

A KEY TO THE BATS OF TEXAS AND ADJACENT REGIONS

By Tony Mollhagan

**Texas Speleological Survey
Volume 3, Number 5
May 1970**

A Publication of the Texas Speleological Association

TEXAS SPELEOLOGICAL SURVEY

Vol. 3, No. 4

A KEY TO THE BATS OF TEXAS AND ADJACENT REGIONS
With an Annotated List

By
Tony Mollhagen

A Publication of the
Texas Speleological Association

May, 1970

TEXAS SPELEOLOGICAL SURVEY

Editor: A. Richard Smith

Staff

Carl E. Kunath
Terry Raines

James R. Reddell
William H. Russell

A KEY TO THE BATS OF TEXAS AND ADJACENT REGIONS With an Annotated List

INTRODUCTION

The purpose of this key and annotated list of bats is to stimulate interest in one of the most essential and neglected components of life in a cave. One needs only to consult the checklist of Reddell (1967) to verify the neglect. Some thirty species of bats are known for Texas alone and well over half of these are repeatedly taken in caves, while another one-fourth are reported as occasional visitors. No doubt many persons have wondered about the kinds of bats that occupy caves and would have made an honest attempt at identification had some means been readily available. It is in this spirit that the following pages are offered.

The key is arranged so that there is always a choice between two statements (a couplet) about some characteristic of a bat. The characters are chosen so that the animal need not be sacrificed. Identification is made by selecting the statement that is true of the animal being considered. At the end of the statement chosen is a number that indicates the location of the next choice to be made. The process is repeated until a name is given instead of a number. For example, starting with the couplet 1 and 1' (which is where you always start), if the bat in hand has a reduced tail membrane, the next choice is whether or not the nose is elongate at couplet 2 and 2'. If the tail membrane were present, the next choice would have been at couplet 6 and 6'.

Occasionally there are supplementary statements within a couplet. They are designed to aid a decision only. The greatest emphasis should be placed on those items mentioned first. For instance, in couplet 1 and 1', whether or not the tail membrane is present is more important to the key than the presence of the tail. Numbers in parentheses following a measurement indicate the range of that measurement from published records. Because of variation between bats of the same species, several of the species key out in more than one place. If the animal being keyed does not exactly conform to one or the other of the statements in a couplet, choose the more likely and proceed.

Following the key and arranged alphabetically by scientific name is an annotated list of the species included within the key. This list includes older scientific names found in the literature (in parentheses); the most frequently used common names; if available, some possibly useful information on the habits and biology; and some general comments on distribution.

Since publication of the surveys of Hall and Kelson (1959), Davis (1960), and Blair et al. (1968), several additional species have been collected within the region to which this key is applicable. These and

some other species which may yet be found in this region are also included, and are so noted in the list.

The selected literature at the end contains a number of additional references not cited. These are mostly general works for individuals who may wish to use other keys or simply to do some supplementary reading. By no means does this represent more than a small portion of the literature available.

Bats, like many other mammals, can and do transmit rabies. Furthermore, some of the larger species are perfectly capable of inflicting painful bites that may become secondarily infected. For these reasons, bats should never be handled without gloves.

Animals to be saved for scientific specimens should be kept alive (they do nicely in a damp cloth bag for a day) as long as possible until they can be properly preserved. Upon death, they decompose rapidly, and at the first opportunity they should be labeled as to date and locality and frozen for eventual skinning, or dropped into a 10% formalin solution (1 part formalin, 9 parts water). Formalin can be purchased in some drug stores. If this method of preservation is used, the mouth should be propped open and an incision made in the abdomen to allow fixation of the internal organs. Once the animals are preserved, they should be given to a competent biologist for deposition in a museum. Specimens in a private collection are of no scientific value. For further information on collecting and preserving specimens, see Hall (1962).

I hope that anyone in the field armed with the above information, a small ruler, and moderately good judgement can identify bats in Texas and adjacent areas. It has been said that keys are written by people who do not need them for people who cannot use them. If this situation is to be avoided here, it can only be accomplished with the help of those using the key--so comments, criticisms, and questions are earnestly solicited.

The preparation of this manuscript was not an exclusive effort. I am indebted to a number of my colleagues and friends for many useful suggestions concerning organization and selection of terms. Among these, I thank especially Robert Martin and Virginia Tipton, who freely donated their own time to test the key. Dr. Robert J. Baker, with his knowledge of bats, gave insight to some of the individual species and read the early draft. Suzanne Fowler Wiley lent a good bit of necessary moral support and cheerful chiding at appropriate times. Special recognition, or perhaps a commendation, is due James Reddell, who was present at the conception of the project, typed the final copy of the manuscript, and was forever looking over my shoulder until its completion.

Figures 8 and 13-15 are modified from Schwartz and Schwartz (1959); figures 9 and 10 were adapted from Villa (1966).

