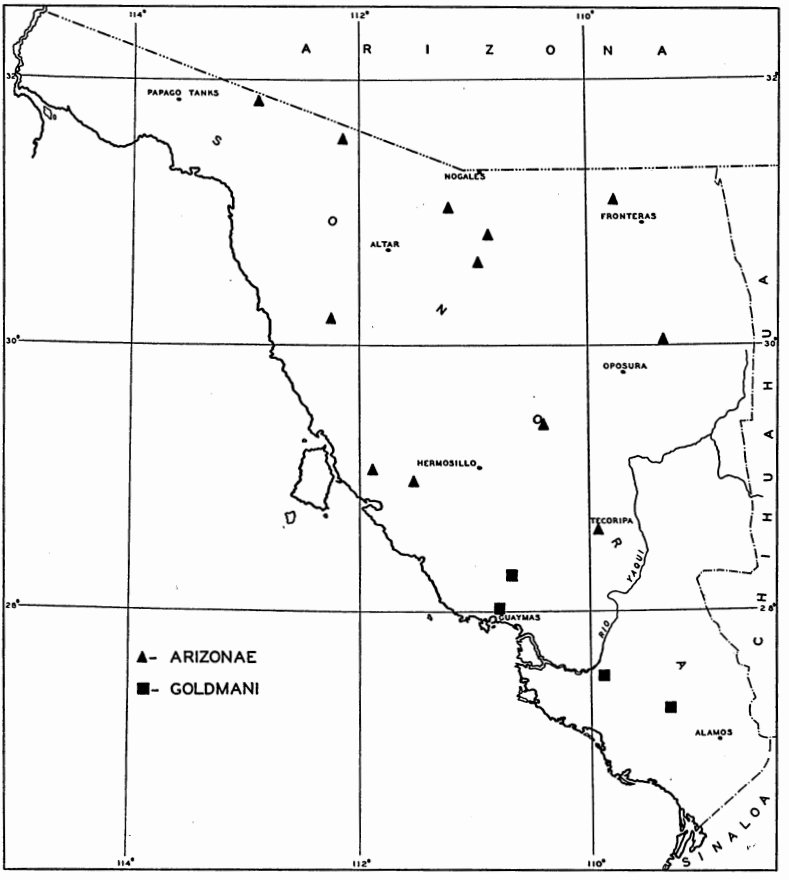
Sylvilagus audubonii arizonae (Allen)

Cottontail

[*Lepus sylvaticus*] var. *arizonae* Allen, *Monogr. N. Amer. Rodentia*, 1877: 332. Type collected September 8, 1865, by Elliot Coues at Beal's Springs, fifty miles west of Fort Whipple, Yavapai County, Arizona.

DISTRIBUTION.—Low deserts of northern Sonora south as far as Tecoripa (Map 22). Recorded from Sonoyta, Sierra de San José, Pozo de Luis, Oputo, and Magdalena (Nelson, 1909: 225); Cerro Blanco (Elliot, 1907: 376); Tecoripa, Ures, and Costa Rica ranch (DRD.); Verrugo Pass (Dice and Blossom, 1937: 42); and by Lamb (notes) from Alamo Wash, and by Charles Sheldon from La Libertad ranch (notes).

REMARKS.—Specimens from Costa Rica ranch, Ures, and Tecoripa are somewhat darker in coloration than specimens of *arizonae* from Arizona and



MAP 22. Distribution of the cottontail, *Sylvilagus audubonii*, in Sonora.

Nevada, but are considerably paler than two specimens of *goldmani* from Obregon.

Sylvilagus audubonii goldmani (Nelson)

Cottontail

Lepus arizonae goldmani Nelson, *Proc. Biol. Soc. Wash.*, 17 (1904): 107. Type collected March 20, 1899, by E. A. Goldman at Culiacan, Sinaloa.

DISTRIBUTION.—Lowlands of southern Sonora north as far as Guaymas (Map 22). Recorded from Camoa, Batamotal, and Ortiz (Nelson, 1909: 226); and Obregon (DRD.).

REMARKS.—These cottontails were common about Obregon.

Pecari angulatus sonoriensis (Mearns)

Peccary

Dicotyles angulatus sonoriensis Mearns, *Proc. U. S. N. M.*, 20 (1897): 3; reprint,

p. 469. Type collected September 8, 1892, by E. A. Mearns and F. X. Holzner on the Río San Bernardino, Sonora, near monument No. 77, Mexican boundary line.

