Bats are Beautiful

Dr. Hugh H. Genoways, Curator, Section of Mammals, and Dr. Robert J. Baker, Research Associate in the Section of Mammals, and Professor of Biological Sciences, Texas Tech University, discuss their research on the unique New World bats of the family Phyllostomidae. Their most recent research trip to Jamaica was funded by the M. Graham Netting Research Fund, through a grant from the Cordelia S. May Charitable Trust.

The thought that "Bats are Beautiful" may bring a smile to your face as you think of these ugly little creatures hanging from the ceilings of haunted houses and flying around deserted bell towers at midnight. You may also remember old wives tales such as "all bats have rabies" or "bats try to fly into women's hair." None of these things is completely true, and some of the tales have no basis in fact whatsoever.

Actually, the 875 species of bats form a unique Order of mammals (those animals possessing hair at least somewhere on their bodies), since they are the only mammals capable of true flight. The flying squirrel familiar to many western Pennsylvanians actually only glides from one place to another. Bats occur almost everywhere in the world except in the coldest regions, such as the Arctic, Antarctic, and the most remote oceanic islands. One reason that very little has been known about bats is that they are active at night, so they are difficult to observe. This association with darkness is one of the main factors in our association of bats with witches and devils, and our general misgivings about them. However, in many areas the careful observer can see bats in the evening just at twilight as they leave their daytime roosts or dart about catching insects. In the daytime, bats seek refuge in a wide variety of places such as caves and mines; the branches and hollows of trees; houses, barns, and other man-made structures; rock crevices, under rocks, and many other places.

For the past six years, we have been studying bats of the Family Phyllostomidae, the New World leaf-nosed bats. These animals occur throughout the tropical portions of North and South America with a few species reaching as far north as the Southwest of the United States. Some species also occur on the Caribbean islands, where we have been conducting our most recent studies. During the summer of 1977 we, along with Dr. John W. Bickham of Texas A & M University, visited the island of Jamaica to complete our studies of the bat fauna of the island. This work was supported by a grant from the M. Graham Netting Research Fund of Carnegie Museum of Natural History.

The New World leaf-nosed bats, as the name implies, are characterized by a peculiar structure occurring on the top of the nose. In many of the 137 species of this family, the structure is more or less leaf-shaped. However, this structure is unique in each species and may be highly modified in some species (as the accompanying photographs will show). The structure may be extremely long in some species, such as Tomes' long-eared bat, 'Lunchorina aurita,' where it may be over 1¼ inches long, or nearly absent in some species such as the Antillean cave bat, 'Brachyphylla cavernarum,' or the wrinkle-faced bat, 'Centurio senex.'

One of the truly unique features of this family is the wide variety of foods that they are able to eat. This diversification in food habits is believed to be the main evolutionary force allowing so many species to be formed and habitats to be occupied by members of the family.
One of the subfamilies (a group of closely related species), Phyllostomatinæ, eats primarily insects and other small animals, but will occasionally eat some fruits. One of the species, the spear-nosed bat ('Phyllostomus hastatus'), has been known to eat small bats and mice as well as insects, whereas the fringelipped bat ('Trachops cirrhosus'), takes various species of lizards and frogs as well as insects. The largest bat in the New World (wingspread 36 inches), the false vampire bat ('Vampyrus spectrum'), is a member of this subfamily. The primary food of this species is birds, which they hunt at night. These bats feed mainly on flock species of birds, which they locate in night roosts, probably by detecting their odor.

Members of the subfamily Glossophaginae feed upon pollen, nectar, other flower parts, and insects. Species in this group have elongated snouts, some extremely so (see accompanying photographs of the long-tongued bat, 'Glossophaga soricina,' and Antillean long-tongued bat, 'Monophyllus redmani'). This allows them to reach the pollen and nectar, particularly in trumpet-shaped flowers. These bats served as the primary pollinators, replacing bees, for some tropical plants, such as bananas.

Some of the most common species of phyllostomatid bats belong to the subfamily Stonodermatinae. These bats feed mainly on fruits, such as mangos, papaya, bananas, palm fruits, wild figs, and other wild fruits. This group is of considerable economic importance because many of the fruits eaten by these bats are also eaten by humans.

The subfamily Phylonycterinae is confined to the islands located in the Caribbean Sea. We have been studying this unique group of bats since 1974. Members of this group feed on fruit, pollen, nectar, and flower parts.