Tony Mollhagen
Department of Biology
Texas Tech University
Lubbock, Texas 79409

A Field Key to the Bats of Texas and Adjacent Regions

- 1 Tail membrane greatly reduced; tail absent (fig. 1).....2
- 1' Tail membrane well-developed; tail present (figs. 2,3,4), but may be very small.....6
- 2 Nose elongate; nose leaf well-developed (figs. 6,7).....3
- 2' Nose not elongate (like in figs. 8,13,14); nose leaf very small or absent.....5
- 3 Forearm length (fig. 5) less than 47 mm (39-47); no lower incisors (front teeth)..... Anoura geoffroyi
- 3' Forearm length greater than 45 mm; four very small lower incisors.....4
- 4 Last two bones of longest finger (fig. 5) greater than 38 mm; hair on upper leg almost to knee and continues as fringe on inside of lower leg..... Leptonycteris nivalis
- 4' Last two bones of longest finger less than 38 mm; little or no hair on upper leg, only scattered small hairs on lower leg..... Leptonycteris sanborni
- 5 First bone of thumb nearly as long as second and wing membrane does not extend forward to the joint between the two bones (fig. 9); ears somewhat pointed and extending well above hair on head; legs only slightly haired, if at all..... Desmodus rotundus
- 5' First bone of thumb only half as long as second and wing membrane extending to the joint between the two bones (fig. 10); ears rounded and not extending distinctly above hair on head; fringe of hair extending down to leg from body..... Diphylla ecaudata
- 6 Tail naturally extending more than 8 mm beyond posterior margin of tail membrane (fig. 2).....7
- 6' Tail not extending or naturally extending less than 8 mm beyond tail membrane (figs. 3,4).....10
- 7 Forearm length greater than 65 mm (73-80).....Eumops perotis
- 7' Forearm length less than 65 mm.....8

- 8 Forearm length greater than 54 mm (58-64); ears, when viewed from above, naturally extending well beyond tip of nose..... Tadarida macrotus
- 8' Forearm length less than 54 mm; ears, when viewed from above, not extending more than 2 mm beyond tip of nose.....9
- 9 Ears continuous across forehead (fig. 11); upper incisors (two front teeth) close together at base and point straight down, inner margins nearly parallel; forearm length 45 to 51 mm..... Tadarida femorosacca
- 9' Ears not attached across forehead (fig. 12); upper incisors set apart at base and convergent at tip; inner margins convergent; forearm length 36 to 47 mm..... Tadarida brasiliensis
- 10 Tail emerginf from upper surface of tail membrane and not extending to posterior margin of membrane (fig. 3).....11
- 10' Tail completely enclosed within the tail membrane and continuing to the posterior margin (fig. 4).....15
- 11 Nose elongate; nose leaf well-developed (figs. 6,7).....12
- 11' Nose not elongate; nose leaf very small or absent.....13
- 12 Forearm length greater than 40 mm (40-45); no lower incisors (front teeth)..... Choeronycteris mexicana
- 12' Forearm length less than 40 mm (30-39); four very small lower incisors..... Glossophaga soricina
- 13 Ear length from notch (fig. 6) less than 16 mm; ears somewhat rounded and appearing to nearly encircle the eyes; no tufts of hair on either side of muzzle..... Mormoops megalophylla
- 13' Ear length from notch greater than 16 mm; ears more pointed and set normally away from eyes; tufts of hair on either side of muzzle.....14
- 14 Wing membranes attached across back; forearm length less than 48 mm (40-47)..... Pteronotus davyi
- 14' Wing membranes not attached across back; forearm length greater than 48 mm (49-63)..... Pteronotus parnellii

- 15 Ear length from notch (fig. 6) greater than 25 mm; ears proportionally large.....16
- 15' Ear length from notch less than 25 mm; ears of normal size.....21
- 16 Nose leaf present (fig. 6,7)..... Macrotus waterhousii
- 16' Nose leaf absent.....17
- 17 Ear length from notch less than 31 mm; ears not joined at base by a small, thin membrane; back hair gray to pale yellow and occasionally brown-tipped; belly whitish; often has strong, sweet-musty odor.....
..... Antrozous pallidus
- 17' Ear length from notch greater than 31 mm; ears may be joined at base by a small, thin membrane; color variable; no particularly strong odor.....18
- 18 Obvious glands (large bumps) on each side of the nose, between the eye and the nostril (fig. 8).....19
- 18' No obvious glands on each side of the nose.....20
- 19 Belly with white-tipped hair; hair of back black at base, with sharp color change to brown at tip..... Plecotus rafinesquii
- 19' Belly tan; hair of back gray or grading from gray at base to tan at tip..... Plecotus townsendii
- 20 Three conspicuous white spots on black back, one just behind each shoulder, the other at the base of the tail; belly white.....
..... Euderma maculatum
- 20' No large white spots on back; only base of hair on back is black; belly pale..... Plecotus phyllotis
- 21 Dense hair, but not as long and dense as on body, over entire upper surface of tail membrane.....22
- 21' Dense hair, but not as long and dense as on body, covering only basal quarter to half of upper tail membrane or covering no part at all.....24

- 22 Forearm length greater than 45 mm (46-55); back color generally gray or brown and frosted with white; light spot at base of thumb and elbow; margin of ear black..... Lasiurus cinereus
- 22' Forearm length less than 45 mm; back color reddish or reddish-brown and frosted with white; light spot at base of thumb only; white or tan patch on front of shoulder; ear margin not black.....23
- 23 Base of back hair black, grading half-way up the hair to white or tan, tips of hair deep reddish-brown with a small amount of white, giving overall color of stained mahogany; lower belly less colored than back while throat and chest lighter still.....
..... Lasiurus seminolus
- 23' Base of back hair black, but grading less than half-way up the hair quickly to tan or pale yellow, tip reddish-brown with a small amount of white, giving overall color of a peach; belly pale..... Lasiurus borealis
- 24 Having combination of basal quarter or half of upper tail membrane densely haired (but not as long or dense as on body) and tragus blunt (like in figs. 6,13).....25
- 24' No part of tail membrane densely haired or not having combination of densely haired base of tail membrane and blunt tragus; if membrane base appears haired, then tragus pointed.....28
- 25 Ears and membranes black, body black or very dark brown; always some back hair with silvery tips; belly browner.....
..... Lasionycteris noctivagans
- 25' Not having combination of ears, body and membranes dark at the same time; no silvery tips to back hair; belly variable.....26
- 26 Forearm length less than 38 mm (33-37); hair of back brown at base, grading to tan and tipped with reddish-brown.....
..... Pipistrellus subflavus
- 26' Forearm length greater than 38 mm; base of back hair black, grading to tan or yellow, and occasionally tipped with black.....27
- 27 Forearm length less than 49 mm (42-49)..... Lasiurus ega
- 27' Forearm length greater than 49 mm (50-59)..... Lasiurus intermedius

