Bats of the United States

By COLIN CAMPBELL SANBORN

IN SPEAKING of any kind of animal it is not possible to generalize with the singular and it is seldom possible with the plural. It can be truthfully stated that bats fly, but there ends the one characteristic that applies to all bats. Their manner of flight, habitat, migration, hibernation, breeding habits, and food preferences are as varied as similar activities among other mammals, for there are many kinds of bats.

The order Chiroptera containing the bats is divided into 2 suborders, 17 families, 215 genera, and an estimated 2000 species and subspecies, so it is not a small group. Bats live around the world, north and south to the limits of tree growth, and up to altitudes of 13,000 feet above sea level. Every faunal area has its population of bats, but in the tropics the greatest diversity of species and abundance of individuals is found. Within the borders of the United States are 3 families—the Vespertilionidae, Molossidae, and Phyllostomidae—16 genera, and 65 species and subspecies.

All are beneficial to man in that they do not interfere with his activities or with his health, and most of them feed entirely on insects. Some bats consume according to estimates, from one-half to their full weight in insects in a day. Although it may not be known if these insects are beneficial or injurious or both, there would most certainly be a great overabundance if there was not some agency to hold their numbers in a reasonable balance. In these days when so much is published about controls of so many things, it should be remembered that bats are a major factor in controlling the insects.

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Study of Bats

Because the habits of bats are such that they are not easily studied, there are many long gaps in our knowledge of their life histories. Some colonial species living in large groups in caves, old buildings and other accessible locations have been studied, and considerable data have been assembled on their hibernation and reproduction. The recapture of bats marked with numbered metal bands on the forearms has supplied information on their age, sense of direction, migration, and power of flight. In fact, bat-banding has provided more information on the ecology of these mammals than any other method of study, but there is still a great deal more to learn about them. There are not enough students engaged in bat-banding, and recoveries have been too few, but it is a growing field of research and one with great possibilities. The book entitled "Bats" by Glover M. Allen is a most useful introduction to the study of these mammals (*1*).

Echo Location

By registering the voices of bats that are pitched too high for the human ear, it has been learned that some species become aware of obstacles in their line of flight by echo location. The sounds he makes are echoed and picked up by the bat. This has been called radar and sonar, but echo location is the best name for this ability. It is undoubtedly possessed by all the insectivorous bats that feed on the wing although experiments have been made on only a few genera.

Characters of Bats

Only the external characters of bats will be considered in this account as a means of identification. The only measurement used will be the length of the forearm because it is easily taken and more satisfactory for the student than trying to measure the total length of the bat. This method was adopted by Burt and Grossenheider in their field guide to the mammals, a very useful book with numerous colored illustrations and helpful distribution maps (*2*).

Many bats may be identified from external appearances, but it is in the skull and teeth that the more important characters are found. For example, bats have from 20 to 38 teeth, 4 of which are canines, but the number of incisors, premolars, and molars varies. Two bats could have the same total number of teeth but different numbers of various kinds of teeth; or the teeth could be of different shapes and sizes. No species has 22 teeth. The skulls also differ from each other; one species of bat has a ridged skull, and another species has a skull without

Key to the vampire bat of Mexico and to the 36 species of bats in the United States

Family, genus, and species	Popular name	Distinguishing character	Customary habitat	General distribution
Desmodontidae: *Desmodus* *D. rotundus murinus.*	Vampire bat.	No tail or tail membrane.	Caves, buildings.	Mexico, *not* in the United States.
Vespertilionidae	Simple-nosed bats.	Tail complete and contained in membrane; no growths on nose.	Predominately cave-inhabiting.	All the States.
Myotis	Little brown bats.	Bicolor; small size; long, pointed tragus.	Caves, buildings.	All the States.
M. lucifugus and 3 races.	Little brown myotis.	Fur glossy.	Caves, buildings.	Most of the States.
M. yummanensis and 2 races.	Yuma myotis.	Fur not glossy.	Caves, buildings.	Western States.
M. velifer and 1 race	Cave myotis.	Large size.	Caves, buildings.	Southwestern States.
M. keenii and 1 race	Keen's myotis.	Ears long.	Caves, buildings.	Northeast half and northwest coast.
M. evotis and 1 race	Long-eared myotis.	Ears longer.	Caves, buildings.	Western States.
M. thysanodes	Fringe-tailed myotis.	Tail membrane edged with hair.	Caves, buildings.	Western States.

ridges. Miller (*3*) classified all the families and genera on cranial and dental characters. Therefore, in collecting bats for future identification, the skull should be damaged as little as possible or not at all.

