

MISCELLANEOUS PUBLICATIONS
MUSEUM OF ZOOLOGY, UNIVERSITY OF MICHIGAN, NO. 46

A CONTRIBUTION TO THE ECOLOGY AND
FAUNAL RELATIONSHIPS OF THE
MAMMALS OF THE DAVIS
MOUNTAIN REGION,
SOUTHWESTERN
TEXAS

BY
W. FRANK BLAIR

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

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A CONTRIBUTION TO THE ECOLOGY AND FAUNAL RELATIONSHIPS OF THE MAMMALS OF THE DAVIS MOUNTAIN REGION, SOUTHWESTERN TEXAS

INTRODUCTION

THE Davis Mountains of southwestern Texas lie in the Basin and Range physiographic province of Fenneman (1931) and are made up of a rugged and irregular mass of igneous rocks surrounded by a relatively level plain. The main mountain mass lies mostly above an altitude of 5000 feet and consists, for the most part, of rugged peaks and ridges alternating with broad smooth valleys. This area is about thirty-five miles wide from east to west and about forty-five miles long from north to south. The eastern part of the area is more sharply dissected than are the western and southern parts, where the broadest intermontane valleys exist. Several peaks are 2000 to 3000 feet above the surrounding country. The several intermittent streams in the region have cut narrow steep-walled canyons. There are various outlying peaks and ridges, particularly east of the main mountain mass (Map 1).

According to the method of soil classification by Carter (1928: 47), the Davis Mountain region is composed mostly of rough stony soils of the Brewster series; in the narrow valleys are dark undifferentiated soils of the Toyah series that bear varying amounts of organic material and in many places are deep and underlain by gravel, which allows good underdrainage. The broad valleys are classified as clay loam of the Verhalen series.

The climate of the Davis Mountain region is arid; the average annual rainfall at Fort Davis is 16.66 inches (forty-nine-year record published by the United States Weather Bureau, 1934: 12). Of the total annual rainfall, 55 per cent occurs in July, August, and September. The average annual temperature at Fort Davis is 60.8° Fahrenheit.

The vegetation of the mountain slopes and narrow canyons consists of oak, pinyon, and yellow-pine forests, brush, and relatively luxuriant grass; that of the surrounding plains is principally of the arid grassland type.

The ecological relationships of the vegetation of the Davis Mountain region have been treated slightly by Bray (1901: 207; 1905: 7; 1906: 76), Bailey (1905: 33), and Carter and Cory (1932: 24), and in considerable detail by Cottle (1931: 105; 1932: 121).

No detailed study of the mammals of the region has been made, but considerable information about them was presented by Bailey (1905). The Davis Mountains lie within the Chihuahuan biotic province of Dice and Blossom (1937: 47). I tentatively consider this province to correspond more nearly to the area mapped by Shreve (1936: 197) as the Chihuahuan

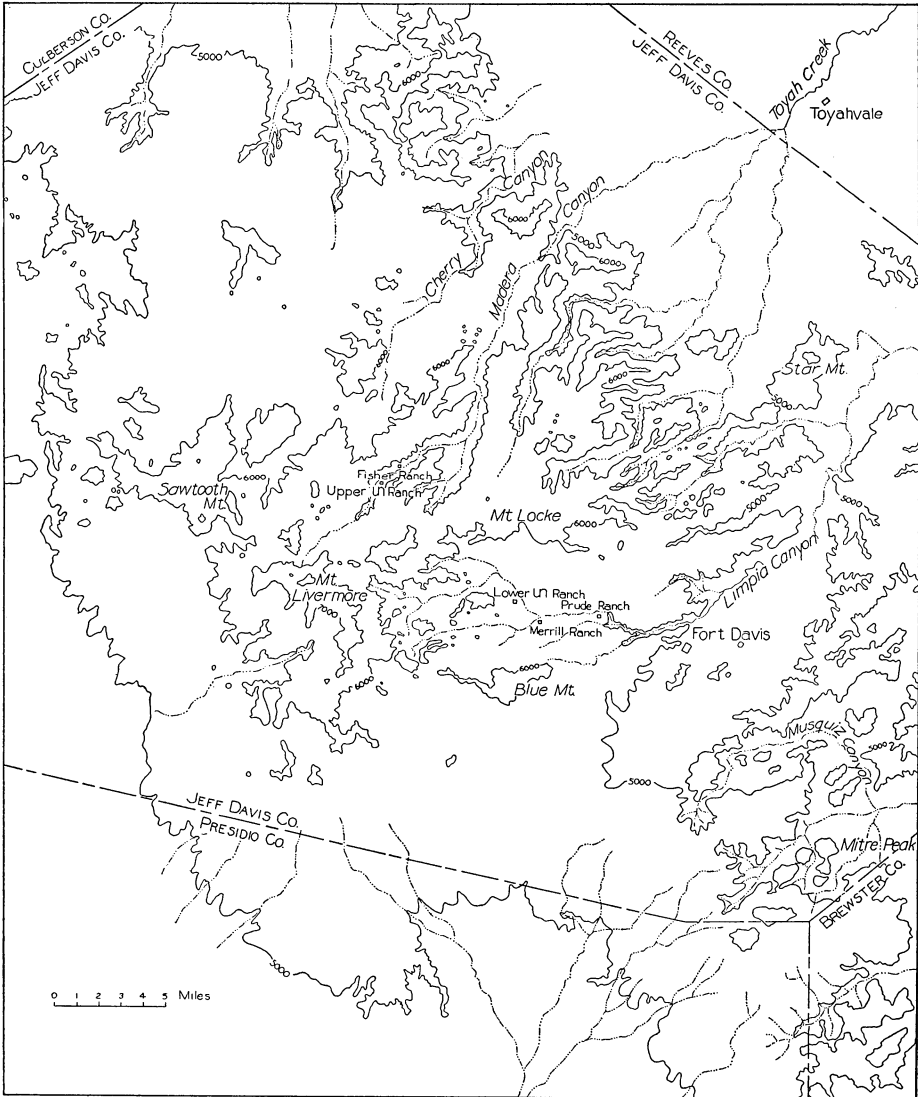
Desert, and to the Chihuahuan biotic province as later restricted by Dice (1939). The term "biotic province," as used here, represents a major division of a continent, distinguished by its physiography, climate, and ecological associations. A biotic province may contain two or more biotic districts, which are distinguished by similar though lesser differences in physiography, climate, and ecological associations (Dice and Blossom, 1937: 45).

The field data which form the basis for this report were collected on the Museum of Zoology—Gustavus D. Pope Expedition to the Davis Mountains. The personnel of the expedition consisted of Josselyn Van Tyne, ornithologist, and myself, mammalogist. Mr. Pope, sponsor of the expedition, spent several days in the field with us. He not only assisted materially in collecting data, but also lent encouragement through his enthusiasm for the project. The expedition remained in the field from March 15 to May 15, 1937. All specimens, unless otherwise specified, are in the Museum of Zoology, University of Michigan. C. C. Sperry of the United States Biological Survey not only helped in many ways in the field, but also has kindly loaned me for study and inclusion in this report a collection of mammals which he made in the same area. For the loan of further comparative material, I am indebted to H. H. T. Jackson of the United States Biological Survey and to H. E. Anthony of the American Museum of Natural History. The necessary collecting permits were kindly furnished by the Texas Game, Fish, and Oyster Commission through William J. Tucker, secretary. I wish to thank W. O. Grubb, Richard K. Merrill, and the other ranchers of the Davis Mountain region for their kind co-operation. Tom Redford, the district game ranger, and Ross Graves, a trapper of predatory animals, were especially helpful. I am indebted to Lee R. Dice and William H. Burt for reading the manuscript and to Josselyn Van Tyne for aid and counsel.

LIFE BELTS

Life belts, as defined by Dice and Blossom (1937: 45), are biogeographic units recognizable in mountainous regions and are believed to result from differences in climate caused by differences in elevation and exposure. Life belts are considered to be subdivisions of biotic districts. Similar life belts sometimes are found in several biotic districts, but I believe, as do Dice and Blossom (1937: 45), that a life belt is approximately uniform only in a single biotic district. Each life belt is characterized by a number of ecological associations. The concept "ecological association," as used here, includes all of the plants and animals present together in a relatively stable environment (Dice and Blossom, 1937: 47). Two life belts are recognizable in the Davis Mountain region. One of these includes the plains surrounding the mountains, and the broad intermontane valleys within the mountain mass.

The other includes the roughlands of the main mountain mass and of outlying peaks surrounded by the plains. The descriptions and discussions of



MAP 1. Main part of the Davis Mountain region. One-thousand-foot contour lines and the principal localities (drawn by P. F. Blair, Jr.; based largely on maps of the United States Geological Survey).

the two life belts and their ecological associations apply to them only as they occur in the Davis Mountain region.

PLAINS LIFE BELT

The Plains life belt occurs mostly below an altitude of 5000 feet, except in broad, intermontane valleys where the short-grass association extends up to 6000 feet. Seven ecological associations are recognized in this belt. Of these, the short-grass and short-grass-yucca associations are the most extensive and occupy most of the level plains. The short-grass-mesquite, mesquite-cholla, stream-bed, cottonwood, and riparian-meadow associations are of relatively small extent, and their distribution is influenced largely by various edaphic factors.