- 28 Forearm length greater than 40 mm.....29
- 28' Forearm length less than 40 mm.....33
- 29 Ears, when laid forward, extend 3-5 mm beyond tip of nose.....30
- 29' Ears not extending beyond tip of nose, or if so, only 1-2 mm.....31
- 30 Fringe of hair along posterior margin of tail membrane; ears nearly same color as body..... Myotis thysanodes
- 30' No fringe of hair along posterior margin of tail membrane; ears black and darker color than body..... Myotis evotis
- 31 Length of only head and body greater than 59 mm; forearm length 42-52 mm; ear length from notch usually greater than 15 mm; tragus blunt, curved and extending less than half-way up the ear (like fig. 13)..... Eptesicus fuscus
- 31' Length of only head and body less than 59 mm; forearm length variable; ear length from notch usually less than 15 mm; tragus pointed, straight, and extending more than half-way up the ear (fig. 14).....32
- 32 Back color gray or very light brown; ear color pale; back hair without silky sheen; forearm length 39-45 mm..... Myotis velifer
- 32' Back color light to dark brown; ear color brown to dark brown; back hair with silky sheen; forearm length 36-40 mm.....
..... Myotis lucifugus
- 33 Ear length from notch greater than 15 mm and ear, when laid forward, extending at least 3 mm beyond tip of nose.....34
- 33' Ear length from notch less than 15 mm and ear, when laid forward, not extending at least 3 mm beyond tip of nose.....36
- 34 Ears distinctly black..... Myotis evotis
- 34' Ear color no more than dark brown.....35
- 35 Fringe of hair along posterior margin of tail membrane.....
..... Myotis thysanodes
- 35' No fringe of hair along posterior margin of tail membrane.....
..... Myotis auricolus

- 36 Ears and membranes black, body black or very dark brown; forearm length 33-39 mm; tragus blunt (figs. 6,13)..... Nycticeius humeralis
- 36' Not having combination of ears, membranes, and body all dark at the same time; forearm length variable, tragus blunt or pointed (figs. 8,14).....37
- 37 Ears black or dark brown and distinctly contrasting with color of body fur.....38
- 37' Ears pale or brown at most, and nearly the same color as body.....43
- 38 Back hair tan to light brown at base, grading to dark brown at tip; tragus pointed..... Rhogeesa tumida
- 38' Back hair dark brown or black at base, tip color variable; tragus variable.....39
- 39 Tragus blunt, extends less than half the distance up the ear, and bends forward and inward (fig. 13); body color pale, forearm length 28-32 mm..... Pipistrellus hesperus
- 39' Tragus pointed, straight, and extends more than half the distance up the ear (fig. 14); body color variable; forearm length variable.....40
- 40 Chest hair black at base, grading quickly to gray or white at tip; back hair black to dark brown at base, grading to tan or gray at tip; forearm length 32-37 mm; calcar never with a keel (fig. 16)..... Myotis yumanensis
- 40' Chest hair black at base, but tip color never gray or white; back hair black at base, but tip color never tan or gray; forearm length variable; calcar usually with a keel (fig. 15).....41
- 41 Hair on underside of wing membrane extends to an imaginary line between elbow and knee; forearm length greater than 36 mm (36-43); tips of back hair dark reddish-brown..... Myotis volans
- 41' Hair on underside of wing membrane does not extend to a line between elbow and knee; forearm length less than 36 mm (29-36); back color light brown to reddish-brown.....42

- 42 Back hair generally reddish and tri-colored, with black base grading sharply to tan or light brown and tipped with brown or red; forearm length of most individuals less than 32.5 mm; (Note: There exists a great amount of overlap on specific characters between this species and M. leibii so final identification should be left to specialists..... Myotis californicus
- 42' Back hair generally brownish and bi-colored, with black base grading to light brown to reddish-brown tips; forearm length of most individuals greater than 32.5 mm..... Myotis leibii
- 43 Ears very pointed and funnel-like, tragus well inside the ear; back color rusty to orange, hair same color base to tip, or tip may be slightly lighter; leg bones long and thin, little wider than a pin..... Natalus stramineus
- 43' Ears pointed but slightly rounded at the top, not funnel-like; tragus exposed; back color tan to dark brown; back hair black or dark brown at base; leg bones not delicate.....44
- 44 Back color gray or very light brown; ear color pale; back hair without silky sheen.....45
- 44' Back color light to dark brown; ears brown; back hair with silky sheen.....46
- 45 Forearm length less than 38 mm (32-37); chest hair black at base, grading quickly to white or gray at tip... Myotis yumanensis
- 45' Forearm length greater than 38 mm (39-44); chest hair black at base but grading to tan or light brown..... Myotis velifer
- 46 Back hair short and dense. (Note: This species and M. lucifugus are sufficiently alike externally that final identification should be left to specialists.)..... Myotis austroriparius
- 46' Hair of normal length and not dense or wooly..... Myotis lucifugus