The Simple-Nosed Bats

In the United States, the Vespertilionidae—bats with simple or plain noses, with no leaves or other growths—is the family of bats with the most representatives. They may be further recognized by the complete membrane between the legs which supports a tail extending to its edge. There are 10 genera and 55 species and subspecies of the Vespertilionidae living in the United States. The members of this family are insectivorous, and most of them feed on the wing.

The Little Brown Bats, the Myotis

Of all the Vespertilionidae, the little brown bats, or the myotis—to use their generic name as a common one, are among the best known, are most widespread and have the greatest number of kinds. They are predominantly cave-inhabiting bats, living in caves, old buildings, and attics. Some species winter in caves in enormous numbers.

In the United States, there are 13 species and a total of 27 subspecies. They are small bats with a forearm length of about 1½ to 2 inches. The hair pattern in most is bicolored (dark bases, paler tips). The general color is dark

Key to the vampire bat of Mexico and to the 36 species of bats in the United States—Continued

Family, genus, and species	Popular name	Distinguishing character	Customary habitat	General distribution
M. volans and 2 races.	Long-legged myotis.	Short ears; small feet.	Caves, buildings.	Western States.
M. californicus and 2 races.	California myotis.	Like Yuma myotis, but feet smaller.	Caves, buildings.	Western States.
M. subulatus and 2 races.	Small-footed myotis.	Black mask on face; size small.	Caves, buildings.	West and northeast.
M. austroriparius	Mississippi myotis.	Fur thick, woolly.	Caves, buildings.	Mississippi Valley and southeast.
M. grisescens	Gray myotis.	Wings rise from base of tarsus.	Caves, buildings.	Northeast through central States.
M. sodalis	Indiana myotis.	Fur tricolor.	Caves.	Northeast and midwest.
M. occultus	Arizona myotis.	Color ochraceous.	Caves.	Southwest.
Eptesicus fuscus and 3 races.	Big brown bats.	Large size; heavy build; brown color.	Caves, buildings.	All the States.
Nycticeius humeralis	Evening bat.	Ears thick and leathery.	Buildings, hollow trees.	East and southeast.
Pipistrellus subflavus.	Eastern pipistrel.	Small; yellowish.	Caves, buildings.	Eastern States.

gray or brown except in some dark northwest races and paler desert forms. A number of species may occur in the same area, and the problem of distinguishing between them is often rather difficult. Most of them should be sent to a specialist for determination as the skull may have to be examined. The color, the small size, and the long-pointed tragus will identify the genus.

Both sexes hibernate or winter together. Copulation takes place in the fall and also in the spring, but fall-inseminated females can produce young in the spring without further insemination. A change in the temperature of the wintering cave may cause some of the population to move to another cave. In spring, the sexes separate; the females go to a different cave to bear their young, and the males leave for other retreats. Each female bears 1 young, sometimes 2.

The American members of the genus *Myotis* were revised in 1928 by Miller and Allen (*4*).

Key to the vampire bat of Mexico and to the 36 species of bats in the United States—Continued

Family, genus, and species	Popular name	Distinguishing character	Customary habitat	General distribution
P. hesperus and 4 races.	Western pipistrel.	Small; grayish.	Caves, buildings.	Western States.
Corynorhinus macrotis.	Eastern big-eared bat.	Ears large; 2 lumps on nose.	Caves, buildings	Southeast.
C. rafinesquei and 3 races.	Western big-eared bat.	Ears large; 2 lumps on nose.	Caves, buildings.	Western and central midwestern States.
Antrozous pallidus.	Pallid bat.	Very large ears, not joined.	Caves, buildings.	Western States.
Lasionycteris noctivagans.	Silver-haired bat.	Black; white tips on fur.	Under bark of trees.	All the States except deep south.
Lasiurus.	Red and hoary bats.	Tail membrane furred on upper side.	Trees and bushes.	All the States.
L. borealis and 1 race.	Red bat.	Red color.	Trees and bushes.	Eastern two-thirds of the United States; California; Arizona.
L. seminolus.	Seminole bat.	Mahogany brown.	Trees and bushes.	Gulf coast.
L. cinereus.	Hoary bat.	Large; yellow brown.	Trees and bushes.	All the States.
Dasypterus intermedius and D. floridanus.	Yellow bat.	Yellow; tail membrane haired on basal half.	Trees and bushes.	Gulf coast and Florida.
D. ega.	Western yellow bat.	Yellow color, etc.	Trees and bushes.	Southern California.
Euderma maculata.	Spotted bat.	Long ears; white spots on back.	Unknown.	Western States.