Twenty (36 per cent) of the fifty-five species of mammals recorded from the Davis Mountain region are known there only from the Plains life belt. These are:

<i>Tadarida mexicana</i>	<i>Dipodomys spectabilis</i>
<i>Taxidea taxus</i>	<i>Dipodomys merriami</i>
<i>Citellus mexicanus</i>	<i>Dipodomys ordii</i>
<i>Citellus pilosoma</i>	<i>Reithrodontomys montanus</i>
<i>Cynomys ludovicianus</i>	<i>Reithrodontomys fulvescens</i>
<i>Thomomys bottae</i>	<i>Peromyscus maniculatus</i>
<i>Cratogeomys castanops</i>	<i>Sigmodon hispidus</i>
<i>Perognathus flavus</i>	<i>Neotoma micropus</i>
<i>Perognathus hispidus</i>	<i>Neotoma albigula</i>
<i>Perognathus penicillatus</i>	<i>Antilocapra americana</i>

The Plains life belt includes the mesquite-grass (desert-grassland) and creosote bush (southern desert shrub) divisions of Shantz and Zon (1924). It is a part of the "extreme arid Lower Sonoran" zone of Bailey (1905), and the Desert Plains (*Aristida-Bouteloua* association) of Clements (1929: 144).

SHORT-GRASS ASSOCIATION

	Records ¹
<i>Pipistrellus hesperus maximus</i>	Numerous
<i>Canis latrans</i> subspecies	2
<i>Citellus pilosoma marginatus</i>	3
<i>Cynomys ludovicianus arizonensis</i>	1
<i>Cratogeomys castanops lacrimalis</i>	10
<i>Onychomys torridus torridus</i>	5
<i>Reithrodontomys montanus griseus</i>	1
<i>Reithrodontomys megalotis megalotis</i>	1
<i>Peromyscus maniculatus blandus</i>	5
<i>Lepus californicus texianus</i>	5
<i>Sylvilagus audubonii neomexicanus</i>	1
<i>Antilocapra americana</i> subspecies	Sight records

¹ Number of animals collected unless otherwise indicated.

The short-grass association, characterized by a sparse cover of short grasses and by the presence of the harvest mouse (*Reithrodontomys montanus*), is, with the exception of the short-grass-yucca, the most extensive association of the Plains life belt. It occupies much of the area surrounding the Davis Mountains, penetrating the mountain area in many of the narrow canyons as narrow strips on level and smooth stream terraces. On the broad, smooth, intermontane valleys of the mountain area this association was found up to an altitude of 6000 feet (Pl. I, Fig. 2).

The grasses in this association were not identified by me, but Cottle (1931: 129, and Fig. 25) found *Bouteloua gracilis* and *B. hirsuta* to be the most important species. In most places only a small percentage of the soil is occupied by grass; woody plants are rare. In the intermontane valleys occasional stunted junipers, probably *Juniperus monosperma* (Cottle, 1931: 30), are to be found. Generally, the soil is free from stones. In some relatively level intermontane areas, where there is a cover of rock fragments, the barren appearance possibly is a result of overgrazing.

Of the mammals recorded from this association, the pipistrelle (*Pipistrellus hesperus*) is the only species that is not a typical inhabitant of grasslands in the region. This bat was shot over the association in narrow canyons. The plains pocket gopher (*Cratogeomys castanops*) was found to be widely distributed here, and was most abundant where the association was found on stream terraces. The desert cottontail (*Sylvilagus auduboni*) was conspicuously less abundant than it was in the short-grass-yucca association, possibly because of the absence of ample cover. Also, the harvest mouse (*Reithrodontomys megalotis*) and deer mouse (*Peromyscus maniculatus*) apparently were less abundant than they were in the short-grass-yucca association. The spermophile (*Citellus spilosoma*) and harvest mouse (*Reithrodontomys montanus*) were found nowhere else. The spermophile may occur also in the short-grass-yucca association.

SHORT-GRASS-YUCCA ASSOCIATION

	Records
<i>Taxidea taxus berlandieri</i>	2
<i>Canis latrans</i> subspecies	1
<i>Cratogeomys castanops lacrimalis</i>	3
<i>Perognathus merriami gilvus</i>	1
<i>Perognathus flavus flavus</i>	3
<i>Dipodomys spectabilis baileyi</i>	4
<i>Dipodomys merriami ambiguus</i>	3
<i>Dipodomys ordii ordii</i>	1
<i>Onychomys torridus torridus</i>	5
<i>Reithrodontomys megalotis megalotis</i>	3
<i>Peromyscus maniculatus blandus</i>	Numerous

<i>Neotoma micropus canescens</i>	1
<i>Lepus californicus texianus</i>	2
<i>Sylvilagus audubonii neomexicanus</i>	10
<i>Antilocapra americana</i> subspecies	Sight records

The short-grass-yucca association, characterized by the presence of a sparse cover of short grasses over which occurs an open stand of several species of xeric shrubs, is one of the most extensive associations of the Plains life belt. Like the short-grass association, it is found on relatively level soil which is fairly free from stones. It was not present in the broad intermontane valleys above 5000 feet altitude nor on stream terraces in narrow canyons (Pl. I, Fig. 1).

In the area described by Cottle (1931: 117, and Fig. 15), representative of this association, the most important components of the sparse herbaceous cover were the three short grasses: *Bouteloua gracilis*, *B. hirsuta*, and *B. eriopoda*. Grasses of less importance listed are *Muhlenbergia monticola* and *Aristida* sp. Other plants widely distributed in this association include a yucca (*Yucca elata*), bear grass (*Nolina texana*), allthorn (*Koeberlinia spinosa*), and ephedra (*Ephedra trifurca*).

Mammals found here but not recorded from the short-grass association are: badger (*Taxidea taxus*), two pocket mice (*Perognathus merriami* and *P. flavus*), three kangaroo rats (*Dipodomys spectabilis*, *D. merriami*, and *D. ordii*), and the plains wood rat (*Neotoma micropus*).

The desert cottontail, harvest mouse (*Reithrodontomys megalotis*), and deer mouse apparently were more abundant here than they were in the short-grass association.

SHORT-GRASS-MESQUITE ASSOCIATION

	Records
<i>Citellus mexicanus parvidens</i>	1
<i>Perognathus merriami gilvus</i>	6
<i>Perognathus hispidus paradoxus</i>	1
<i>Dipodomys merriami ambiguus</i>	1
<i>Onychomys torridus torridus</i>	4
<i>Peromyscus eremicus eremicus</i>	1
<i>Peromyscus maniculatus blandus</i>	2
<i>Peromyscus leucopus tornillo</i>	2
<i>Neotoma micropus canescens</i>	13
<i>Neotoma albigula robusta</i>	1
<i>Sylvilagus audubonii neomexicanus</i>	Sight records

The short-grass-mesquite association, characterized by a sparse cover of short grasses and by the presence of numerous low clumps of mesquite, was

found only at the northeastern base of the Davis Mountains. It occupies the broad, relatively level floor of Limpia Canyon at an altitude of about 4300 feet. In this area a few rock fragments litter the ground. The maguey (*Agave* sp.), yucca (*Yucca* sp.), and several species of cacti (*Opuntia*) occur sparingly.

Mammals found here but not in the short-grass-yucca association are: Mexican spermophile (*Citellus mexicanus*), plains pocket mouse (*Perognathus hispidus*), white-throated wood rat (*Neotoma albigula*), cactus mouse (*Peromyscus eremicus*), and wood mouse (*P. leucopus*). The plains wood rat (*Neotoma micropus*), rare in the short-grass-yucca association, and the desert cottontail were abundant in this association.

MESQUITE-CHOLLA ASSOCIATION

	Records
<i>Citellus mexicanus parvidens</i>	4
<i>Perognathus merriami gilvus</i>	2
<i>Perognathus hispidus paradoxus</i>	2
<i>Dipodomys merriami ambiguus</i>	1
<i>Onychomys torridus torridus</i>	1
<i>Reithrodontomys fulvescens fulvescens</i>	3
<i>Peromyscus eremicus eremicus</i>	2
<i>Peromyscus maniculatus blandus</i>	2
<i>Peromyscus leucopus tornillo</i>	1
<i>Sigmodon hispidus berlandieri</i>	1
<i>Neotoma micropus canescens</i>	1
<i>Sylvilagus audubonii neomexicanus</i>	7

The mesquite-cholla association was encountered only in a small side canyon of lower Limpia Canyon, about fifteen miles northeast of Fort Davis, at an altitude of about 4300 feet. The soil is comparatively light and sandy. The most conspicuous plants of this association are: arborescent cacti (*Opuntia* sp.), mesquite (*Prosopis* sp.), and catclaw (*Acacia* sp.). These plants, with a few other woody species, form dense, thorny thickets. An extremely sparse cover of short grasses is present in open areas in the thicket. Tall grasses and other herbs grow about the bases of the spreading thorny plants, where they apparently are protected from grazing.

This is one of the most interesting associations of the region because of the diverse ecological types represented among the mammals. The golden harvest mouse (*Reithrodontomys fulvescens*), a brush-inhabiting species, is the only one apparently confined to the association. The other species all occur in one or more of the other associations of the area.

STREAM-BED ASSOCIATION

	Records
<i>Pipistrellus hesperus maximus</i>	Numerous
<i>Lasiurus cinereus</i>	8
<i>Tadarida mexicana</i>	5
<i>Procyon lotor fuscipes</i>	2
<i>Mephitis mephitis varians</i>	1
<i>Thomomys bottae limpiae</i>	4

This association is represented in the bed of the lower part of Limpia Creek. Here the creek bed widens, has several channels, and occupies much of the canyon floor. The soil varies from coarse to fine sands, derived from the igneous mountain mass, with occasional gravels and boulders interspersed. Although the stream flows only during the rare times of heavy rainfall, there are occasional shallow water holes. In much of the stream bed, except in the main channels, which are characteristically of barren sand, there is a sparse cover of low herbs. *Baccharis* occasionally forms fairly dense growths (Pl. III, Fig. 1).