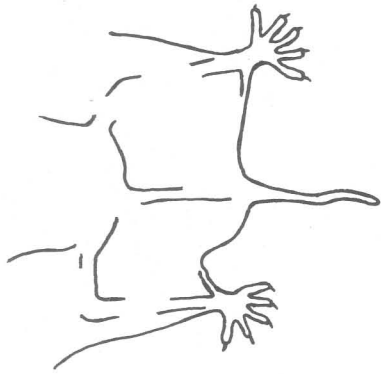


Fig. 2 TAIL EXTENDING BEYOND MEMBRANE



Fig. 4 TAIL ENCLOSED IN MEMBRANE

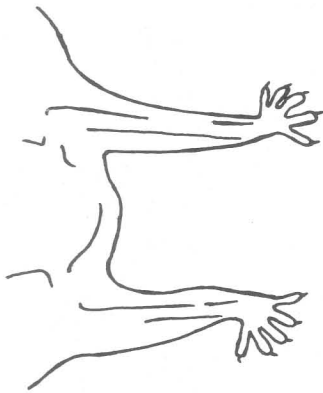


Fig. 1 MEMBRANE REDUCED; TAIL ABSENT



Fig. 3 TAIL EMERGING FROM MEMBRANE

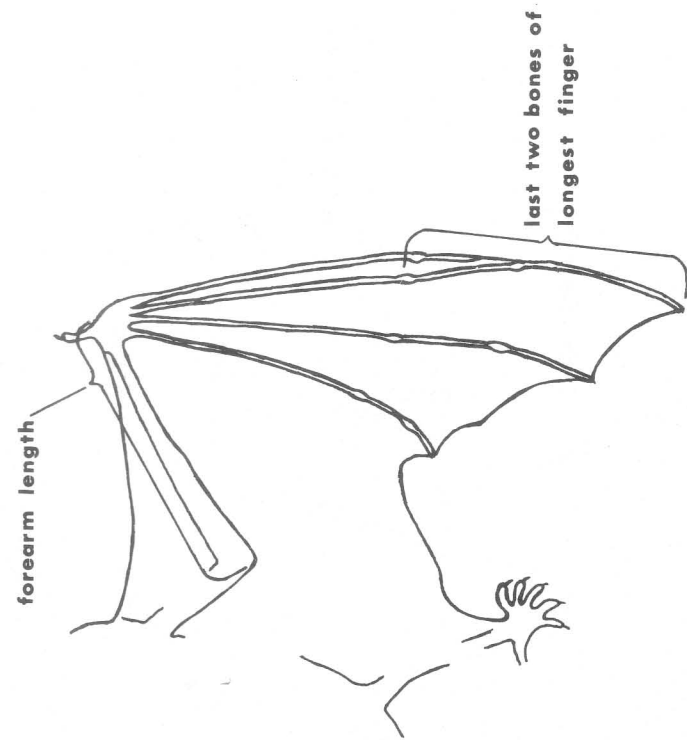


Fig. 5 RIGHT WING

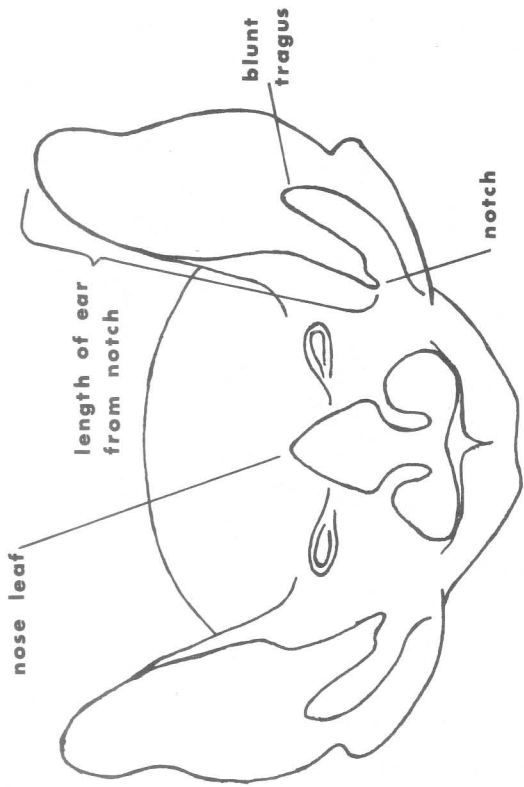


Fig. 6 FACE VIEW

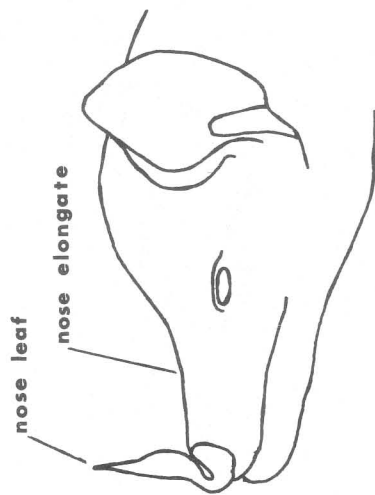


Fig. 7 HEAD PROFILE

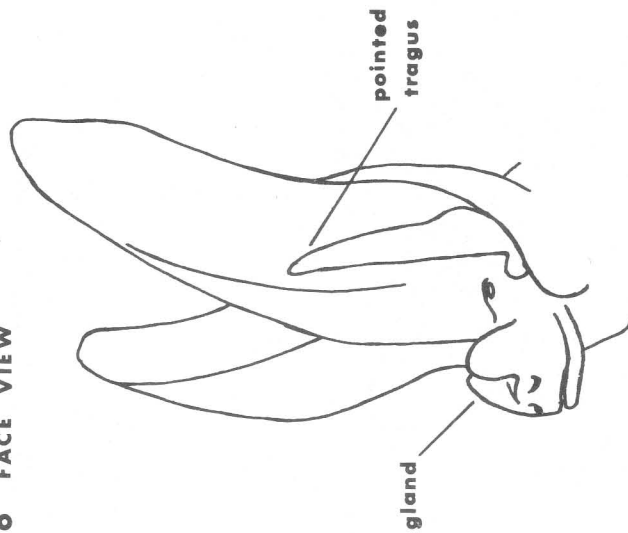


Fig. 8 P. TOWNSENDII

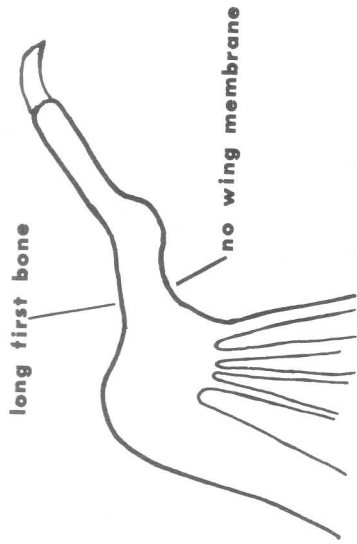


Fig. 9 DESMODUS THUMB

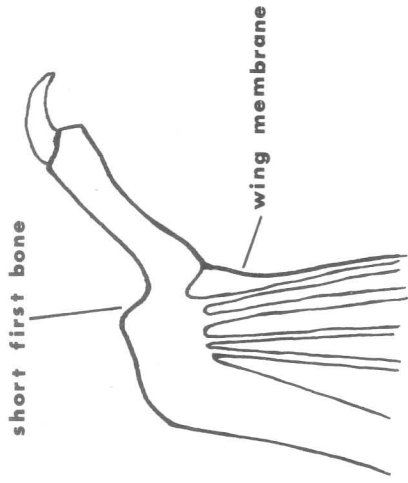


Fig. 10 DIPHYLLA THUMB



Fig. 11 T. FEMOROSACCA EARS



Fig. 12 T. BRASILIENSIS EARS



Fig. 14 MYOTIS



Fig. 13 PIPISTRELLUS

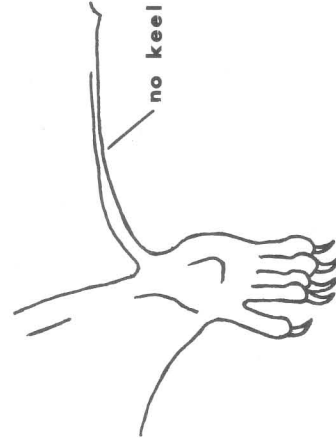


Fig. 16 LEFT HIND FOOT WITHOUT KEEL

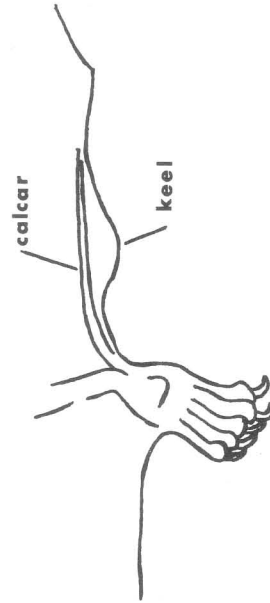


Fig. 15 LEFT HIND FOOT WITH KEEL

AN ANNOTATED LIST OF THE BATS OF TEXAS AND ADJACENT REGIONS

Anoura geoffroyi. Geoffroy's Tailless Bat. Appears to be strictly a cave bat. They hang in tight clusters of up to 15 individuals, usually not too far from the entrance in scooped-out depressions in the ceiling. In flight they are swift and can hover. Largely nectar feeders although possibly insectivorous to some extent. No records in Texas or the adjacent areas.