Myotis lucifugus

The little brown myotis (*Myotis lucifugus*) ranges over all eastern United States, south to Florida and northwest into Alaska. A dark race (*alascensis*) is found from southern Alaska to northern California and west into Montana and Idaho. A paler race (*carissima*) exists in the semiarid west from Montana to the California Sierras and eastern Oregon. A pale buffy desert race (*phasma*) occurs in the Great Basin of California and Colorado. These myotis live in caves, mine tunnels, attics, and old houses. Large colonies have been found wintering in northern Illinois, the caves of southern Indiana, and in Arkansas.

Myotis yummanensis

The Yuma myotis (*Myotis yummanensis*) is slightly smaller than the little brown myotis and has shorter and less glossy fur. It is a western species ranging from the arid Great Basin into eastern Texas. A darker race

Key to the vampire bat of Mexico and to the 36 species of bats in the United States—Continued

Family, genus, and species	Popular name	Distinguishing character	Customary habitat	General distribution
Molossidae	Free-tailed bats.	Tail extends past membrane.	Caves, buildings.	Mainly western and southwestern States.
Tadarida mexicana.	Mexican free-tailed bat.	Small size.	Caves, buildings.	Western States.
T. cynocephala.	Florida free-tailed bat.	Small size.	Caves, buildings.	Gulf coast.
T. molossa.	Big free-tailed bat.	Larger; large ears.	Caves, buildings.	Texas.
T. femorosacca.	Pocketed free-tailed bat.	Forearm, 2 inches.	Caves, buildings.	Arizona; California.
Eumops perotis californicus.	Western mastiff bat.	Very large; forearm over 3 inches.	Buildings and cliffs.	Southern California.
E. glaucinus	Florida mastiff bat.	Smaller.	Buildings.	Miami, Fla.
Phyllostomidae.	Leaf-nosed bats.	Leaf-like growth on end of nose.	Caves.	Southwestern States.
Macrotus californicus.	Leaf-nosed bat.	Ears large.	Caves, buildings.	Arizona, Nevada, and southern California.
Leptonycteris nivalis.	Long-nosed bat.	Large size; no tail.	Caves.	Southern Arizona and Texas.
Choeronycteris mexicanus.	Hog-nosed bat.	Short tail.	Caves.	Southern Arizona and California.
Mormoops megalophylla.	Leaf-chinned bat.	Face short; folds of skin under chin.	Caves.	Southwest border of the United States.

(*saturatus*) lives in the moist northwest, ranging from northern California to southern British Columbia. A form which is intermediate in color (*sociabilis*) is found in Idaho, Montana, eastern California, and on the coast of southern California. This bat has been taken in association with the long-legged (*Myotis volans*) and California myotis (*Myotis californicus*) in the roof of an old building in southern California and with the Arizona myotis (*Myotis occultus*) under a bridge. A colony of 1,000 present on the 3d of September under a galvanized iron roof had dropped to 200 on the 23d of September, and all had gone by the 16th of December. A large colony was found at the 100- and 200-foot levels of a mine.

Myotis velifer

The cave myotis (*Myotis velifer*) is larger than the little brown myotis. It has a general color of dull sepia or drab above and is paler on the underparts with pure white hairs on the sides of the belly. It lives in southern California and western Arizona. A paler race (*incautus*) ranges through the arid parts of Texas, New Mexico, and northeast Kansas. It is usually found in caves, sometimes in large numbers. A colony in Riverside County, Calif., was present from May through August.

Myotis keenii

Keen's myotis (*Myotis keenii*) of southern Alaska, British Columbia, and Washington is distinguished by its very long ears, which extend well beyond the nose when they are bent forward. It is less glossy and more buffy in color than the little brown myotis. An eastern race (*septentrionalis*) has a wide range from Arkansas, Missouri, and North Dakota east to the Atlantic coast and north to Canada. It has been found wintering in caves in northern Illinois and Arkansas and was at once noticeable by the long ears.