The pocket gopher (*Thomomys bottae*), the most characteristic mammal of this association, is restricted to the sandy soil. In the Roughland life belt it is replaced by another species (*T. umbrinus*). Most of the mammals recorded probably have their homes elsewhere and enter the association only in search of food or water or in other normal movements. The bats are attracted to water holes to secure either food or water, or both; they also feed over other parts of the association. The raccoon (*Procyon lotor*) and plains skunk (*Mephitis mephitis*) apparently enter the association from their homes near by.

COTTONWOOD ASSOCIATION

	Records
<i>Pipistrellus hesperus maximus</i>	Numerous
<i>Lasiurus cinereus</i>	1
<i>Tadarida mexicana</i>	5
<i>Peromyscus leucopus tornillo</i>	7
<i>Sylvilagus audubonii neomexicanus</i>	2

Many of the small, intermittent streams at the lower elevations in the region are bordered in part by groves of cottonwood (*Populus* sp.). In Limpia Canyon, cottonwoods extend to an altitude of about 4800 feet. Some of the individual trees are large, having trunks several feet in diameter.

The mammals recorded from this association, except for the desert cottontail, are more or less closely associated with the cottonwoods. The

wood mouse is a semiarbooreal form that is concentrated in the cottonwood groves. The bats spend a great deal of their feeding time flying about the tops of the trees. Of the three species of bats, the pipistrelle, more than the others, seems to confine its feeding to the vicinity of the cottonwoods.

RIPARIAN-MEADOW ASSOCIATION

	Records
<i>Reithrodontomys megalotis megalotis</i>	3
<i>Sigmodon hispidus berlandieri</i>	8

In Limpia Canyon, about one mile north of Fort Davis, there is a limited area of heavy cover formed by tall grasses and various woody and herbaceous plants. In some places the tall grasses are in almost pure stands. A cotton rat, found to be abundant here, and a harvest mouse, widely distributed in other associations of both life belts, were the only two species of mammals recorded.

ROUGHLAND LIFE BELT

The Roughland life belt includes all of the Davis Mountains above approximately 5000 feet, except the broad valleys occupied by the short-grass association of the Plains life belt. Seven ecological associations are recognized. Of these, the oak-juniper, pinyon-juniper, grama-bluestem, and catclaw associations are the more extensive. More limited in area are the stream-bed, riparian-oak, and yellow-pine-juniper associations.

Twenty-three (42 per cent) of the fifty-five species of mammals recorded from the Davis Mountain region are, so far as known, restricted there to the Roughland life belt. Because this belt is surrounded by the Plains life belt, species found there are more or less isolated from other populations of the same species that are present on other similar mountain ranges in the northern part of the Chihuahuan biotic province. The twenty-three species restricted to the Roughland life belt in the Davis Mountain region are:

<i>Myotis volans</i>	<i>Lynx rufus</i>
<i>Eptesicus fuscus</i>	<i>Citellus variegatus</i>
<i>Antrozous pallidus</i>	<i>Thomomys umbrinus</i>
<i>Ursus americanus</i>	<i>Perognathus collis</i>
<i>Ursus texensis</i>	<i>Peromyscus boylii</i>
<i>Bassariscus astutus</i>	<i>Peromyscus pectoralis</i>
<i>Spilogale leucoparia</i>	<i>Sigmodon ochrognathus</i>
<i>Spilogale gracilis</i>	<i>Neotoma mexicana</i>
<i>Mephitis macroura</i>	<i>Erethizon epixanthum</i>
<i>Conepatus mesoleucus</i>	<i>Sylvilagus robustus</i>
<i>Urocyon cinereoargenteus</i>	<i>Odocoileus hemionus</i>
<i>Felis concolor</i>	

This life belt includes the pinyon-juniper and yellow-pine-Douglas-fir divisions of Shantz and Zon (1924). The extent of the yellow-pine forest is much less than their map would seem to indicate, and Douglas fir is not known from the Davis Mountains. This belt includes the Upper Sonoran, Transition, and Canadian life zones of Bailey (1905), and is part of the Pinus-Juniperus formation of Clements (1920: 193).

OAK-JUNIPER ASSOCIATION

	Records
<i>Pipistrellus hesperus maximus</i>	1
<i>Ursus americanus amblyceps</i>	Reported
<i>Bassariscus astutus flavus</i>	1
<i>Felis concolor stanleyana</i>	Reported
<i>Lynx rufus baileyi</i>	Reported
<i>Citellus variegatus couchii</i>	2
<i>Peromyscus boylii attwateri</i>	7
<i>Peromyscus pectoralis laceianus</i>	1
<i>Neotoma mexicana mexicana</i>	9
<i>Sylvilagus robustus</i>	1
<i>Sylvilagus audubonii neomexicanus</i>	1
<i>Odocoileus hemionus canus</i>	Sight records

The rather extensive forests on the mountain slopes may be separated into three associations, which are differentiated on the basis of differences in their respective plant dominants. An oak (*Quercus grisea*) is the most important dominant between elevations of approximately 5000 and 6000 feet. Here the juniper (*Juniperus monosperma*) is a conspicuous associate. Above the 6000-foot contour this association in many places grades into one in which the oak is replaced as the principal dominant by the pinyon (*Pinus edulis*), but the juniper remains as an important dominant. In other places, where the oak-juniper association extends above 6000 feet, areas may be occupied by either association, although as a general rule the oak-juniper association occurs on the south slopes and the pinyon-juniper on the north slopes. Wherever either association occurs the characteristic dominant of the other generally is present. In many places the oak and pinyon are approximately equal in abundance. The third forest association of the Roughland life belt occurs on north slopes above 6000 feet and is characterized by the dominance of the western yellow pine (*Pinus brachyptera*).

The species of mammals are, for the most part, the same in the three associations. The only species recorded from the oak-juniper association that probably do not occur in the other two are the desert cottontail and

the encinal mouse (*Peromyscus pectoralis*). The mammals of the oak-juniper association are either wide-ranging species that occur in many associations or saxicolous forms that are associated with the abundant rock outcrops. In this latter group are the ring-tailed cat (*Bassariscus astutus*), rock squirrel (*Citellus variegatus*), brush mouse (*Peromyscus boylii*), encinal mouse, and Mexican woodrat (*Neotoma mexicana*). Those parts of the association lacking rocks are sparsely populated by mammals.

The oak-juniper association corresponds in general to the *Quercus-Juniperus* plant association of Clements (1920: 200).

PINYON-JUNIPER ASSOCIATION

	Records
<i>Pipistrellus hesperus maximus</i>	2
<i>Ursus americanus amblyceps</i>	Reported
<i>Spilogale gracilis arizonae</i>	1
<i>Felis concolor stanleyana</i>	Reported
<i>Lynx rufus baileyi</i>	Reported
<i>Reithrodontomys megalotis megalotis</i>	1
<i>Peromyscus boylii attwateri</i>	12
<i>Neotoma mexicana mexicana</i>	2
<i>Lepus californicus texianus</i>	1
<i>Odocoileus hemionus canus</i>	3

This association usually is found on north-facing slopes and bluffs above an altitude of about 6000 feet and is characterized by the presence of the pinyon (*Pinus edulis*) as the most important dominant. The juniper (*Juniperus monosperma*) and oak (*Quercus grisea*) generally are present. On the bluffs, rocks are an important part of the environment, but on the slopes they may be scarce or lacking (Pl. III, Fig. 2).

The only species of mammals recorded from the pinyon-juniper association but not from the oak-juniper association are: spotted skunk (*Spilogale gracilis*), harvest mouse (*Reithrodontomys megalotis*), and jack-rabbit (*Lepus californicus*). It is quite possible that they occur in both associations.

This association corresponds generally to the *Pinus-Juniperus* plant association of Clements (1920: 197).

YELLOW-PINE-JUNIPER ASSOCIATION

	Records
<i>Ursus americanus amblyceps</i>	Reported
<i>Felis concolor stanleyana</i>	Reported
<i>Lynx rufus baileyi</i>	Reported
<i>Peromyscus boylii attwateri</i>	4
<i>Sylvilagus robustus</i>	1
<i>Odocoileus hemionus canus</i>	1

This association is characterized by the presence of the western yellow pine (*Pinus brachyptera*) as an important dominant. In some places the yellow pine is in nearly pure stands, in others it is mixed with the juniper (*Juniperus monosperma*), pinyon (*Pinus edulis*), and oak (*Quercus grisea*). This association usually is on north-facing slopes and in protected ravines above the 6000-foot contour.

No species of mammals were taken here that were not found also in the oak-juniper and pinyon-juniper associations. The small list of species recorded results from the less extensive collecting here than in either the oak-juniper or the pinyon-juniper association.

This association corresponds to the Pinus-Pseudotsuga plant association of Clements (1920: 207).