Antrozous pallidus. Pallid Bat. Known to frequent caves, but primarily only as night roosts. They are commonly found roosting in buildings. Prey species include large moths and some ground-dwelling invertebrates such as scorpions, centipedes, and Jerusalem crickets. Distribution corresponds to the arid regions of the western United States and Mexico. In Texas, no records east of the Llano Estacado in the north or Kerr and Cameron counties in the south. Known also from Tamaulipas and Coahuila.

Choeronycteris mexicana. Mexican Long-tongued Bat. Does frequent caves. Not inclined to mingle with other bats, either their own kind or other species. Fly at the slightest disturbance. Nectar feeders. Tropical distribution. Unknown in Texas but specimens from Coahuila, Tamaulipas, and Arizona suggest their possible presence in the Rio Grande Valley or Trans-Pecos.

Desmodus rotundus. Vampire Bat. Normally a cave dweller. Often roost in compact clusters but have been found singly. Excreta from large clusters often form pools of black, tar-like liquid from which an odor of ammonia arises. Diet exclusively blood, frequently that of horses, cattle, and burros. Can be recognized by habit of running mouse-like along vertical walls. Take flight quickly upon being disturbed. Distribution from the tropics with records from Nuevo Leon and Tamaulipas. Occurrence in the Trans-Pecos suggested by a possibly recent fossil in West Texas.