Myotis evotis

Another western myotis is the long-eared myotis (*Myotis evotis*), which differs from Keen's myotis by its still longer black ears, its contrasting light brown color, and by a fringe of scattered hairs on the edge of the tail membrane. One race (*evotis*) is found in the northwest—Washington, Oregon, and northern California; and a lighter form (*chrysonotus*) is found in the west and southwest. It is not a very common bat; those taken have been found in old buildings—one was found in a tent—but so far it has not been observed in caves or mine shafts.

Myotis thysanodes

The fringe-tailed myotis (*Myotis thysanodes*) is larger than the long-eared species; its ears are shorter, and it is most easily identified by the heavy fringe of hairs on the edge of the tail membrane. It is also western in distribution—from Washington south into Mexico. The fur is buff in color, paler on the underparts. It has been found in old buildings, attics, ruins, and mine tunnels.

Myotis volans

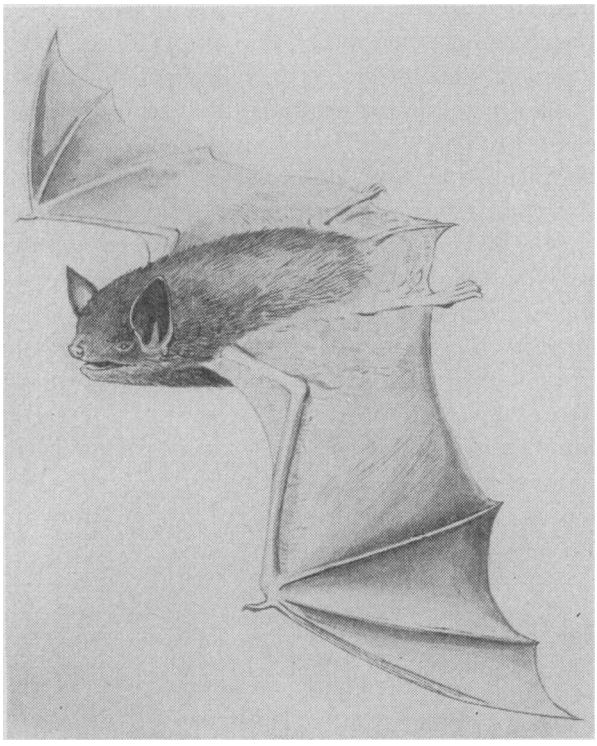
The range of the long-legged myotis (*Myotis volans*) includes all the west coast east to Idaho, Montana, and New Mexico. It is about the size of the little brown myotis but has shorter, rounded ears, a small foot, a keeled calcar, and more fur on the under side of the wing membrane. The northern race (*longicrus*) is smoky brown, and the southern race (*interior*) is ochraceous buff or tawny. There is much variation in the color, however, depending on the amount of wear and the season. It lives in the roofs of old buildings, and young have been found in June.

Myotis californicus

The California myotis (*Myotis californicus*) is much like the Yuma myotis but has a smaller foot and occupies the same general range in the west. A darker form (*caurinus*) is found from Alaska to northern California. The typical race (*californicus*) lives in California and west to Arizona, New Mexico, and Texas but is replaced in the Great Basin by a paler form (*pallidus*). In color, these bats are brown or ochraceous. They have been found roosting in caves, mine tunnels, and old buildings.

Myotis subulatus

The masked myotis (*Myotis subulatus*) is sometimes confused with the little brown myotis but may be distinguished by its black face and ears. The midwestern race (*subulatus*) of



Little brown myotis (*Myotis lucifugus*).

the dry plains, from Kansas and Colorado to Montana, is some shade of buff above and buff to nearly white below. A darker form (*melanorhinus*) is found from Washington south through California and west to Texas. A third race occurs in eastern United States—this is Leib's myotis (*leibii*), and is a cave inhabitant of the eastern States, west to Ohio.

Myotis austroriparius

The Mississippi myotis (*Myotis austroriparius*) is found along the gulf coast from Florida to Georgia and has been recorded as having been found in Tennessee and southern Indiana. Although it is very similar to the little brown myotis, it can usually be identified by the short, thick wooly fur. It lives in caves and old buildings. One or two young are born in May (*5*).

Myotis grisescens

A large heavy-bodied myotis in which the wing is attached to the ankle instead of the side of the foot is the gray myotis (*Myotis grisescens*). The fur is almost unicolor above instead of being darker at the base. Its range is from southern Illinois and Indiana, south to Georgia and Alabama, and west to Missouri and Arkansas. It is a cavedweller and may occupy the same cave throughout the year. A colony of females with small young was found in an Arkansas cave in the middle of June.