CATCLAW ASSOCIATION

	Records
<i>Ursus americanus amblyceps</i>	Reported
<i>Urocyon cinereoargenteus scottii</i>	1
<i>Citellus variegatus couchii</i>	2
<i>Perognathus collis collis</i>	3
<i>Peromyscus leucopus tornillo</i>	1
<i>Peromyscus boylii attwateri</i>	2
<i>Sigmodon ochrognathus</i>	1
<i>Sylvilagus robustus</i>	4
<i>Sylvilagus audubonii neomexicanus</i>	5

The catclaw association is present on hillsides and on steep, rocky canyon walls in various places at the lower elevations in the Davis Mountains. It was observed from as low as 4800 feet, on the walls of Limpia Canyon, up to an altitude of 5500 feet. The amount of rock varies from an abundance on the canyon walls to almost none on some of the hillsides. The most abundant of the various thorny shrubs that occur in this association is the catclaw (*Acacia* sp.). In some places the thorny shrubs form dense thickets, in others they are widely spaced. Clumps of coarse grasses are scattered throughout the area. The catclaw association apparently corresponds to the plant community described by Carter and Cory (1932: 29) as "roughland-grassland with large amounts of associated shrubs" (Pl. II, Fig. 2).

According to reports by local residents, the black bear, although it probably ranges over a great many associations, prefers extensive catclaw thickets. The gray fox (*Urocyon cinereoargenteus*) and the desert cotton-tail are wide-ranging species that occur in many associations. The rock squirrel (*Citellus variegatus*) and brush mouse (*Peromyscus boylii*) prefer rock masses here as in other associations. The cotton rat (*Sigmodon*

ochrognathus) and wood mouse were rare. The mountain cottontail (*Sylvilagus robustus*) was most often encountered here and the upland pocket mouse (*Perognathus collis*) was found only in this association.

GRAMA-BLUESTEM ASSOCIATION

	Records
<i>Citellus variegatus couchii</i>	1
<i>Perognathus merriami gilvus</i>	4
<i>Onychomys torridus torridus</i>	1
<i>Reithrodontomys megalotis megalotis</i>	5
<i>Peromyscus eremicus eremicus</i>	1
<i>Peromyscus boylii attwateri</i>	3
<i>Peromyscus pectoralis laceianus</i>	4
<i>Sigmodon ochrognathus</i>	7
<i>Lepus californicus texianus</i>	Sight record
<i>Sylvilagus robustus</i>	Sight record

This association occupies many of the rough, stony slopes in the lower parts of the Davis Mountains and, on south slopes, extends up to an altitude of at least 6500 feet. It is characterized by a much heavier cover of grasses than that present in the short-grass association of the Plains life belt. The principal grasses, according to Carter and Cory (1932: 30), are several species of grama grasses (*Bouteloua hirsuta*, *B. gracilis*, *B. curtispindula*, *B. eriopoda*, and *B. chondrosiodes*), needle grasses (*Aristida* sp.), blue-stems (*Andropogon* sp.), and such coarse grasses as *Elyoncrus barbiculmis*, *Epicampes berlandieri*, *E. emersleyi*, and *Heteropogon contortus*. In some places oaks (apparently *Quercus grisea*), junipers (*Juniperus monosperma*), and pinyons (*Pinus edulis*) are scattered sparsely through it (Pl. II, Fig. 1).

This association apparently corresponds to the "Roughland-grassland of relatively thick cover of grasses," of Carter and Cory (1932: 30).

The mammals are particularly interesting because of the ecological types represented. The pocket mouse (*Perognathus merriami*), grasshopper mouse (*Onychomys torridus*), harvest mouse (*Reithrodontomys megalotis*), and jackrabbit are grassland species that are widely distributed in the associations of the Plains life belt. The others, with the exception of the cactus mouse (*Peromyscus eremicus*), are confined to the Roughland life belt. The cotton rat (*Sigmodon ochrognathus*) and mountain cottontail are characteristic inhabitants of brushy and heavily grassed situations, whereas the rock squirrel, brush mouse (*Peromyscus boylii*), and encinal mouse (*Peromyscus pectoralis*) occur on rock masses in various associations.

STREAM-BED ASSOCIATION

	Records
<i>Pipistrellus hesperus maximus</i>	1
<i>Procyon lotor fuscipes</i>	Tracks
<i>Spilogale leucoparia</i>	1
<i>Mephitis mephitis varians</i>	1
<i>Citellus variegatus couchii</i>	1
<i>Thomomys umbrinus texensis</i>	3

In general aspect, the stream-bed association in the Roughland life belt does not differ materially from the same association of the Plains life belt. The stream channel is narrower and less braided, and there is a greater abundance of boulders. The plant cover is essentially the same, *Baccharis* being the most conspicuous plant.

Here, as in the Plains life belt, a pocket gopher, but of a different species, is the only mammal actually making its home within the limits of the association. The rock squirrel occurs occasionally where there are boulders present. The other species recorded apparently range through the association in search of food and water.

RIPARIAN-OAK ASSOCIATION

	Records
<i>Myotis volans interior</i>	1
<i>Pipistrellus hesperus maximus</i>	1
<i>Lasiurus cinereus</i>	1
<i>Antrozous pallidus pallidus</i>	1
<i>Mephitis macroura milleri</i>	1
<i>Conepatus mesoleucus mearnsi</i>	1
<i>Citellus variegatus couchii</i>	1
<i>Thomomys umbrinus texensis</i>	3
<i>Reithrodontomys megalotis megalotis</i>	3
<i>Peromyscus leucopus tornillo</i>	2
<i>Sigmodon ochrognathus</i>	6
<i>Lepus californicus texianus</i>	1
<i>Odocoileus hemionus canus</i>	Sight records

In relatively narrow canyons above 5500 feet, the level canyon floor bordering the stream bed is occupied often by an open stand of oak, apparently *Quercus grisea* (Cottle, 1932: 127). A sparse cover of short grasses alternates with the stands of oaks. The soil is heavy in most places, but varies to sandy in a few others. The surface is mostly free from stones.

Probably none of the species recorded from this association is confined to it, although the brown bat (*Myotis volans*) and pallid bat (*Antrozous*

pallidus) were obtained nowhere else in the region. The skunk (*Mephitis macroura*), hog-nosed skunk (*Conepatus mesoleucus*), and mule deer (*Odocoileus hemionus*) are wide-ranging species that undoubtedly wander over many associations. The rock squirrel only occasionally enters it. The pocket gopher (*Thomomys umbrinus*) occurs in this association where there is sandy soil, and, as well, is found in the near-by stream-bed association. The wood mouse (*Peromyscus leucopus*) appears here probably because of the presence of trees. The harvest mouse (*Reithrodontomys megalotis*) and cotton rat (*Sigmodon ochrognathus*) were found only where piles of oak brush formed suitable cover for them. The jackrabbit, a typical grassland species, was only rarely encountered.

ANNOTATED LIST OF MAMMALS

All of the original information available about the mammals of the Davis Mountain region is included here. Literature records are included where they augment the original information available and in the few instances where previously reported species were not secured. The taxonomic arrangement of the mammals follows Miller (1924) except for subsequent changes in the nomenclature of a few forms. The localities are in Jeff Davis County, Texas, unless otherwise indicated.

Myotis volans interior Miller

Brown Bat

An adult female was shot over a water hole in upper Limpia Canyon about five miles east of Mount Livermore. This is, as far as I know, the first record of this bat from Texas. Miller and Allen (1928: 144) recorded it from near-by parts of New Mexico and Chihuahua.

Pipistrellus hesperus maximus Hatfield²

Canyon Bat

This was the most commonly encountered bat in the Davis Mountain region. Fourteen were collected in Limpia Canyon about one mile north of Fort Davis, at an altitude of about 4800 feet. Two were shot about two miles and one about three miles northwest of Fort Davis. One was shot over a water hole in upper Limpia Canyon five miles east of Mount Livermore, at an altitude of about 5500 feet.

The canyon bats did not begin flying until late in the evening, and not many of them were out until it was too dark for accurate shooting. They did most of their feeding about the foliage of the cottonwoods and oaks, and generally crossed unforested areas only in moving from one feeding place to another.

² Hatfield (1936).

At 11:00 A.M. on May 8, about one mile west of Mount Locke, Van Tyne discovered two bats beneath a slab of rock approximately eighteen inches in diameter and five inches thick. The one collected proved to be a canyon bat. One of the bats took flight when Van Tyne was about ten feet from the rock, but the other did not fly until the stone was moved.

Eptesicus fuscus pallidus Young

Big Brown Bat

The big brown bat was reported by Bailey (1905: 211) from an altitude of 5700 feet in the Davis Mountains.

Lasiurus cinereus (Beauvois)

Hoary Bat

Ten adult females of this species were collected from April 1 to 26 at the following localities: one mile north (altitude about 4800 feet) and two miles northwest of Fort Davis; five miles east of Mount Livermore (altitude 5500 feet). No males were taken. Most of those obtained were flying several minutes before dusk. One was taken by means of a wire stretched over a water hole, by the method described by Borell (1937: 478). No hoary bats were seen after April 26; it is probable that they migrated northward soon after that date.

The hoary bat was found to be slow and lumbering in its flight and was much more easily shot than the other species of bats encountered. However, the vitality of the species is remarkable. A wounded animal invariably attempted to bite when handled, and all of the hoary bats obtained had to be dispatched finally by ether.

The one previous record of this species from the Davis Mountains, an adult male, was taken "at 5700 feet altitude, in a gulch northeast of Mount Livermore" (Bailey, 1905: 213).