Diphylla ecaudata. Hairy-legged Vampire Bat. Not as common in its range as Desmodus. Diet exclusively of blood, frequently that of smaller livestock such as sheep and goats. Excreta may not form pools as in Desmodus but rather may be dry, brown stains. Frighten easily and have been collected in mixed clusters. Tropical distribution but are known from Tamaulipas at several localities, and in Texas by a single specimen from Val Verde County.

Eptesicus fuscus. Big Brown Bat. In Texas, not a common cave bat, although are known to hibernate there. Frequently found roosting in buildings. Somewhat colonial and loosely associated with wooded and/or montane regions. Diet of insects. Aggressive when handled and moderately large. Distribution from the north. Records from New Mexico, Coahuila, Nuevo Leon, Tamaulipas, and all but southern and central Texas, where they are seemingly rare.

Euderma maculatum. Spotted Bat. There are very few specimens of this bat so very little is known of their habits. Most have been taken in montane areas. Their distribution is western United States and north-western Mexico, including records from New Mexico and Chihuahua. Texas specimens are from Big Bend National Park.

Eumops perotis. Greater Mastiff Bat. Rare and colonial. The largest bat in the region and because they are large require a drop of 20 feet or more to gain flight. No records from caves. Commonly found roosting in crevices and shelters in steep-walled canyons. Occasionally chatter during the day, thereby exposing their roosting sites. Restricted to the driest regions of the Southwest and Mexico. The few Texas records are from the Trans-Pecos.

Glossophaga soricina. Pallas' Long-tongued Bat. Often found roosting in caves in colonies of a few to several hundred. Frighten easily and are noisy in flight. Feed on nectar and occasionally fruit. Distribution is tropical with numerous records in Tamaulipas.

Lasionycteris noctivagans. Silver-haired Bat. Little is known of habits. Unknown in caves, preferring to hang solitarily in trees. Ranges throughout southern Canada and northern United States in summer. Texas and lowland New Mexico records are rare and are presumably migrants passing through to and from wintering regions in Central and South America. These bats are unknown in southern Texas and Mexico. The mountains of west Texas may be high enough to allow the presence of this bat in summer.

Lasiurus borealis. Red Bat. A solitary, tree-hanging bat. Summer resident at lower elevations of the eastern and extreme western United States; and coastal and southern Mexico. Those records in north-central Mexico and central and west Texas probably represent migrants. These bats are common in orchards, particularly peach orchards, where they have been mistaken for peaches hanging in the trees.

Lasiurus cinereus. Hoary Bat. Like other members of the genus, it is solitary and hangs in trees and shrubs. A fairly large animal that, when captured, emits loud hissing and clicking sounds. Seems to prefer higher altitudes and northern latitudes throughout North America. They are migratory which accounts for the many spring and fall records in warmer regions. There are specimens from Coahuila, Tamaulipas, and New Mexico. Texas records are confined to the western two-thirds of the state.

Lasiurus (=Dasypterus) ega. Southern Yellow Bat. Little is known of their habits. Have been found associated with palm groves where they often hang singly under the lower fronds. Their presence is often indicated by small piles of guano beneath a tree. Distribution is largely tropical, but are found in some arid regions of western and north-central Mexico, as well as California, Arizona, and New Mexico. The lower Rio Grande Valley is good habitat.

Lasiurus (=Dasypterus) intermedius (includes floridanus). Yellow Bat. Habits similar to L. ega in that they are associated with palm groves. It has been suggested that they are slightly colonial. General distribution is coastal in Mexico and the southeastern United States. In Texas and Tamaulipas only a few records are more than 75 miles inland.

Lasiurus seminolus. Seminole Bat. A solitary, tree-hanging bat. Unknown in caves. Seemingly associated with heavy deciduous forests at lower elevations along the Atlantic and Gulf coasts. Records in Texas and Mexico are few. Habits appear similar to L. borealis.

Leptonycteris nivalis. Long-nosed Bat. Throughout the range, it is a common cave dweller. In flight, produces a loud swishing noise with wings. Eyes gleam red in the light of a lantern. Colonial and shy. Have a faint sweetish odor. Often found above 6,000 feet. Nectar feeder. Range extends from the central plateau of Mexico to the Big Bend region of Texas.

Leptonycteris sanborni (=yerbabuenae). Sanborn's Long-nosed Bat. Habits like those of L. nivalis except usually found at elevations lower than 6,000 feet. Range extends from southern Mexico up the west coast to Arizona and southwestern New Mexico. This suggests their possible occurrence in extreme west Texas.

Macrotus waterhousii. Gray Leaf-nosed Bat. Generally tropical and subtropical in distribution, but occurs in the Sonoran and Mojave deserts of Arizona and California. Specimens from Tamaulipas, Nuevo Leon, and a probable sub-fossil record from the Trans-Pecos indicate their possible occurrence in Texas. Colonial and commonly associated with other species, particularly Desmodus, Antrozous, and Plecotus. Primarily a warm cave form, but will also use mines, tunnels, and guildings for roosts. Migratory in some of the northern parts of its range. Food habits include some flightless ground-dwelling insects.

Mormoops (=Aello) megalophylla. Peters Leaf-chinned Bat; Old Man Bat. Generally roost in clusters in deep, warm caves. They fly rapidly at the slightest disturbance. Face and ears have a ragged appearance. Found at warmer elevations throughout Mexico and Central America. Ranges northward up the Rio Grande Valley to the Sierra Vieja and Chinati Mountains, where they are not common except locally.