Myotis sodalis

One myotis is known from wintering colonies only, no group of breeding females having been found. This is the Indiana myotis (*Myotis sodalis*) which ranges from Vermont to Alabama and west to Arkansas. It is similar to the little brown myotis, but the foot is smaller and the fur in unworn pelage has a tricolor pattern. This is one of the myotis which has been observed to shift from one cave to another during winter.

Myotis occultus

A colony of the rare Arizona myotis (*Myotis occultus*) was discovered in 1939 in southern California (*6*). Before 1939, it had been known from a few specimens collected in New Mexico, Arizona, and California. This colony was located roosting in crevices on the under side of a bridge. It was under observation from the 20th of April to the 13th of August but had disappeared when a visit was made on the 17th of February. This myotis appears to be in the process of losing one of the small upper premolars—the premolar was absent in 45 of 67 skulls examined. The bat is ochraceous, tawny above and buff below.

The Big Brown Bats

The big brown bats of the genus *Eptesicus* are worldwide in distribution. They are represented in the United States by one species (*Eptesicus fuscus*) which is divided into four subspecies based on color. This bat is found all over the United States, and there is some intergradation between races. The eastern form (*fuscus*) is olive brown above, but the color becomes darker and richer in the Florida race (*osceola*). In the drier parts of the west and the southwest is found a pale form (*pallidus*) in which the underparts are almost white, while on the California coast north to British Colombia lives a dark race (*bernardinus*). It is easily identified by the rounded ears, the

Big brown bat (*Eptesicus fuscus*).

blunt tragus, its color and size, and a forearm about 2 inches long. The bats live in small colonies in caves, attics, and old buildings and hibernate in caves. Eleven females in captivity gave birth to 23 young.

The Evening Bat

Rafinesque's or the evening bat (*Nycticeius humeralis*) is small (forearm, 2 inches) and differs from the myotis by the blunt tragus and the rounded thickened ears. Although it has been taken in Michigan and Illinois, it is more common in the south and ranges to Florida and Texas and west to Arkansas and Missouri. Harper (*7*) records a colony of 50 in Georgia, found in a hole of a dead cypress 45 feet from the ground. This was on the 25th of May; the females had 2 young. Young have been recorded from Alabama and Georgia in the last week of May. We have no notes on hiberation, but we believe it migrates south in winter from the northern States.

The Pipistrels

The pipistrels, called Georgian bats in the east, are among our smallest bats. The forearm length is a little over 1 inch. Besides their small size, they can be distinguished from the myotis by the blunt, rather than pointed, tragus. In the eastern species, the forearm is a lighter color than the wing membrane. Also, the fur is tricolored. The eastern pipistrel (*Pipistrellus subflavus*), yellowish in color, ranges over the eastern half of the country and roosts in attics, old buildings, and caves. Hibernation has been observed in Arkansas earlier than is usual for the myotis; many of this species have been found in a semidormant state early in October. One to three young are produced each year. The western pipistrel (*Pipistrellus hesperus*) is a whitish or yellowish gray with black ears. It ranges from western Texas north to Washington; over this area, a number of slightly different races have been named. It has been found under rock slabs on mountainsides, in crevices of rocks, and in crevices in mine tunnels.

The Big-Eared Bats

The lump-nosed or big-eared bats of the genus *Corynorhinus* are well named, for their ears, which are joined in the middle, are over an inch in height. In front of the eyes are two prominent lumps. The color is a shade of brown with no white spots so this genus cannot be confused with any other bat. The eastern species (*Corynorhinus macrotis*) is confined to the southeastern part of the United States. The western species (*Corynorhinus rafinesquei*) and its races are found over all the west and east through southern Illinois, Indiana, and into Tennessee.

A most complete study of the western bat was published in 1952 (*8*). This reports them roosting in attics and caves, always hanging from wall or ceiling, and never hiding in cracks or crevices. Winter roosts, summer nurseries, and night-resting spots where they retired after feeding, were used. Mating occurred from October through the winter, and young appeared in late May. The young were able to fly in about 3 weeks.