Antrozous pallidus pallidus (LeConte)

Pallid Bat

One specimen of this bat was shot April 26, over a water hole in upper Limpia Canyon about five miles east of Mount Livermore. Three specimens in the Museum of Zoology collection are labeled Fort Davis. The species has been recorded from various other localities in southwestern Texas by Bailey (1905: 214).

Tadarida mexicana (Saussure)

Freetail Bat

Ten specimens were collected by Sperry and me over the stream-bed and cottonwood associations in Limpia Canyon about one mile north of

Fort Davis, 4800 feet altitude, and one specimen two miles northwest of Fort Davis.

Bailey (1905: 215) reported that "a few were shot in the canyons of the Davis Mountains July 10, and their unmistakable odor was noticeable among the old adobe walls at Fort Davis."

Ursus americanus amblyceps Baird

Black Bear

The skull of an immature male that was taken with dogs was obtained in December, 1935, by Jim Espy, about fifteen miles north of Fort Davis. The species is said to be encountered occasionally in the region. A skull in the collection of the Museum of Zoology is from Fort Davis.

Bailey (1905: 187) found the black bear to be rather common in the Davis Mountains in 1901 and 1902, particularly on the slopes of Mount Livermore.

Ursus texensis texensis Merriam

Texas Grizzly

The only record of the grizzly bear from Texas is one recorded by Bailey (1905: 192) from "near the head of Limpia Creek," in the Davis Mountains, in 1890. The animal was later described by Merriam (1914: 191) as *Ursus texensis*.

Procyon lotor fuscipes Mearns

Raccoon

An adult raccoon was found dead on the highway about one mile north of Fort Davis. An adult male was shot on the rainy night of May 6, near Limpia Creek, five miles north of Fort Davis, 4700 feet altitude. The species was reported to be fairly common in canyons having pools of water here and there. Raccoon tracks were seen about a water hole in upper Limpia Canyon about five miles east of Mount Livermore, at an altitude of 5500 feet.

Bassariscus astutus flavus Rhoads

Ring-tailed Cat

An adult female was trapped at the base of a rock bluff in the oak-juniper association on the north side of Limpia Canyon about two miles northwest of Fort Davis, at an altitude of 4800 feet. This species is reported to be fairly common in the Davis Mountains, where it is nearly always associated with rocky canyon walls. Ross Graves, a trapper, caught two ring-tailed cats during the season of 1936-37.

Spilogale leucoparia Merriam

Texas Spotted Skunk

An adult male was trapped in upper Limpia Canyon about five miles east of Mount Livermore, at an altitude of 5500 feet. The stream bed in which the specimen was taken was bordered on one side by the catclaw association and on the other by the riparian-oak association.

This specimen differs markedly from the specimen referred to *Spilogale gracilis arizonae*. It is smaller in most measurements (total length, 410 mm. as compared with 427 mm. in a specimen of *arizonae*; foot length, 42.7 mm. as compared with 46.1 mm.; and basilar length of Hensel, 48.6 mm. as compared with 48.9 mm.), but the zygomatic breadth exceeds that of *arizonae* by 2 mm., the mastoid breadth by 1.4 mm., the breadth of the skull behind the postorbital process by 1.7 mm., and the length of the upper carnassial by 0.4 mm. The specimen lacks the prominent white spot at the base of the tail (present in *arizonae*) and has much smaller white lateral rump patches than are present in *arizonae*.

Spilogale gracilis arizonae Mearns

Desert Spotted Skunk

An adult male was trapped in the pinyon-juniper association on the steep, rocky, south wall of upper Limpia Canyon about five miles east of Mount Livermore, at an altitude of 5600 feet.

This specimen fits perfectly into a series of *S. g. arizonae* from Tucson, Arizona and, therefore, has been referred to that subspecies.

Mephitis mephitis varians Gray

Plains Skunk

An adult male was trapped by Sperry under the roots of a cottonwood, overhanging a cut bank in Limpia Canyon, about one mile north of Fort Davis, and an adult female was taken at a water hole in upper Limpia Canyon about five miles east of Mount Livermore, at an altitude of about 5500 feet. Both were in stream-bed associations, and both were lean. There were frequent reports that skunks were found dead in the region.

The plains skunk, which ranges northward over the Staked Plains, was reported from the Davis Mountains by Bailey (1905: 202).

Mephitis macroura milleri Mearns

Southwestern Skunk

The only specimen of this species obtained was an adult male that was shot at midday in the riparian-oak association in a canyon about three miles north of Mount Livermore. Like the specimens of the plains skunk, it was extremely lean.

Conepatus mesoleucus mearnsi Merriam

Hog-nosed Skunk

A hog-nosed skunk was found dead by Pope and Van Tyne in the riparian-oak association, upper Limpia Canyon, about five miles east of Mount Livermore, at an altitude of about 5500 feet. This was reported by Bailey (1905: 202) to be the commonest skunk in the Davis Mountains.

Taxidea taxus berlandieri Baird

Badger

The skulls of two badgers that had been trapped during the spring of 1937 by Ross Graves were obtained. They were taken in the short-grass-yucca association about seven miles northeast of Marfa, Presidio County. The badger is widely distributed in the grasslands of western Texas (Bailey, 1905: 184).

Urocyon cinereoargenteus scottii Mearns

Desert Gray Fox

The partial skeleton of an adult male was picked up among the rocks on the north wall of Limpia Canyon about two miles northwest of Fort Davis at an altitude of 4800 feet.

Canis latrans subsp.

Coyote

The coyote was surprisingly scarce in the Davis Mountains, the only specimens obtained being the skulls and skeletons of those trapped by Ross Graves. These include one trapped fourteen miles southwest, two six miles south, and one sixteen miles south of Fort Davis.

Felis concolor stanleyana Goldman³

Mountain Lion

The mountain lion of the Davis Mountain region has been referred to this race by Goldman (1936: 137; 1938: 63). The mountain lion is said to be found occasionally in the region. The Fisher brothers said that they had killed several of them. Lions are persecuted here more because of their deer-killing than because of the damage that they do to domestic stock. When we were in the mountains, the Fisher brothers were attempting to locate a lion that supposedly had killed several deer during the winter. An immature skull in the collection of the Museum of Zoology is labeled "Fort Davis Mountain."

³ Goldman (1936, 1938).

Lynx rufus baileyi Merriam

Plateau Bobcat

We obtained the skulls of three adults trapped in December, 1936, and January, 1937, by Ross Graves about fifteen miles north of Fort Davis. The bobcat was reported to be common in the region. The Fisher brothers informed us that they often caught them with the aid of dogs.

Bailey (1905: 170) recorded the species from the Davis Mountains, and said that, "Canyons, gulches, and cliffs are its favorite haunts."

Citellus variegatus couchii (Baird)

Rock Squirrel

The rock squirrel was one of the most conspicuous small mammals in the region. Specimens were collected in all but the pinyon-juniper and yellow-pine-juniper associations of the Roughland life belt. They were taken at the following localities: one to three miles northwest and one mile north of Fort Davis, at an altitude of about 4800 feet; south slope of Mount Locke, at an altitude of about 6000 feet; five miles east of Mount Livermore, at an altitude of about 5500 feet; one mile north of Mount Livermore, at an altitude of about 6500 feet; and seven miles northeast of Mount Livermore. The principal requirement for the presence of this species is the presence of rocks.

The rock squirrel of the Davis Mountain region was assigned to the race *grammurus* by Howell (1938: 142). The series available to me indicates closer affinities with typical *couchii*.

Citellus mexicanus parvidens (Mearns)

Mexican Spermophile

This species was abundant in the mesquite-cholla association in Limpia Canyon about fifteen miles northeast of Fort Davis at an altitude of about 4300 feet, where four specimens were obtained. Another was trapped in the short-grass-mesquite association, 4300 feet altitude, in lower Limpia Canyon about sixteen miles northeast of Fort Davis. This species, according to Bailey (1905: 86), is widely distributed in western Texas, but only one specimen, from Alpine, Brewster County, previously has been recorded from the Davis Mountain region (Howell, 1938: 121).

Citellus pilosoma marginatus (Bailey)

Plains Spermophile

One was collected in the short-grass association two miles south of Fort Davis, and two on the old Fort grounds at Fort Davis. One had a burrow in the edge of a shallow ditch, and the other had one beneath a thorny shrub. Sperry collected two specimens at Fort Davis.

This race was considered by Howell (1938: 127) to be synonymous with *C. s. major* of the Staked Plains. The specimens examined by me, from the Davis Mountains, differ considerably in color from typical *C. s. major*, therefore, it is my belief that the race *C. s. marginatus* should be recognized as distinct from *C. s. major*.

Cynomys ludovicianus arizonensis Mearns

Prairie Dog

An adult male was collected by Sperry in the short-grass association ten miles southwest of Fort Davis. The species is rare in the Davis Mountain region because of a recent poisoning campaign. The site of a former colony was seen in the short-grass association two miles west of Mount Locke at an altitude of about 6000 feet.

Bailey (1905: 89) recorded the prairie dog from an altitude of "5800 feet in an open valley on Limpia Creek at a point where the first yellow pines appear."

Thomomys bottae limpiaae Blair⁴

Limpia Pocket Gopher

Two specimens were trapped about one mile northwest and two about two miles northwest of Fort Davis, Limpia Canyon, at an altitude of 4800 feet. All were in the stream-bed association.

Thomomys umbrinus texensis Bailey⁵

Davis Mountain Pocket Gopher

Three topotypes were collected in the riparian-oak association in upper Limpia Canyon about five miles east of Mount Livermore, at an altitude of 5500 feet. Two adult females and an adult male were trapped in the stream-bed association about two miles north of Mount Livermore, at an altitude of 6000 feet.