The vampire bats, with which all of you will be familiar, are members of the subfamily Desmodontinae. There are three species of vampires in this subfamily. All feed on blood. The common vampire ('Desmodus rotundus') feeds mainly on blood of other mammals, whereas the hairy-legged vampire ('Diphylla ecaudata') and white-winged vampire ('Diaemus youngii') feed mainly on the blood of birds. These bats

1 -- Waterhouse's big-eared bat (Macrotus waterhousii) hanging from the ceiling of a limestone cave on Jamaica. Another member of this genus occurs in the Southwest of the United States. These members of the subfamily Phyllostomatinæ catch many of their prey insects and arachnids on the ground.

2 -- On the head of the greater rounded-eared bat (Toratia bidens), a member of the Phyllostomatinæ, can be noted part of the white line that extends down the back of the species.

Two members of the insect-eating subfamily Phyllostomatinæ, 3 -- Hairy spear-nosed bat (Mimon crandalum) has an elongated nose leaf and large ears.
4 — The large southern spear-nosed bat
(*Phyllostoma stenops*) is about
the fourth largest
species of bat in the
New World.

5 — Long-tongued
bat, (*Glossophaga soricina*), and
Antillean long-
tongued bat,
(*Monophyllus radiatus*) (6 — are
members of the
subfamily
Glossopaginaceae.
Note the elongated
snouts of these species.
Members of this
subfamily use the
elongated snouts and
tongues to obtain
pollen and nectar
from flowers.

Three species of the
subfamily Steno-
derminae. 7 — The
Jamaican fruit-eating
bat, (*Artibeus jamaicensis*), is one
of the most common
members of the
family in most of the
New World tropics.
8 — Neotropical leaf-nosed bat, *Sphaeronycteris toxophyllum*, is a rare species. Only males of this species have the highly modified nose leaf seen here. 9 — Greater white-lined bat, *Chiroderma villosum*, and other members of the genus *Chiroderma* are characterized by large eyes.

10 — Jamaican fig-eating bat, *Ariteus flavescens* is a rare species that occurs only on the island of Jamaica. Note the white spot on the shoulder of this species. 11 — Greater white-lined tailless bat, *Vampyrodes caracciolo* and several other members of the subfamily *Stenoderminae* are characterized by white lines on their backs.
These three members of the subfamily Phyllonycterinae are confined to the Antillean islands. Note the reduced nose leaf of all of these species. 12—Antillean cave bat, *Brachyphylla cavernarum.* 13—Buffy flower bat, *Erophylla sezekorni.* 14—Jamaican flower bat, *Phylonycteris aphylla.*

Feed by biting their prey with their razor-sharp teeth. The blood flows freely from the wound because the saliva of these bats contains an anticoagulant. The bats lap up the blood as it flows from the wound; they do not suck the blood of their prey.

Our studies have centered on determining the answers to such questions as how many species of phyllostomatid bats are there? What are their relationships to each other? Where do the different species of phyllostomatid bats occur? How did they get there? What chromosomes (cellular units that carry the hereditary material of living organisms) do each species have? How did the bat faunas inhabiting the Caribbean islands develop?

What is the value of knowing this kind of information? Phyllostomatid bats compose a major component of the ecosystems of the New World tropics. On several nights we have collected between 500 and 1000 specimens from a few paths and streambeds in an area less than one-half square mile. The human populations of the New World tropics are increasing at a tremendous rate. This means that the habitats, especially the forests, are being destroyed at a very high rate. In order to be able to preserve a portion of these areas, it is necessary to understand their functioning. Our studies of the bat faunas should aid in this understanding.

Another aspect being investigated is how the sex of individuals of these bats is determined. The sex of individual humans is determined by the inheritance of a combination of two chromosomes, and some phyllostomatid bats have the same mechanism as humans. However, there are several other mechanisms used by some of the species in this family. An understanding of these unique mechanisms may lead to an understanding of the abnormalities in inheritance of sex in humans.

Certainly one simple reason for studying these bats is that facts such as those above are not currently known. They are of interest even if they do not lead to learning of anything of economic value; the information has biological value. After studying and learning about bats, we have become more and more convinced that “Bats are Beautiful.”

—Hugh H. Genoways and Robert J. Baker
Two members of the subfamily Stenodermatae. 15 — Guadeloupe white-lined bat (*Chiroderma improvisum*) was described as a new species by us in 1976. 16 — The wrinkle-faced bat (*Centurio senex*) has a nearly naked face. This species has a flap of skin under its chin that it uses to cover its face and eyes while it sleeps hanging in trees.

17 — The hairy-legged vampire, (*Diphylla ecaudata*), is one of the species of phyllostomatid bats that feeds on blood. 18 — Peters’ tent-making bats (*Urodema bilobatum*) cut the mid-ribs of palm leaves or banana leaves so that they hang down forming a “tent.” These bats hang up on the under side of these “tents” and sleep during the daylight.