Myotis auriculus (in part evotis and keenii). Big-eared Myotis. Less than fifty specimens available so very little is known of their habits. They are unknown in Texas, but records from New Mexico, Coahuila, Nuevo Leon, and Tamaulipas indicate they may be found in the Trans-Pecos.

Myotis austroriparius. Southeastern Myotis. Known to occur in caves. Also known to inhabit attics and old buildings where they will hang singly or in mixed clusters. Ranges through the southeastern United States. A single record for the region is from Bowie County, Texas.

Myotis californicus. California Myotis. Bats of this species inhabit caves, mines, and crevices. They principally are dwellers of arid and semi-arid regions of northern Mexico and western United States and Canada. They are seldom captured more than one or two at a time. Specimens are reported from New Mexico, Trans-Pecos Texas, Coahuila, and Tamaulipas.

Myotis evotis. Long-eared Myotis. Infrequently found in caves. Inhabits thinly forested areas or semi-deserts of the western United States. Thought to roost singly or in very small clusters of their own kind in crevices, old buildings, and possibly even trees. The only records for thea are in New Mexico.

Myotis leibii (=subulatus). Small-footed Myotis; Masked Bat. Occasionally found in caves, but appear to prefer cliffs or bluffs as roosting sites. Fairly widespread but not a common bat. Usually taken in arid environments. Extends range to this region from the west. Records are from New Mexico, Trans-Pecos Texas, Chihuahua, and Nuevo Leon.

Myotis lucifugus (includes occultus). Little Brown Myotis. Has been taken in caves, usually as hibernators. A western race is known by specimens from New Mexico, western Mexico, and Texas (one only from Ft. Hancock). This bat is to be considered rare in Texas.

Myotis thysanodes. Fringed Myotis. Commonly taken in caves where they hang singly or in clusters of 15-50 individuals. Not particularly common, but ranges widely over arid regions of western Mexico and United States. Records in this region are a few in Coahuila and Chihuahua, several in Trans-Pecos Texas, and many in New Mexico.

Myotis velifer. Cave Myotis. Typically a colonial cave dweller, but will take advantage of bridges and old buildings. Among the commonest of bats in the region. Often sole resident of a cave but also frequently found in the proximity of, or in the same clusters with other species. Although most Myotis will bite in self defense, this one seems more inclined to do so. Occurs in the western two-thirds of Texas and all the adjacent regions.

Myotis volans. Long-legged Myotis. Infrequent visitor to caves. Little known of the habits. Most records are from the higher altitudes of montane regions of western United States and Mexico. Represented in the region by records in Trans-Pecos Texas, Coahuila, and New Mexico.

Myotis yumanensis. Yuma Myotis. Roosts singly or in small clusters on walls and ceilings of caves and apart from other species. Prefers open and arid regions of western Mexico, United States, and Canada. Range extends eastward through Chihuahua, New Mexico, and the western half of Texas.

Natalus stramineus (=mexicana). Mexican Funnel-eared Bat. Often found in caves associated with other species but usually not in large numbers. Reported to be both alert and docile. Flying membranes very thin. Distribution is essentially tropical. A few records in Tamaulipas are the only ones for the region.

Nycticeius humeralis. Evening Bat. No cave records for the species. Little known of the biology, but appears to be somewhat solitary and roosts in trees. Noted to be seen flying among trees at dusk. Numerous records from Coahuila, Nuevo Leon, and Tamaulipas, and reported to be very common in eastern and coastal Texas.

Pipistrellus hesperus. Western Pipistrelle; Western Canyon Bat. Only occasionally found in caves, despite being a common resident of the arid and semi-arid regions of the Southwest. In such regions it is usually the first bat seen flying in the evening. In Mexico they are found only in the arid northwestern two-thirds of the country, while they are unknown east of the Panhandle and Trans-Pecos Texas.

Pipistrellus subflavus. Eastern Pipistrelle; Georgia Bat. Hibernates in caves but the numbers usually fall off in summer. Frequently found hanging singly some distance from other bats but clusters of up to fifty individuals are known. Mexican records are from Coahuila and Tamaulipas. In Texas, known only from the eastern half of the state.

Plecotus (=Idionycteris) phyllostis. Allen's Big-eared Bat. A rare animal for which there are no cave records. Most specimens have been taken in wooded mountains. Has two flaps of skin between the ears. Records for the region are from southern Tamaulipas and south-central New Mexico.

Plecotus (=Corynorhinus) rafinesquii (=macrotis). Rafinesque's Big-eared Bat. Utilizes caves to some extent. Habits, so far as are known, similar to P. townsendii. Distributed through the southeastern United States and the only record for the region is in Polk County, Texas.

Plecotus (=Corynorhinus) townsendii (in part rafinesquii). Townsend's Big-eared Bat. Primarily a cave dweller, but has been known to use bridges and old buildings. Clusters are usually of less than 50 individuals, but single individuals are commonly found in secluded corners of shelters. When resting, the very long ears are curled around so as to appear not unlike the horns of mountain sheep. Many records in north-central Mexico. Texas records are all west of the Panhandle and Edwards Plateau.

Pteronotus davyi. Davy's Naked-backed Bat. Roosts often in large numbers in warm caves. A relatively slow flier. In the large part of the range, they are reported to be an early flier. The only records for the region are in west-central Tamaulipas.

Pteronotus parnellii (includes rubiginosa). Parnell's Mustached Bat. Known in warm caves. Reported to occur both singly in colonies of other species and in clusters of over two hundred of their own kind. Quick to leave roosts and fly rapidly. Often confused with Desmodus in ability to scamper along cave walls. Tropical distribution generally but a record in west-central Tamaulipas indicates that they are not confined to the tropics.