Cratogeomys castanops lacrimalis Nelson and Goldman⁶

Plateau Pocket Gopher

Six specimens of this species were collected by me and three by Sperry in the short-grass association in Limpia Canyon about one mile north of Fort Davis, at an altitude of about 4800 feet, and two in the same association about five miles east of Mount Livermore. Mounds of this species were seen in the same association about six miles northwest of Fort Davis, and in the short-grass-yucca association seven miles northeast of Marfa, Presidio

⁴ Blair (1939).

⁵ For present taxonomic arrangement see Blair (1939).

⁶ Nelson and Goldman (1934).

County. Sperry collected three in the short-grass-yucca association about twelve miles southwest of Fort Davis.

Perognathus merriami gilvus Osgood

Merriam Pocket Mouse

This species was collected at the following localities: about seven miles northeast of Marfa, Presidio County, at an altitude of about 4900 feet; lower Limpia Canyon, fifteen and sixteen miles northeast of Fort Davis, at an altitude of about 4300 feet; and on the south slope of Mount Locke, at an altitude of 6000 feet. It was found in the short-grass-yucca, short-grass-mesquite, mesquite-cholla, and grama-bluestem associations. This is probably the most habitat-tolerant species of pocket mouse in the region. It ranges from the short-grass-mesquite association, at an altitude of 4300 feet in the Plains life belt to the grama-bluestem association, at an altitude of 6000 feet, in the Roughland life belt.

Perognathus flavus flavus Baird

Silky Pocket Mouse

Three adult males were trapped in the short-grass-yucca association about seven miles northeast of Marfa, Presidio County, at an altitude of about 4900 feet.

Perognathus hispidus paradoxus Merriam

Plains Pocket Mouse

Two were trapped in the mesquite-cholla association in lower Limpia Canyon about fifteen miles northeast of Fort Davis, at an altitude of 4300 feet, and one in the short-grass-mesquite association about sixteen miles northeast of Fort Davis, at an altitude of 4300 feet.

Perognathus penicillatus eremicus Mearns

Desert Pocket Mouse

The desert pocket mouse was reported from Toyahvale by Bailey (1905: 138). None was collected by myself.

Perognathus collis collis Blair⁷

Upland Pocket Mouse

Two were taken by me and one by Sperry in the catclaw association on the rocky, south wall of Limpia Canyon about one mile north of Fort Davis at an altitude of about 4800 feet.

⁷ Blair (1938).

Dipodomys spectabilis baileyi Goldman

Banner-tailed Kangaroo Rat

One specimen was collected four miles southwest of Fort Davis, at an altitude of about 5000 feet, and five, about seven miles northeast of Marfa, Presidio County, in short-grass-yucca associations. Eleven were collected by Sperry from twelve to fourteen miles southwest of Fort Davis.

Dipodomys merriami ambiguus Merriam

Four-toed Kangaroo Rat

Three adult males were collected in the short-grass-yucca association about seven miles northeast of Marfa, Presidio County, at an altitude of 4900 feet; one in the short-grass-mesquite association in lower Limpia Canyon about sixteen miles northeast of Fort Davis, at an altitude of about 4300 feet; one in the mesquite-cholla association in lower Limpia Canyon about fifteen miles northeast of Fort Davis, at an altitude of 4300 feet; and one by Sperry twelve miles southwest of Fort Davis.

Dipodomys ordii ordii Woodhouse

Five-toed Kangaroo Rat

One was trapped in the short-grass-yucca association about seven miles northeast of Marfa, Presidio County, at an altitude of 4900 feet. Five specimens were obtained by Sperry from twelve to fourteen miles southwest of Fort Davis.

Onychomys torridus torridus (Coues)

Grasshopper Mouse

Four specimens were taken in a badly overgrazed situation about six miles northwest and another about two miles northeast of Fort Davis. One was trapped on the south slope of Mount Locke, at an altitude of about 6000 feet; five, seven miles northeast of Marfa, Presidio County, at an altitude of about 4900 feet; four in lower Limpia Canyon about sixteen miles northeast of Fort Davis, at an altitude of 4300 feet; and one in lower Limpia Canyon about fifteen miles northeast of Fort Davis, at an altitude of 4300 feet. A female was collected by Sperry about fifteen miles south of Fort Davis. These mice were found in the short-grass, grama-bluestem, short-grass-yucca, short-grass-mesquite, and mesquite-cholla associations.

Reithrodontomys montanus griseus Bailey

Gray Harvest Mouse

An adult male, the only specimen taken in the Davis Mountains, was trapped in the short-grass association about six miles northwest of Fort

Davis at an altitude of 5200 feet. This is the first record of the species from Trans-Pecos Texas.

Reithrodontomys megalotis megalotis (Baird)

Harvest Mouse

Six specimens were obtained about two miles northwest of Fort Davis, at an altitude of 5000 feet; one on the south slope of Mount Locke, at an altitude of 6000 feet; four in Limpia Canyon about one mile north of Fort Davis, altitude, 4700 feet; six in upper Limpia Canyon about five miles east of Mount Livermore, altitude, 5800 feet; one about one mile west of Mount Locke, at an altitude of 6100 feet; and three about seven miles northeast of Marfa, Presidio County, at an altitude of about 4900 feet. In the riparian-oak association, these harvest mice were numerous in piles of brush left after the cutting of the oak (*Quercus grisea*). Here they were associated with the mountain cotton rat (*Sigmodon ochrognathus*).

This harvest mouse is the most widely distributed mammal in the Davis Mountain region. It was found in the short-grass, short-grass-yucca, and riparian-meadow associations of the Plains life belt, and in the grama-bluestem, riparian-oak, and pinyon-juniper associations of the Roughland life belt. The species previously was known from the Davis Mountains by one specimen collected two miles north of Alpine (Bailey, 1905: 106).

Reithrodontomys fulvescens fulvescens Allen

Golden Harvest Mouse

Three specimens, an adult female, a young adult female, and an adult male, were trapped in the mesquite-cholla association in lower Limpia Canyon about fifteen miles northeast of Fort Davis, at an altitude of 4300 feet.

Peromyscus eremicus eremicus (Baird)

Cactus Mouse

One specimen was taken in the grama-bluestem association about one mile north of Mount Livermore, at an altitude of about 6500 feet; one in the short-grass-mesquite association in lower Limpia Canyon about sixteen miles northeast of Fort Davis, at an altitude of 4300 feet; and two in the mesquite-cholla association in lower Limpia Canyon about fifteen miles northeast of Fort Davis, at an altitude of 4300 feet.

Peromyscus maniculatus blandus Osgood

Deer Mouse

Mice of this species were taken at the following localities: four miles southwest of Fort Davis; six miles northwest of Fort Davis, at an altitude

of 5200 feet; one mile west of Mount Locke, at an altitude of 6100 feet; seven miles northeast of Marfa, Presidio County; and lower Limpia Canyon, fifteen to sixteen miles northeast of Fort Davis, at an altitude of 4300 feet. Sperry collected three specimens twelve miles southwest, and another ten miles south of Fort Davis. They were found in the short-grass-yucca, short-grass, short-grass-mesquite, and mesquite-cholla associations.

Peromyscus leucopus tornillo Mearns

Wood Mouse

Two wood mice were trapped by me and five by Sperry in the cottonwood association, Limpia Canyon, one mile north of Fort Davis, at an altitude of 4700 feet. Two were taken in the riparian-oak and one in the catclaw association, upper Limpia Canyon, about five miles east of Mount Livermore, at an altitude of 5500 feet; two in the short-grass-mesquite and one in the mesquite-cholla association in lower Limpia Canyon, fifteen to sixteen miles northeast of Fort Davis, at an altitude of about 4300 feet.

Peromyscus boylii attwateri Allen

Brush Mouse

Specimens were taken at the following localities: six in Limpia Canyon about one mile northwest of Fort Davis, at an altitude of 4800 feet; nine in upper Limpia Canyon about five miles east of Mount Livermore, at altitudes of 5500–5900 feet; five on the north, west, and south slopes of Mount Locke, at altitudes of 6000–6500 feet; and four about one mile north of Mount Livermore, at an altitude of 6500 feet. Associations in which this species was found, all within the Roughland life belt, are: oak-juniper, pinyon-juniper, yellow-pine-juniper, catclaw, and grama-bluestem. Like the encinal mouse (*P. p. laceianus*), this is a saxicolous form, and it occurs in rocky situations in the above associations.

Peromyscus pectoralis laceianus Bailey

Encinal Mouse

Two encinal mice were trapped in the grama-bluestem association, Limpia Canyon, about two miles northwest of Fort Davis, at an altitude of 5000 feet, and two in the same association on the south slope of Mount Locke, at an altitude of 6000 feet. One was taken in the oak-juniper association, Limpia Canyon, about one mile northwest of Fort Davis, at an altitude of 4900 feet.

Although this species and the brush mouse (*P. b. attwateri*), which closely resembles it, are found together in the Davis Mountains, the encinal mouse is usually in the grama-bluestem association, whereas the brush mouse is most abundant in the forest associations of the Roughland life belt.

Sigmodon hispidus berlandieri Baird

Hispid Cotton Rat

Seven specimens were collected by me and one by Sperry in the riparian-meadow association in Limpia Canyon about one mile north of Fort Davis, at an altitude of 4800 feet. One was collected in the mesquite-cholla association in lower Limpia Canyon about fifteen miles northeast of Fort Davis, at an altitude of 4300 feet.