The Pallid Bat

The pallid bat (*Antrozous pallidus*) and its races are similar to the big-eared bats in that they have long ears, but these are not joined and the nose lacks the lumps in front of the eyes. They range over the west, from Washington

south to western Texas. The general color is yellowish. Its intensity depends on the area; it is lightest in desert country and darkest in the northwest. These bats roost in crevices or caves, mine tunnels, and old buildings (a female with 2 young was found in the cavity of a dead cypress in Mexico). The pallid bat appears to be, to some extent at least, a ground-feeder. Some items of its food have been identified as beetles (*Polyphylla*), grasshoppers, scorpions, and the flightless Jerusalem cricket. In fact, one collector reported catching two of these bats in mousetraps set on the ground.

The Tree-Living Bats

Bats of the six genera—*Myotis*, *Eptesicus*, *Nycticeius*, *Pipistrellus*, *Corynorhinus*, and *Antrozous*—are all colonial species living in caves, old buildings, and other sheltered places. Those to be described are all tree-living, hanging singly in bushes or trees or sheltering under loose bark of trees. Three of them are migratory and during migration often appear around buildings. Their ranges cover almost all of the United States.

The first is the silver-haired bat (*Lasionycteris noctivagans*), so named because the almost black fur is tipped with white, giving it a frosted or silvery appearance. Another characteristic is that the upper side of the tail membrane is completely covered with hair. It is often found roosting under the loose bark of pine trees. The female bears two young. Some individuals are migratory; 2 were found on board a ship 20 miles off the coast of North Carolina. It has also been reported hibernating in New York State.

The Red and Hoary Bats

There are two other tree-living bats in which the upper side of the tail membrane is covered by hair. These are the small red bats (*Lasiurus borealis*), with forearms of about 1½ inches, and the larger hoary bat (*Lasiurus cinereus*) whose forearm is more than 2 inches long. Both are solitary species roosting in trees and bushes. Red bats have been seen hanging in sumac less than 3 feet from the ground.

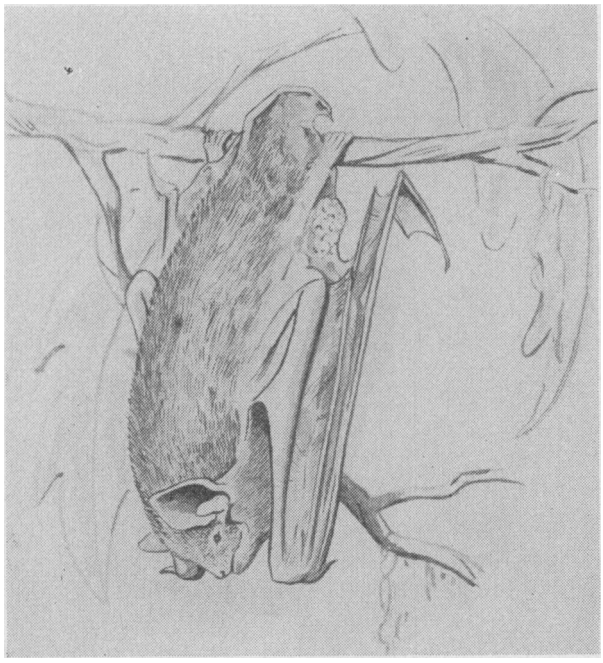
Red Bat (*Lasiurus borealis*).

The red bat is brownish red in summer and duller in winter when the hairs are tipped with white. The gulf coast form is dark, more black than red, and is called the Seminole bat. The western race (*Lasiurus borealis teliotis*) is paler. The eastern form has been recorded from Bermuda in winter and has twice been observed in September on ships off the coast of North Carolina. The red bat has 3 to 4 young. It feeds on insects usually taken on the wing, but a Seminole bat was shot with a cricket in its mouth which it must have taken from or near the ground.

The hoary bat is brown with white-tipped hairs and a buffy throat. It is also migratory, going south in winter. It has two young which sometimes become too heavy for the female to carry. One mother was found on the ground with 2 young weighing 25 percent more than she weighed.

The Yellow Bats

The yellow bats are also tree-living, but in them it is only the basal third of the tail membrane that is furred. They are medium-sized bats (forearm, about 2 inches long) and are yellowish in color. Their range is South America and Mexico, but one species (*Dasypterus intermedius*) ranges along the gulf coast from Texas into Florida. In Florida, *Dasypterus intermedius* is referred to as a Florida yellow



Yellow bat (*Dasypterus intermedius*).

bat (*Dasypterus floridanus*). Another (*Dasypterus ega*) is found in southern California. They are known to have 3 to 4 young. Since they are not easily accessible for study or banding, little has been learned of their habits. They roost in trees and bushes. In Florida during August, they are early flyers, appearing about sunset.