Rhogeessa tumida. Little Yellow Bat. Little known of habits. Apparently does not roost in caves. An early flier that feeds in groups. Records from the Sierra de Tamaulipas are the only ones near the region.

Tadarida brasiliensis (= mexicana; includes cynocephala). Guano Bat; Brazilian or Mexican Free-tailed Bat. A summer resident of any cave of consequence. Occasionally makes forays to the north from wintering areas in Mexico during warmer periods. Quite colonial, from a few individuals in small caves to a million or more in larger ones. Like other members of the genus and Eumops, has a distinct musty odor. Very common throughout the region.

Tadarida femorosacca. Pocketed Free-tailed Bat. The biology and habits of this bat are poorly understood, but are seemingly similar to T. brasiliensis. The only records from the region are Carlsbad Caverns, New Mexico, and Big Bend National Park, Texas.

Tadarida macrotus (= molossa). Big Free-tailed bat. Relatively rare. Somewhat colonial. If occurring in caves, they must be large enough to permit a free-fall from a perch to initiate flight. What few records are available for the region are in Trans-Pecos, Texas. Seem to prefer high-walled canyons in dry areas.

Selected References

- Allen, G.M. 1939. Bats. New York: Dover. 368 pp.
- Alvarez, T. 1963. The recent mammals of Tamaulipas, Mexico. Univ. Kansas Publ., Mus. Nat. Hist., 14:363-473.
- Blair, W.F., A.P. Blair, P. Brodkorb, F.R. Cagle, and G.A. Moore. 1968. Vertebrates of the United States. 2nd ed. New York: McGraw-Hill. 616 pp.
- Campbell, C.A.R. 1925. Bats, mosquitoes, and dollars. Boston: Stratford. 262 pp.
- Christian, J.J. 1956. The natural history of a summer aggregation of the big brown bat, Eptesicus fuscus fuscus. Amer. Midl. Nat., 55:66-95.
- Cockrum, E.L. 1956. Homing, movements, and longevity of bats. J. Mammal., 24:474-492.
- Constantine, D.G. 1967. Activity patterns of the Mexican free-tailed bat. Univ. New Mexico Publ. in Biol., 7:1-79.
- _____. 1967a. Rabies transmission by air in bat caves. Public Health Service Publ., 1617:1-51.
- Dalquest, W.W. 1947. Notes on the natural history of the bat Corynorhinus rafinesquii in California. J. Mammal., 28:17-30.
- _____. 1953. Mammals of the Mexican state of San Luis Potosi. Louisiana State Univ. Press, Baton Rouge. 229 pp.
- Davis, W.B. 1960. The mammals of Texas. Texas Parks and Wildlife Dept. Bull., 41. 267 pp.
- _____. 1966. The mammals of Texas. Texas Parks and Wildlife Dept. Bull., 41. Rev. Ed.
- Eads, R.B., J.S. Wiseman, and G.C. Menzies. 1957. Observations concerning the Mexican free-tailed bat, Tadarida mexicana, in Texas. Texas J. Sci., 9:227-242.
- Glass, B.P. 1951. A key to the skulls of North American mammals. Stillwater: Oklahoma State Univ. 53 pp.
- Gould, E. 1955. The feeding efficiency of insectivorous bats. J. Mammal., 36:399-407.

- Greenhall, A.M., and J.L. Paradiso. 1968. Bats and bat banding. Bur. Sport Fisheries and Wildlife Resource Publ., 72. 48 pp.
- Hall, E.R. 1962. Collecting and preparing study specimens of vertebrates. Univ. Kansas, Mus. Nat. Hist., Misc. Publ., 30. 46 pp.
- _____, and W.W. Dalquest. 1963. The mammals of Veracruz. Univ. Kansas Publ., Mus. Nat. Hist., 14:165-362.
- _____, and K.R. Kelson. 1959. The mammals of North America. New York: Ronald Press, 2 vols.
- Krutzsch, P.H. 1954. A key to the bats of western North America. Chicago Acad. Sci., Nat. Hist. Misc., 133. 6 pp.
- Milstead, W.W., and D.W. Tinkle. 1959. Seasonal occurrence and abundance of bats (Chiroptera) in northwestern Texas. Southwestern Nat., 4:134-142.
- Orr, R.T. 1954. Natural history of the pallid bat, Antrozous pallidus (Le Conte). Proc. California Acad. Sci., 28:165-246.
- Raun, G.G. 1962. A bibliography of the recent mammals of Texas. Bull. Texas Mem. Mus., 3. 81 pp.
- _____, and J.K. Baker. 1959. Some observations of Texas cave bats. Southwestern Nat., 3:102-106.
- Reddell, J.R. 1967. A checklist of the cave fauna of Texas. III. Vertebrata. Texas Acad. Sci. J., 19:184-226.
- Schwartz, C.W., and E.R. Schwartz. 1959. The wild mammals of Missouri. Univ. Missouri Press. 341 pp.
- Storer, T.I. 1926. Bats, bat towers and mosquitoes. J. Mammal., 7:85-90.
- Twente, J.W., Jr. 1955. Aspects of a population study of cavern-dwelling bats. J. Mammal., 36:379-390.
- Villa R., B. 1966. Los murcielagos de Mexico. Universidad Nacional Autonoma de Mexico, Instituto de Biologia, Mexico. 491 pp.