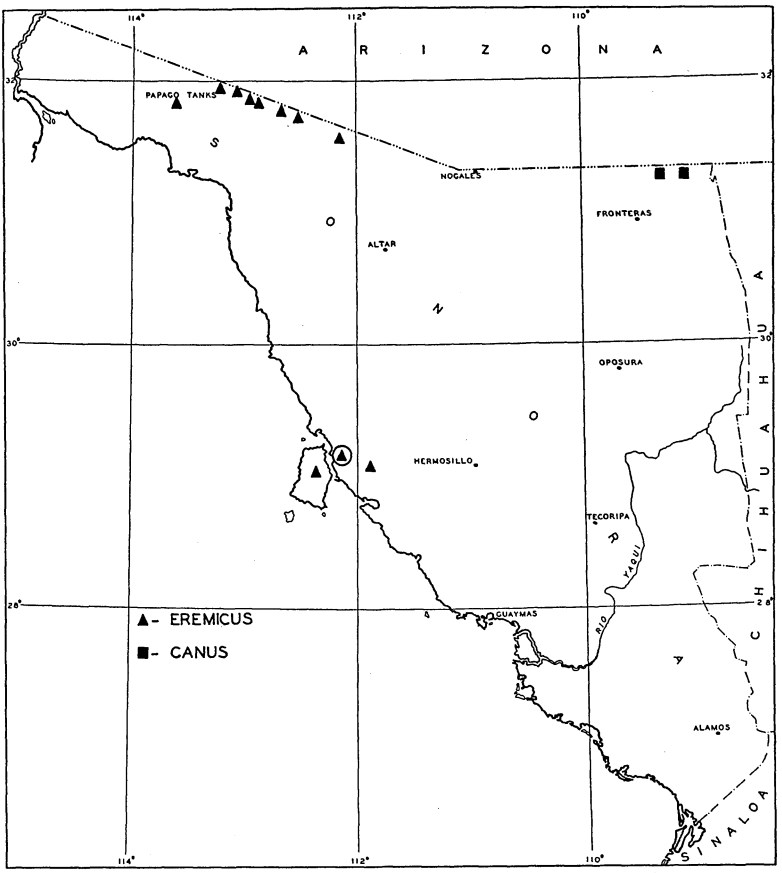
DISTRIBUTION.—Northern Sonora, south at least to the Río Yaqui. Recorded from Río San Bernardino (type locality), Cajon Bonito Creek, Sierra Cobota, Pozo de Luis, and Santo Domingo (Mearns, 1907: 163–68); fifteen miles south of Querobabi and Ures (DRD.); Costa Rica ranch and Alamo Wash (Lamb, notes); and La Libertad ranch and Seriland (Sheldon, notes).

Odocoileus hemionus eremicus (Mearns)

Burro Deer

Dorcelaphis hemionus eremicus Mearns, *Proc. U. S. N. M.*, 20 (1897): 4, reprint, p. 470. Type collected December, 1895, by Dr. W. J. McGee in the Sierra Seri near the Gulf of California, opposite Tiburón Island, in the most arid portion of Sonora.

DISTRIBUTION.—Desert region of northwestern Sonora, mainland and Tiburón Island (Map 23). Recorded by Mearns (1907: 209–10) as occurring



MAP 23. Distribution of the mule deer, *Odocoileus hemionus*, in Sonora.