The Spotted Bat

The rarest bat in the United States is the spotted bat (*Euderma maculata*). It cannot be confused with any other bat as the upper side is dark brown and is marked with white at the base of the ears, with a white spot on each shoulder, and with another at the base of the tail. The ears are more than 1 inch in length. The forearm is about 2 inches. The 9 known specimens have been taken in California, Nevada, Arizona, New Mexico, Utah, and Montana. They were found hanging on a fence, on the base of a cliff, on the sides of buildings under the eaves, and dead in buildings.

The Free-Tailed Bats

The *Molossidae* or free-tailed bat is the second family of bats in the United States. The tail, instead of being wholly in the membrane, extends some ways beyond it. The family is represented by 2 genera and 6 species. Caves, old buildings, and attics are all used as roosting places. These bats do not hang from the ceilings or walls but prefer to hide in cracks and crevices. Their presence is marked by a very strong musky odor.

Tadarida mexicana

Best known among the *Molossidae* is the Mexican free-tailed bat (*Tadarida mexicana*) which is the species living in the Carlsbad Caverns, N. Mex. They arrive there early in March, and the colony increases during the summer until early fall when millions are present. Most of them have left by November. The recovery of a banded specimen showed that it had flown 800 miles into Mexico.

Tadarida cynocephala

A closely related species, the Florida free-tailed bat (*Tadarida cynocephala*), is found in Florida and along the gulf coast. A colony studied by Sherman (*9*) was present during the entire year except for a week in March which appeared to be the breeding period. The females each produced one young in June.

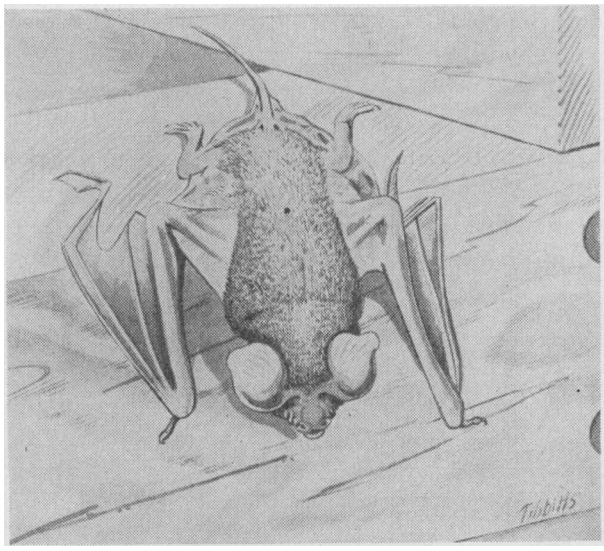
Tadarida molossa

There are two other free-tailed bats of the genus *Tadarida* but neither are found in such large colonies. The big free-tailed bat (*Tadarida molossa*), with a forearm of about 2½ inches, is widespread over South America and into Mexico. One large colony has been reported from Texas, and there are records of single specimens from Iowa and many of the western States. The Texas colony reported by Borell in 1939 (*10*) was found in a crevice of a cliff and was composed of females only. It was discovered in May, when the females were pregnant, and remained until the middle of October.

Tadarida femorosacca

The pocketed free-tailed bat (*Tadarida femorosacca*) is a Mexican species that just extends over the border of the United States where it has been reported from Arizona and California.

All these bats are reported as not leaving their roosting places until after dark. They are also



Free-tailed bat (*Tadarida mexicana*).

known as "guano" bats because the droppings from large colonies form deposits of commercial value as fertilizer.

The Mastiff Bats

The largest of the free-tailed bats are known as the mastiff bats. One species (*Eumops perotis californicus*) is found in southern California and Arizona. The other (*Eumops glaucinus*) is known from a colony in the Miami High School, Florida. It has been present since 1928 but does not increase in size.