Sigmodon ochrognathus Bailey

Mountain Cotton Rat

Six specimens were collected in piles of oak brush in the riparian-oak association, at an altitude of about 4800 feet, and one in catelaw association, at an altitude of 5500 feet, in upper Limpia Canyon about five miles east of Mount Livermore. A harvest mouse (*R. m. megalotis*) also was abundant in the piles of oak brush. Seven cotton rats were trapped in the grama-bluestem association on the south slope of Mount Locke, at an altitude of 6000 feet. This cotton rat is an inhabitant of the Roughland life belt only, and is replaced in the Plains life belt by *S. h. berlandieri*.

Neotoma micropus canescens Allen

Plains Wood Rat

One was trapped in the short-grass-yucca association about seven miles northeast of Marfa, Presidio County, at an altitude of about 4900 feet. The characteristic stick and trash nests of plains wood rats were found here at the bases of very thorny shrubs, from the trunks and lower branches of which the bark had been stripped. One was collected in the mesquite-cholla association in lower Limpia Canyon, about fifteen miles northeast, and thirteen in the short-grass-mesquite association, about sixteen miles northeast of Fort Davis, at an altitude of 4300 feet. In the latter place, their nests were abundant in low clumps of mesquite and one large stick nest was placed against a century plant.

Neotoma albigula robusta Blair^s

White-throated Wood Rat

An adult female was trapped at a rock slide beside the highway in Limpia Canyon about two miles northwest of Fort Davis, at an altitude of about 4800 feet, and an adult male was obtained in the short-grass-mesquite association in lower Limpia Canyon about sixteen miles northeast of Fort Davis, at an altitude of 4300 feet. Specimens in the collection of the Biological Survey are from Kent, Marfa, and Paisano.

^s Blair (1939).

Neotoma mexicana mexicana Baird

Mexican Wood Rat

One was trapped about one mile north and seven about one mile northwest of Fort Davis, Limpia Canyon, at an altitude of 4900 feet. The latter were in the oak-juniper association. All were caught near rock masses on steep canyon walls. A male was shot at 8:45 p.m. on April 15, on the perpendicular surface of a rock mass on the north wall of Limpia Canyon, about two miles northwest of Fort Davis. One was trapped about one mile north (altitude, 6500 feet) and one about five miles east (altitude, 5600 feet) of Mount Livermore, in the pinyon-juniper association.

Erethizon epixanthum subsp.

Porcupine

Several people in Fort Davis said that a porcupine had been caught near there in the autumn of 1936, and that it had been kept in Fort Davis for some time. Bailey (1905: 151) recorded the finding of porcupine signs in the Davis Mountains in 1901.

Lepus californicus texianus Waterhouse

Black-tailed Jackrabbit

The black-tailed jackrabbit was found to be fairly abundant in the short-grass-yucca association, where two adult males were shot seven miles northeast of Marfa, Presidio County. It frequently was encountered in the short-grass association, where specimens were taken two, five, and ten miles west, and eight miles northwest of Fort Davis, and about five miles east of Mount Livermore. The jackrabbit rarely was seen in the riparian-oak or pinyon-juniper associations. One was taken in the riparian-oak association in upper Limpia Canyon, five miles east of Mount Livermore, and one in the pinyon-juniper association one and one-half miles west of Mount Locke. One was seen in the grama-bluestem association on the south slope of Mount Locke, at an altitude of 6000 feet.

Sylvilagus robustus (Bailey)

Mountain Cottontail

Three specimens of this species, which also is known from the Chisos and Chinati Mountains, have been recorded previously from the Davis Mountains. One of these, the type, was taken at an altitude of 6000 feet. On the basis of the specimens and of his observations, Bailey (1905: 160) stated that the altitudinal range of the species was 6000–8000 feet.

The mountain cottontail was rather scarce in the Davis Mountains in the spring of 1937, and only six specimens were collected. One of these

was found dead in the yellow-pine-juniper association on the north slope of Mount Livermore, at an altitude of about 6800 feet. The animal apparently had been killed and partially consumed by a predator on the previous night. Its mouth contained a pinyon twig with needles. The other five specimens, all females, were taken one and two miles northwest of Fort Davis and in upper Limpia Canyon about five miles east of Mount Livermore, at altitudes ranging from 4800 to 5500 feet, and in oak-juniper and catclaw associations. One, taken early in the morning of May 11, was sitting on a flat rock when first seen, but when approached it hopped beneath a low juniper. One was killed just at dusk at the base of a large boulder, and two, detected by means of a flashlight, were shot after night-fall. On four occasions mountain cottontails were observed but not collected in the catclaw association. They were very wild and generally ran before one could approach within shotgun range. An immature skull in the collection of the Museum of Zoology, collected by Crystal Thompson on August 18, 1914, is labeled Fort Davis.

On only one occasion was a mountain cottontail encountered at midday. This animal was flushed from a form in the oak-juniper association on the south slope of Mount Locke, at an altitude of about 6000 feet.

The evidence seems to indicate that mountain cottontails occur in the Davis Mountains wherever there is good, brushy cover. There seems to be no reason to believe that altitude is a direct factor in the local distribution of the species.

Sylvilagus audubonii neomexicanus Nelson

Desert Cottontail

Nine specimens were collected by Sperry and me in the short-grass-yucca association about seven miles northeast of Marfa, Presidio County, at an altitude of about 4900 feet. In this situation, the cottontails often were found hiding in clumps of yucca and various desert shrubs. When frightened they usually took refuge in the abandoned holes of the banner-tailed kangaroo rat (*D. s. baileyi*). Other specimens were collected at localities one and seven miles north, fifteen miles northeast, one and two miles northwest, six miles west, and twelve and fourteen miles (C. C. Sperry collection) southwest of Fort Davis. Altitudes of occurrence ranged from 4300 to 5100 feet. The specimens were collected in the following associations: short-grass (one specimen), short-grass-yucca (one), mesquite-cholla (seven), cottonwood (two), catclaw (five), oak-juniper (one), and on rock slides (three).

The present taxonomic arrangement of the desert cottontails of Trans-Pecos Texas is unsatisfactory, but it seems best to refer all of the specimens of this species from the Davis Mountain region to the race *neomexicanus*.

The series of desert cottontails from the mesquite-cholla association in lower Limpia Canyon fits well into a series of *neomexicanus* from the Texas Panhandle. The series from the vicinity of Fort Davis and from the short-grass-yucca association, seven miles northeast of Marfa, Presidio County, average slightly smaller than the lower Limpia Canyon series, and apparently represent intergradation toward the race *minor*. The Marfa series is slightly paler in color than either the Fort Davis or lower Limpia Canyon series. There seems to be no justification for assigning any of the specimens from the Davis Mountain region to the race *cedrophilus* as did Nelson (1909: 230), since the largest and darkest specimens (lower Limpia Canyon series) are easily referable to *neomexicanus*.

Odocoileus hemionus canus Merriam

Mule Deer

The only specimens of the mule deer obtained in the region were skulls and antlers. The skull of a buck was picked up in Brown Canyon about three miles northwest of Mount Locke. An antler was found at the west base of Mount Locke, at an altitude of 6200 feet, and another about one mile west of Mount Locke. The skeleton of a doe was discovered in the grama-bluestem association on the south slope of Mount Locke, at an altitude of 6000 feet. Another skull of a buck and an antler were picked up by Pope in the yellow-pine-juniper association about five miles east of Mount Livermore. There is a skull of a buck in the collection of the Museum of Zoology labeled "Fort Davis." Deer often were seen in the pinyon-juniper, oak-juniper, and riparian-oak associations. They seemed to be holding their own in the Davis Mountains.

Antilocapra americana subsp.

Pronghorn

The pronghorn is fairly abundant in the grasslands of the Davis Mountain region, and individuals occasionally were seen in the short-grass and short-grass-yucca associations between Fort Davis and Marfa, Presidio County.

FAUNAL RELATIONSHIPS OF THE MAMMALS

Thirteen of the species of mammals known from the Davis Mountain region are wide-ranging species that occur in many biotic provinces of North America. The ranges of these species include the Great Plains and at least part of the biotic provinces to the east and west of the plains. These species are:

Eptesicus fuscus
Lasiurus cinereus

Canis latrans
Felis concolor

<i>Ursus americanus</i>	<i>Lynx rufus</i>
<i>Procyon lotor</i>	<i>Peromyscus maniculatus</i>
<i>Mephitis mephitis</i>	<i>Peromyscus leucopus</i>
<i>Taxidea taxus</i>	<i>Sigmodon hispidus</i>
<i>Urocyon cinereoargenteus</i>	

Twenty-four of the species range widely in the western and southwestern United States and occur in most of the biotic provinces in that region:

<i>Myotis volans</i>	<i>Dipodomys ordii</i>
<i>Pipistrellus hesperus</i>	<i>Onychomys torridus</i>
<i>Antrozous pallidus</i>	<i>Reithrodontomys megalotis</i>
<i>Tadarida mexicana</i>	<i>Reithrodontomys fulvescens</i>
<i>Ursus texensis</i>	<i>Peromyscus eremicus</i>
<i>Bassariscus astutus</i>	<i>Peromyscus boylii</i>
<i>Spilogale gracilis</i>	<i>Neotoma albigula</i>
<i>Citellus variegatus</i>	<i>Erethizon epixanthum</i>
<i>Thomomys bottae</i>	<i>Lepus californicus</i>
<i>Thomomys umbrinus</i>	<i>Sylvilagus audubonii</i>
<i>Perognathus penicillatus</i>	<i>Odocoileus hemionus</i>
<i>Dipodomys merriami</i>	<i>Antilocapra americana</i>

Six species of mammals recorded from the Davis Mountain region have affinities with the fauna of the Great Plains:

<i>Citellus spilosoma</i>	<i>Perognathus hispidus</i>
<i>Cynomys ludovicianus</i>	<i>Reithrodontomys montanus</i>
<i>Perognathus flavus</i>	<i>Neotoma micropus</i>

Eleven of the species have ranges that center in the Chihuahuan biotic province:

<i>Spilogale leucoparia</i>	<i>Dipodomys spectabilis</i>
<i>Mephitis macroura</i>	<i>Peromyscus pectoralis</i>
<i>Conepatus mesoleucus</i>	<i>Sigmodon ochrognathus</i>
<i>Citellus mexicanus</i>	<i>Neotoma mexicana</i>
<i>Cratogeomys castanops</i>	<i>Sylvilagus robustus</i>
<i>Perognathus collis</i>	

One species known from the Davis Mountain region is mostly confined to the Chihuahuan and Tamaulipan biotic provinces. This is the Merriam pocket mouse (*Perognathus merriami*).