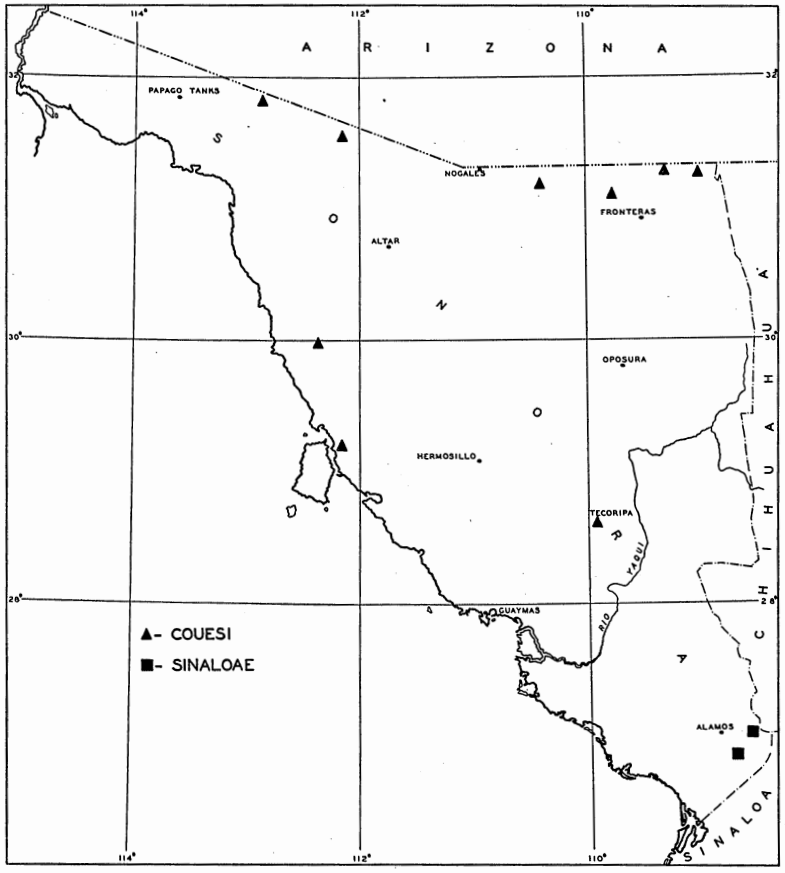
on Tiburón Island, at Sierra Seri (type locality), Cerro Salada, Sonoyta, Pozo de Luis, Sierra de Santa Rosa, Sierra de Sonoyta, Sierra de Quitobaquita, and Sierra Nariz. Hornaday (1908: 315) reports them as being present at Papago Tanks, and Charles Sheldon (notes) records them from La Libertad ranch.

Odocoileus hemionus canus Merriam

Mule Deer

Odocoileus hemionus canus Merriam, *Proc. Wash. Acad. Sci.*, 3 (1901): 560. Type collected October 7, 1900, by E. W. Nelson and E. A. Goldman at Sierra en Media, Chihuahua.

DISTRIBUTION.—Northeastern Sonora (Map 23). Recorded from Cañon de Guadalupe and San Bernardino Valley (sight records, Mearns, 1907: 200).



MAP 24. Distribution of the Coues deer, *Odocoileus couesi*, and the Sinaloa deer, *O. sinaloae*, in Sonora.

Odocoileus couesi (Coues and Yarrow)

Coues Deer

Cariacus virginianus var. *couesi* Coues and Yarrow, *Rept. upon Geogr. and Geol. Expl. and Surv. West of 100th Meridian*, 5 (1875): 72. Type collected September, 1874, by J. T. Rothrock at Camp Crittenden, Pima County, Arizona.

DISTRIBUTION.—Mountainous portion of most of Sonora west to the Gulf opposite Tiburón Island and south as far as Tecoripa (Map 24). Specimens from Tecoripa (DRD.); Picu Pass, twenty miles east of Puerto Libertad (Dice and Blossom, 1937: 44); Pozo de Luis, Río San Bernardino, Sierra de Guadalupe, and Sierra de San José (Mearns, 1907: 176–77); and Sierra de Santa Cruz (J. A. Allen, 1895: 200–1). Hornaday (1908: 107) records them from the Sierra Cubabi, and Charles Sheldon (notes) lists them among the mammals he encountered in Seriland (Sierra Seri).

Odocoileus sinaloae Allen

Sinaloa Deer

Odocoileus sinaloae Allen, *Bull. Amer. Mus. Nat. Hist.*, 19 (1903): 613. Type collected December 16, 1895, by J. H. Batty at Escuinapa, southern Sinaloa.

DISTRIBUTION.—Alamos district of southern Sonora (Map 24). Specimens from Guirocoba and El Cobre (DRD.).

REMARKS.—Two skins and skulls from the Alamos district fit in with *sinaloae* rather than *battyi* in that there is no dark dorsal stripe or black chin spots, also they have a rufous tail and a smaller skull with spike antlers.