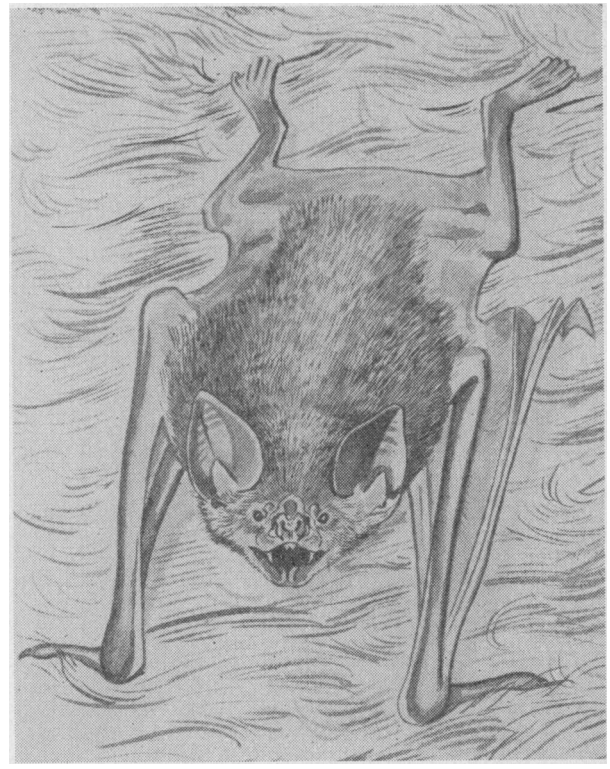
The California mastiff bat is the largest bat in the United States. The forearm is over 3 inches long. Its size and large ears easily identify it. It lives in colonies up to 70 in old buildings, attics, crevices of buildings and cliffs. The roosts are usually where the animal has a drop of about 30 feet below it to enable it to take wing. Like other free-tailed bats they fly late and return to the roost in about an hour. It is believed that they leave again for another meal before dawn. The one young is born late in May or June. Howell has published two papers (the second with Little) concerning their habits and young (*11*, *12*).

The Leaf-Nosed Bats

The third and last family of bats inhabiting the United States are tropical species that just cross the Mexican border. All are leaf-nosed bats of the family Phyllostomidae. They are easily identified by a triangular leaf on the top of the nose. They belong to four different genera with relatives in Central and South America and in the West Indies.

The California leaf-nosed bat (*Macrotus californicus*) lives in mine tunnels, caves, and sometimes old buildings in California, Arizona, and Nevada, in colonies up to 500. Their legs are long, and they hang from the ceiling making a half turn in the air when alighting. They are of good size—the forearm is about 2 inches long—gray in color, and have a tail that extends to the edge of the membrane. Items of their food have been identified as moths, grasshoppers, katydids, and harvest flies, some of which must have been taken from the ground. One specimen was taken in a mousetrap. The one young is born in late May or June.

The long-nosed bat (*Leptonycteris nivalis*) has a very long muzzle, as the name implies, and no tail. The ears are small, and the forearm is about 2¼ inches long. Large colonies have been found in the Big Bend National Park region of Texas and others in mine tunnels in



Vampire bat (*Desmodus rotundus murinus*).

Arizona. It is believed to feed on insects from night-blooming flowers because cactus pollen has been found in some of the stomachs examined.

Another leaf-nosed bat resembling the long-nosed bat is the hog-nosed bat (*Choeronycteris mexicanus*). It is smaller than the long-nosed bat; the forearm is less than 2 inches; and it has a short tail half the length of the tail membrane. It may have the same feeding habits, however. It is recorded from mine tunnels in Arizona and from garages and buildings in San Diego, Calif. Young attached to the female were found in July.

The leaf-chinned bat (*Mormoops megalophylla*) has a grotesque face formed by folds of skin across the chin of the short face. It is a cave-inhabiting species and has been recorded from the United States only a few times.

The Vampire Bat

A bat not living in the United States but of particular interest as it appears to be increasing its range to the north is the vampire (*Desmodus rotundus murinus*). It ranges from Uruguay and central Chile north into Mexico. It lives from the seacoast to 11,000 feet above sea level in Peru and over the Andes into the hot jungle where it probably roosts in hollow trees. It has been found in palm-thatched huts in central Brazil.

The vampire has fewer teeth (*20*) than any other bat, and the premolars and molars are functionless. The canines are large, and the upper incisors are large, pointed, and sharp. It is with these that it scoops out a bit of skin from its host and then laps up the blood. Its victims may be fowls, cattle, horses, dogs, people, or other bats.

A tightly screened building or a strong light is the best protection against vampires. When I was in Brazil, I had to tie my horses to a picket line and hang a powerful gasoline lantern over them to keep the bats away. Before that, 14 vampires were found feeding on 1 horse.

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