In brief, the faunal affinities of the mammals of the Davis Mountain region are: thirteen species (23.5 per cent) widely distributed, twenty-four (43.5 per cent) western and southwestern, six (11 per cent) Great Plains,

eleven (20 per cent) Chihuahuan, and one (2 per cent) Chihuahuan and Tamaulipan.

BIOGEOGRAPHIC RELATIONSHIPS OF THE REGION

Of the ecological associations of the Plains life belt in the Davis Mountain region, the stream-bed, cottonwood, and riparian-meadow associations are widely distributed, edaphically produced associations that occur in many biotic provinces, and the short-grass association is similar to the short-grass association of the Great Plains grasslands. On the other hand, the short-grass-yucca association, which is the most extensively distributed association of the Plains life belt in the region, and the short-grass-mesquite and mesquite-cholla associations are characteristic of the Chihuahuan biotic province. Because of the predominance of characteristic Chihuahuan associations, the Plains life belt is considered to be most closely related to the grasslands of the Chihuahuan biotic province, which extends westward and southward from the region.

The associations of the Roughland life belt in the Davis Mountain region are essentially similar to those that occur on other mountain ranges in the Chihuahuan biotic province. Therefore, the close relationship of the Davis Mountain region to the Chihuahuan biotic province is also clearly indicated by the ecological associations of the Roughland life belt.

The affinities of the mammals further make evident the necessity of including the Davis Mountain region with the Chihuahuan biotic province. Twelve of the fifty-five species known from the region are largely confined to the Chihuahuan biotic province. Opposed to these, there is only a small Great Plains element (six species) in the region. The remainder of the species are widely distributed and occur in many biotic provinces.

Four races (*Thomomys bottae limpiae*, *T. umbrinus texensis*, *Perognathus c. collis*, and *Neotoma albigula robusta*) as now known are endemic to the Davis Mountain region. The presence of these endemic races and certain differences in the vegetation, the absence of the lechuguilla (*Agave lecheguilla*) and the scarcity of the ocotillo (*Fouquieria splendens*) probably will necessitate the recognition of the Davis Mountain region as a biotic district separate from the Big Bend region to the south. No northern limit of the district can be approximated from the evidence now available, but from general observations it appears that the line separating the Davis Mountain district from the Big Bend area probably should run in an east-west direction a few miles south of Marathon, Brewster County, Texas.

SUMMARY

Two life belts are recognized in the Davis Mountain region. The Plains life belt coincides with the level plain surrounding the mountain mass and

penetrates the mountains in broad, smooth, intermontane valleys. The Roughland life belt includes the slopes of the mountains and narrow canyons within the mountain area.

The predominating ecological associations of the Plains life belt are of general types that extend southward and westward in the Chihuahuan biotic province, but one of the extensive associations is characteristic of the Great Plains grasslands. The associations of the Roughland life belt are similar to those on other mountain ranges in the Chihuahuan biotic province.

Fifty-five species of mammals have been recorded from the Davis Mountain region. Of these, twenty species are known only from the Plains life belt, and twenty-three from the Roughland life belt.

Of the fifty-five species of mammals in the Davis Mountain region, twelve are largely confined to the Chihuahuan biotic province.

Since the ecological associations and the mammals of the Davis Mountain region have their affinities largely with those of the Chihuahuan biotic province, the region is considered to be a part of that province. The presence of four endemic races makes desirable the recognition of the Davis Mountain region as a biotic district of the Chihuahuan biotic province.

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PLATE I

FIG. 1. Short-grass-yucca association about seven miles northeast of Marfa, Presidio County; altitude, about 4900 feet; April 11, 1937.

FIG. 2. Short-grass association in foreground and in middle background; pinyon-juniper association in ravine; oak-juniper and pinyon-juniper associations on slopes of hills in background. About one mile west of Mount Locke; altitude, about 6100 feet; May 10, 1937.

PLATE I

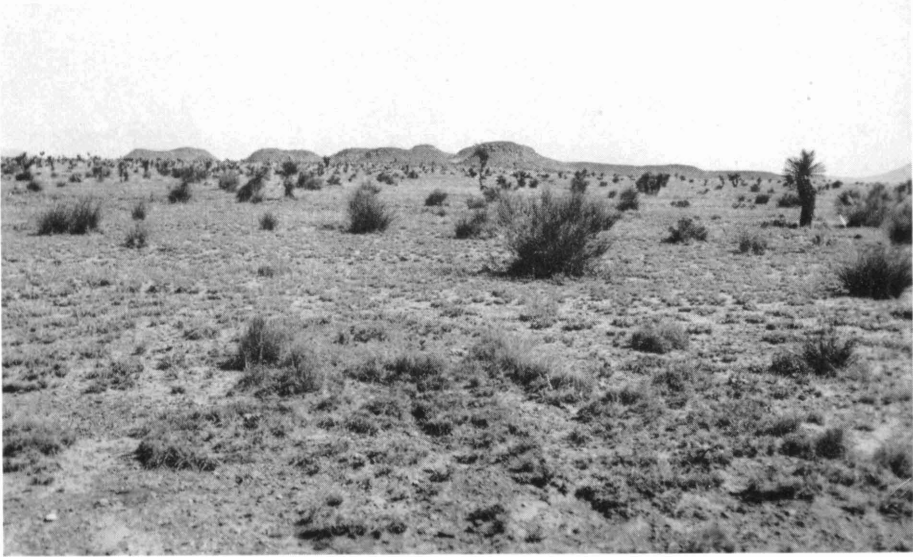


FIG. 1.



FIG. 2.

PLATE II

FIG. 1. Grama-bluestem association on south slope of Mount Locke; altitude, about 6000 feet; May 13, 1937. The preferred habitat of the mountain cotton rat (*Sigmodon ochrognathus*).

FIG. 2. Catelaw association on south wall of Limpia Canyon, about one mile northwest of Fort Davis, with grama-bluestem association in left background; altitude, about 4900 feet; May 13, 1937. The preferred habitat of the mountain cottontail (*Sylvilagus robustus*).

PLATE II



FIG. 1.



FIG. 2.

W. FRANK BLAIR

PLATE III

FIG. 1. Limpia Canyon about eleven miles northeast of Fort Davis; altitude, about 4500 feet; May 2, 1937. Stream-bed association (Plains life belt) in foreground.

FIG. 2. Pinyon-juniper association on north slope of Mount Locke, with short-grass association in foreground; altitude at top of mountain, about 6800 feet; May 10, 1937.

PLATE III

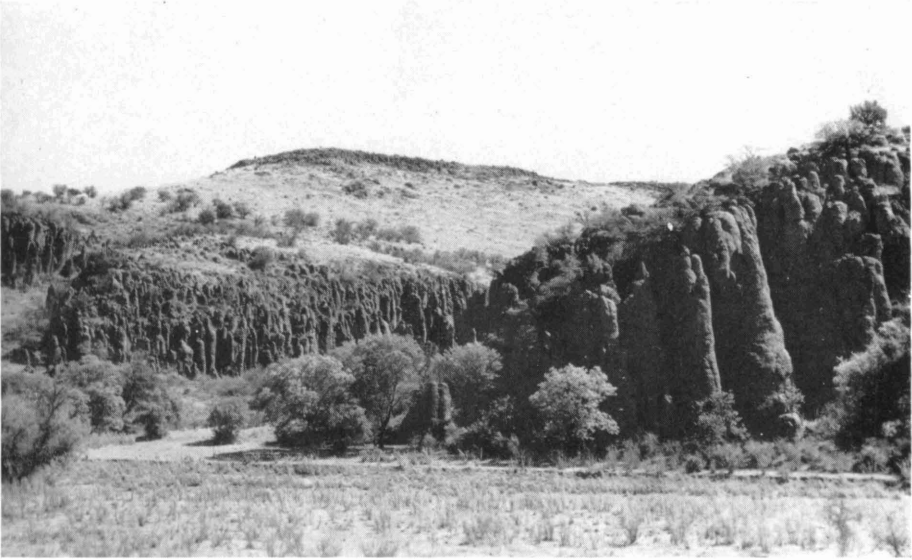


FIG. 1.



FIG. 2.

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