Antilocapra americana mexicana Merriam

Pronghorn

Antilocapra americana mexicana Merriam, *Proc. Biol. Soc. Wash.*, 14 (1901): 31. Type collected October 4, 1899, by E. W. Nelson and E. A. Goldman at Sierra en Media, Chihuahua.

DISTRIBUTION.—Desert plains area of northwestern Sonora, south to Hermosillo. Recorded from La Osa, Pozo de Luis, between Cobota and Sierra Nariz, Santa Rosa Valley near monuments Nos. 161, 178, 179, and 183, and Seriland (Mearns, 1907: 230–31).

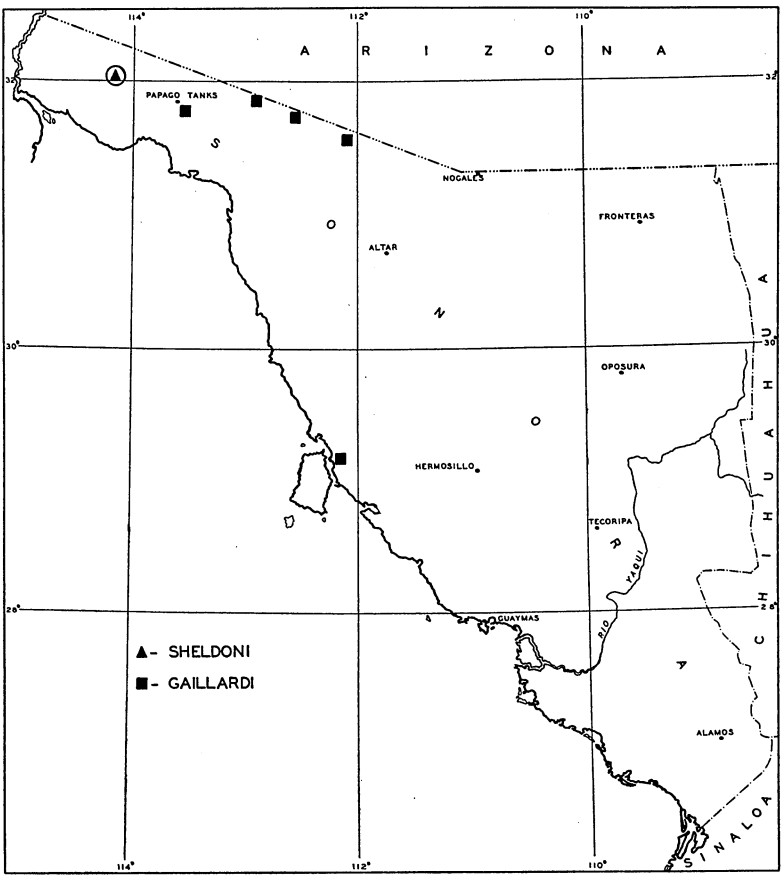
REMARKS.—In 1925 Nelson (p. 63) reported four bands of pronghorn antelope in northwestern Sonora with an estimated number of 595 individuals. These ranged south nearly to Hermosillo at that time.

Ovis canadensis gaillardi Mearns

Bighorn Sheep

Ovis canadensis gaillardi Mearns, *U. S. N. M. Bull.*, 56 (1907): 240. Type collected February 21, 1894, by Edgar A. Mearns in the Gila Mountains, between Tinajas Altas and the Mexican boundary line, Yuma County, Arizona.

DISTRIBUTION.—Northwestern Sonora south to Seriland, opposite Tiburón Island (Map 25). Recorded from Sierra Cobota, Sierra Nariz, Sonoyta, and Seriland (Mearns, 1907: 244); also Sierra Pinacate (Hornaday, 1908).



MAP 25. Distribution of the bighorn sheep, *Ovis sheldoni* and *Ovis canadensis gaillardi*, in Sonora.

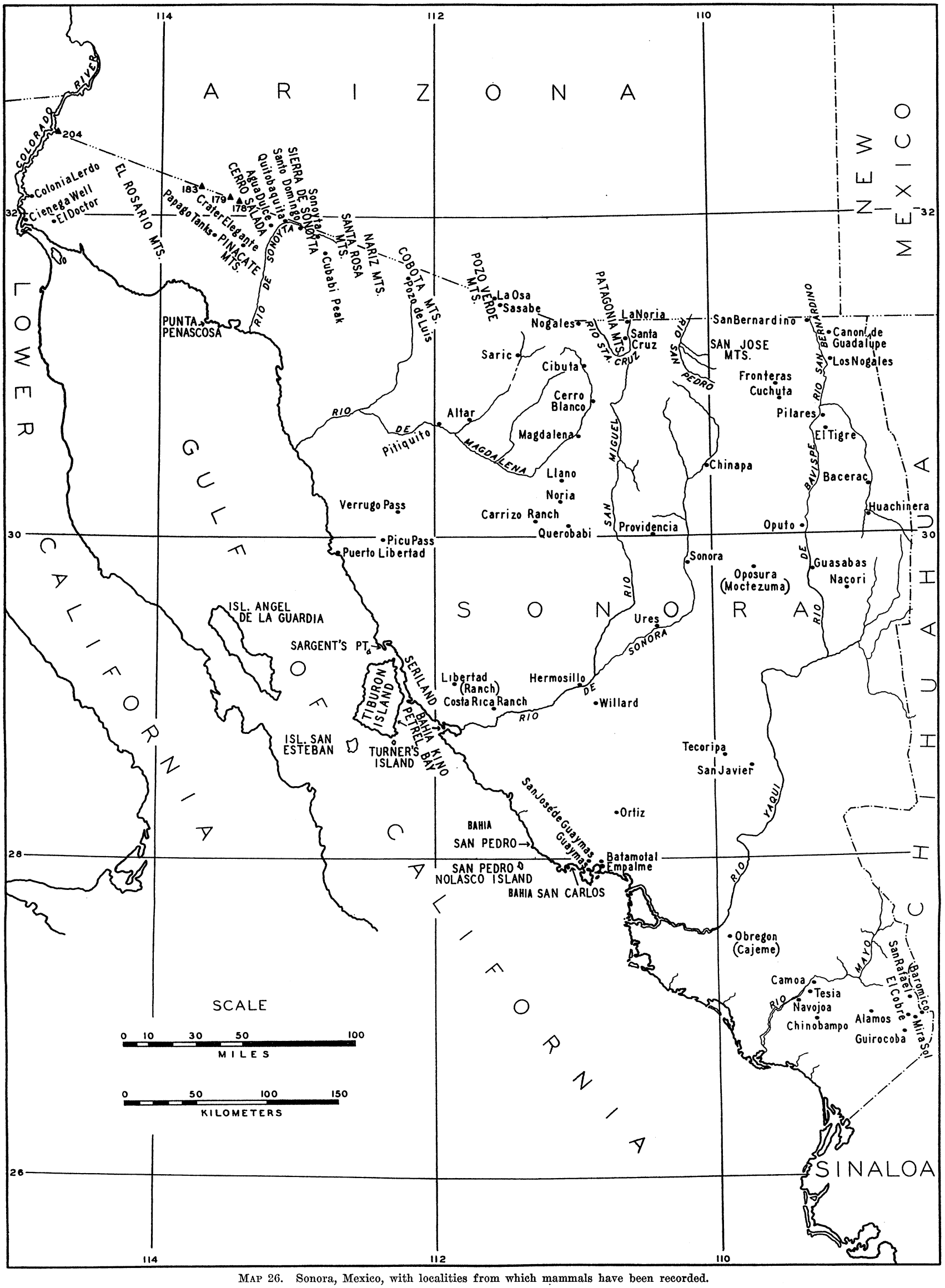
Ovis sheldoni Merriam

Bighorn Sheep

Ovis sheldoni Merriam, Proc. Biol. Soc. Wash., 29 (1916): 130–31. Type collected March 10, 1916, by Charles Sheldon at El Rosario, northern Sonora.

DISTRIBUTION.—Known only from Sierra El Rosario, Sonora (Map 25).

REMARKS.—The type locality of *sheldoni* is less than twenty miles from that of *gaillardi*, and although Merriam presumes that the intervening low desert between the Gila Mountains and Sierra El Rosario has served as an effective barrier I can hardly see how it would function as such during the winter months. I have not compared specimens from the two localities, but Merriam's description of *sheldoni* is not convincing to me, and I doubt that the small Sierra Rosario support a distinct species of this large game animal.



MAP 26. Sonora, Mexico, with localities from which mammals have been recorded.

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